NV8500 Family Digital Routers

User's Guide

Miranda

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- **Revision**: 2.3
- **Software Version**: -none-
- **Part Number**: UG0034-04

Notice

FCC Statement

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.

Declaration of Conformance (CE)

All of the equipment described in this manual has been designed to conform with the required safety and emissions standards of the European Community. Products tested and verified to meet these standards are marked as required by law with the CE mark. (See Symbols and Their Meanings on page v.)

When shipped into member countries of the European Community, this equipment is accompanied by authentic copies of original Declarations of Conformance on file in Miranda GVD offices in Grass Valley, California USA.

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Contact Miranda for details on the software license agreement and product warranty.

Technical Support Contact Information

Miranda has made every effort to ensure that the equipment you receive is in perfect working order and that the equipment fits your needs. In the event that problems arise that you cannot resolve, or if there are any questions regarding this equipment or information about other products manufactured by Miranda, please contact your local representative or contact Miranda directly through one of the appropriate means listed here.

- Main telephone: 530-265-1000 (9 am to 9 pm PST)
  Fax: 530-265-1021

  In the Americas, call toll-free: +1-800-224-7882 (9 am to 9 pm EST)
  In Europe, the Middle East, African or the UK, call +44 (0) 1491 820222 (9 am to 6 pm, GMT)
  In France, call +33 1 55 86 87 88 (9 am to 5 pm, GMT + 1)
  In Asia, call +852-2539-6987 (9 am to 5 pm, GMT + 8)
  In China, call +86-10-5873-1814
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Note Return Material Authorization (RMA) required for all returns.

Change History

The table below lists the changes to the Digital Router User's Guide.

- User's Guide Part # UG0034-04
- Software version: -none-

Rev	Date	ECO	Description	Approved By
1.0	21 Apr 09	15703	Initial release.	DM, DC
2.0	10 Oct 09	16114	Incorporates material for the NV8576, NV8280, and NV8144 with corrections and new information.	DM, DC
2.1	12 Jan 10	16272	Minor corrections, page 74, 76.	DM, DC
2.2	27 Mar 10	16912	Changes to SFP modules; UniConfig connections; Added signal numbering for backplanes. Changed WECO to terminal block. Added monitoring functions for NV8144.	DEM, RH, BH
2.3	01 Feb 11	17412	Address signal numbering for backplanes. Updated for new monitor backplane for NV8144. Address hybrid cards and functionality, NV8300 and PS8300, changes to I/O cards. Removed NV8280-Plus. New port numbering.	DEM, RH, BH

Restriction on Hazardous Substances (RoHS)

Miranda is in compliance with EU Directive RoHS 2002/95/EC governing the restricted use of certain hazardous substances and materials in products and in our manufacturing processes.

Miranda has a substantial program in place for RoHS compliance that includes significant investment in our manufacturing process, and a migration of Miranda product electronic components and structural materials to RoHS compliance.

It is our objective at Miranda GVD to maintain compliance with all relevant environmental and product regulatory requirements. Detailed information on specific products or on the RoHS program at Miranda is available from Miranda Customer Support at

1-800-719-1900 (toll-free) or
1-530-265-1000 (outside the U.S.).

Important Safeguards and Notices

This section provides important safety guidelines for operators and service personnel. Specific warnings and cautions appear throughout the manual where they apply. Please read and follow this important information, especially those instructions related to the risk of electric shock or injury to persons.

Warning

Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any service other than that contained in the operating instructions unless you are qualified to do so.

Symbols and Their Meanings

The lightning flash with arrowhead symbol within an equilateral triangle alerts the user to the presence of dangerous voltages within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle alerts the user to the presence of important operating and maintenance/service instructions.

The Ground symbol represents a protective grounding terminal. Such a terminal must be connected to earth ground prior to making any other connections to the equipment.

The fuse symbol indicates that the fuse referenced in the text must be replaced with one having the ratings indicated.

The presence of this symbol in or on Miranda equipment means that it has been designed, tested and certified as complying with applicable Underwriter's Laboratory (USA) regulations and recommendations.

The presence of this symbol in or on Miranda equipment means that it has been designed, tested and certified as essentially complying with all applicable European Union (CE) regulations and recommendations.

General Warnings

A warning indicates a possible hazard to personnel which may cause injury or death. Observe the following general warnings when using or working on this equipment:

- Heed all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.
- This equipment is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the equipment inputs or outputs.
- Route power cords and other cables so they are not likely to be damaged.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages may exist at several points in this equipment. To avoid injury, do not touch exposed connections and components while power is on.
- Do not wear rings or wristwatches when troubleshooting high current circuits such as the power supplies.
- To avoid fire hazard, use only the specified fuse(s) with the correct type number, voltage and current ratings as referenced in the appropriate locations in the service instructions or on the equipment. Always refer fuse replacements to qualified service personnel.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Have qualified service personnel perform safety checks after any service.

General Cautions

A caution indicates a possible hazard to equipment that could result in equipment damage. Observe the following cautions when operating or working on this equipment:

- When installing this equipment, do not attach the power cord to building surfaces.
- To prevent damage to equipment when replacing fuses, locate and correct the problem that caused the fuse to blow before re-applying power.
- Use only the specified replacement parts.
- Follow static precautions at all times when handling this equipment.
- This product should only be powered as described in the manual. To prevent equipment damage, select the proper line voltage on the power supply(ies) as described in the installation documentation.
- To prevent damage to the equipment, read the instructions in the equipment manual for proper input voltage range selection.
- Some products include a backup battery. There is a risk of explosion if the battery is replaced by a battery of an incorrect type. Dispose of batteries according to instructions.
- Products that have (1) no on/off switch and (2) use an external power supply must be installed in proximity to a main power output that is easily accessible.

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1. Introduction

The NV8500 family is a series of highly flexible high-density routers supporting standard-definition (SD), high-definition (HD) and 3.0 Gb/s (3Gig) video signals, and AES digital asynchronous (AES async) and MADI (Multichannel Audio Digital Interface) audio signals. This section provides an overview of the NV8500 family of routers, including signal flow and rates, power supply, active cards and frame expansion. It is recommended that you read this section before starting any installation tasks.

Product Overview

The NV8500 family is composed of several routers that are either standalone routers or "expandable" routers that can be connected together to create larger switching matrices. Expandable router frames are denoted by the word "Plus". A fully non-blocking matrix architecture allows for one-to-one and one-to-many routing. Because inputs and outputs are independent, configurations do not have to be numerically squared or identical in number.

The configuration of an individual router is based on the input or output cards installed. There are two general classes of I/O cards: standard and hybrid. Standard input cards receive incoming SD, HD or 3Gig video signals, or AES Async audio signals. The signals are forwarded to the crosspoint card, which in turn routes the signal to standard output cards for distribution.

Hybrid I/O cards perform the same tasks as standard I/O cards, but allow for much greater flexibility and additional signal options. Previously, to route MADI audio signals *and* SD, HD or 3Gig video signals required two separate router frames: one for audio signals and one for video signals. Hybrid cards enable you to realize the full routing potential of these two separate routers in a single frame.

Part of the hybrid offering is a unique input card that can receive up to 8 video inputs *plus* one MADI stream, and an output card that can distribute 16 video outputs *plus* two MADI streams. Used in combination with the Miranda NV8900 converter, these inputs and output cards enable the full switching matrix to be used, not just a subset, when managing AES signals. For details, see Using an AES/MADI Converter (NV8900) on page 4.

In addition, hybrid I/O cards enable you to manage video signals and their associated embedded audio without using an external de-embedder/embedder and separate audio router to route the audio. Because video and embedded audio channels are routed within a single router frame, the occurrence of any audio/video delay is minimized and predictable.

Hybrid I/O cards are also designed as a "green" alternative requiring fewer resources, specifically:

- Less facility space and power is needed because one NV8500 Series router can perform routing functions that previously required two frames.
- The need to power and house separate video/audio de-embedders and embedders is eliminated.
- Increased flexibility enables you to maximize the signals routed through a single existing router frame; one frame can be configured to meet specific, unique routing needs.

- Expandable frames enable you to create switching matrices that can easily grow to meet future needs without investing in multiple standalone routers.

Hybrid I/O cards work in tandem with hybrid crosspoint cards and hybrid control cards. If any hybrid I/O cards are installed, all control cards and crosspoint cards in the frame must also be hybrid. Standard and hybrid control cards or crosspoint cards cannot be mixed in a single frame.

Hybrid modules have green markings for easy identification.

Standard I/O cards installed in standalone routers allow for configurations as small as 9 inputs and 18 outputs, increasing in increments of 9 inputs or 18 outputs. Configurations using hybrid I/O cards are more varied and depend on the individual type of hybrid I/O card installed. Configurations can be as small as 8 inputs and 16 outputs.

Standard I/O cards and hybrid I/O cards may be intermixed in a single router frame.

The following is a list of routers within the NV8500 family and the corresponding switching matrix.

Router	Switching Matrix	Expandable	Expanded Switching Matrix
NV8144	144 inputs × 144 outputs	No	N/A
NV8280	288 inputs × 576 outputs	No	N/A
NV8576	576 inputs × 1152 outputs	No	N/A
NV8576-Plus	576 inputs × 576 outputs	Yes	1152 inputs × 1152 outputs

Input cards, output cards, control cards, crosspoint cards, monitor cards, fan trays and power supply modules are “hot swappable” and installed through the front of the router frame for easy access. The rear of the router features a back plate into which backplanes can be installed that use different types of connectors. Each backplane receives or distributes signals for a single front card allowing for maximum switching configuration flexibility. The back plate also contains connections to system functions, such as a router control system, alarms or reference signals. For more information, see Frame Rear — Backplane Slots and System Connections on page 18.

Frame Expansion

Expandable routers (NV8576-Plus) have half the number of outputs and standalone routers, but when two expandable routers are connected together, the inputs and outputs are doubled. Therefore, two identical NV8576-Plus frames can be connected to create an 1152 × 1152 switching matrix.

The two frames are linked by connecting expansion connections on one router to expansion connections on a second router.

The expansion connections include the following:

- I/O Signals — Each frame has up to 128 signal expansion connectors, each forwarding up to 9 signals between two connected routers. Connectors reside on the output expansion backplane. See Expansion Signal Connections on page 87.
- Control System — Only one router frame of the pair is connected directly to the router control system. Using control system expansion connections, control system connections are required between the two routers. This enables the control system to see both routers through one control system connection. See Control System Expansion Connections on page 93.

- Frame Monitor System—Only one router frame of the pair is connected directly to the monitoring equipment. Monitor connections are required between the two routers. This enables the monitoring equipment to see both router frames through one monitor connection. See Expansion Frame Monitor Connections on page 99.

Figure 1-1 shows the flow of signals between two connected router frames. The signals are forwarded to the connected router through signal expansion connections.

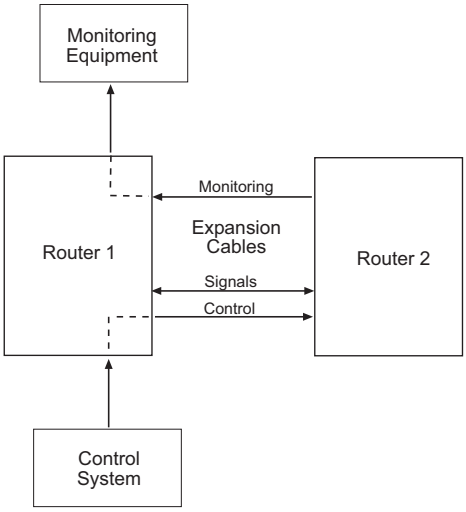


Figure 1-1. Frame Expansion Diagram

Signal Types and Rates

Routers in the NV8500 family support SD, HD and 3Gig video signals, and MADI and AES Async audio signals, both balanced and unbalanced. Each signal type is received or distributed by a specific input card or output card and an associated backplane. For a detailed list of I/O cards and the signals managed, see Input Cards on page 36 and Output Cards on page 40.

The following table lists the standards and rates for each signal type.

Signal Type	Standard	Rates Supported
AES Async (balanced or unbalanced)	AES3	Sample rates 32 to 192 kHz (passed through)
MADI synchronous streams (unbalanced)	MADI	Sample rate 48kHz, locked to reference
3Gig (SD-SDI, HD-SDI and 3.0 Gb/s combined)	SMPTE 259M, 292M 424M	Auto re-clock at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s or auto bypass with pass-through from 19 Mb/s to 3.0 Gb/s.
Embedded audio in 3Gig video streams	SMPTE 299M	For hybrid 3Gig cards, embedded audio de-embedded, routed, and re-embedded. Sample Rate 48kHz, locked to video reference.

Reference signals are required for proper switching of SD, HD and 3Gig signals. (See Video Reference on page 31.) No reference is required for AES async signals.

Using an AES/MADI Converter (NV8900)

The NV8500 family can incorporate the NV8900 for converting incoming AES Sync signals to MADI for internal routing and back to AES Sync for output. This low-profile (1RU) external frame is a powerful addition to the NV8500 family that enables you to maximize the switching matrix.

When receiving AES Async inputs directly, an input card receives up to 9 signals through 9 connectors on the backplane. However, a crosspoint card can switch up to 128 audio channels per input card. The result is that 119 signal "spaces" go unused. To maximize use of the switching matrix in these situations, a 3G/TDM input card and a 3G/TDM output card have been created. These I/O cards, working in tandem with the NV8900, enable full use of the switching matrix.

The hybrid 3G/TDM input card can receive up to 8 video signals and one MADI stream. The 3G/TDM output card can distribute 16 video signals and two MADI streams. Each MADI stream can contain up to 32 signals (64 audio channels). The NV8900 enables you to receive 32 AES audio signals and convert them into one MADI stream for use as an input. Similarly, for outputs, the NV8900 converts *two* outgoing MADI streams into 64 AES audio channels for use as output, maximizing the switching matrix of the crosspoint card.

Figure 1-2 illustrates how the converter works for incoming and outgoing AES signals.

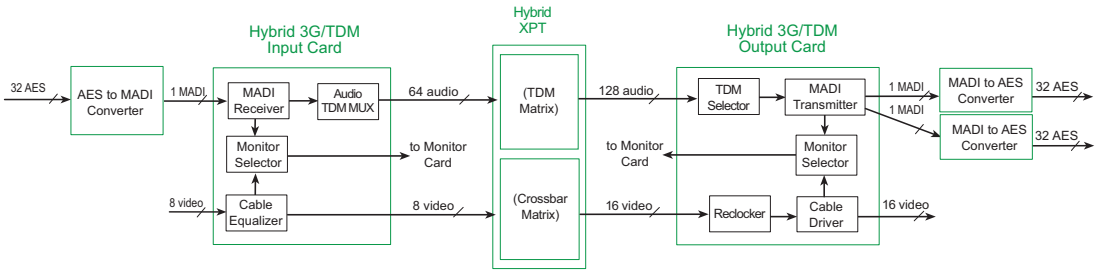


Figure 1-2. Example of NV8900 converters

Mounting and Cooling

Router frames in the NV8500 family mount in a rack with dimensions up to 32RU (55.97 inches, 1,422.4 mm) high, and up to 17.2 inches (436.88 mm) deep. When placing the rack in your facility, be sure to leave enough space for air flow through the front and rear of the router and within easy access of an AC power source. For installation instructions, see Rack Mount on page 71.

The NV8500 familyrouters have no user-serviceable fuses.

The router frames have one or more fan trays providing forced air cooling through five speed-controlled fans. In the NV8144 and NV8280 frames, a single fan tray is located at the top of the chassis. For the NV8576 and NV8576-Plus frames, there are two fan trays: one located at the top and one located at the bottom of the chassis.

Fan trays are accessed from the front of the frame. The fans draw cooling air from the center-front of the router, through the door, and exhaust it through the rear of the frame at the top and bottom. The router must have the door correctly installed and closed for proper airflow through the chassis.

Caution	If airflow is impeded, overheating may occur.

Each fan features speed control which spins the fan at the optimal rate required to ensure that a constant temperature is maintained within the router frame. Temperature sensors on each fan sense the

temperature at the inlet of each fan and increase or decrease the speed of the fan as required. By rotating only as needed to meet cooling needs, fan noise is significantly reduced in partially loaded frames or in environments with lower ambient temperatures. Maintaining a constant temperature also increases the life span of router circuitry.

Each fan features two LEDs that indicate if the fan is receiving power and if there is a failure. For more information, see Indicator LEDs on page 121.

There is a removable air filter located on the inside of the door assembly. It is recommended that maintenance on filters be performed on a regular basis. For more information, see Air Flow on page 123.

Standard and Hybrid Quick Reference

This section provides a brief overview of the NV8500 family requirements for standard (non-hybrid) and hybrid active cards. See descriptions of each column in the bulleted list following the table.

Router	I/O Cards Installed			Standard or Hybrid Required?		Power Supply Frame		Power Supply Modules		New Power Drop?
	Non-Hybrid Coax	Non-Hybrid Fiber Optic	Hybrid Coax	Control Card	XPT	NV8000	NV8300	PS8100	PS8300	
NV8144	X			S	S	NA	NA	1,1		
		X		S	S	NA	NA	1,1		
			X	H	H	NA	NA	1,1		
NV8280	X			S	S	1		2,2		
		X		S	S		1		2,2	Yes
			X	H	H		1		2,2	Yes
NV8576 and NV8576-Plus	X			S	S	2		4,4		
		X		S	S		2		4,4	Yes
			X	H	H		2		4,4	Yes

- Router — The router frame type in the NV8500 series.
- I/O Cards Installed — denotes which type of input and output cards are installed. Each card manages different signal types:

  Non-hybrid coax = standard SD, HD, 3Gig or AES async.

  Non-hybrid fiber optic = standard SD, HD, 3Gig.

  Hybrid coax = hybrid SD, HD, 3Gig or 3G/TDM (3G and MADI combined).

- Standard or hybrid required?

  Standard I/O cards can be used with standard control cards and standard crosspoint (XPT) cards or with hybrid control cards and hybrid crosspoint cards. Hybrid I/O cards require the installation of hybrid control cards and hybrid crosspoint cards. Standard and hybrid I/O cards can be mixed in the same router, but the installation of any hybrid I/O cards requires that all control cards and all crosspoint cards also be hybrid. (See Standard vs. Hybrid Cards on page 33.)

  S = standard; H = hybrid.

- Power supply frame — The type of power supply frame required to power the router (NV8000 or NV8300) and how many frames needed, 1 or 2.

  The NV8000 uses PS8100 power supply modules (875 Watts); the NV8300 uses PS8300 power supply modules (1,350 Watts). Different I/O cards require different power, which determines which power supply frames and which power supply modules are required.

  NA = Not Applicable. The NV8144 does not use an external power supply frame. Power supply modules are installed directly into the router frame.

- Power supply modules

  1,1 or 2,2 or 4,4 = The number of required and (optional) redundant power supply modules installed. 1,1 stands for 1 required and 1 redundant; 2,2 = 2 required and 2 redundant, and so on. (See Connecting to Power on page 103.)

- New power drop?

  The NV8300 power supply frame uses the WC0157-00 power supply cable that uses a 20Amp twist lock connector. This may require a change to your facility's power drop so that the power outlet can accommodate the power supply frame's power draw and connector. For details, contact Technical Support. (See Technical Support Contact Information on page iii.)

Upgrading to Hybrid

The NV8500 family routers feature standard and hybrid I/O cards and corresponding control cards and crosspoint cards. If you currently have a NV8500 family router with standard I/O cards installed and are upgrading to hybrid I/O cards, the following rules apply:

1 If one or more hybrid input, output or filler card is installed in a router frame. (See Overview of Active Cards on page 33.)

  All crosspoint cards must be changed to hybrid crosspoint cards.

  All redundant crosspoint cards or cardsets must be changed to hybrid redundant crosspoint cards or cardsets.

  All control cards must be changed to hybrid control cards.

2 If any hybrid I/O cards are installed in the NV8280 or NV8576 frame, all power supply modules must be upgraded to PS8300 modules and installed in a NV8300 power supply frame. *Except,* the NV8144, which can use PS8100 power supply modules at all times, even when hybrid modules are installed:

  PS8300 modules can only be installed in a NV8300.

  PS8300 power supply modules *cannot* be installed in a NV8000 power supply frame; PS8100 power supply modules *cannot* be installed in a NV8300 power supply frame.

  NV8300 uses 20Amp twist lock connector; installation of a new power drop may be required. For details, contact Technical Support. (See Technical Support Contact Information on page iii.)

The AC source connector to NV8300 uses the WC0157-00 power cord; the power cord from NV8300 to the router frame is WC0154.

For NV8576 frames, internal cabling must be changed to WC0125-01. For details, contact Technical Support. (See Technical Support Contact Information on page iii.)

3 Hybrid crosspoint cards and hybrid control cards *can* be used with both hybrid I/O cards *and* standard I/O cards. Standard crosspoint cards and standard control cards *cannot* be used with hybrid I/O cards.

Figure 1-3 illustrates the power supply frame, power supply modules, control cards, crosspoint cards (XPT), redundant crosspoint cards or cardsets, and cabling required when upgrading a router with hybrid I/O cards.

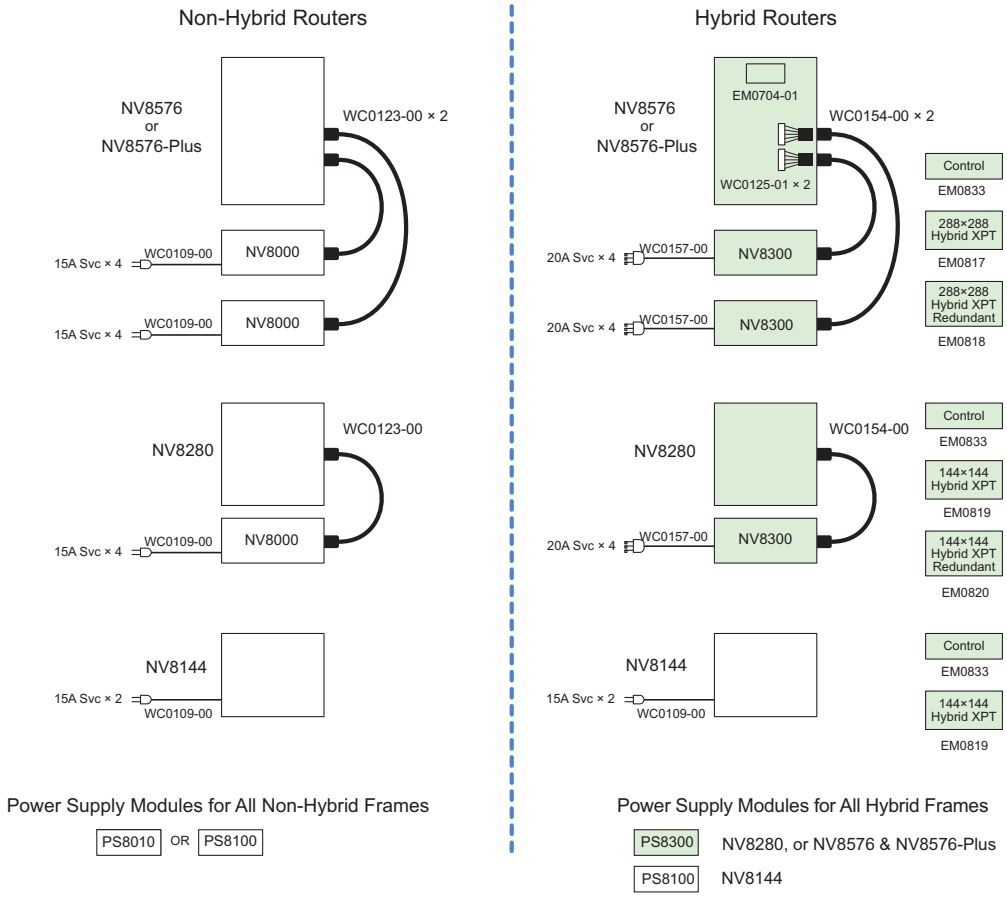


Figure 1-3. Illustrated Overview of Upgrade Requirements

Power Supply Overview

Power for the NV8500 family routers frames is supplied through one of two Miranda power supply modules. The PS8100 module produces 875 Watts and the PS8300 module produces 1,350 Watts. The module is either installed in the router frame (NV8144) or installed in an external, separate power supply frame: the NV8000 or the NV8300. Each power supply frame can house up to 4 modules: 2 required and 2 optional for redundancy.

The NV8000 uses the PS8100 modules. The NV8300 uses the PS8300 modules. PS8300 modules cannot be installed in a NV8000 frame; PS8100 modules cannot be installed in a NV8300 frame.

The type of power supply modules, and if and how many power supply frames are required, depends on: 1) the type of router frame, 2) if one or more expandable frames are connected, and 3) the type of I/O cards installed in the router frame (standard or hybrid).

The NV8144 is unique because power supply modules are installed directly into the router frame. In addition, the PS8100 power supply modules are sufficient to power any type of I/O card installed, including hybrid cards.

For the NV8280, NV8576 and NV8576-Plus, installation of a single hybrid card requires upgrading to the more powerful PS8300 power supply modules. In turn, PS8300 modules can only be installed in the NV8300 power supply frame.

PS8100 and PS8300 power supply modules cannot be inter-mixed in a single frame. Only one type of power supply module can be installed at any one time. For details on which power supply frame to use and which modules to install, see Connecting to Power on page 103.

For redundancy, additional (optional) power supply modules can be installed as a backup power source should the primary source fail. All routers are fully operational using only the primary or redundant power supplies; the router will continue to operate if AC is lost to either the primary or redundant power supplies. For a list of power requirements, see Connecting to Power on page 103.

Each power supply module has its own AC main cable. This allows for two AC main circuits to be used to provide AC power and AC circuit breaker redundancy.

Both the PS8100 and the PS8300 power supply module accepts a wide range of AC input voltages and produces five +48 VDC outputs. The power supply automatically senses the AC input voltage range (90–130 and 180–250 VAC) and adjusts to maintain a relatively constant DC output; no voltage selection is required.

The five regulated outputs are directed to modules in the router where on-board regulators produce the DC voltages required by the local circuits. Each output powers one of the five green LEDs and output test points located on the front of the power supply module. Under normal operation, all five LEDs are lit. (See Indicator LEDs on page 121.)

Figure 1-4 shows the PS8100 and PS8300 power supply module architecture.

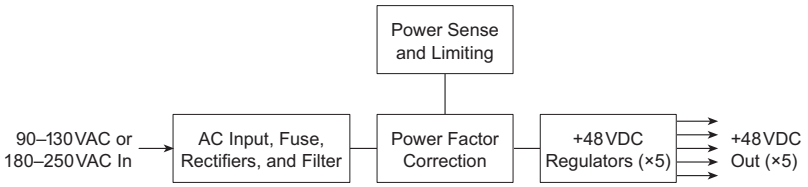


Figure 1-4. Power Supply Module Diagram

For information on making power supply connections, see Connecting to Power on page 103.

The PS8100 power supply module, PS8300 power supply module, NV8000 power supply frame, and NV8300 power supply frame have no serviceable fuses.

Power supply module cooling is provided by a single low-speed fan located along the front edge of each PS8100 or PS8300 module, which draws a small quantity of air across internal heat sinks.

Power Supply Distribution

Each power supply module produces five +48 VDC outputs, called branches. Each branch is distributed to cards (modules) installed in the router frame.

For the NV8144, only one primary and one redundant power supply is installed, so all branches are distributed to all modules, as shown:

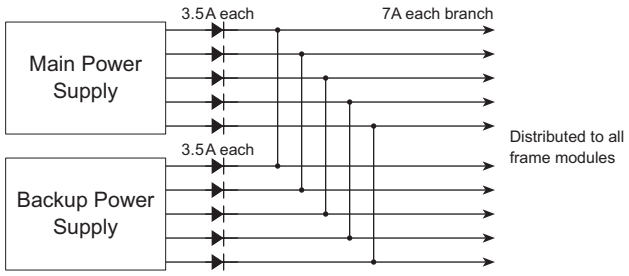


Figure 1-5. Distribution of Power Supply - 5 Branches

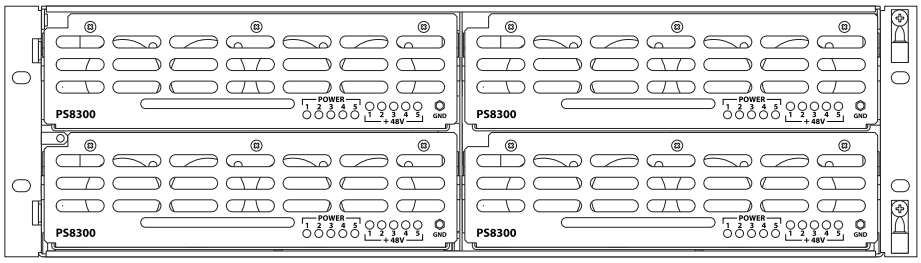
In this situation, the power supply modules provide all power to all installed input, output, control, monitor and crosspoint cards. Because of the power distribution, if power to the power supply modules is disconnected, the entire router frame is effected.

However, in the NV8280 and NV8576 frames, which require more than one set of primary and redundant power supply modules, each power supply module supplies power to only a limited set of cards (modules). If power to the power supply modules fails, only certain cards are impacted. By determining which cards are not receiving power, you can discover which power feed has failed and immediately modify routing and initiate repairs.

NV8280

The NV8280 requires two primary power supply modules plus two optional redundant power supply modules. This means that each set of two power supply modules distribute 10 power supply branches to the router frame. The power supply modules are labeled PS1 and PS3 for the primary module and PS2 and PS4 for the optional redundant module, as follows:

PS1 — Primary PS2 — Redundant to PS 1



PS3 — Primary PS4 — Redundant to PS 3

The following illustrates the specific cards each power supply module powers when facing the front of the router frame.

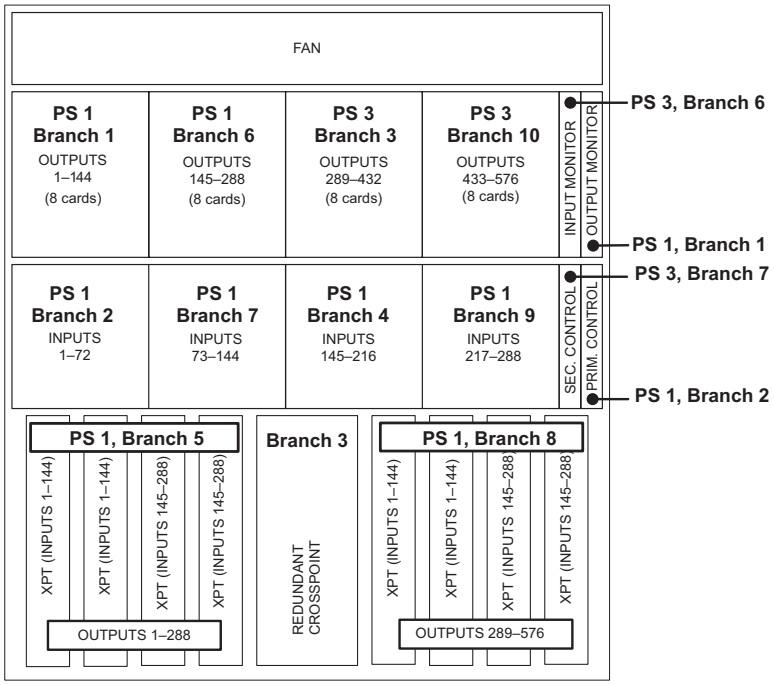


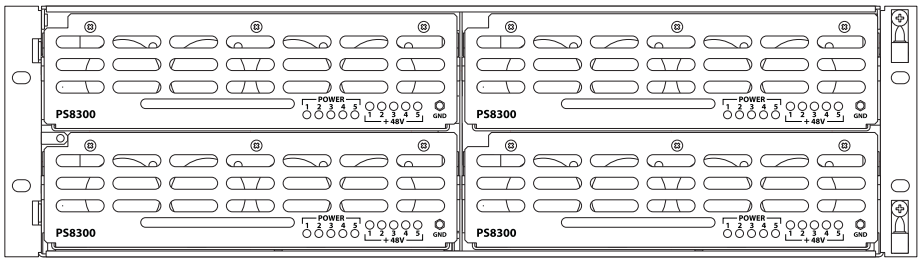
Figure 1-6. NV8280 Frame Power Supply Branches

NV8576 and NV8576-Plus

The NV8576 and NV8576-Plus router frame requires two power supply frames (NV8000 or NV8300) providing 4 primary power supply modules and 4 optional redundant power supply modules for a total of 8 modules. The power supply modules are number PS 1 through PS 8. Facing the front of the power supply frame, the power supply modules are numbered as follows:

Power Supply Frame 1

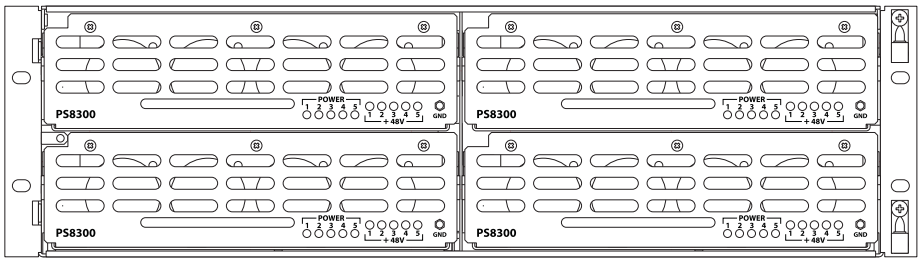
PS1 — Primary PS2 — Redundant to PS 1



PS3 — Primary PS4 — Redundant to PS 3

Power Supply Frame 2

PS5 — Primary PS6 — Redundant to PS 5



PS7 — Primary PS8 — Redundant to PS 7

Figure 1-7. Two Power Supply Frames for the NV8576 or NV8576-Plus

The following illustrates which power supply modules power specific cards when facing the front of the router frame.

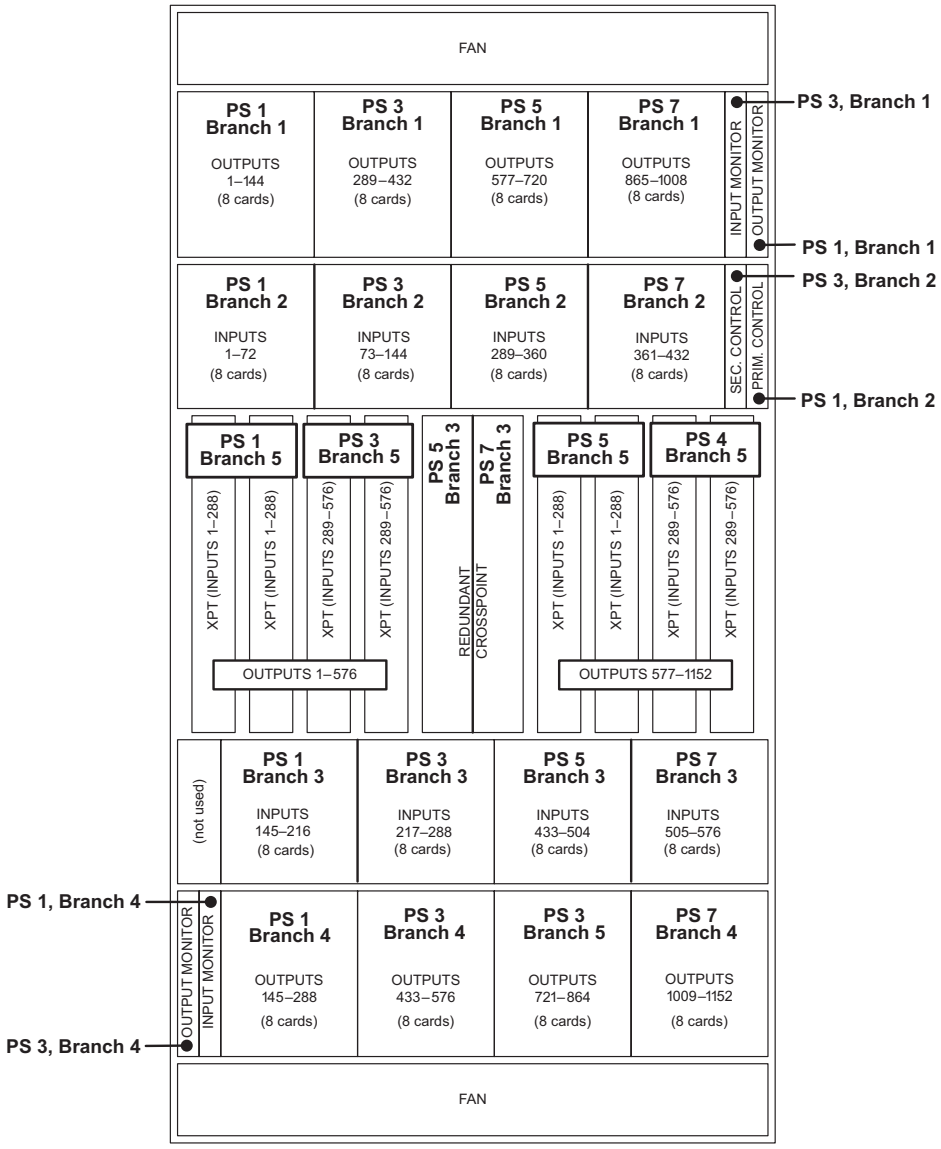


Figure 1-8. NV8576 or NV8576-Plus Frame Power Supply Branches

Frame Module Slots and Connections

Router frames in the NV8500 family have slots for input, output, monitor, control and crosspoint cards. Cards are installed in slots from the front of the router frame. The rear of the router is a back plate into which backplanes containing connectors for receiving, distributing or monitoring signals are installed. The back plate also contains connections for system functions, such as a control system, alarms or references.

Active circuitry is contained on the input cards, output cards, control cards, power supply modules, crosspoint cards and fan trays installed through the router's front. The backplane modules are pas-

sive and do not contain active circuitry, with the exception of the backplane containing LC (fiber optic) connectors.

Depending on the router frame, up to four internal motherboards span the frame and distribute input or output signals, control signals, timing information and power. Active cards plug into the motherboards from the front of the router and backplanes plug into the same motherboards from the rear. Each input card and output card has a corresponding backplane through which signals are received or distributed. All cards are “hot-swappable,” but the cards must be paired with the appropriate corresponding backplane. Each front card features LEDs that warn if an incorrect card is installed in the corresponding card slot for that backplane. For more information, see About Backplanes on page 23.

Frame Front—Card Slots

The different router frames in the NV8500 family have common card slots. For more information on each type of card housed in the router frames, see Overview of Active Cards on page 33. For information on signal numbering and corresponding card slots, see Signal Numbering on page 57.

NV8144

Figure 1-9 shows the front of the NV8144 router frame with the door removed. At the top of the frame is the fan tray. Directly below the fan tray are slots for active cards. On the far left are 8 slots for output cards. Directly to the right of the output cards is a single slot for the monitor card. Near the center of the frame, to the right of the output cards, are two slots. The first slot holds a 144 × 144 crosspoint card. The second slot holds a second, optional 144 × 144 crosspoint card for redundancy.

To the right of the crosspoint card slots are 16 slots for input cards. To the right of the input card slots are two additional slots for the primary and secondary control cards. Below the active card slots, at the bottom of the frame, are two slots for two power supply modules.

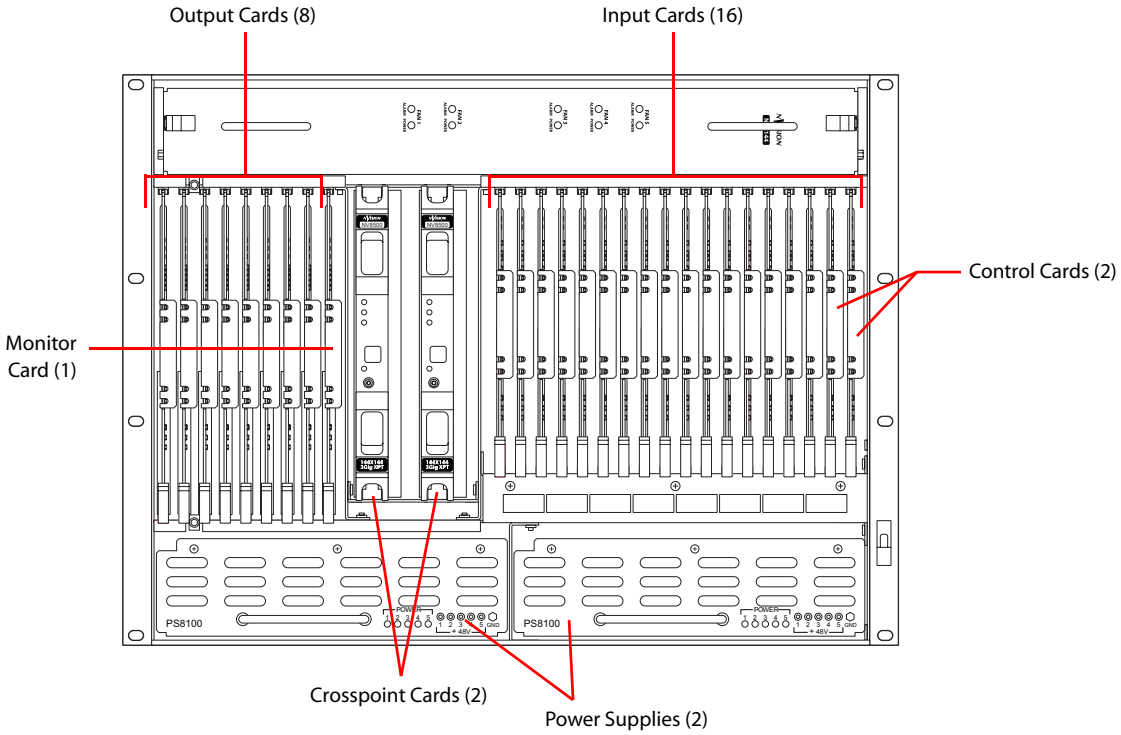


Figure 1-9. NV8144 with Door Removed (Front View)

NV8280

Figure 1-10 shows the front of the NV8280 router frame with the door removed. From this view, you can see the modules inserted in the slots. At the top of the frame is the fan tray. Directly below are 32 slots for output cards. Below the output cards are 32 slots for input cards, for a total of 64 cards. To the far right of the output card slots are two additional slots for the input monitor and output monitor cards. Similarly, to the far right of the input card slots are two additional slots for the primary and secondary control cards.

Below the input card slots, at the bottom of the frame, are 10 crosspoint card slots. The fifth and sixth crosspoint card slots house an optional redundant crosspoint cardset (single module).

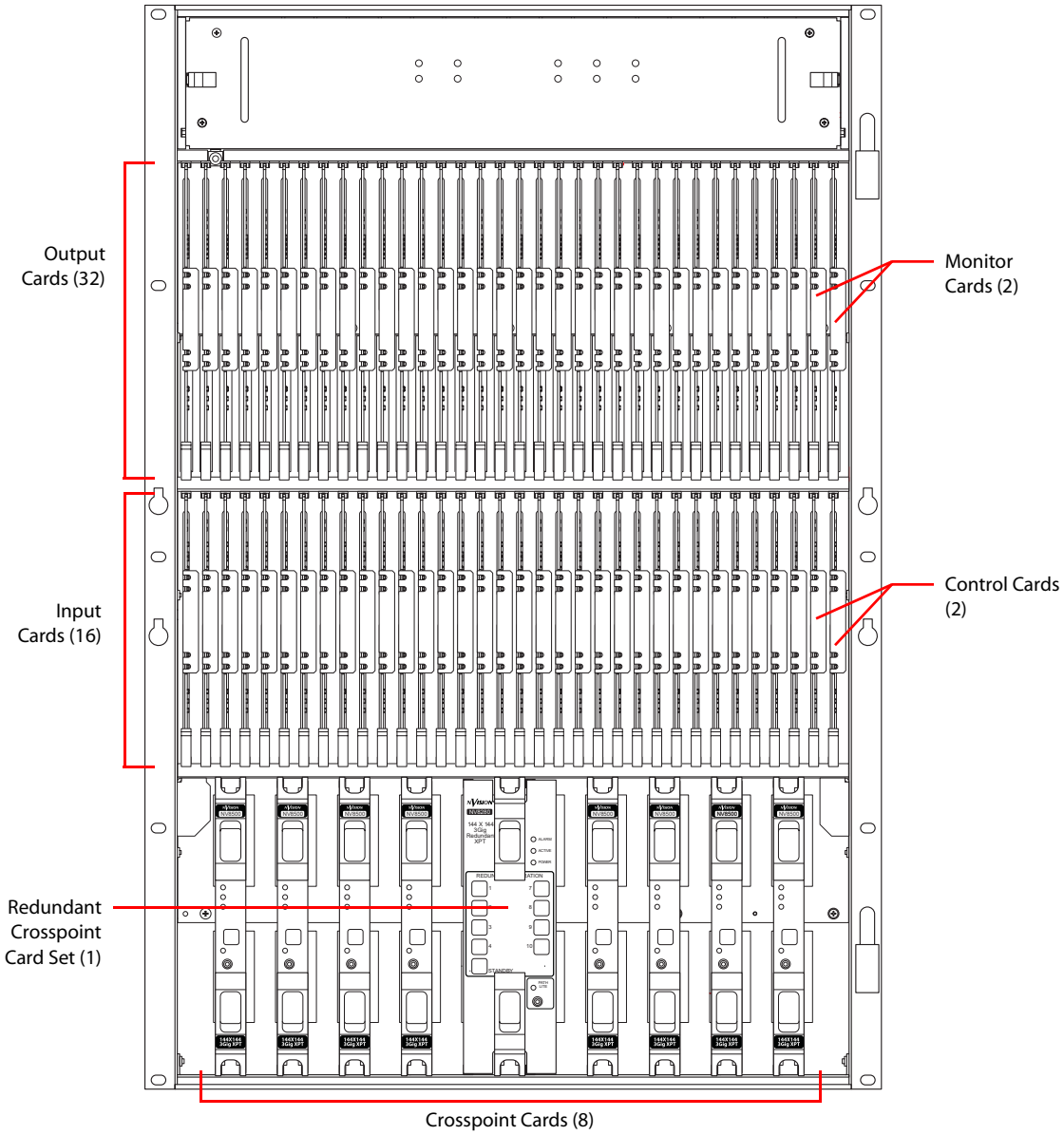


Figure 1-10. NV8280 with Door Removed (Front View)

NV8576 and NV8576-Plus

Figure 1-11 on page 17 shows the front of the NV8576 router frame with the door removed. The NV8576 and the NV8576-Plus have identical frames. From this view, you can see the modules inserted in the slots. Unique expansion output cards and corresponding expansion output backplanes enable the NV8576-Plus to connect to another NV8576-Plus frame. The frames themselves are not changed. For more information, see Frame Expansion on page 2.

The router is divided into three regions: upper, middle and lower. The upper and lower regions are mirror images of each other featuring 32 slots for output cards and 32 slots for input cards, for a total of 64 output cards and 64 inputs cards. Cards in the bottom region of the frame are installed 180° opposite those in the top region. In the upper region, to the far right of the output card slots, are two additional slots for the input monitor card and the output monitor card. Similarly, to the far right of the input card slots are two additional slots for the control cards (one primary and one secondary). Two more monitor card slots are featured in the lower region to the far left of the output cards.

In the middle region are 10 slots for crosspoint cards. The fifth and sixth crosspoint card slots house an optional redundant crosspoint cardset.

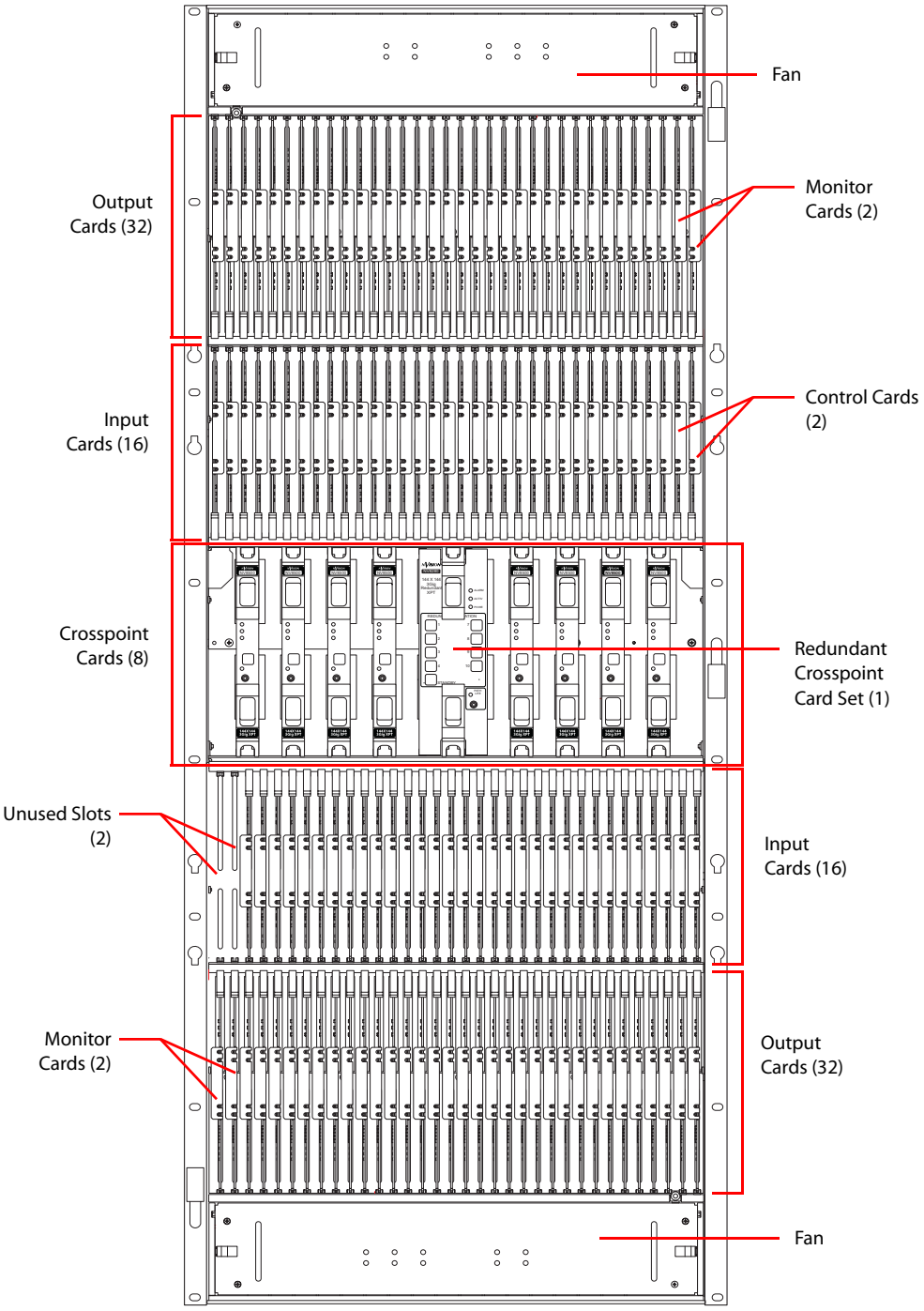


Figure 1-11. Nv8576/NV8576-Plus with Door Removed (Front View)

Frame Rear—Backplane Slots and System Connections

The rear of the NV8500 family router frames feature a back plate containing openings for installation of interchangeable backplanes housing connectors. The type and number of connectors change depending on the signal being managed and the type of router frame. For more information on backplanes, see About Backplanes on page 23.

NV8144

Figure 1-12 illustrates the rear of the NV8144 frame. The rear of the router contains backplanes, system connections and connections to power. When facing the rear, the farthest left-hand section has a blank plate. This corresponds to the control cards, which are installed through the front of the router frame. Next to the control card plate are 16 backplanes housing connectors for receiving incoming signals. These backplanes are installed in slots that correspond to active cards for inputs. (See Frame Front — Card Slots on page 13.) The middle section contains system connections, such as audio and video references, control systems, and so on. For details, see System Connections on page 27.

To the right of the system connections is a single backplane with connectors for sending signals to monitoring equipment. To the right of the monitor backplane are 8 backplanes housing connectors for distributing outgoing signals. These backplanes are installed in slots that correspond to active cards for outputs.

At the very top of the frame are grills for exhausting warm air dispersed by the fans in the fan tray. (See Mounting and Cooling on page 4.) Near the bottom of the frame are two power connections for connecting the two power supply modules to power. To the right of the left-most power connection is a connection for alarms. (See System Alarm on page 32.)

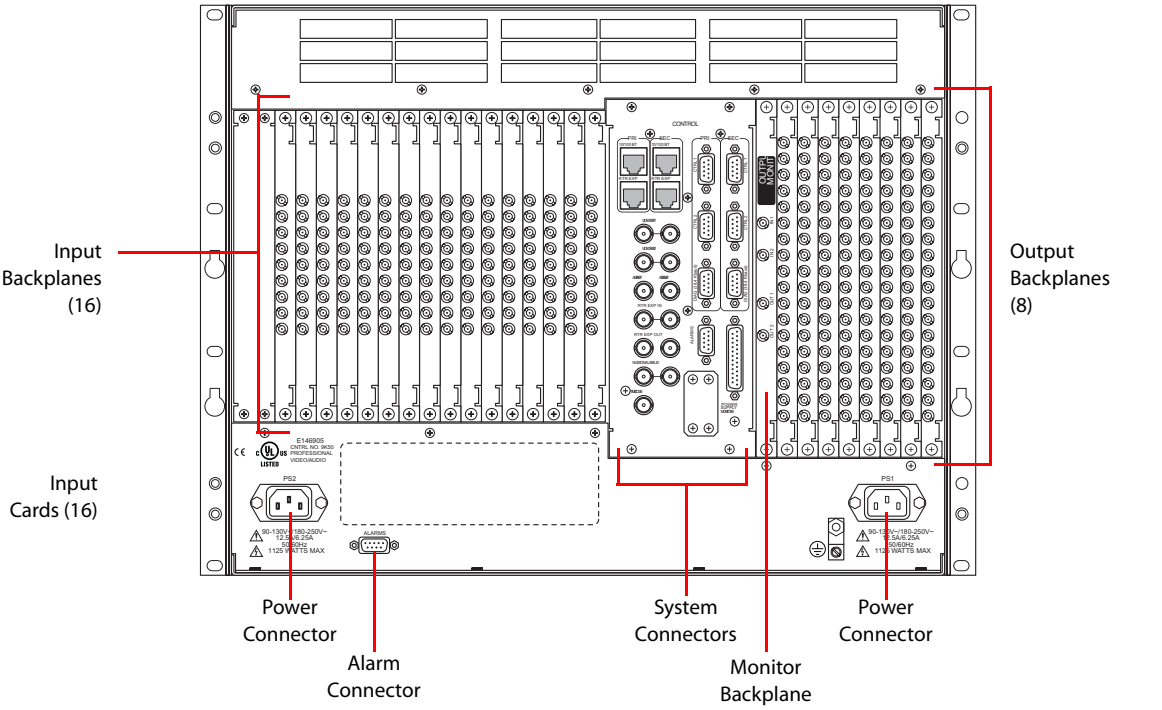


Figure 1-12. NV8144 Rear of Router Frame (Rear View)

NV8280

Figure 1-13 on page 20 illustrates the rear of the NV8280 frame. The rear of the router contains backplanes, system connections and connections to power. At the very top of the frame are grills for exhausting warm air dispersed by the fans in the fan tray. Directly below the fan tray, starting from the left-hand side when facing the rear of the router, are two backplanes for monitoring signals. To the right of the monitor backplanes are 32 backplanes housing connectors for distributing outgoing signals. These backplanes are installed in slots that correspond to active cards for outputs. (See Frame Front — Card Slots on page 13.)

In the section directly below the output backplanes, starting from the left, is a blank backplate. This corresponds with the control cards which are installed through the front of the router. Next to the backplate are 32 backplanes housing connectors for receiving incoming signals. These backplanes are installed in slots that correspond to active cards for inputs.

At the very bottom of the frame, on the left-hand side, are system connections, such as audio and video references, control systems, and so on. For details, see System Connections on page 27. On the right-hand side is a single power connection for connecting the router to a power supply frame.

Near the bottom of the frame are connections for system and power functions. For details, see System Connections on page 27.

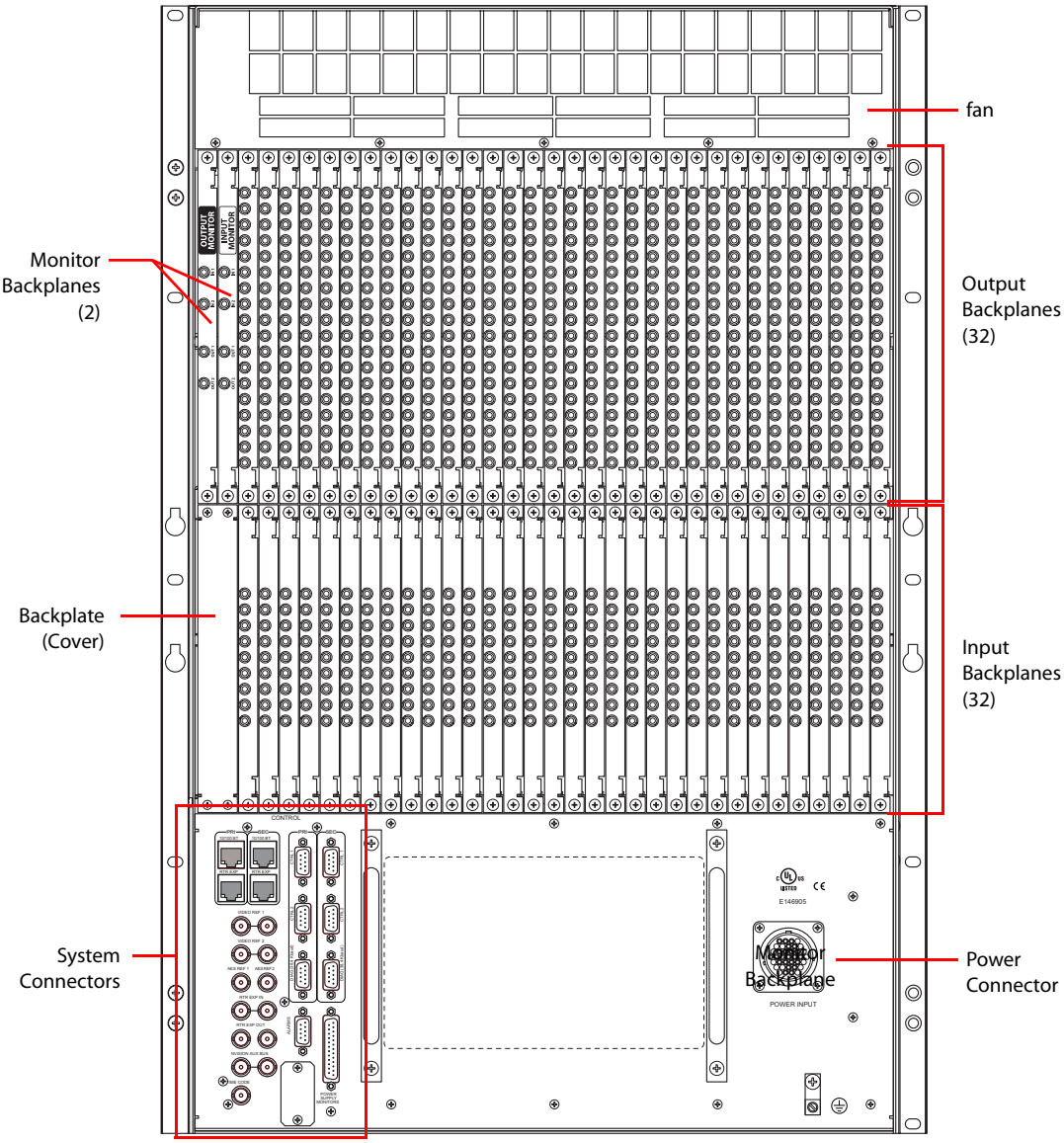


Figure 1-13. NV8280 Rear of Router Frame (Rear View)

NV8576 and NV8576-Plus

Figure 1-14 on page 22 illustrates the rear of the NV8576 or NV8576-Plus frame. The rear of the router contains backplanes, system connections and connections to power. Similar to the front of the router, the rear of the frame is divided into three regions: upper, middle and lower. The upper and lower regions are mirror images of each other featuring a total of 32 slots for output backplanes corresponding to output cards and 32 slots for input backplanes corresponding to input cards, for a total of 64 backplanes for outputs and 64 backplanes for inputs.

In the upper region, to the far left of the output backplanes are two additional backplanes for monitoring signals. Likewise, in the lower region, to the far right of the input backplanes are two more backplanes for monitoring signals. In the middle region, are connections for system and power functions.

Grills are located at the very top and very bottom of the frame for exhausting warm air dispersed by the fans in the fan tray.

In the center of the frame, on the left-hand side, are system connections, such as audio and video references, control systems, and so on. For details, see System Connections on page 27. On the right-hand side are two power connections for connecting the router to two power supply frames.

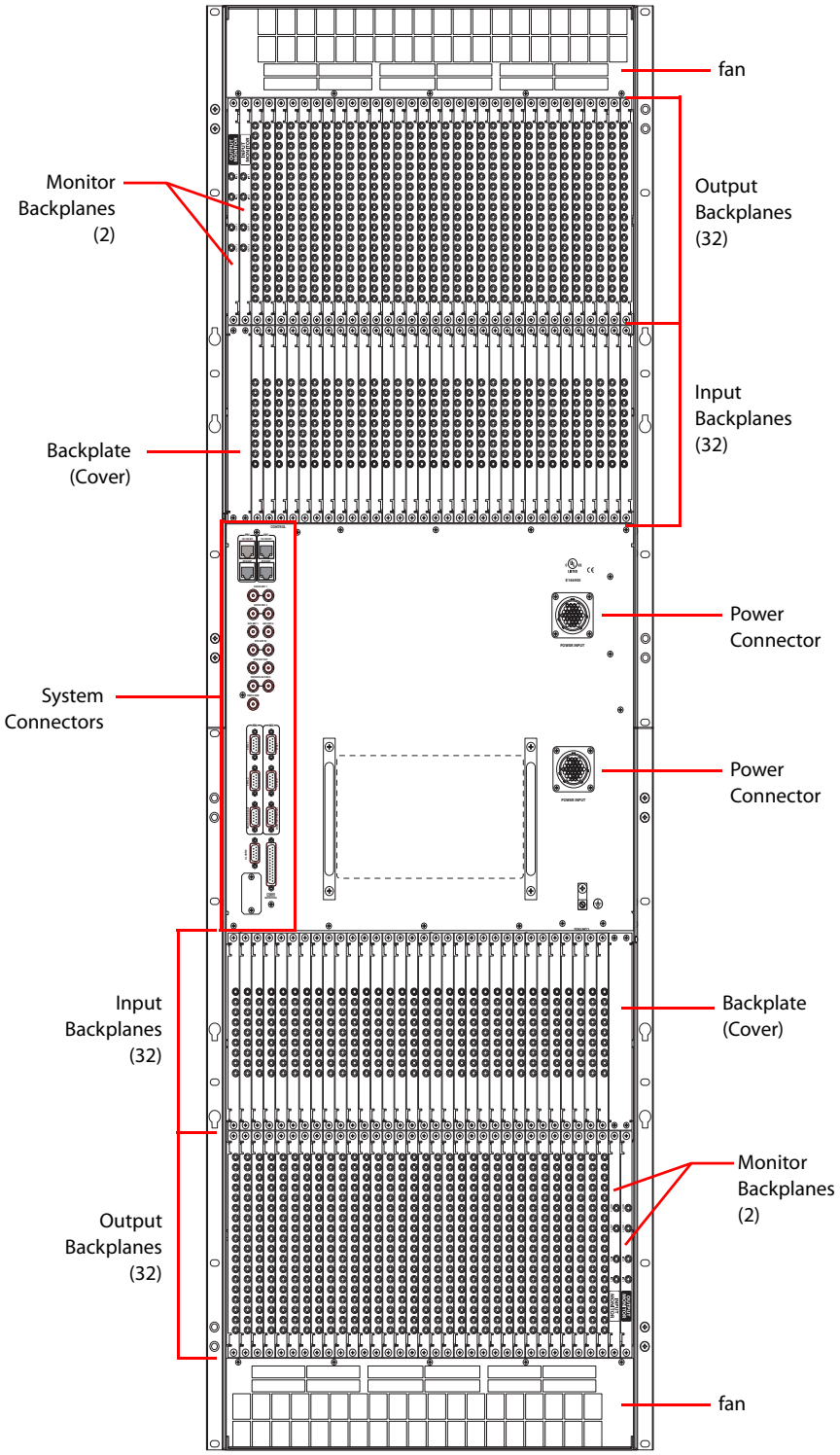


Figure 1-14. NV8576/NV8576-Plus Rear of Router Frame (Rear View)

About Backplanes

Routers in the NV8500 family feature backplane modules that are installed in the rear of the frame. The type of backplane installed depends on the signal being managed and the task being performed. Certain backplanes are used for receiving inputs or distributing outputs, other backplanes receive or distribute signals for monitoring purposes.

For the NV8576-Plus, when two expandable router frames are connected, unique backplanes manage the distribution of signals between the connected frames. If an "expansion" output card is associated with the backplane, both local signals *and* signals from the expansion connectors are managed. If a "filler" output card is associated with the backplane, *only* signals from the expansion connectors are managed. For more information on expansion or filler output cards, see Output Cards on page 40.

For proper operation, each backplane must match its corresponding input card, output card, or monitor card. For example, if a backplane is to receive coaxial input signals, then a coax input card must be installed in the corresponding card slot.

Signal Types and Backplane Connectors

The following table lists each signal type and related connector types on backplanes. Backplanes containing DIN 1.0/2.3 or terminal block connectors are passive; backplanes with LC connectors have active circuitry:

Backplanes for Standard I/O Cards.

Type of Signal Managed	Input Connectors	Output Connectors	Output Plus Expansion Connectors	Cable	Part Number
AES async, unbalanced (coax)	9 DIN 1.0/2.3	18 DIN 1.0/2.3	9 DIN 1.0/2.3 plus 2 expansion	coax, proprietary	Input EM0791 Output EM0793 Expansion EM0789 Filler EM0789
AES async, balanced (twisted pair)	9 terminal block	18 terminal block	9 terminal block plus 2 expansion	coax, proprietary	Input EM0828 Output EM0829 Expansion EM0830 Filler EM0830
SD, HD, 3Gig (coax)	9 DIN 1.0/2.3	18 DIN 1.0/2.3	9 DIN 1.0/2.3 plus 2 expansion	coax, proprietary	Input EM0791 Output EM0793 Expansion EM0789 Filler EM0789

Type of Signal Managed	Input Connectors	Output Connectors	Output Plus Expansion Connectors	Cable	Part Number
SD, HD, 3Gig (fiber optic)	9 LC	18 LC	9 LC plus 2 expansion	fiber optic, proprietary	Input EM0691 Output EM0694 Expansion EM0698 Filler EM0698
Monitor (coax)	2 DIN 1.0/2.3	2 DIN 1.0/2.3	NA	coax	Input EM0715 Output EM0846 (Note: The NV8144 uses only one backplane, the EM0715).

Backplanes for Hybrid I/O Cards.

Type of Signal Managed	Input Connectors	Output Connectors	Output Plus Expansion Connectors	Cable	Part Number
3G/TDM (video and MADI) Unbalanced; no embedded audio (coax)	9 DIN 1.0/2.3 (8 used for video, 1 used for audio)	18 DIN 1.0/2.3 (16 used for video, 2 used for audio)	9 DIN 1.0/2.3 plus 2 expansion (8 video, 1 audio)	coax, proprietary	Input EM0791 Output EM0793 Filler EM0789
	Note: 1 TDM connector supports mono 64 audio channels				
SD, HD, 3Gig with embedded audio (coax)	9 DIN 1.0/2.3 (only 8 used))	18 DIN 1.0/2.3 (only 16 used)	9 DIN 1.0/2.3 plus 2 expansion (only 8 used)	coax, proprietary	Input EM0791 Output EM0793 Filler EM0789
Monitor (coax)	2 DIN 1.0/2.3	2 DIN 1.0/2.3	NA	coax	Input EM0715 Output EM0846 (Note: The NV8144 uses only one backplane, the EM0715).

Types of Backplanes

Figure 1-15 on page 25 is an example of the different types of backplanes available for I/O cards, filler cards, expansion cards and monitor cards. The type of backplane used depends on the type of signal being received or distributed, not whether the I/O cards is standard or hybrid. This means that standard and hybrid I/O cards use the same backplanes for similar signals. Filler cards use the same backplane as expansion cards, but use only the two expansion connectors; the remaining output connectors are unused. For details, see Overview of Active Cards on page 33.

In the NV8576 and NV8576-Plus frames, backplanes installed in the lower portion of the router are rotated 180° from those in the upper region and “face” in the opposite direction. Expansion back-

planes featuring terminal block connectors and two expansion connectors are currently under development.

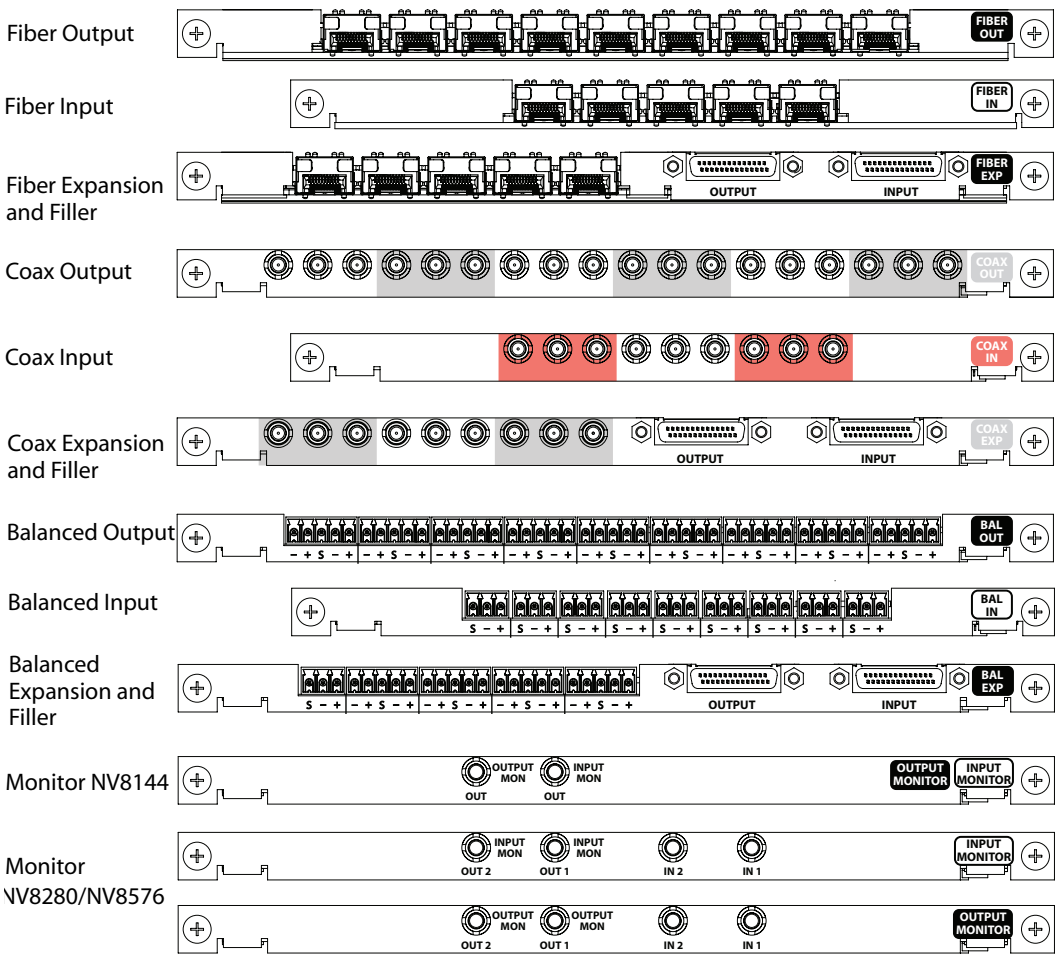


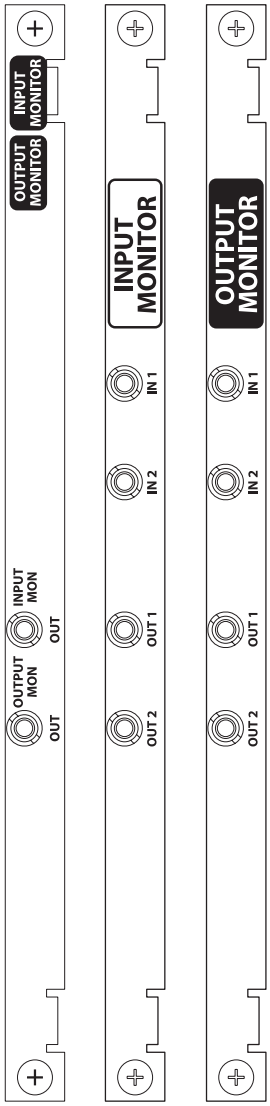
Figure 1-15. Backplanes

Viewing from top to bottom backplanes are grouped by connector type with one backplane for inputs, the next for outputs and the third for expansion or filler signals. The first set of backplanes feature LC connectors for fiber optic signals (SD, HD, 3Gig), followed by DIN 1.0/2.3 connectors for coax signals (SD, HD, 3Gig and AES Async unbalanced), and then by terminal block connectors for twisted pair signals (AES Async balanced).

The last three backplanes shown are for monitoring signals. There is a single backplane for the NV8144 and two backplanes for monitoring inputs and outputs in the NV8280, NV8576 and NV8576-Plus frames. The NV8144 monitors both inputs and outputs through a single backplane and monitor card. The NV8280, NV8576 and NV8576-Plus use a separate backplane and card for monitoring inputs and a separate backplane and card for monitoring outputs.

Notice that the LC connectors are actually modules containing two connectors each. The input backplane and the expansion backplane contain 5 modules totalling 10 LC connectors. The output backplane contains 9 modules for a total of 18 LC connectors. When making input and expansion connections, one LC connector remains empty because only 9 signals are allowed on the input backplane and the expansion backplane. For details, see Making Signal Connections on page 81.

Monitor Backplanes



Depending on the router frame, up to 4 monitor cards can be installed. Each monitor card produces 2 signals that can be sent to monitoring equipment for the purpose of assessing signal presence and quality. There is a single type of monitor card that monitors inputs or outputs. Whether the card monitors inputs, outputs, or both depends on the type of router frame, the slot into which it is installed in the frame, and the backplane associated with the card.

The NV8144 has one monitor card slot for monitoring both inputs and outputs.

The NV8280, NV8576 and NV8576-Plus router frames have separate monitor card slots for monitoring inputs and outputs. The NV8280 router frame uses two cards: one for inputs; one for outputs. The NV8576 and NV8576-Plus router frame uses four cards: two for inputs; two for outputs. The card slot determines the signals monitored: a monitor card in the input monitor card slot monitors inputs; a monitor card in the output monitor card slot monitors outputs.

In the NV8280, the input monitor card receives one signal from each input card. Similarly, an output monitor card receives one signal from each output card. The NV8576 and NV8576-Plus monitor cards work exactly the same way except that the monitor cards in the upper region of the router frame receive signals only from the output cards and input cards located in the upper region. Likewise, the monitor cards in the lower region of the frame receive signals only from the input and output cards installed in the lower region of the frame.

To maximize efficiency, only one signal is sent from each input or output card to the monitor card for forwarding to monitoring equipment. This means that only one signal from each input card or output card is monitored at any give time.

Whether or not input and/or output monitor signals can be accessed and managed depends on the application version currently loaded on the router's control cards and if a Monitor Level has been created using the Miranda Router Configurator. (See the *Miranda Router Configurator User's Guide*.)

There are no separate monitor cards for monitoring signals managed through standard or hybrid I/O cards. The same monitor cards are used for both.

The monitor card must have a corresponding monitor backplane installed. (See Figure 1-15 on page 25.) The backplane contains connectors through which signals are sent from the monitor card to monitoring equipment. For the NV8144 there is a single monitor backplane that monitors both inputs and outputs. Backplane connectors are labeled 'OUTPUT MON' and 'INPUT MON'.

For the NV8280, NV8576 and NV8576-Plus there is one monitor backplane for inputs and a separate monitor backplane for outputs. The backplane connectors are labeled 'IN 1', 'IN 2', 'OUT 1' and 'OUT 2'. Two of the connectors connect cables to the monitoring equipment. The other two connectors are used for "chaining together" multiple monitor cards or multiple routers.

The connectors labeled ‘IN’ on the backplane:

- Cross-connect monitor cards to other monitor cards, such as when two expandable frames (NV8576-Plus) are connected together, which enables the monitoring equipment access to all inputs or outputs, or
- Connect to an ‘OUT’ connector when cross-connecting multiple monitor cards in the same frame to each other. This only applies to NV8576 or NV8576-Plus.

The connectors labeled ‘OUT’ on the backplane:

- Connect to an ‘IN’ connector when cross-connecting monitor cards (as noted above), or
- Send signals for monitoring purposes to monitoring equipment.

System Connections

Routers in the NV8500 family feature connections for managing system functions, located on the rear of the router. Figure 1-16 is an example of an NV8576 frame. While the system connections on other router frames may not be positioned exactly as shown in this example, all connections are labeled as indicated and perform the functions stated in the following sections.

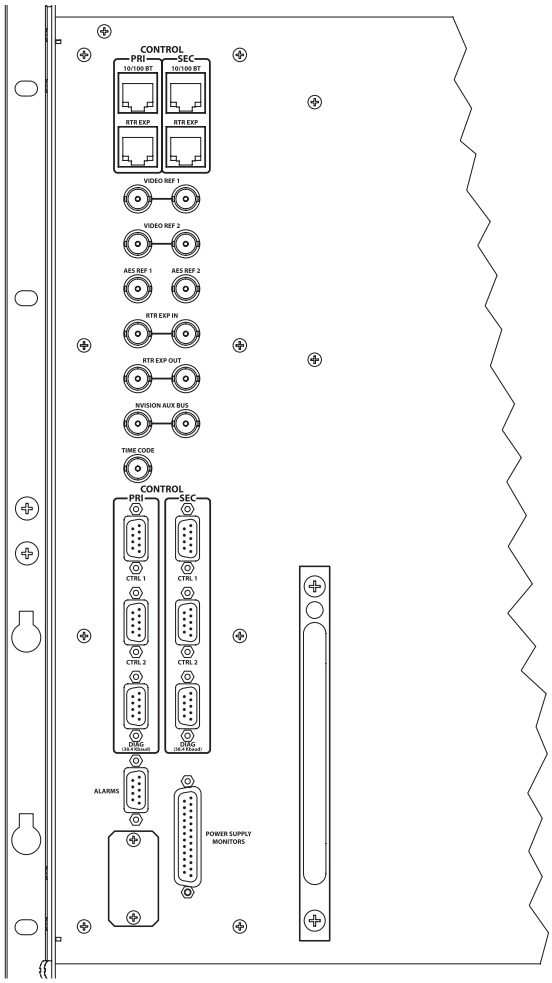


Figure 1-16. System Connections for NV8576 Router Frame

These connections allow you to connect:

- A router control system.
- Reference signals.
- A PC running the Miranda Router Configurator application.
- System alarms that sends notification of a system failure, such as a fan or power supply malfunction.

Router Control System Connections

Router control systems run on a separate platform connected to the router. The router provides two ways to connect to a router control system: serial or Ethernet. (There is also a Miranda Aux Bus connection present, but it is not in use at this time.) The router control system determines whether the serial or Ethernet connection is used. If a redundant control system is being used, *both* the serial and Ethernet connections must be used to properly send status information to both control systems.

Serial Control Connections

The NV8500 family routers have four serial ports, as shown in Figure 1-17. The ports are divided into two sets, one primary control (‘PRI’) and one secondary control (‘SEC’). Primary control is the connection to the primary control card. Secondary control is the connection to the secondary control card (which is optional for redundancy). Each set is further divided into connections that correspond to router control systems: ‘CTRL 1’ corresponds to the primary control system and ‘CTRL 2’ corresponds to a secondary, alternate control system. Using ‘CTRL 2’ connections you can connect to an alternate control system (i.e., backup system) or set up dual control. For installation instructions, see Serial Control Connections on page 90.

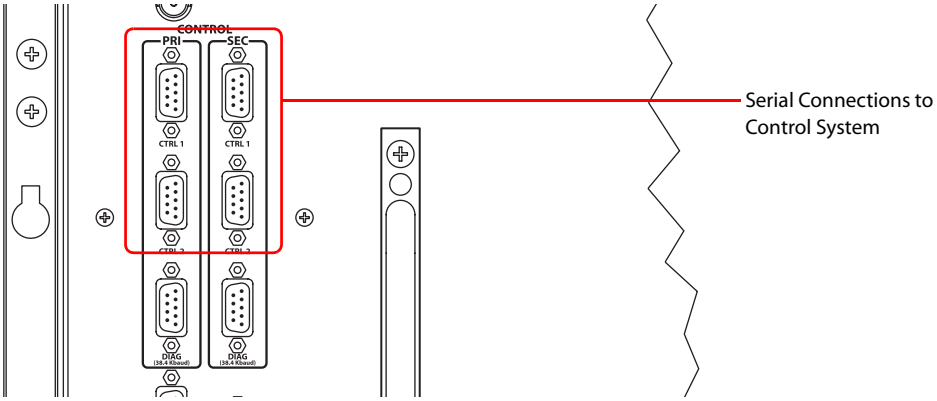


Figure 1-17. Serial Control Connections (Rear View)

Ethernet Control Connections

The router has two Ethernet ports, labeled '10/100BT', as shown in Figure 1-18. These ports are also divided into two sets, one primary ('PRI') and one secondary ('SEC'). The primary port connects a NV9000 router control system to the primary control card. The secondary port connects an NV9000 router control system to the secondary control card. For installation instructions, see Ethernet Control Connections on page 92.

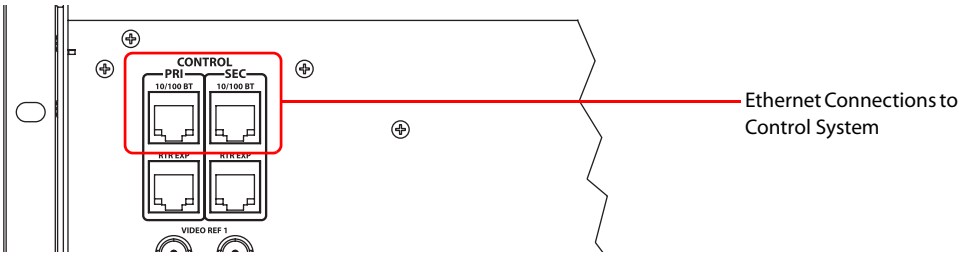


Figure 1-18. Ethernet Control Connections (Rear View)

For the router to communicate with the router control system through an Ethernet connection, you must configure an IP address in the control card. The IP address is set using the Miranda Router Configurator (MRC). However, MRC runs on a PC and similarly cannot communicate with the router until an IP address has been entered. Therefore, you must initially use a serial connection—using the 'DIAG' port(s)—to the computer (PC) running MRC to define the IP address(es). (See Serial Control Connections on page 90.)

Aux Bus Control Connections

The Miranda Aux Bus connection is located on the rear of the router. However, the Aux Bus connection is not used at this time.

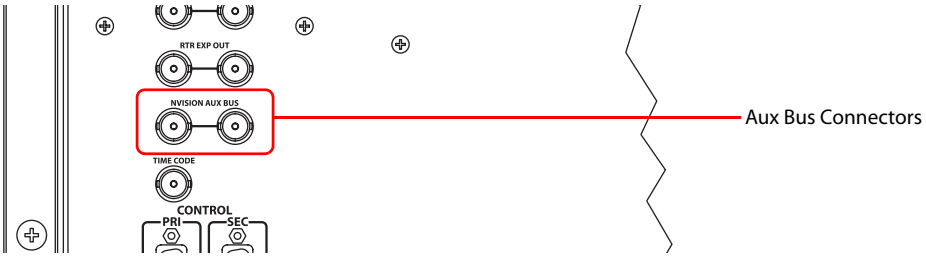


Figure 1-19. AUX Bus Control Connections (Rear View)

Control System Expansion Connections

To manage the two router frames of an NV8576-Plus, control system expansion connections must be connected between the two routers. Expansion control connections are located on the rear of the router, as shown in Figure 1-20.

There are two connections provided. Only one is required for control system expansion connections. The other connection is available as a backup (in case a cable breaks).

For instructions on making control system expansion connections, see Control System Expansion Connections on page 93.

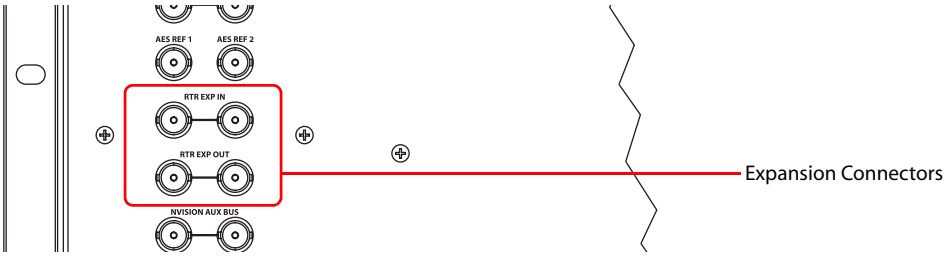


Figure 1-20. Expansion Control Connections

Diagnostic Connections

The diagnostic connections enable the router to communicate with the Miranda Router Configurator (MRC) application. MRC runs on a PC separate from the router and is used to perform system setup tasks, and configure and monitor the router. (See Chapter 3, Configuration, on page 111.)

Diagnostic connections connect the router to the computer (PC) running the MRC application. Two diagnostic connections are located on the rear of the router, labeled ‘DIAG’. The ports are divided into two sets: one primary (‘PRI’) and one secondary (‘SEC’), as shown in Figure 1-21. The primary control connects to the primary control card. The secondary control connects to the secondary (optional for redundancy) control card. For instructions, see Making Diagnostic Connections on page 94.

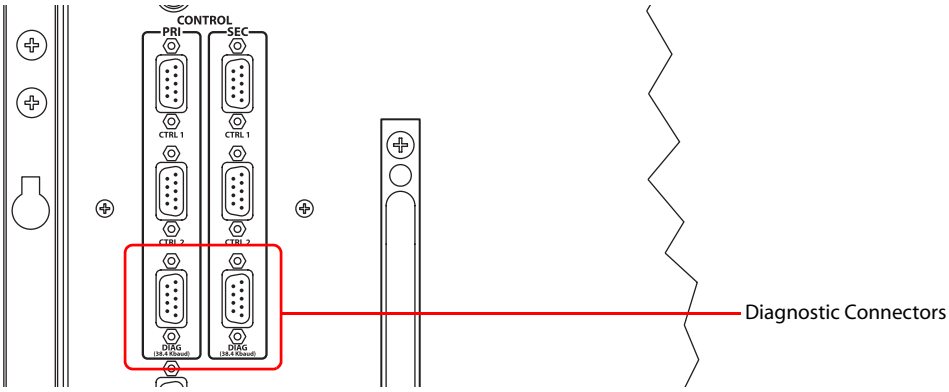


Figure 1-21. Permanent Diagnostic Connections (Rear View)

Reference Connections

The NV8500 provides both AES (audio) and video reference connections. Internal audio clocks can be set to either the AES reference or generated by the control card from the video reference. References are used in order of priority, as follows:

1 AES REF 1

2 AES REF 2

3 VIDEO REF 1

4 VIDEO REF 2

AES References

The AES reference is used for clock generation, which provides a timing reference for AES Sync signals and for timing circuits on the control card.

Routers in the NV8500 family have two AES reference connections labeled ‘AES REF1’ and ‘AES REF2’, as shown in Figure 1-22. Both connections are shared by the primary control card and the secondary control card. (See Control Cards on page 48.) The AES reference connections are “redundant” and use the same reference type. When both reference connections are connected, if one reference fails, the control card automatically fails-over to the redundant reference.

The AES reference connection requires a stable signal source of AES with a sample rate of 48 kHz. For instructions on making AES reference connections, see Making AES Reference Connections on page 95.

Figure 1-22. Connections to AES References (Rear View)

Video Reference

Routers in the NV8500 family provide timing reference connections for video signals, labeled ‘VIDEO REF 1’ and ‘VIDEO REF 2’, as shown in Figure 1-23. Located on the rear of the router, these connections provide a reference input for determining the router’s video frame switch point. The video reference connections require a stable source of PAL, NTSC or Tri-level sync.

If a video reference is present, signals switch at the defined frame and line switch points. If a video reference is not present, the router still performs the switch, but to an internal reference. If a video reference is not connected, the control card displays a lit red LED. (See Indicator LEDs on page 121.) For instructions on making video reference connections, see Making Video Reference Connections on page 95.

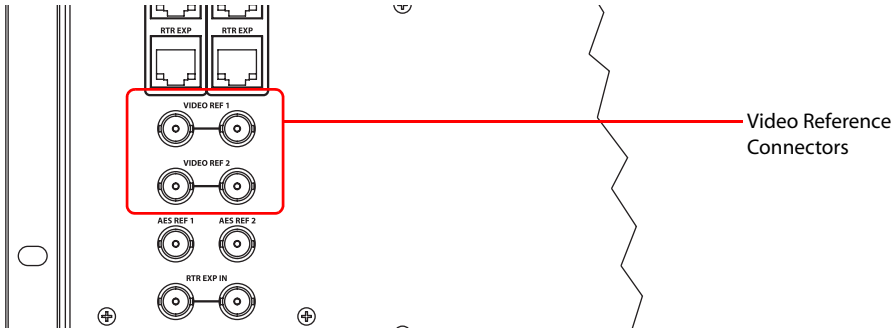


Figure 1-23. Connections to Video References (Rear View)

Redundant and Dual Video References

There are two video reference connections. The same reference can be used for both connections or a different reference for each connection. When using the same, or “redundant,” references for both connections, if one reference fails, the control card fails-over to the redundant reference. When

using different references, or “dual” references, switch takes can occur based on one or the other reference. For example, if ‘VIDEO REF 1’ uses NTSC as a reference and ‘VIDEO REF 2’ uses PAL as a reference. Using the Miranda Router Configurator, the type of setting is selected: redundant or dual, and if dual, which outputs use which video reference on an output by output basis. (See the *Miranda Router Configurator User’s Guide*.)

Switch points use references based on priority, as follows:

Reference	First	Second	Third
Redundant	VIDEO REF 1	VIDEO REF 2	Internal free running
Dual	VIDEO REF 1 or VIDEO REF 2	Internal free running	NA

Internal free running signals are those that are not locked to any reference, but still passed through the router.

Time Code Reference Connection

There is one connection for a reference source for Time Code signals labeled ‘TIME CODE’, as shown in Figure 1-24. However, time code signals are not supported at this time.

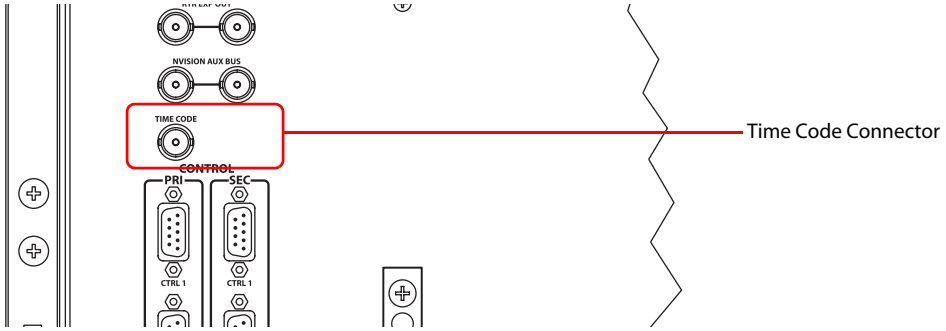


Figure 1-24. Time Code Reference Connection (Rear View)

System Alarm

Routers in the NV8500 family have a system alarm that sends notification of a malfunction, such as when a fan or power supply is not functioning properly. The NV8000 power supply frame, NV8300 power supply frame, and the router frames each have alarm connections that can be connected to external equipment that display visual signals when an alarm is activated. Creation of an external alarm indicator is outside the scope of this manual, however basic instructions on wiring the alarm connection for external monitoring is provided. See Alarm Indicator Equipment on page 101.

In addition to an alarm connection, the routers are connected to a router control system that receives status information from the router’s control card(s). (See Router Control System Connections on page 28.) The control card reads the status of NV8000 or NV8300 power supply frame and fans through the ‘Power Supply Monitors’ connection. (See Power Supply Overview on page 7.) In addition, the control card monitors the router frame power supply, fans, and video reference connections. Both power supply frame and router frame information is communicated to the router control system and viewable using the Miranda Router Configurator. (See the *Miranda Router Configurator User’s Guide*.)

The alarm connection is labeled ‘ALARMS’ and is located on the rear of the router, as shown in Figure 1-25. For instructions on making alarm connections, see Making Alarm Connections on page 100.

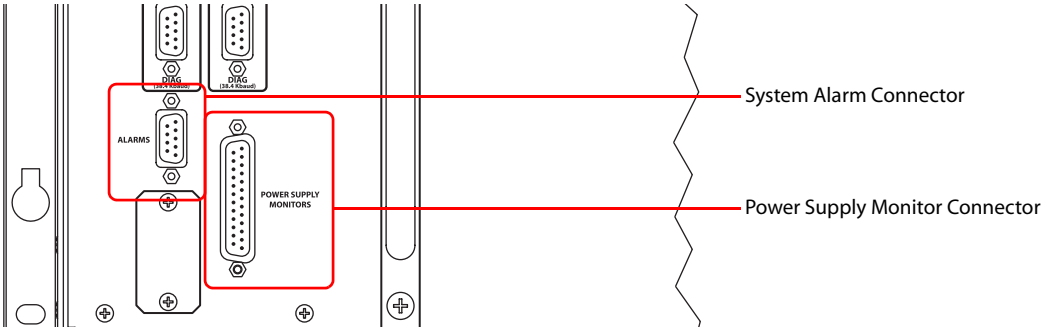


Figure 1-25. System Alarm Connection (Rear View)

Overview of Active Cards

Routers in the NV8500 family feature several active cards that perform signal routing. Input cards receive incoming signals and forward them to crosspoint cards, which in turn route the signals, as directed by the control card, to output cards for distribution.

There are two categories of active cards: standard and hybrid. Standard cards manage AES Async audio signals or SD, HD and 3Gig video signals. Any audio signals embedded in video signals are passed through. Hybrid cards manage SD, HD and 3Gig video signals, de-embedding embedded audio. Hybrid cards also manage SD, HD and 3Gig video signals combined with MADI signals.

Standard I/O cards work with a standard crosspoint card and standard control card, or with a hybrid crosspoint card and hybrid control card. Hybrid I/O cards must have a hybrid crosspoint card and hybrid control card installed to switch properly; hybrid I/O cards do not work with standard cross-point cards or standard control cards. (See Standard vs. Hybrid Cards on page 33.)

Depending on the router frame, there can be up to 64 input cards and 64 output cards. The I/O cards and their functions are described in the following sections. For information on installing cards, see Installing Cards on page 76.

Standard vs. Hybrid Cards

The NV8500 series routers can have standard cards, hybrid cards, or both installed in a single frame.

Standard I/O cards are:

- AES Async (balanced and unbalanced)
- 3Gig (SD, HD and 3Gig combined); embedded audio is passed through.

Hybrid I/O cards are:

- Hybrid 3G/TDM (AES10; unbalanced); embedded audio in video stream is passed through.
- Hybrid 3Gig (SD, HD and 3Gig combined); embedded audio is de-embedded for routing and re-embedded for distribution.

Standard input cards receive incoming SD, HD or 3Gig video or AES Async signals, forward them to the crosspoint card, which in turn routes the signal to standard output cards for distribution.

Figure 1-26 illustrates the standard I/O cards and how signals are routed in a standalone router frame when using standard crosspoint cards and standard control cards.

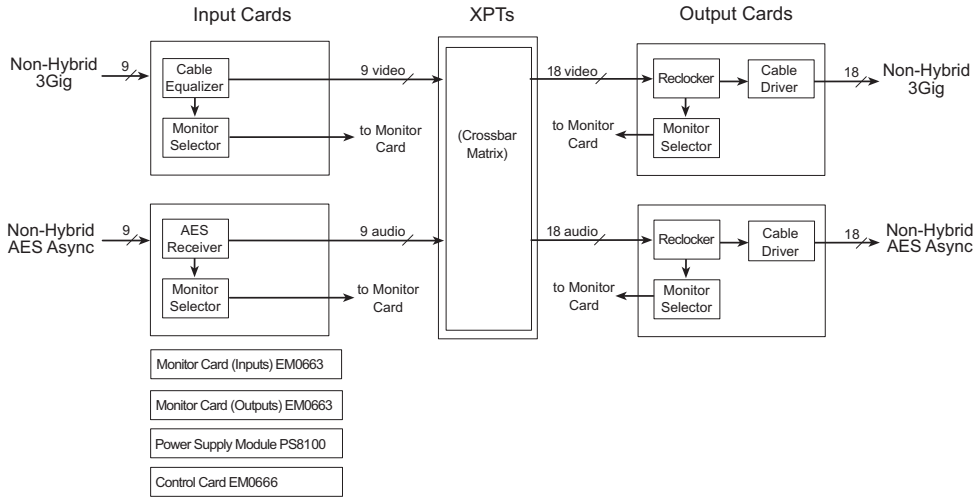


Figure 1-26. Block Diagram of Standard I/O Cards and Standard Crosspoint

Hybrid input cards and output cards perform the same tasks as standard I/O cards, but allow for much greater flexibility. Using hybrid I/O cards you can manage MADI audio signals and video signals all within a single router frame. In addition, hybrid I/O cards enable you to route video signals and their associated embedded audio without using an external de-embedder/embedder or audio router to route the audio.

Figure 1-27 illustrates the hybrid I/O cards and how signals are routed in a standalone router frame.

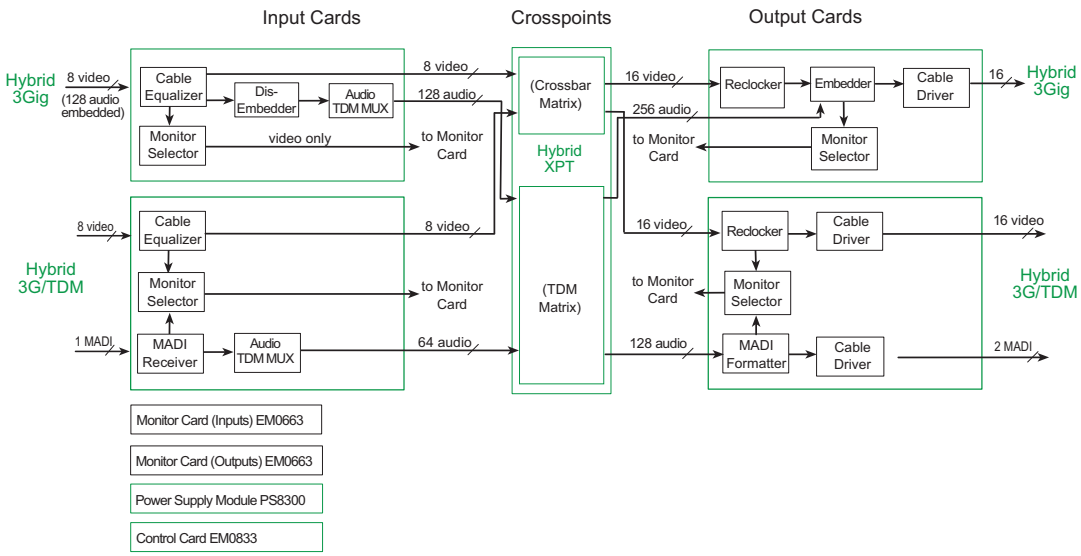


Figure 1-27. Block Diagram of Hybrid I/O Cards and Hybrid Crosspoint

Standard I/O cards and hybrid I/O cards can be inter-mixed in the same router frame. However, any time even a single hybrid I/O card is installed, all control cards and crosspoint cards must also be hybrid. You cannot mix standard and hybrid control cards or crosspoint cards; all crosspoint cards

and all control cards must be of the same type. To put it another way, any time a hybrid I/O card is installed in a frame, all control cards must be hybrid control cards and all crosspoint cards must be hybrid crosspoint cards, regardless of where in the frame the hybrid I/O card is installed. For an overview, see Standard and Hybrid Quick Reference on page 5.

Figure 1-28 illustrates hybrid I/O cards and standard I/O cards installed in a single router frame. Notice that the crosspoint card is hybrid.

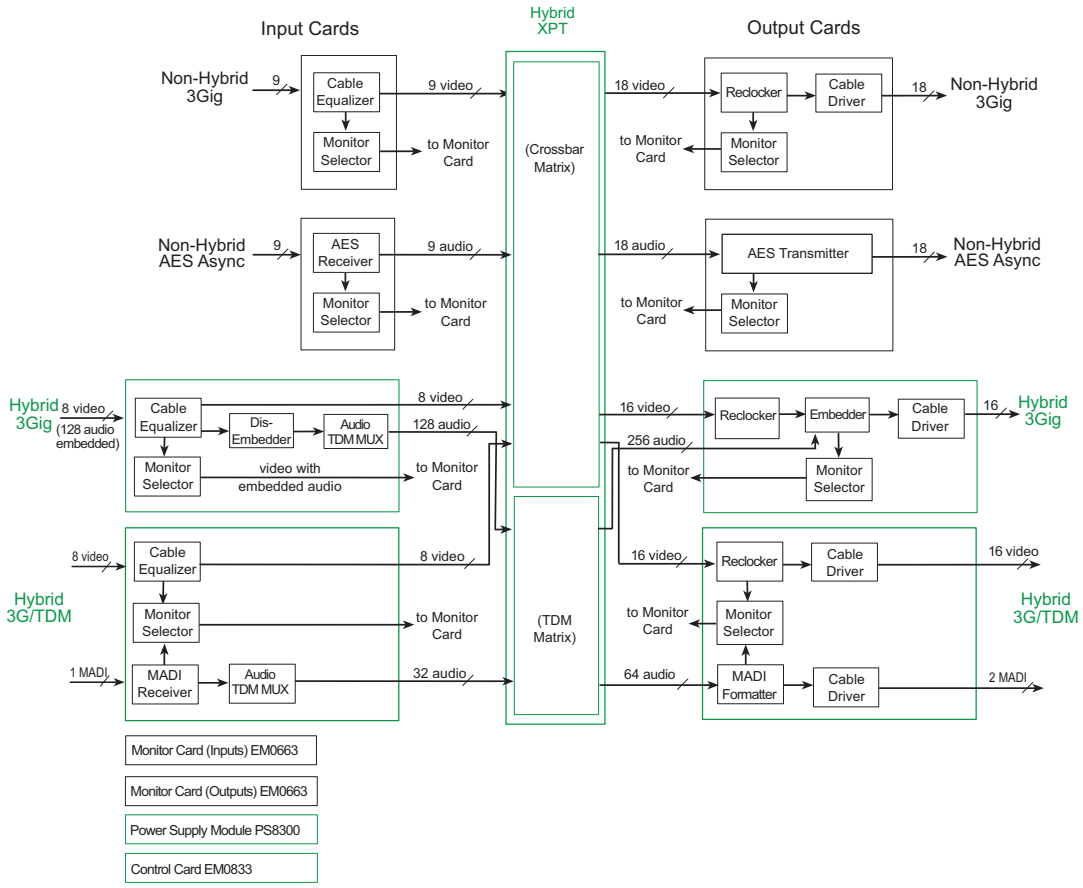


Figure 1-28. Block Diagram of Standard I/O Cards, Hybrid I/O Cards, and Crosspoint Cards in a Single Frame

Standard cards and hybrid cards have different power requirements. For power requirements, see Connecting to Power on page 103.

Input and Output Cards

Input cards and output cards support AES Async or MADI audio signals and SD, HD or 3Gig video signals. Each type of signal requires a unique type of card. For example, to support AES Async signals, I/O cards that specifically manage AES Async signals must be installed. Different types of input cards and output cards can be inter-mixed in a single frame to meet specific switching configuration needs. In addition, for each I/O card installed, the corresponding backplane must also be installed so that the signals can be received or distributed through proper connectors. (See About Backplanes on page 23.)

Visual Status Indicators

All input cards and output cards have a circuit that performs status reporting and drives the card's functions. Five LEDs on the front of the card indicate the card's status: alarm (red), power good (green), software is loaded (amber), and whether the communication with the control card is good (green) or bad (red). For more information, see Indicator LEDs on page 121.

Input Cards

Input cards receive incoming signals through connectors housed on backplanes. The input card must be paired with the correct corresponding backplane. For example, if the input card manages coax signals, it must be paired with a backplane containing coax connectors appropriate for that signal type. (See About Backplanes on page 23.)

Input cards are divided into two general categories: standard and hybrid. (See Standard vs. Hybrid Cards on page 33.) Standard input cards manage AES Async audio signals (AES Async can only be routed as stereo signals) and SD, HD or 3Gig video signals. Hybrid cards manage MADI audio signals and SD, HD or 3Gig video signals.

Both standard and hybrid video input cards can receive embedded audio signals. However, only the 3Gig hybrid input card can de-embed audio signals in a video stream and forward the video and audio signals separately to the crosspoint card for routing. Corresponding hybrid output cards re-embed the audio in the video stream for distribution.

MADI signals are combined with video signals on a single input card, called 3G/TDM, to maximize use of switching matrix space. (See Using an AES/MADI Converter (NV8900) on page 4.) The combined 3G/TDM card does not de-embed signals in the video streams. Audio signals are passed through.

If any hybrid input cards are installed, all crosspoint cards and all control cards must also be hybrid to ensure successful routing. Also, for the NV8576 and NV8280 frames, power needs require installation of PS8300 power supply modules and use of the NV8300 power supply frame. (See Connecting to Power on page 103.) For the NV8144 frame, the PS8100 power supply modules and the NV8000 power supply frame provide sufficient power even when hybrid modules are installed.

Video signals may be received through coax or fiber optic cables and connectors. At this time, only standard 3Gig input cards support fiber optics. Hybrid input cards supporting fiber optics are scheduled for a future release.

The following tables list the different input cards available:

Standard Input Cards

Input Card Part Number	Signal Type	Total Number of Inputs per Card	Cable Equalization	Corresponding Backplane Part Number
8500-3GIG-IN-COAX (coax)	3Gig (SD, HD and 3Gig combined)	9	(for cables listed or equivalent cables) 400 m Belden 1694A, 250 m Belden 1855A at 270 Mb/s 150 m Belden 1694A, 100 m Belden 1855A at 1.5 Gb/s 100 m Belden 1694A, 45 m Belden 1855A at 3.0 Gb/s Note: Cable equalizers are not present on input cards managing fiber optic signals.	EM0791 (coax)
8500-3GIG-IN-FIBER (fiber optic)				EM0696 (fiber optic)
8500-AES-ASYNC-IN (coax)	AES Async Digital Audio Unbalanced	9	NA	EM0791 (coax)
8500-AES-ASYNC-IN (terminal block)	AES Async Digital Audio Balanced	9	NA	EM0828 (terminal block)

Hybrid Input Cards

Input Card Part Number	Signal Type	Total Number of Inputs per Card	Cable Equalization	Corresponding Backplane Part Number
8500H-IP-3G-DEM-CX (coax)	3Gig with embedded audio (SD, HD and 3Gig combined)	8 video streams; 128 embedded audio channels (1 video stream has up to 16 embedded audio channels.)	(for cables listed or equivalent cables) 400 m Belden 1694A, 250 m Belden 1855A at 270 Mb/s 150 m Belden 1694A, 100 m Belden 1855A at 1.5 Gb/s 100 m Belden 1694A, 45 m Belden 1855A at 3.0 Gb/s	EM0791 (coax)
8500H-IP-3G-TDM-CX (coax)	3Gig and MADI Sync Digital Audio, Unbalanced	8 video streams; 1 MADI streams composed of 64 audio channels		EM0791 (coax)

The functions of each type of card are described in the proceeding sections. Cards are listed by the signal type supported and whether standard or hybrid.

AES Async (Standard)

The standard audio input card—AES Async (8500-AES-ASYNC-IN)—receives up to 9 balanced or unbalanced incoming signals through local I/O connectors: DIN 1.0/2.3 for unbalanced signals and WECO terminal block for balanced signals. An incoming signal can be distributed to any or all output cards.

Each card has 9 AES receivers composed of a cable receiver and a cable equalizer. The AES receiver distributes five copies of the signal to the motherboard. The motherboard forwards the copies to crosspoint cards for distribution to output cards, or if an expandable frame, to expansion connectors for distribution to a connected frame. The motherboard also distributes one signal to a monitor selector for distribution to the monitor card. (See Monitor Cards on page 49.)

Figure 1-29 shows the signal flow for a standard AES Async input card. The block diagram shows a hybrid crosspoint card. Standard signals are forwarded to the crossbar matrix on the hybrid crosspoint card. Only hybrid input cards can forward audio signals to the hybrid crosspoint card's TDM matrix. (See Crosspoint Cards on page 47.)

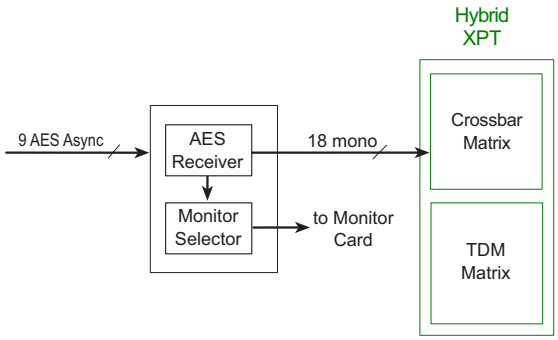


Figure 1-29. Standard AES Async Input Card Block Diagram

The AES Async input card is a standard card and must be used in conjunction with a standard AES Async output card. This input card may be used with a standard crosspoint card and standard control card or with a hybrid crosspoint card and hybrid control card.

3G/TDM (Hybrid)

The 3G/TDM input card (8500H-IP-3G-TDM-CX) received up to 8 3Gig video signals (combined SD, HD and 3Gig) and one MADI stream composed of 64 mono channels through 9 local DIN 1.0/2.3 connectors.

Each card has 8 cable equalizers, one for each of the 8 incoming video signals. Each cable equalizer distributes five copies of the video signal to the motherboard. The motherboard forwards the copies to hybrid crosspoint cards for distribution to output cards. An incoming signal can be distributed to any or all hybrid output cards. The motherboard also distributes one video signal to a a monitor selector for distribution to the monitor card. (See Monitor Cards on page 49.)

Any embedded audio in the video stream is passed through and routed with the video signal. The audio is not de-embedded.

One MADI stream is received though one input connector at a sample rate of 48 kHz. MADI audio signals are grouped into 32-bit packets for each audio stream with one MADI stream composed of up to 64 continuous channels.

Each MADI signal is transformer coupled to remove "noise" and forwarded to a MADI receiver. The receiver extracts clock and data information, removing any unnecessary synchronization information. The signal is then forwarded to an audio TDM Mux and then to the motherboard for forwarding to the crosspoint card.

Figure 1-30 shows the signal flow for a 3G/TDM hybrid input card. The block diagram shows a hybrid crosspoint card, which uses a TDM Mux for audio signals and a crossbar matrix for video signals. (See Crosspoint Cards on page 47.)

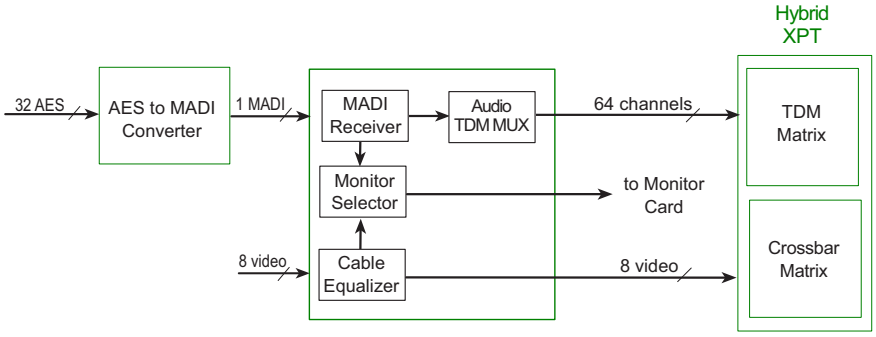


Figure 1-30. Hybrid 3G/TDM Input Card Block Diagram

In general, the 3G/TDM input card is a hybrid card requiring the installation of hybrid control cards and hybrid crosspoint cards for proper switching. While installation of a hybrid 3G/TDM output card is recommended, it is possible to forward outgoing signals to a 3Gig hybrid output card, which can embed the audio signals into a video stream.

3G/TDM cards can be used with NV8900 converters. For more information, see Using an AES/MADI Converter (NV8900) on page 4.

3Gig (Standard)

The standard 3Gig input card (combined SD, HD and 3Gig: 8500-3GIG-IN-COAX for coax; 8500-3GIG-IN-FIBER for fiber optic) receives up to 9 video signals. Each card has 9 cable equalizers. Each cable equalizer distributes five copies of the signal to the motherboard. The motherboard forwards the copies to crosspoint cards for distribution to output cards. An incoming signal can be distributed to any or all standard output cards. The motherboard also distributes one signal to a a monitor selector for distribution to the monitor card. (See Monitor Cards on page 49.)

The routers pass embedded audio signals through, unchanged.

Figure 1-31 shows the signal flow for a standard video input card. The card is shown with a hybrid crosspoint card, which uses a crossbar matrix for video signals. (See Crosspoint Cards on page 47.)

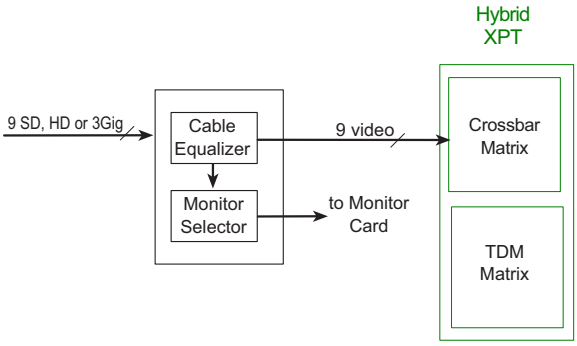


Figure 1-31. Video Input Card Block Diagram

The standard 3Gig input card must be used in conjunction with a standard 3Gig output card. These output cards may be used with a standard crosspoint card and standard control card or with a hybrid crosspoint card and hybrid control card.

3Gig (Hybrid)

The 3Gig hybrid input card (8500H-IP-3G-DEM-CX) receives up to 8 video streams composed of either SD, HD or 3Gig signals. Each stream can carry up to 16 embedded audio channels for a total of 128 audio channels. The hybrid input card automatically detects if the video format has embedded audio. Embedded audio is de-embedded for separate routing.

Hybrid video input cards only support coax cables and connectors at this time. Fiber optics will be supported in a future release.

Each video stream is forwarded to cable equalizers and then onward to a de-embedder. The de-embedder separates the embedded audio channel from the video stream. The audio channels are forwarded to an Audio TDM Mux and then to the motherboard for distribution to a hybrid crosspoint card. Similarly, the video signals are forwarded to a buffer and then the motherboard, which in turn distributes the signals to a hybrid crosspoint card. The motherboard also distributes one signal to a a monitor selector for distribution to the monitor card. (See Monitor Cards on page 49.)

Figure 1-32 shows the signal flow for a hybrid 3Gig video input card and a hybrid crosspoint card. Audio signals are de-embedded and forwarded to a TDM matrix while video signals are sent to a crossbar matrix. (See Crosspoint Cards on page 47.)

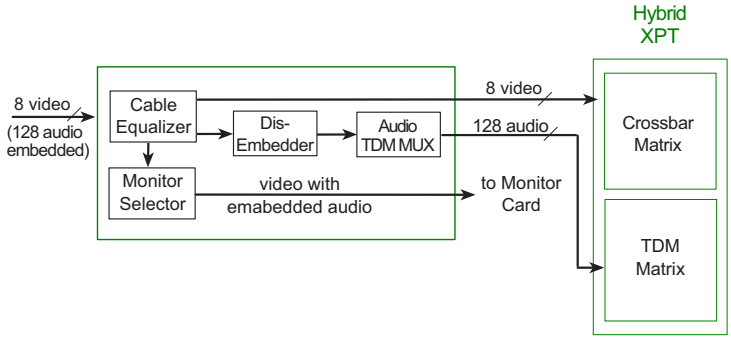


Figure 1-32. Hybrid 3Gig Video Input Card Block Diagram

The 3Gig hybrid video input card must be used with a hybrid 3Gig output card, hybrid control cards and hybrid crosspoint cards for proper switching.

Output Cards

Output cards distribute outgoing signals through connectors housed on backplanes. The output card must be paired with the correct corresponding backplane. For example, if the output card manages fiber optic signals, it must be paired with a backplane containing LC (fiber optic) connectors. (See About Backplanes on page 23.)

Output cards are divided into two general categories: standard and hybrid. Standard output cards manage AES Async audio signals and SD, HD and 3Gig video signals. Any embedded audio signals are passed through with the video signals. Hybrid output cards manage MADI audio signals and SD, HD and 3Gig video signals.

MADI signals are managed on a hybrid output card that can also distributes 3Gig signals, maximizing switching matrix usage. A NV8900 converter can be combined with the 3G/TDM card so that AES signals can be brought into the TDM matrix through a MADI connection; the MADI stream is routed as discrete AES signals. (See Using an AES/MADI Converter (NV8900) on page 4.)

The hybrid 3Gig input cards de-embed audio for separate routing from the video stream. When the audio and video are sent to the hybrid 3Gig output card, the audio is re-embedded for distribution with the video signals.

For a detailed description of standard and hybrid cards, see Standard vs. Hybrid Cards on page 33.

Output cards are further divided by function: standalone, expansion and filler:

- Standalone output cards manage local signals for the frame in which they are installed. These cards are installed in standalone routers frames (NV8144, NV8280 and NV8576).
- Expansion output cards manage local signals *and* signals from the expansion connectors when two expandable router frames are connected (NV8576-Plus).
- Filler output cards manage signals *only* from the expansion connectors when two expandable router frames are connected and not fully populated (NV8576-Plus). They do not handle local output signals.

Expansion and filler cards can be combined in a single expandable router frame (NV8576-Plus). Standalone cards are used exclusively in a standalone router frame (NV8144, NV8280 and NV8576). Currently there are only standard expansion cards; hybrid expansion cards are scheduled for a future release.

The following is a list of the different standard output cards available:

Output Card Part Number	Category	Signal Types	Number of Inputs from XPT	Sample Rates for Outputs	Corresponding Backplane Part Number
Standard SD, HD and 3Gig Signals (Coax)					
8500-3GIG-OUT-COAX	Standalone	SD, HD, 3Gig	18 video	Auto re-clock at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s or auto bypass with pass-through from 19 Mb/s to 3.0 Gb/s	EM0793
8500-3GIG-OUT-COAX-EXP	Expansion		9 video 2 expansion		EM0789
8500-OUT-FILLER-EXP	Filler		2 expansion		EM0789
Standard SD, HD and 3Gig Signals (Fiber Optic)					
8500-3GIG-OUT-FIBER	Standalone	SD, HD, 3Gig	18 video	Auto re-clock at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s or auto bypass with pass-through from 19 Mb/s to 3.0 Gb/s	EM0694
8500-3GIG-OUT-FIBER-EXP	Expansion		9 video 2 expansion		EM0698
8500-OUT-FILLER-EXP	Filler		2 expansion		EM0698
Standard AES Async Signals					
8500-AES-ASYNC-OUT (coax)	Standalone	AES Async Digital Audio Unbalanced	18 stereo	32 to 192 kHz (passed through)	EM0793
	Expansion		9 stereo 2 expansion		EM0789
	Filler		2 expansion		EM0789

Output Card Part Number	Category	Signal Types	Number of Inputs from XPT	Sample Rates for Outputs	Corresponding Backplane Part Number
8500-AES-ASYNC-OUT (terminal block)	Standalone	AES Async Digital Audio Balanced	9 stereo	32 to 192 kHz (passed through)	EM0829
	Expansion		9 stereo 2 expansion		EM0830
	Filler		2 expansion		EM0830

The following is a list of the different hybrid output cards available:

Output Card Part Number	Category	Signal Types	Number of Inputs from XPT	Sample Rates for Outputs	Corresponding Backplane Part Number
Hybrid SD, HD and 3Gig Signals (Coax)					
8500H-OP-EMB-CX	Standalone	SD, HD, 3Gig with embedded audio	16 video streams; 256 embedded audio channels (1 video stream as up to 16 embedded audio channels.)	Auto re-clock at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s or auto bypass with pass-through from 19 Mb/s to 3.0 Gb/s	EM0793
8500-OUT-FILLER-EXP	Filler	SD, HD, 3Gig	8 video 128 embedded audio 2 expansion		EM0789
Hybrid 3G/TDM Signals					
8500H-OP-3G-TDM-CX	Standalone	3Gig and MADI Sync Digital Audio, Unbalanced	16 video 2 MADI streams,	Video: Auto re-clock at 270 Mb/s or auto bypass with pass-through from 19 Mb/s to 360 Mb/s. Audio: 1 stream of 64 channels each, 32 bits at 48 kHz, locked to reference.	EM0793
8500-OUT-FILLER-EXP	Filler		8 video 1 MADI stream 2 expansion		EM0789

Standalone AES Async (Standard)

AES Async output cards (8500-AES-ASYNC-OUT) receive 18 signals from the crosspoint card (via the motherboard). The card contains 18 re-clockers. Each re-clocker creates two copies of the signal, feeding one copy to a cable driver and one copy to a Monitor Selector (18x1 Mux). The cable driver forwards the signal to a connector (DIN 1.0/2.3 for unbalanced signals; terminal block for balanced signals) to distribute the outgoing signal. The Monitor Selector sends one output to the motherboard, which in turn forwards the signal to a monitor card. (See Monitor Cards on page 49.)

Figure 1-33 shows the flow of a signal through the AES Async output card. The diagram shows a hybrid crosspoint card, which uses a crossbar matrix for routing audio signals for standard I/O

cards. The TDM matrix is only used for signals from hybrid audio I/O cards. (See Crosspoint Cards on page 47.) For signal re-clocking rates, see Signal Flow on page 50.

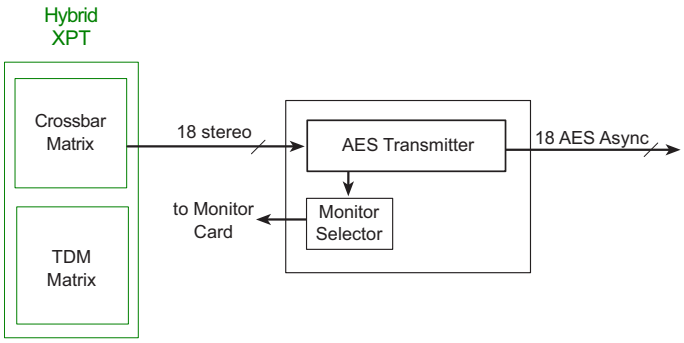


Figure 1-33. Standard AES Async Output Card Block Diagram

The AES Async output card is a standard card and must be used in conjunction with a standard AES Async input card. This output card may be used with standard crosspoint cards and standard control cards or with hybrid crosspoint cards and hybrid control cards.

Standalone 3G/TDM (Hybrid)

The 3G/TDM output card (8500H-OP-3G-TDM-CX) receives 16 3Gig video signals and 2 MADI streams from the crosspoint card (via the motherboard) and forwards the signals to local connectors. Each MADI stream is composed of 64 channels. A NV8900 converter may be used to convert outgoing MADI signals into AES signals. (See Using an AES/MADI Converter (NV8900) on page 4.)

Each of the 64 audio channels is forwarded to a TDM selector. The selector places the audio channels on a single wire and then forwards the channels to a MADI transmitter. The transmitter rejoins right and left channels, channel status information, and user bits to create a MADI signal. The transmitter has a cable driver, which forwards the signal to local connectors for distribution.

The 3Gig video signals received from the crosspoint card are sent to a reclocker and then a cable driver for distribution to backplane connectors. On 3G/TDM output cards, embedded audio in the video streams is passed through and distributed with the outgoing video stream.

For monitoring purposes, a copy of the MADI and video signals are also sent to a monitor card. (See Monitor Cards on page 49.)

Figure 1-34 shows the signal flow for a hybrid 3G/TDM output card. The hybrid crosspoint card uses a TDM matrix to switch audio signals from hybrid I/O cards. Video signals are managed by a crossbar matrix. (See Crosspoint Cards on page 47.) The block diagram shows an NV8900 con-

verter that can convert the MADI output to AES, greatly expanding routing flexibility. (See Using an AES/MADI Converter (NV8900) on page 4.)

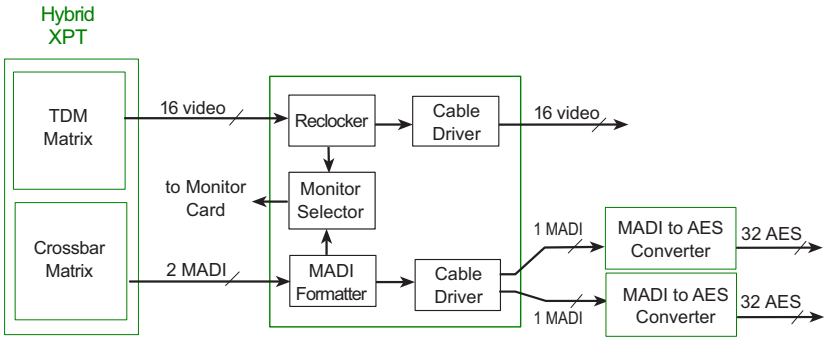


Figure 1-34. Hybrid 3G/TDM Output Card Block Diagram

MADI output cards are hybrid cards and used in conjunction with the hybrid MADI input card, hybrid control cards and hybrid crosspoint cards.

Standalone 3Gig (Standard)

The standard 3Gig output card manages SD, HD and 3Gig signals combined (8500-3GIG-OUT-COAX; 8500-3GIG-OUT-FIBER). Each output card cards receive 18 signals from the crosspoint card (via the motherboard). The card contains 18 re-clockers. The re-clocker creates two copies of the signal, feeding one copy to a cable driver and one copy to a Monitor Selector (18×1 Mux). The cable driver forwards the signal to a connector (coax or fiber optic) to distribute the outgoing signal. The Monitor Selector sends the output to the motherboard, which in turn forwards the signal to a monitor card. (See Monitor Cards on page 49.)

Note Cable drivers are not present on output cards managing fiber optic signals.

Figure 1-35 shows the flow of a signal through the 3Gig standard output card with a hybrid crosspoint card. On a hybrid crosspoint card, video signals from standard output cards are routed through the crossbar matrix. (See Crosspoint Cards on page 47.) For signal re-clocking rates, see Signal Flow on page 50.

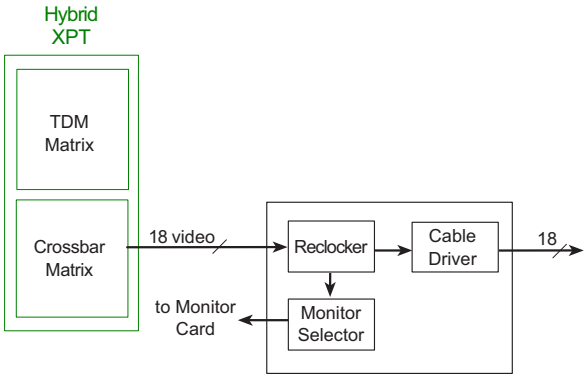


Figure 1-35. 'Standalone' Standard SD or 3Gig Output Card Block Diagram (Coax Cards)

Standard standard 3Gig output card is used in conjunction with the standard 3Gig input card. This output card may be used with standard crosspoint cards and standard control cards or with hybrid crosspoint cards and hybrid control cards.

Standalone 3Gig (Hybrid)

The 3Gig hybrid output card (8500H-OP-3G-EMB-CX) receives 16 video signals and 256 audio signals from the crosspoint card (via the motherboard). The card contains re-clockers. The re-clocker creates two copies of each signal to an embedder, which re-embeds the audio into the video stream. The embedder forwards one copy to a monitor selector (16×1 Mux) for distribution to a monitor card. (See Monitor Cards on page 49.) The embedder forwards the other copy to a cable driver which in turn forwards the signal to a connector for distribution.

Figure 1-36 shows the flow of a signal through the standalone 3Gig hybrid output card. For signal re-clocking rates, see Signal Flow on page 50.

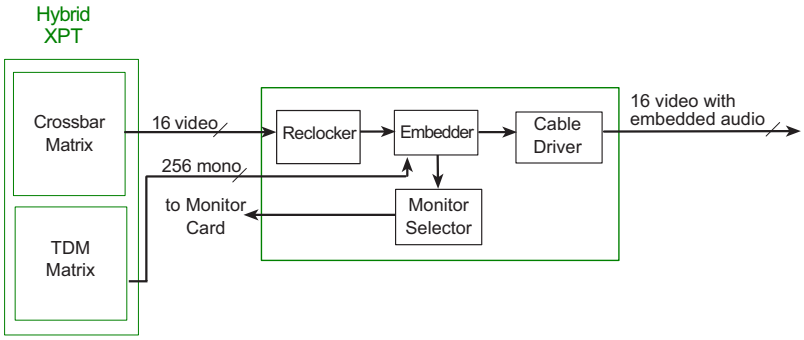


Figure 1-36. 'Standalone' Hybrid 3Gig Output Card Block Diagram

Hybrid 3Gig output cards are used in conjunction with the hybrid 3Gig input card, hybrid control cards and hybrid crosspoint cards.

Expansion (Standard)

Expansion output cards are used with the NV8500 family expandable frames: NV8576-Plus. Standard expansion cards either route AES Async audio signals (8500-AES-ASYNC-OUT-EXP) or 3Gig video signals (8500-3GIG-OUT-COAX-EXP; 8500-3GIG-OUT-FIBER-EXP). Currently there are no hybrid expansion cards. Hybrid expansion cards are scheduled for a future release.

Each expansion card receives 18 signals from the local crosspoint cards (via the motherboard). 9 of these signals are forwarded to a 2x1 Mux. The expansion card forwards 9 additional signals to cable drivers. The cable drivers feed the outputs to an expansion connector for distribution to a second connected router. At the same time, the second router sends 9 signals to the first router through a second expansion connector. Signals arriving through these expansion connectors are forwarded through a cable receiver to the 2x1 Mux mentioned above.

The 2x1 Mux forwards the signal to one of 9 reclockers. The reclocker creates two copies of the input, sending one copy to a cable driver and one copy to a 9x1 Mux. The cable driver forwards the output to a DIN 1.0/2.3 (coax), terminal block (coax), or LC connector (fiber optic) to distribute the outgoing signal. The Mux sends the output to the motherboard, which in turns forwards the signal to a monitor card.

Note Cable drivers are not present on output cards managing fiber optic signals.

The expansion cards on the local router and the expansion cards on the connected router "mirror" each other, performing identical tasks. To illustrate, the expansion output cards receive and distribute signals as follows, where card 1 belongs to the local router and card 2 belongs to the connected router:

- Card 1 receives 9 signals from the local crosspoint cards (one copy of the local input). It sends these signals to both the output monitor cards and to local I/O connectors as outgoing signals.
- Card 1 also sends 9 additional local signals to the expansion connectors and on to card 2.
- Card 1 receives 9 signals from card 2 through the expansion connectors.
- At the same time, card 2 performs the exact same tasks card 1 is performing.

Figure 1-37 shows the flow of a signal through the expansion output card:

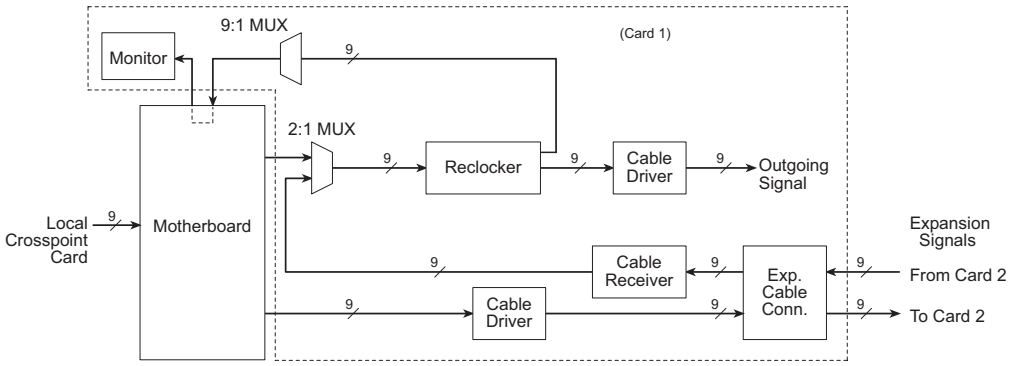


Figure 1-37. Expansion Output Block Diagram (Coax Cards)

Standard expansion output cards are used in conjunction with standard input cards, standard crosspoint cards and standard control cards. The standard expansion output cards may be used with hybrid crosspoint cards and hybrid control cards.

Filler (Standard and Hybrid)

The NV8576-Plus uses filler output cards (8500-OUT-FILLER-EXP) to allow expansion of the router's inputs when expansion of outputs is not required. If at a later date outputs need to be increased, filler output cards can be replaced with expansion output cards. Expansion and filler cards can be combined in a single frame.

Filler cards are available for standard or hybrid output cards. (See Standard vs. Hybrid Cards on page 33.) However, there are no filler cards for fiber optic signals. Filler fiber optic cards are scheduled for a future release.

When two routers are connected, the filler cards on the local router forward signals to a cable driver. The cable driver feeds the outputs to one of two expansion connectors for distribution to a second, connected router.

Note

Cable drivers are not present on output cards managing signals through fiber optic connectors.

Figure 1-38 shows the flow of a signal through the filler output card:

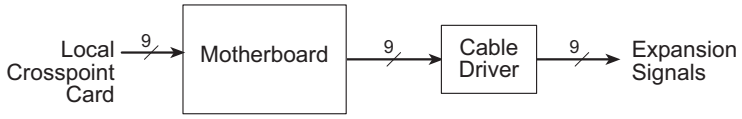


Figure 1-38. Filler Output Block Diagram

Standard filler output cards are used in conjunction with standard input cards, standard crosspoint cards and standard control cards or with hybrid crosspoint cards and hybrid control cards. Hybrid filler cards must be used with hybrid input cards, hybrid crosspoint cards and hybrid control cards.

Crosspoint Cards

Crosspoint cards receive signals from the input cards (via the motherboard) and switches the signals, as directed by the control card, to the appropriate output cards (again, via the motherboard). A router frame can house up to 8 crosspoint cards and either one redundant crosspoint card in a single slot (NV8144) or a redundant cardset in a double-slot (2-card module: NV8280; NV8576). There are two categories of crosspoint cards: standard and hybrid. Standard crosspoint cards can only be used with standard I/O cards. Hybrid crosspoint cards can be used with either hybrid I/O cards or standard I/O cards. Standard crosspoint cards cannot be used with hybrid I/O cards.

Crosspoint cards must be installed in pairs. For details, see Installing Cards on page 76.

Standard and hybrid crosspoint cards cannot be mixed in a frame. Crosspoint cards must either be all standard or all hybrid, depending on the I/O cards installed. The installation of even a single hybrid I/O card requires that hybrid crosspoint cards be installed. This means that in a router frame containing both standard and hybrid I/O cards, all crosspoint cards must be hybrids. For more information, see Standard vs. Hybrid Cards on page 33.

The following lists the crosspoint cards available. There are two general switching matrices: 144 × 144 and 288 × 288. The router frame determines which matrix is used and how many crosspoint cards are installed. (See Installing Cards on page 76.)

Catalog Number	Standard or Hybrid	Router
288-3GIG-XPT	Standard	3Gig 288×288 crosspoint for NV8576/NV8576-Plus
288-3GIG-XPT-RED	Standard	Redundant 288×288 crosspoint for NV8576/NV8576-Plus
8500H-XPT-288	Hybrid	3Gig 288×288 crosspoint for NV8576/NV8576-Plus
8500H-RXPT-288	Hybrid	Redundant 288×288 crosspoint for NV8576/NV8576-Plus
144-3GIG-XPT	Standard	3Gig 144×144 crosspoint for NV8144 and NV8280
144-3GIG-XPT-RED	Standard	Redundant 144×144 crosspoint for NV8280. No redundant 144×144 crosspoint for NV8144
8500H-XPT-144	Hybrid	3Gig 144×144 crosspoint for NV8144 and NV8280
8500H-RXPT-144	Hybrid	Redundant 144×144 crosspoint for NV8280. No redundant 144×144 crosspoint for NV8144

The card slot in which the crosspoint card is installed determines the range of signals managed. For details, see Crosspoint Slots and Signals Switched on page 67.

Redundant Crosspoints

An second crosspoint card can be installed in the NV8144 as a redundant card should the primary crosspoint fail. Similarly, an optional, redundant crosspoint cardset (2-card module) can be installed in crosspoint slots 5 and 6 in the NV8280, NV8576 and NV8576-Plus router frames. These crosspoint cardsets are unique and cannot be used in place of another crosspoint card. When a redundant crosspoint cardset is installed in these slots, function buttons located on the front of the module become active. When an operator presses a particular button, the crosspoint card set can either take over active control from another crosspoint card or act as a ‘hot” backup in stand-by mode. If it is configured to take active control, the redundant crosspoint cardset takes over the current functions of a specific, selected crosspoint card creating N-to-1 redundancy. For details, see Setting Redundant Crosspoint Switching on page 118.

Figure 1-39 shows the flow of signals through a crosspoint card.

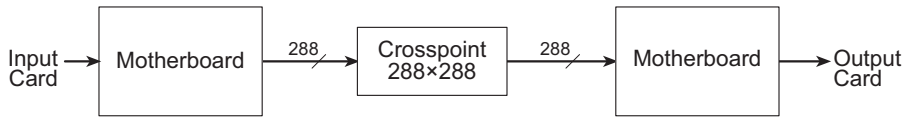


Figure 1-39. Crosspoint Block Diagram

Visual Indicators

The crosspoint card and redundant crosspoint cardset includes a status reporting circuit. Five LEDs on the front of the card or cardset indicate the card’s status: alarm (red), power good (green), software is loaded (amber), and whether there is good (green) or bad (red) communication with the control card. For more information, see Indicator LEDs on page 121.

Control Cards

A router can have a primary and a secondary control card. The secondary card is optional and used as a redundant, or stand-by, control card. Each card receives commands from the router control system, and in turn sends commands that control the input, output, crosspoint and monitor cards. Only the active control card sends commands to the I/O cards. The active control card constantly updates the stand-by control card.

There are two control cards available. One for router frames with standard I/O cards installed and one for frames with hybrid I/O cards installed. The installation of a hybrid I/O card requires that all crosspoint cards and all control cards also be hybrid. Standard and hybrid control cards cannot be mixed within a single frame. All control cards must either be standard or hybrid.

Catalog Number	Standard or Hybrid	Router
8500-NV	Standard	NV8144, NV8280. NV8576 and NV8576-Plus
8500H-NV	Hybrid	NV8144, NV8280. NV8576 and NV8576-Plus

Both the primary control card and the secondary control card receive commands from the router control system, but only the active control card responds. Because both cards receive router control system commands, if the active control card fails, the stand-by control card automatically takes over processing without interruption. In addition, the primary control card and secondary control card communicate with each other. Should either control card fail, the newly active control card communicates the failure to the router control system.

Note The MRC configuration application requires installation of the EM0833 control card. The UniConfig configuration application requires installation of the EM0666 control card. Contact Technical Support for details.

Visual Indicators

The control card receives power from the motherboard and includes a status reporting circuit. Four LEDs on the front of the control card indicate the card's status: low battery (red), alarm (red), active (amber), and operating normally (green). For more information, see Indicator LEDs on page 121.

Monitor Cards

Depending on the router frame, up to 4 monitor cards (8500-MNTR) can be installed. Each monitor card produces 2 signals that can be sent to monitoring equipment for the purpose of assessing signal presence and quality. The monitor card must have a corresponding monitor backplane that sends the signals to the monitoring equipment. Each backplane has 4 connectors: 2 inputs and 2 outputs. An operator can select any 4 signals (2 inputs and 2 outputs) to monitor using the Miranda Router Configurator (MRC) or through the NV9000 router control system. When two expandable frames are connected, monitor connections are cross-connected to allow the monitoring equipment access to monitor signals both frames.

Only one signal is sent from each input card or output card to the monitor card for forwarding to monitoring equipment. This means that only one signal from each input card or output card is monitored at any give time.

The NV8144 uses one monitor card, which performs both input and output monitoring. The card receives signals from each of the 8 output cards and 16 input cards. The signals are then sent to monitoring equipment through connectors on a unique monitor backplane (EM0846).

The NV8280, NV8576 and NV8576-Plus router frames have separate slots for monitor cards monitoring inputs or outputs. The NV8280 router frame has slots for one of each while the NV8576 and NV8576-Plus router frames have slots for two of each. The input monitor card and the output monitor card slots use the same monitor card and the signal processing is the same for each. However, different backplanes are used to distribute input monitor signals or output monitor signals.

In the NV8280, the input monitor card receives one signal from each of input card. Similarly, an output monitor card receives one signal from each output card. The NV8576 and NV8576-Plus monitor cards work in exactly the same manner except that the monitor cards in the upper portion of the router frame receive signals only from the output cards and input cards located in the upper region. Likewise, the monitor cards in the lower region of the frame receive signals only from the input and output cards installed in the lower region of the frame.

For connection information, see Making Monitor Connections on page 96.

Signal Flow

Routers switch incoming signals to designated output connections. Switching is directed by settings configured in the router control system, which sends commands to the control card. In turn, the control card directs how switching occurs on the crosspoint card. The flow of signals through a frame depends on the router frame type and whether the signals are local or being sent to a second, connected frame. For a description of control cards and crosspoint cards, see Overview of Active Cards on page 33.

Standalone Routers

The NV8500 family standalone routers include the NV8144, NV8280 and NV8576.

The NV8144 can house two 144 × 144 crosspoint cards (one required and one optional for redundancy).

The NV8280 and NV8576 router frames each house up to 8 crosspoint cards and an optional redundant crosspoint cardset (a single module). The NV8280 crosspoint cards having a switching matrix of 144 × 144 and the NV8576 crosspoint cards have a 288 × 288 matrix. When facing the front of these frames, the crosspoint card slots are numbered 1 through 10, from left to right. An optional redundant crosspoint cardset can be installed in slots 5 and 6. All other crosspoint cards are installed in slots 1 through 4 and slots 7 through 10. This creates two sets of 4 crosspoint cards, with each set of 4 fanning out and distributing inputs to all outputs.

Each standalone router switches signals via the crosspoint card differently. In a fully loaded NV8144 frame (i.e., all active cards installed), all inputs are sent to the primary crosspoint card and redundant crosspoint card, if installed, for distribution to any or all outputs.

In a fully loaded NV8280 or NV8576 frame, inputs on the left side of the frame (when facing the front of the router) are forwarded to crosspoint cards 1, 2, 7 and 8. Inputs situated on the right side of the frame are forwarded to crosspoint cards 3, 4, 9 and 10. (See Figure 1-40 on page 51.) All inputs are also forwarded to the optional redundant crosspoint cardset.

Outputs are distributed from each crosspoint card to specific output cards such that crosspoint cards in the left side of the frame (when facing the front of the router) send signals to output cards located in the left side of the frame. Similarly, crosspoint cards in the right side of the frame send signals to output cards located in the right side of the frame. (See Figure 1-41 on page 52.)

The redundant crosspoint cardset distributes outputs only if a primary crosspoint card has failed and performs exactly the same switching functions as the failed card.

For more information on crosspoint cards, the slots into which they are inserted, and the signals switched, see Crosspoint Slots and Signals Switched on page 67.

Router	Maximum Switching Matrix	Number of signals switched by one Crosspoint Card	Inputs	Forwarded to Crosspoint Cards in Slots
NV8144	144 inputs × 144 outputs	144 × 144	1–72	1, 2, 7 and 8
			73–144	3, 4, 9 and 10
NV8280	288 inputs × 576 outputs	144 × 144	1–144	1, 2, 7 and 8
			145–288	3, 4, 9 and 10

Router	Maximum Switching Matrix	Number of signals switched by one Crosspoint Card	Inputs	Forwarded to Crosspoint Cards in Slots
NV8576	576 inputs × 1152 outputs	288 × 288	1–288	1, 2, 7 and 8
			289–576	3, 4, 9 and 10

As an example, NV8576 has 8 crosspoint cards, each managing up to 288 × 288 signals. The cards are divided into two sets of 4, with each set of 4 fanning out and distributing 288 inputs to all 1152 outputs. When facing the front of the router, in a fully loaded frame inputs 1–288 located on the left side of the frame are forwarded to crosspoint cards 1, 2, 7 and 8. Inputs 289–576, located on the right side of the frame, are forwarded to crosspoint cards 3, 4, 9 and 10. See Figure 1-40 and Figure 1-41 on page 52.

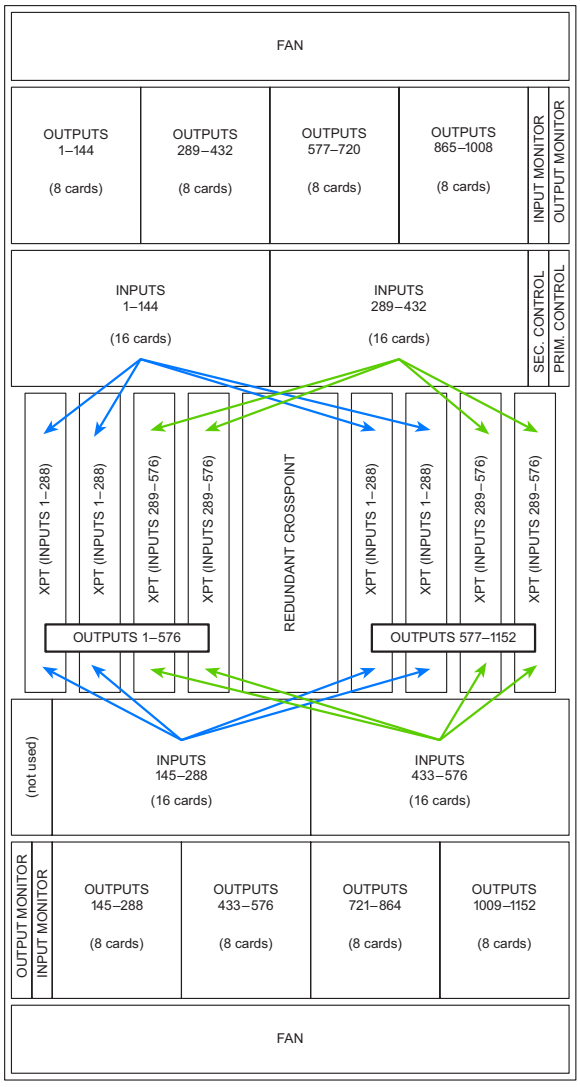


Figure 1-40. Example of NV8576 Inputs Signal Flow (Front View)

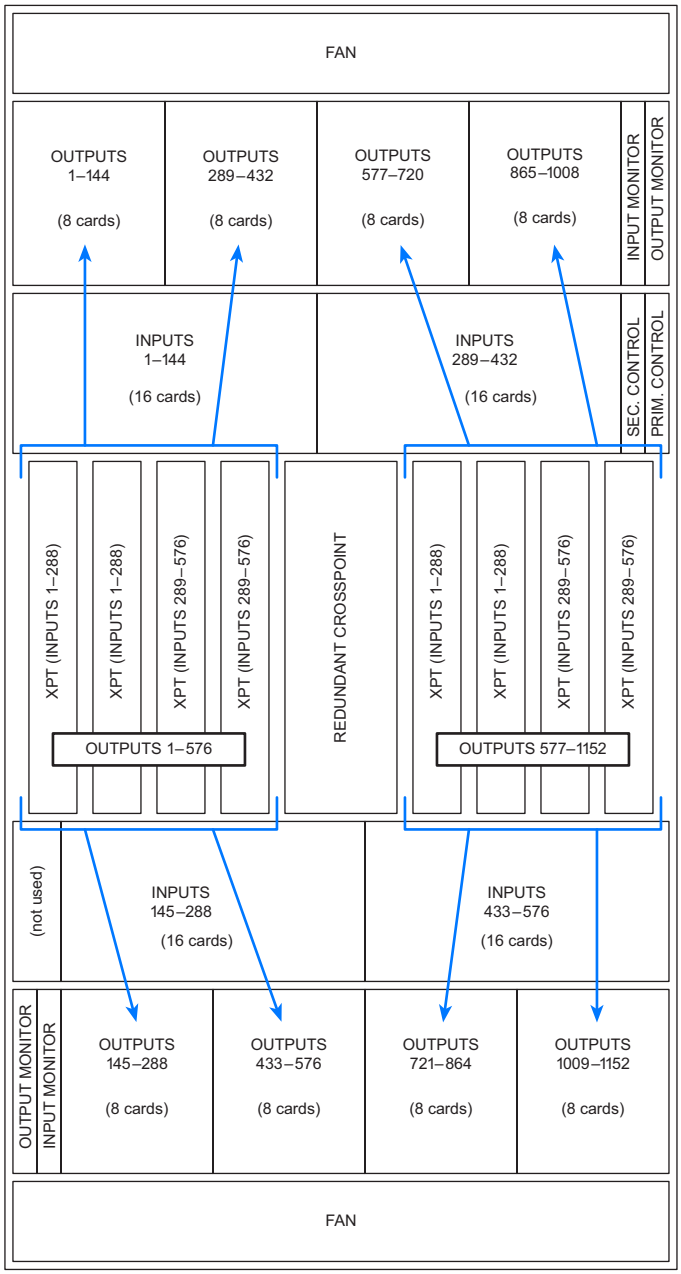


Figure 1-41. Example of NV8576 Outputs Signal Flow (Front View)

The following block diagrams (Figure 1-42, Figure 1-43 on page 53 and Figure 1-44 on page 54) illustrate the signal flow through the NV8576, NV8280 and NV8144 router frames. Crosspoint cards (XPT) must be installed in pairs, indicated by the dashed lines.

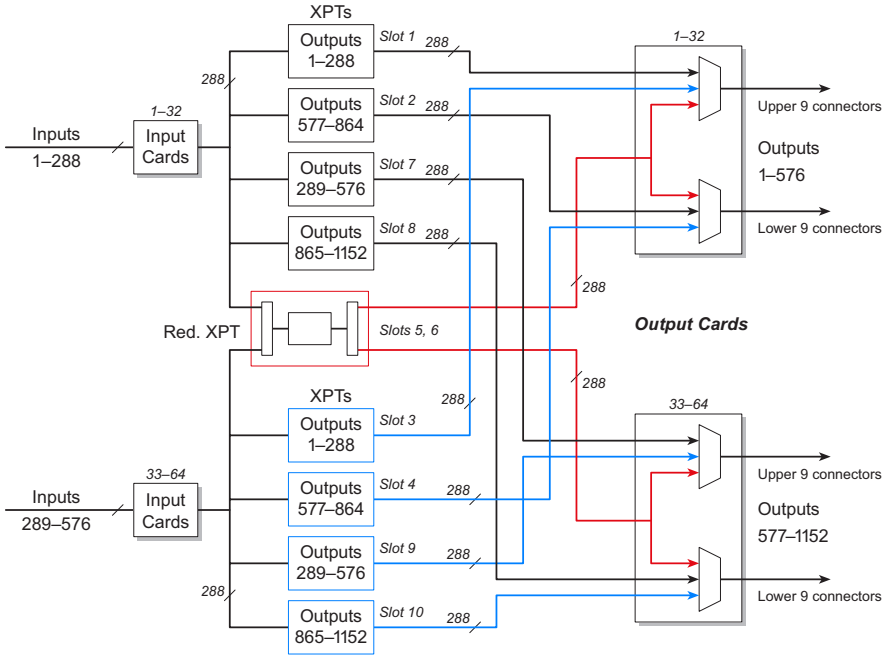


Figure 1-42. Block Diagram of NV8576 Signal Flow

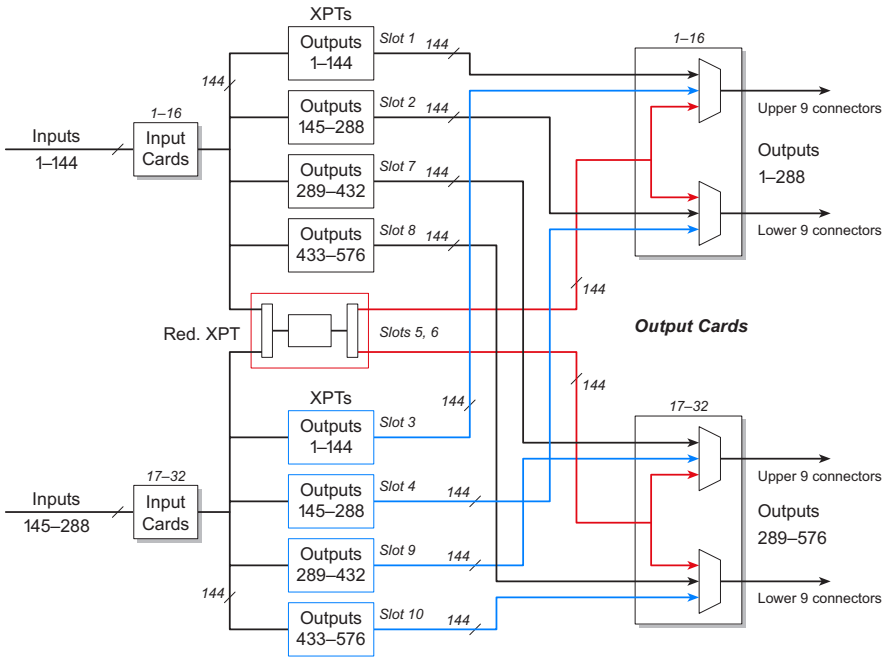


Figure 1-43. Block Diagram of NV8280 Signal Flow

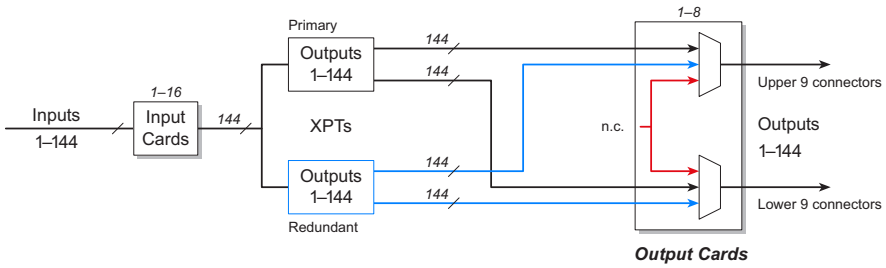


Figure 1-44. Block Diagram of NV8144 Signal Flow

Expandable Routers

The NV8576-Plus expandable router frame can be used as a standalone router or connected to an identical router to increase the switching matrix. The signal flow of inputs and outputs in an expandable router is identical to a standalone router, with one exception: When two expandable routers are connected, signals from one router are distributed to the second connected router, and vice versa, through expansion connections and expansion cards or filler output cards. Expansion cards and filler cards send expansion signals between two connected routers, but only expansion cards also send local outputs. (See Filler (Standard and Hybrid) on page 46.) Currently, expansion output cards exist only for standard signals, not for hybrid signals. (See Expansion (Standard) on page 45.) Filler cards exist for both standard and hybrid signals.

Each output only goes through a crosspoint card once. Before an output is forwarded to a connected router, it goes to the crosspoint card on the local router for switching to the expansion connections, through which it is sent to the second router. From the expansion connection on the first router, the signal is sent directly to the corresponding expansion connection on the second router and then directly to that output card.

Figure 1-45 illustrates the signal flow for two connected NV8576-Plus routers.

Figure 1-45. Example of Signal Flow Between Two NV8576-Plus Routers

The following block diagrams illustrate the signal flow through the NV8576-Plus router frame. Crosspoint cards (XPT) must be installed in pairs. Red indicates the redundant crosspoint card.

The following shows NV8576-Plus, Frame 1:

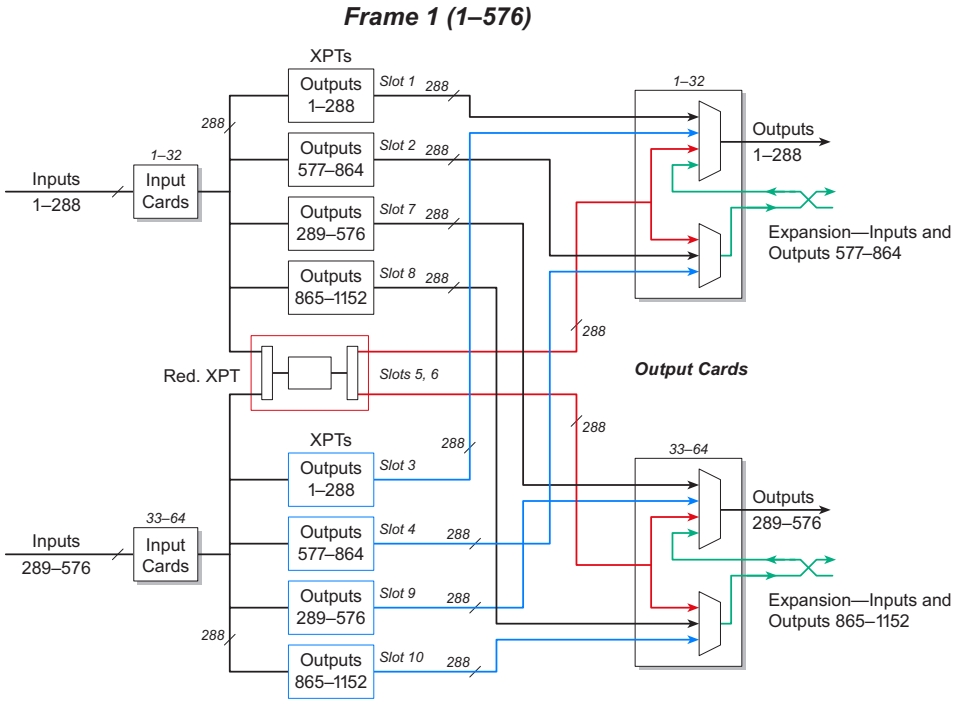


Figure 1-46. Block Diagram of NV8576-Plus Signal Flow

The following shows NV8576-Plus, Frame 2:

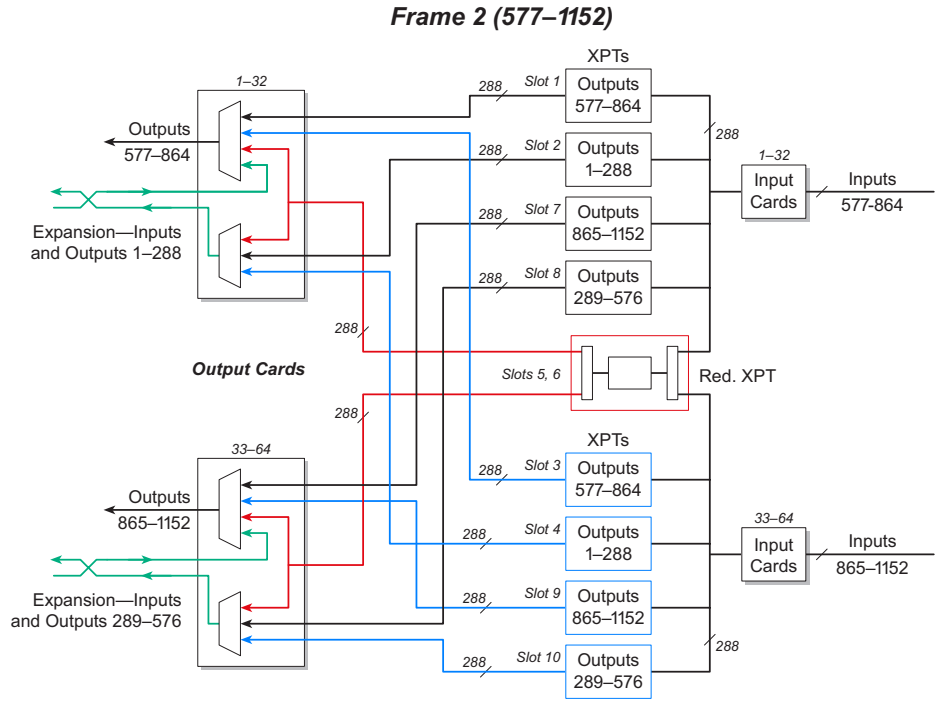


Figure 1-47. Block Diagram of NV8576-Plus Signal Flow

Signal Numbering

When making physical connections to a router, each connector on a backplane has a unique signal number assigned. Signal numbers are assigned to each connector based on three factors: 1) where individual connectors are located on the backplane, 2) where in the router frame the backplane is installed, and 3) whether the router is standalone or connected to a second router frame. Video and audio signals are numbered on different matrices. Therefore the video signals and audio signals can be numbered using the same numbers. For example, there can be signals 18 and 19 for video and signals 18 and 19 for audio.

Each connector on a backplane corresponds to a signal number. Signal numbers are assigned from top-to-bottom in ascending order. The lowest signal number is assigned to the top connector with each connector below being assigned the next incremental, greater number. For example, the 9 connectors on a backplane correspond to signals 1 through 9, with 1 being the top connector, 2 being the connector directly below 1, 3 being the connector below 2, and so on. Similarly, if an identical input card is installed in Input Slot 2, the associated backplane connectors would correspond to signals 10 through 18, with 10 being the top connector, 11 the next connector below 10, and so on.

All connectors and corresponding signals are numbered from top-to-bottom. This includes the NV8576 and NV857-Plus frame, which have two separate regions for backplanes: one in the upper section of the frame and one in the lower section of the frame. Backplanes installed in the lower region of the frame are rotated 180° from those in the upper portion and "face" in the opposite direction. (See About Backplanes on page 23.) Even though the backplanes are installed differently in the upper and lower regions, the signal numbering for each backplane connector *is identical*. In other words, whether the backplane is installed in the upper region or lower region of the frame, when facing the rear of the router frame the signal numbers applied to connectors are always numbered in ascending order from top-to-bottom and right-to-left (when facing the rear of the router frame).

The type of signal also determines the signal numbers assigned. For example, if a MADI stream is composed of 64 mono channels, one connector may have signals numbered 1 through 64.

Several reference documents have been created that list each spigot on a router frame and the corresponding signal number. To receive a copy, contact Technical Support. (See Technical Support Contact Information on page iii.)

- NV8144 — RF0272-00
- NV8280 — Refer to RF274-00, using only spigots in the upper region of the NV8576 for the NV8280 frame.
- NV8576 standalone frame — RF274-00.
- NV8576-Plus, Frame 1 of two expansion frames connected together — RF275-00.
- NV8576-Plus, Frame 2 of two expansion frames connected together — RF276-00.

Card Slot Location and Signal Numbers

Input cards and output cards are inserted in slots through the front of the router and connect to corresponding backplanes (via the motherboard) installed in the rear of the frame. When viewed from the front of the router, card slots are numbered in ascending order from left-to-right, such that Slot

1 is the first slot on the left, Slot 2 is the next card slot to the right of Slot 1, Slot 3 is the next card slot to the right of Slot 2,and so on.

The slot into which the card is installed determines the range of signal numbers assigned to the backplane. For example, a standard input card is installed in Input Slot 1 manages inputs 1–9. The connectors on the backplane associated with the input card are assigned signal numbers 1–9.

Important! Although card slots are numbered from left-to-right in ascending order when facing the front of the router frame, physical signal connections are made to backplane connectors located on the *rear* of the frame. This means that when facing the rear of the router the slots are numbered the *opposite*, or right-to-left. To put it another way, when you are facing the rear of the frame, the card slots, and resulting range of signal numbers associated with each slot, are in ***reverse order***. For example, when viewing the router frame from the rear, Input Slot 1 corresponds with the backplane installed in the farthest *right* location. Input Slot 2 is the next slot to the *left* of Slot 1, Input Slot 3 is the next slot to the *left* of Slot 2, and so on.

Figure 1-48 illustrates how connectors are associated with signal numbers for standard input or output cards when facing the *rear* of the router frame. In this example, each number represents a signal number assigned to an individual connector on a backplane receiving inputs. Each column corresponds to the range of signal numbers managed by the card in that slot. In this example, there are a total of 16 input card slots. Notice that signals are numbered in ascending order from top-to-bottom and right-to-left.

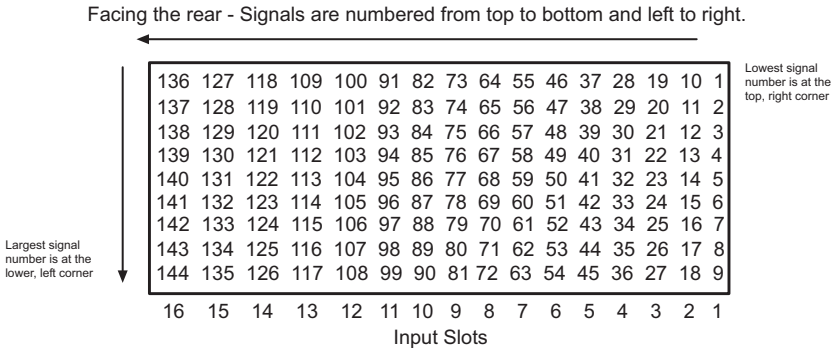


Figure 1-48. Example of Backplane Connectors and Corresponding Signal Numbers

Standard I/O Signals

Standard I/O cards and corresponding backplane manage either 9 inputs, 18 outputs, or 9 outputs plus 2 expansion signals. This is true whether the signal is audio or video. For a complete list of backplanes, see About Backplanes on page 23.

Figure 1-49 is an example of connectors on a backplane installed in either Input Slot 1 for inputs, Output Slot 1 for outputs, or Output Slot 1 for expansion signals plus outputs. These backplanes correspond to standard cards: AES Async or 3 Gig. (See Input and Output Cards on page 35.) Each connector corresponds to a signal number with the lowest signal number—in this example ‘1’—at the top ascending in order to the last connector.

For details on each backplane type and connectors, see About Backplanes on page 23.

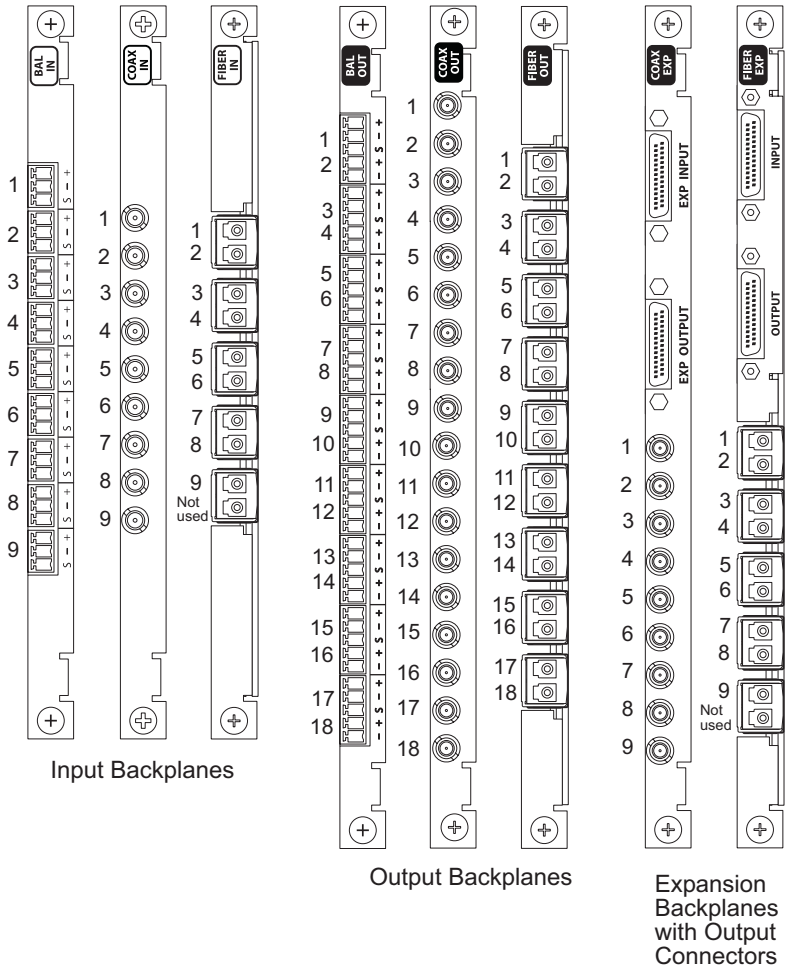


Figure 1-49. Example of Signal Numbering for Standard Backplanes in Slot 1

Signal Numbering for LC Backplanes

LC input backplanes and LC expansion backplanes used for fiber optic signals have five sets of two connectors each for a total of 10 connections. Because only 9 input signals are managed by an input card and only 9 output signals are managed by an expansion card, one connector is left unused. For the NV8576 and the NV8576-Plus, in the upper region of the frame the bottom connector is not used. In the bottom region of the frame the backplanes are rotated 180° from those in the upper portion and "face" in the opposite direction. Therefore, the top connector is not used.

For signal numbering purposes, the signal numbers in the lower region of the frame start with the *second connector* and not the first connector. In other words, in the lower region of the frame, signal numbering starts with the first usable LC connector.

Figure 1-50 illustrates how signal numbers are applied to LC input backplanes and LC expansion backplanes in both the upper region and lower region of the router frame.

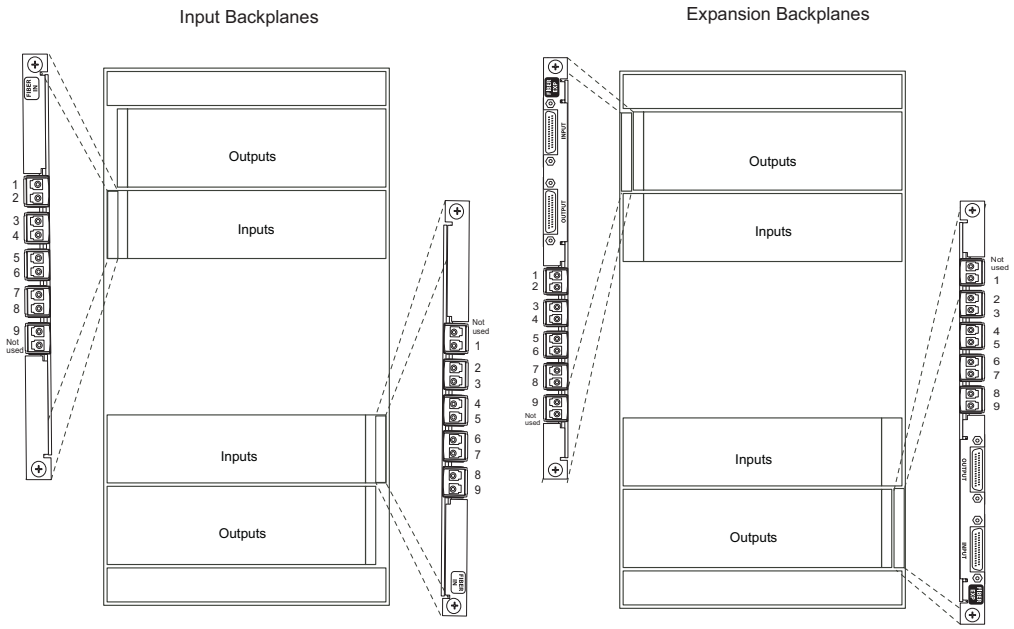


Figure 1-50. Example of Signal Numbers and LC Backplanes (rear view)

For an enumeration of the NV8576 and NV8576-Plus I/O connectors and corresponding signal number, see reference document RF274-00.

Hybrid I/O Signals

Unlike standard I/O cards which manage 9 inputs and 9 outputs or 18 outputs, the number of signals hybrid I/O cards manage differ depending on the type of signal. (See Standard I/O Signals on page 58.) Similar to standard signals, all signal numbers are assigned in ascending order, from top-to-bottom.

Note

Currently hybrid I/O cards do not include fiber optic and expansion signals. These cards are scheduled for a future release.

3Gig input cards can de-embed embedded audio signals. Each video signal can have 16 audio channels embedded. Because the crosspoint card can manage a maximum of 128 audio inputs, the number of video signals received through a single input card is limited to 8 (8 video signals contain 16 audio channels each = 128). However, the corresponding backplane has 9 connectors. Because connectors and corresponding signals are numbered in ascending order from top to bottom, it is recommended that you connect to the first 8 connectors, leaving the ninth connector empty. This means that the top connector will have the lowest signal number, increasing by one for each connector next in descending order. Although the ninth, bottom-most connector is not used, it is still assigned a signal number.

For the 3G/TDM input card and backplane, there are 9 connectors. The first 8 connectors are used for video signals and the ninth connector is used to receive one MADI stream containing 64 channels.

Because the NV8576 and the NV8576-Plus frames have upper and lower regions that mirror each other, the backplanes are rotated 180°. In the upper region of the frame the bottom connector is not

used. In the bottom region of the frame the backplanes are rotated 180° from those in the upper portion and “face” in the opposite direction. Therefore, the top connector is not used. Figure 1-50 on page 60 illustrates how backplanes are inserted in upper and lower regions. For installation instructions, see Installing Backplanes on page 72.

Figure 1-51 is an example of connectors on a backplane installed in either Input Slot 1 for inputs or Output Slot 1 for outputs. These backplanes correspond to hybrid I/O cards 3G/TDM or 3Gig. (See Input and Output Cards on page 35.) Each connector corresponds to a signal number with the lowest signal number—in this example ‘1’—at the top ascending in order to the last connector. There are currently no expansion output cards for hybrid signals. Hybrid expansion output cards are scheduled for future release.

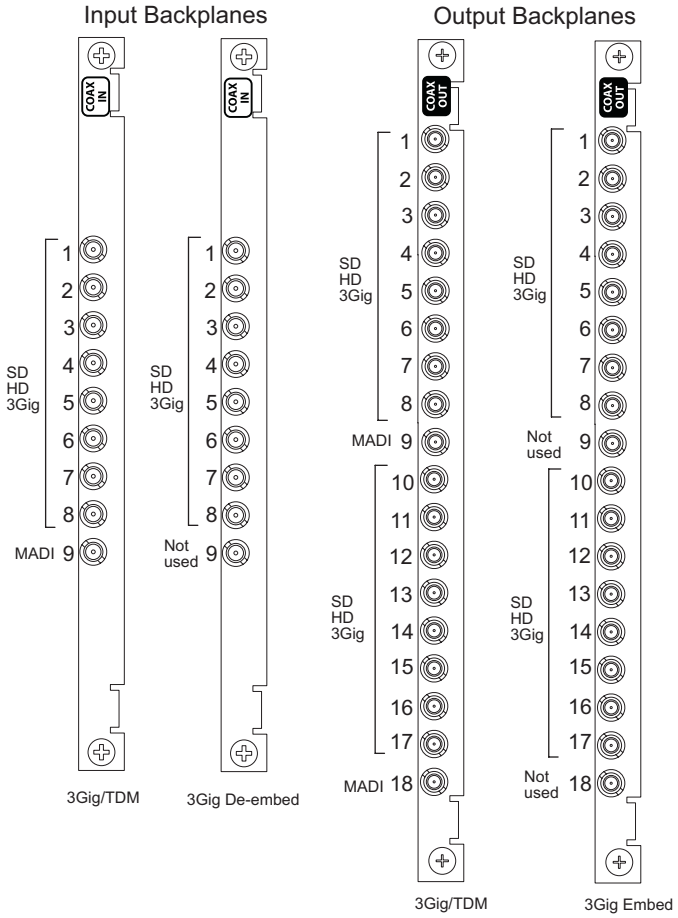


Figure 1-51. Example of Signal Numbering for Hybrid Backplanes in Slot 1

Example of Signal Numbers and Specific Frames

The following illustrate how signals are numbered in each NV8500 Series router. For simplicity, only standard I/O cards are used in this example. When making physical connections, it is important to review the numbering sequences to ensure the correct signal number is associated with the correct backplane connector.

Signal numbering for hybrid I/O cards has too many combinations to cover in this User’s Guide. However, in general the numbering sequences for each frame follow the same ordering as described here for frames with standard I/O cards. The Miranda Router Configurator (MRC) and

the NV9000-SE Utilities applications are being re-designed as “smart” configuration tools that will “read” the I/O card in each card slot and populate configuration interfaces with the correct signal numbers. Release of these upgraded configurators is scheduled for late-2010.

For inputs, each card slot manages nine signals. For outputs, each card slot manages 18 signals. For expansion cards installed in output card slots, each slot manages 9 output signals and two expansion signals.

Figure 1-52 illustrates the signal number ranges when facing the *rear* of the NV8576 or NV8576-Plus router.

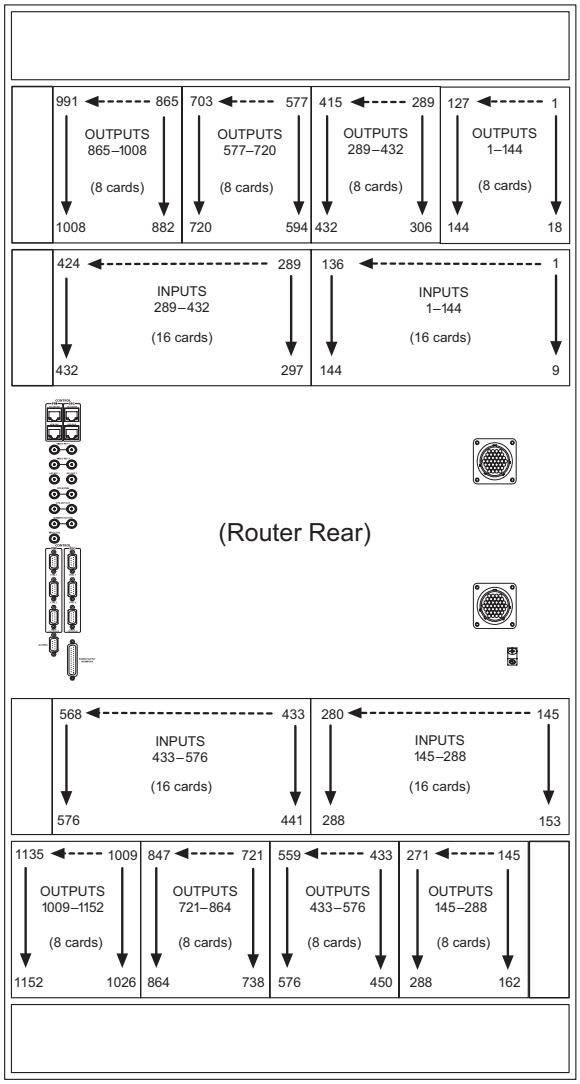


Figure 1-52. Signal Numbering for NV8576 and NV8576-Plus (Rear View)

Figure 1-53 illustrates the signal number ranges when facing the *rear* of the NV8280 router.

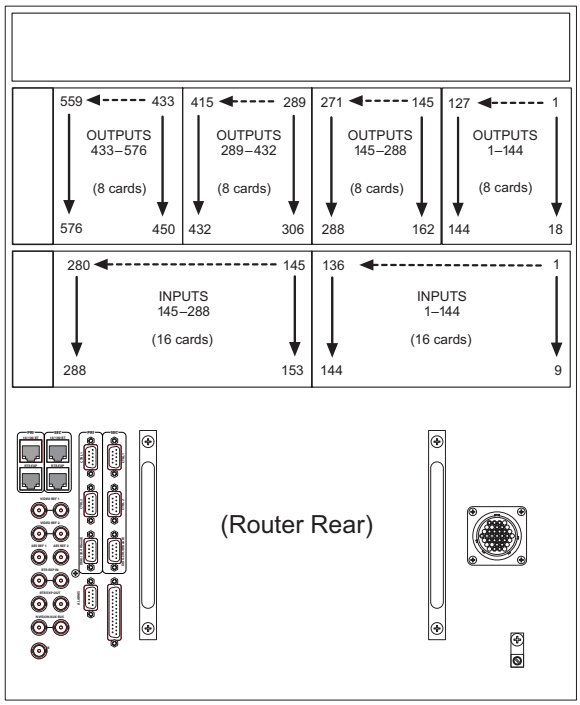


Figure 1-53. Signal Numbering for NV8280 (Rear View)

Figure 1-54 illustrates the signal number ranges when facing the *rear* of the NV8144 router.

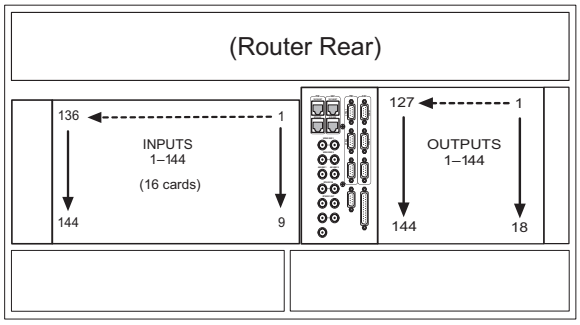


Figure 1-54. Signal Numbering for NV8144 (Rear View)

Figure 1-55 shows the standalone NV8576 frame with standard I/O cards installed and which signal numbers correspond to which slots when viewing the router from the *front*.

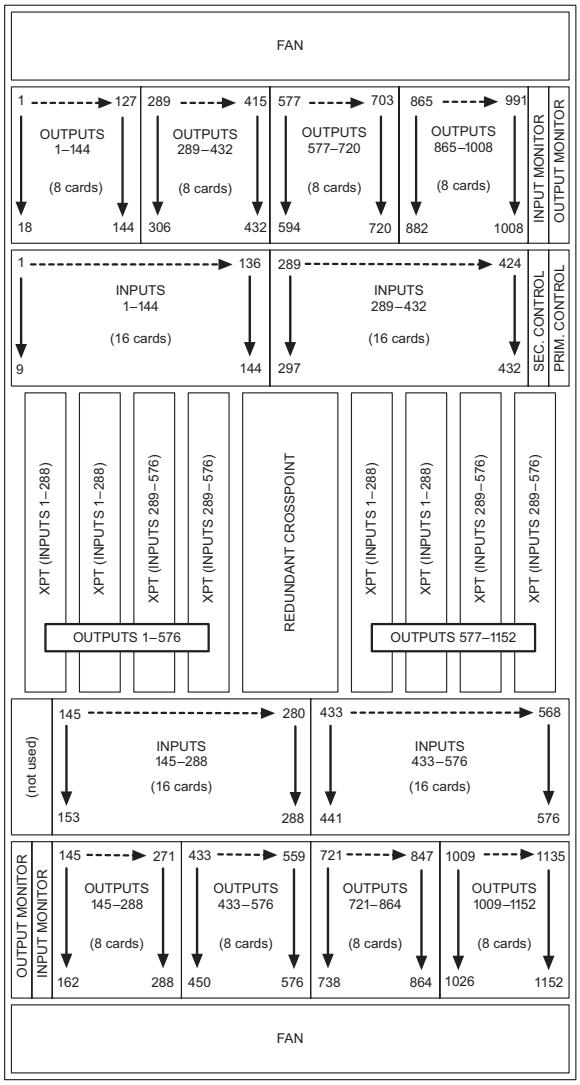


Figure 1-55. Example of NV8576 Slots and Corresponding Signal Numbers (Front View)

Figure 1-58 shows the standalone NV8280 frame with standard I/O cards installed and which signal numbers correspond to which slots when viewing the router from the *front*.

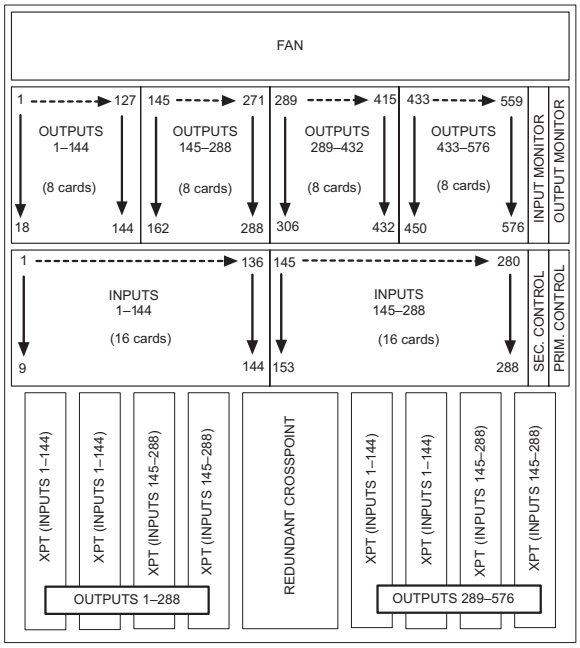


Figure 1-56. Example of NV8280 Slots and Corresponding Signal Numbers (Front View)

Figure 1-57 shows the standalone NV8144 frame with standard I/O cards installed and which signal numbers correspond to which slots when viewing the router from the *front*.

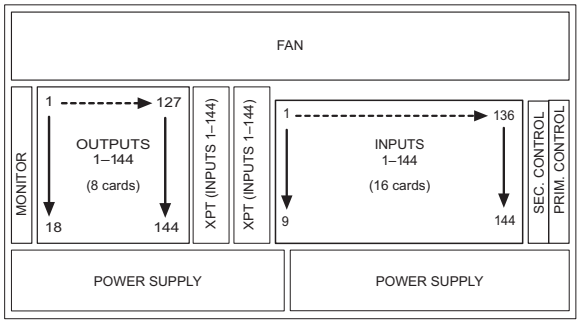


Figure 1-57. Example of NV8144 Slots and Corresponding Signal Numbers (Front View)

Expandable Frames and Signal Numbers

Expandable router frames have the same input backplanes as standalone frames, but different output backplanes. Both expansion and filler cards and corresponding backplanes send signals to a second connected router. However, only expansion output cards and backplanes also manage local outputs. Filler cards only process expansion signals; not local outputs are managed. Expansion output backplanes have 9 output connectors plus two high-density expansion connectors. The two expansion connectors forward specific outputs to the second router. For example, Output Slot 1 corresponds to local outputs 1–9 and forwards to the second router through the expansion connectors outputs 577–585.

When two expandable router frames are connected, one router is designated Router 1 and the other Router 2. Each router manages inputs and outputs locally. In addition, each router forwards outputs

to the connected router and receives inputs from the connected router, effectively doubling the total number of inputs and outputs. For example, when two NV8576-Plus routers are connected, each router switches up to 576 inputs and 576 outputs locally. In addition, each router forwards 576 outputs to the connected router and receives 576 inputs from the connected router, doubling the switching matrix for a total of 1152 inputs and 1152 outputs.

Because each signal must have a unique signal number, when two expandable routers are connected together, signals are numbered from 1 to the total of the matrix of the two connected frames. For example, the NV8576-Plus frame can switch 576 × 576. When two frames are connected the switching matrix expands to 1152 × 1152. The number for the two connected frames is 1–1152, incorporating both routers instead of two routers both managing signals numbered 1–576.

The number assigned to a signal depends from which router the signal originates. For example, if using two NV8576-Plus frames, Router 1 has local inputs 1–576 and Router 2 has local inputs 577–1152. Similarly, Router 1 has local outputs 1–576 and sends outputs 577–1152 to Router 2. Router 2 has local inputs 577–1152 and sends outputs 1–576 to Router 1.

Figure 1-58 shows which signal numbers correspond to which slots when viewing two connected NV8576-Plus routers from the front.

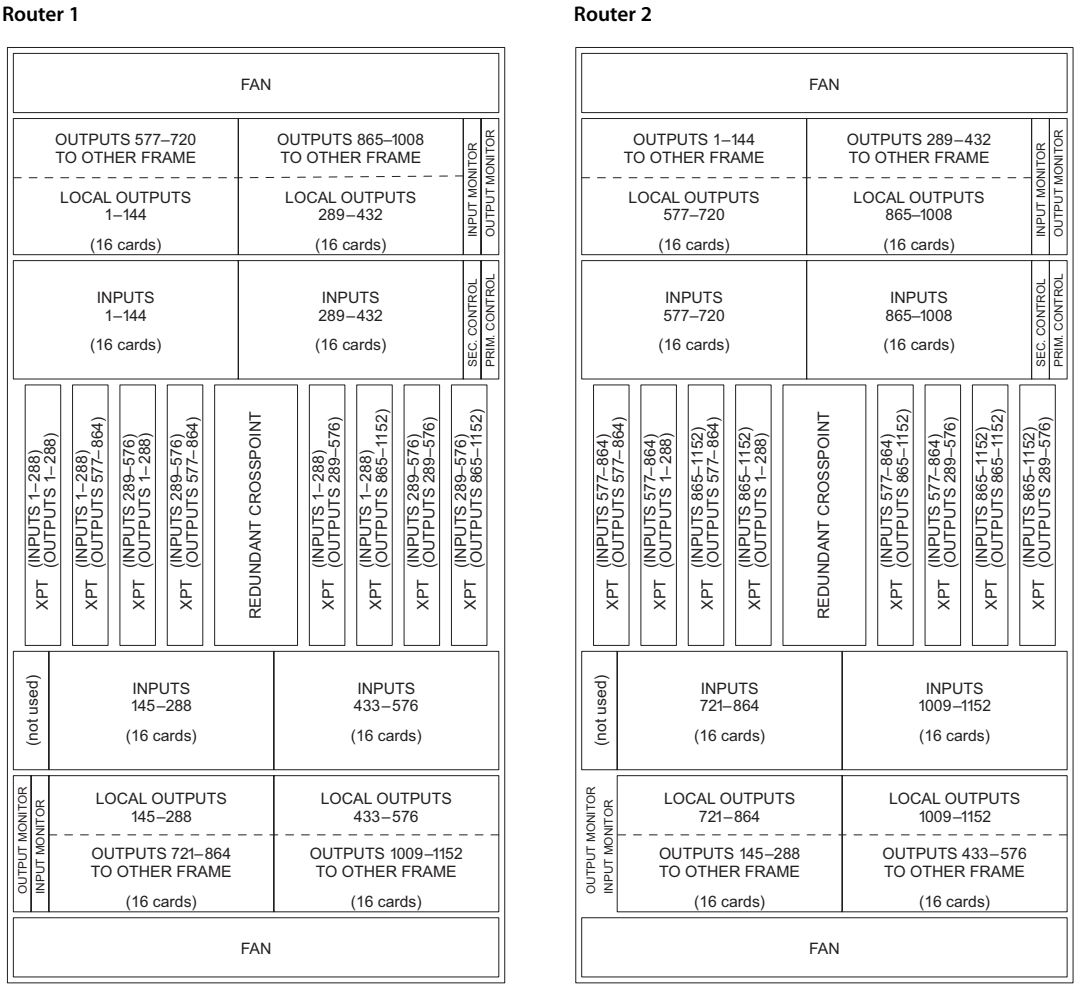


Figure 1-58. NV8576-Plus Signals and Corresponding Numbers for Connected Pair (Front View)

Crosspoint Slots and Signals Switched

The NV8144 has two slots for crosspoint cards: one primary and one redundant for backup. All signals pass through the primary (active) crosspoint card.

The NV8280, NV8576 and NV8576-Plus have 8 slots for 8 crosspoint cards and two slots for a redundant crosspoint cardset (a single module). Depending on the slot in which it is installed, the crosspoint card switches different signals. Slots are numbered 1 through 10, from left to right, when facing the front of the router. The redundant crosspoint cardset occupies slots 5 and 6. (Refer to Figure 1-55 and Figure 1-58.)

The optional redundant crosspoint cardset can be installed as a backup for any of the other 8 crosspoint cards. For more information, see Setting Redundant Crosspoint Switching on page 118.

Because the crosspoint cards installed in a specific slot manage specific outputs, depending on your configuration, you may not need all 8 crosspoint cards. For example, if you are only switching inputs 1–288 and outputs 1–288 using a stand-alone NV8576 router, crosspoint cards are required only in slots 1 and 2. The other slots can remain empty. See Figure 1-10 and Figure 1-11.

However, due to router architecture, crosspoint cards *must* be installed in adjacent pairs to successfully route signals. Cards must be installed in pairs in slots 1 and 2, slots 3 and 4, slots 7 and 8, or 9 and 10. For example, you could install crosspoint cards in slots 1, 2, 5 and 6. But you could not install crosspoint cards in only slots 1, 3, and 5.

2. Installation

In general, router frames arrive at your facility fully configured with all cards and backplanes installed. However, connections between devices and the router, the router and control system, and power sources must be made. The following section is a guide to performing all installation and reconfiguration tasks. Installation and reconfiguration tasks should be performed in a specific order to avoid possible complications.

Perform reconfiguration tasks in the following order:

1 Mount the router in a rack. If reconfiguring, skip this step if the router is already rack mounted and not being remounted. See Rack Mount on page 71.

2 Router frames ship with backplanes installed, however if reconfiguring, remove backplanes and reinstall in the newly desired slots. See Installing Backplanes on page 72.

3 Install active cards in the appropriate front card slots. If reconfiguring, remove cards and reinstall in the newly desired slots. Make sure that the appropriate backplane is installed for each active card. See Installing Cards on page 76.

4 Make connections between the source of incoming signals and the destination of outgoing signals, and the router. If reconfiguring, change signal connections to match new backplane and active card configuration. See Making Signal Connections on page 81.

5 Make connections between the router and the router control system. If reconfiguring, skip this step if all necessary router control system connections are still adequate. See Making Router Control System Connections on page 90.

6 Make diagnostic connections. Diagnostic connections enable the router and Miranda Router Configurator (MRC) to communicate. This is important when initially configuring the router and any time the router is reconfigured. See Making Diagnostic Connections on page 94.

7 Make connections to signals acting as references for audio and video signals. If reconfiguring, verify that all necessary reference connections are made for the signals being routed. See Making AES Reference Connections on page 95 and Making Video Reference Connections on page 95.

8 Connect to external equipment to monitor signal quality. See Making Monitor Connections on page 96.

9 Connect the alarm connection on the router to an external indicator. If reconfiguring, skip this step if alarm connections are still adequate. See Making Alarm Connections on page 100.

10 Connect power, being sure to install power supply modules *after* power is connected. See Connecting to Power on page 103.

11 Install MRC. If reconfiguring, MRC does not need to be reinstalled. See the *Miranda Router Configurator User's Guide*.

Package Contents

When your NV8500 family products from Miranda arrive, immediately inspect the shipping container for any obvious damage. If the container is damaged, unpack and inspect the contents. If the contents are damaged, notify the carrier immediately.

When unpacking the shipping container, look for the packing slip and compare it against the contents to verify that everything ordered was received. If anything is missing (or if equipment is damaged unrelated to shipping), please contact Miranda. For contact information, see Technical Support Contact Information on page iii.

The package does not contain mounting rack, network cables, video cables, mounting screws, or grounding wire.

Note

The NV8280, NV8576 and NV8576-Plus use a separate power supply frame, the NV8000 or the NV8300. (See Connecting to Power on page 103.)

This document does not address the shipment or installation of any other equipment or software that can be used in conjunction with the routers, including control systems or configuration software.

Preparing for Installation

You will need the following items before getting started:

- ☐ A PC running Windows® 2000 or higher, or Windows XP Professional.® This PC is required for system configuration.

  PC hardware requirements:

  - ☐ CD drive.
  - ☐ EIA-232 serial COM port (DE9) capable of operating at 38.4kbps.
  - ☐ 10BaseT or 10/100BaseT (preferred) Ethernet port.
- ☐ 100 MB/s Ethernet switch with at least 4 ports.
- ☐ Ethernet cables (category 5) with RJ-45 connectors.
- ☐ EIA-232 serial cable with DE9 connectors, wired straight-through, male to female.
- ☐ Coaxial cable and 75 Ω BNC connectors.
- ☐ Belden 1855a, or equivalent, cable and DIN 1.0/2.3 connectors *and/or* LC connectors and fiber optic cable.
- ☐ Reference video source (BNC) at the line rate appropriate for your system.
- ☐ (Optional) Tool for connecting DIN 1.0/2.3 connectors.
- ☐ Frame rack suitable for mounting the router.

Depending on the nature of your usage, you will also need an assortment of video cables, video sources, video monitors, and tools. WECO cables are provided for WECO connectors.

Rack Mount

Routers in the NV8500 family are designed to mount in a 19” (482.6 mm) EIA rack. The NV8280, NV8576 and NV8576-Plus also use an additional frame that requires mounting: the NV8000 or the NV8300 power supply. Although it is not required that both the router and power supply frame be mounted in the same rack, this manual assumes only one rack being used.

For details about power requirements and how to connect to power, see Connecting to Power on page 103.

If you are using an NV8900 Converter, be sure to take into account the facility space needed for these devices. (See Using an AES/MADI Converter (NV8900) on page 4.)

How to rack mount the router

1 Determine the placement of the router frame, and if applicable, the NV8000 or the NV8300 power supply, in the rack, and the rack in the facility. When placing the frames and rack, keep in mind the following requirements:

- The NV8144 requires 8RUs, the NV8280 requires 16RUs, and the NV8576 or NV8576-Plus require 32RUs of vertical space.
- The NV8000 and the NV8300 power supply require 3RUs of vertical space.

  For each NV8576 or NV8576-Plus router, two power supply frames are required totalling 6RUs of vertical space.

  For the NV8280, only one power supply frame is required.
- Be sure to locate the rack near an accessible AC source power outlet. The AC source is used to power either the NV8144 frame, or the NV8000 or the NV8300 power supply frame, which supplies power to the associated router.
- If connecting two expandable router frames (NV8576-Plus), the frames must be located near each other, side-by-side, in order to make expansion connections. (See Expansion Signal Connections on page 87.)
- To ensure proper cooling, leave space for unrestricted air flow through the front of the router, and a minimum of six inches clearance at the rear where the cooling fans are located.
- Allow space for cabling to I/O connectors.

2 If using an NV8000 or NV8300 power supply, locate the power supply frame. If not using a power supply frame, go to Step 6.

3 If the NV8000 or NV8300 was shipped with the power supply modules (PS8100 or PS8300) in the frame, remove them to make the frame lighter for installation.

Important

Do not reinstall the power supply modules. The modules are installed after power is connected. For more information, see Connecting to Power on page 103.

4 Lift the power supply frame into position and attach the power supply frame to the front of the rack with the appropriate screws. Be sure to leave room for the router frame to be mounted in the rack. Place screws in all frame mounting screw holes.

5 If needed for a NV8576 or NV8576-Plus router, repeat steps 2 through 4 for the second power supply frame.

6 Locate the NV8144, NV8280, NV8576 or NV8576-Plus router frame.

7 Remove the front door by turning the retaining screws counter clockwise, opening the door, and lifting it free of the hinges.

Caution Do ***not*** use the front door handle to lift the entire frame. Doing so may damage the door.

8 If the router was shipped with the circuit boards and fan tray in the frame, consider removing them to make the frame lighter for installation. If removing circuit boards, be sure to note which card was installed in which slot for later reinstallation.

Caution Handle all circuit boards with care. Be sure to use electrostatic discharge (ESD) protection and place the circuit boards in ESD bags or on an ESD surface. Do not stack boards without ESD protection.

9 Lift the frame into position and attach the router frame to the front of the rack with the appropriate screws. Be sure to place screws in all frame mounting screw holes.

Caution An equipment jack or two people are required to lift and install the router frame. The router frame is considered too heavy for one person to lift and install in the rack.

10 If removed, reinstall the fan trays in the fan slots at the top and bottom of the router. The tray is inserted right-side up.

11 If removed, reinstall circuit boards. Be sure to install them in the correct location. For installation instructions, see Installing Cards on page 76.

12 Reinstall the front door. Do not connect to power until all installation tasks are completed. (See Connecting to Power on page 103.)

Installing Backplanes

Routers in the NV8500 family use backplanes to connect to cabling that receives or distributes signals for an associated input, output or monitor card. (See About Backplanes on page 23.) Backplanes are inserted into slots at the rear of the router. Coax backplanes are passive and contain no active circuitry, whereas backplanes for fiber optic signals contain active circuitry.

Each backplane must have a corresponding card installed in the associated slot through the front of the router. (See Installing Cards on page 76.) Usually all backplanes are installed in the router frame at the factory, however instructions are provided for upgrading purposes.

Figure 2-1 shows the backplane locations at the rear of an NV8576 router. For the NV8576-Plus, the backplane location is identical, but the output backplanes have unique connectors for connecting to a second NV8576-Plus router frame.

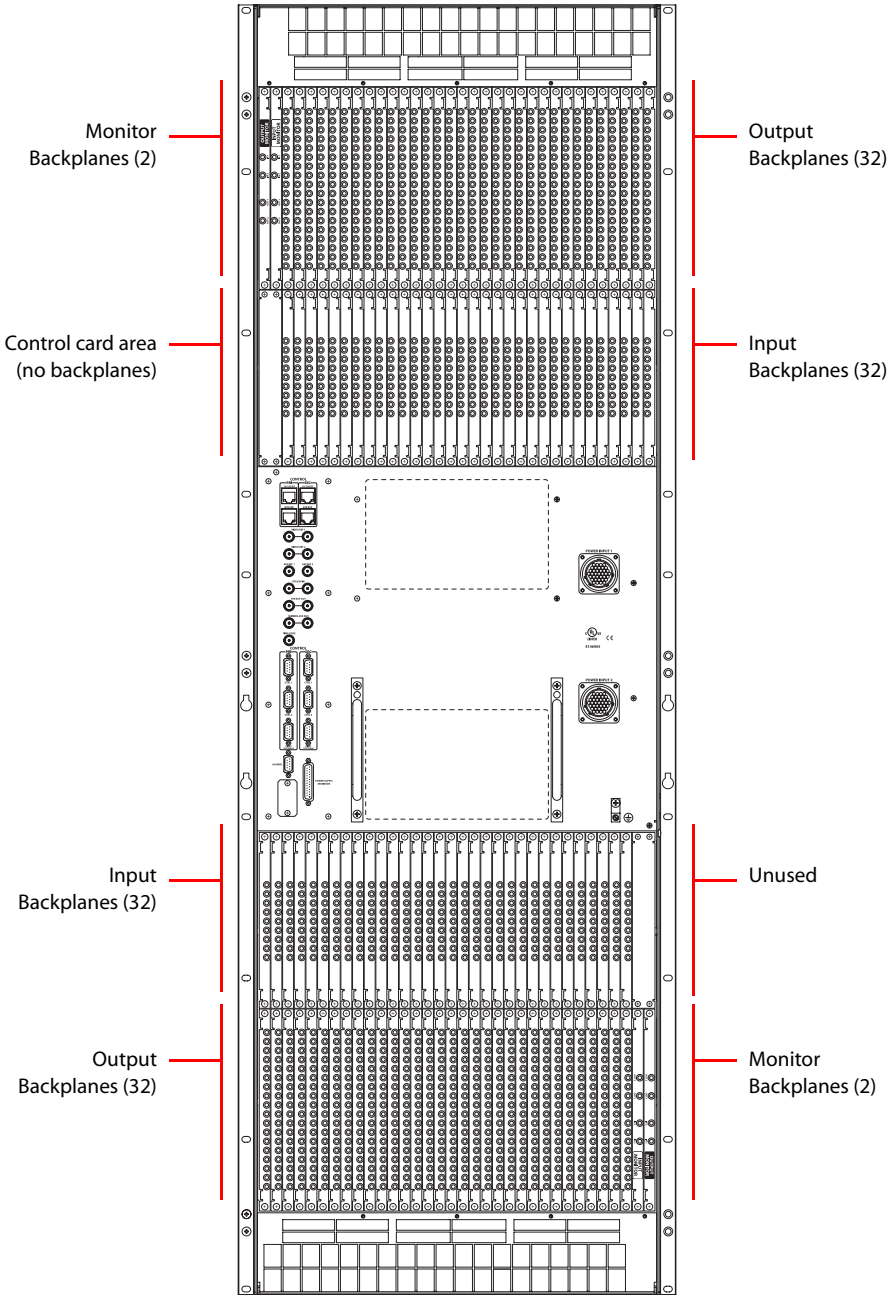


Figure 2-1. NV8576 Frame with Backplanes (Rear View)

Figure 2-2 shows the backplane locations at the rear of an NV8280 router.

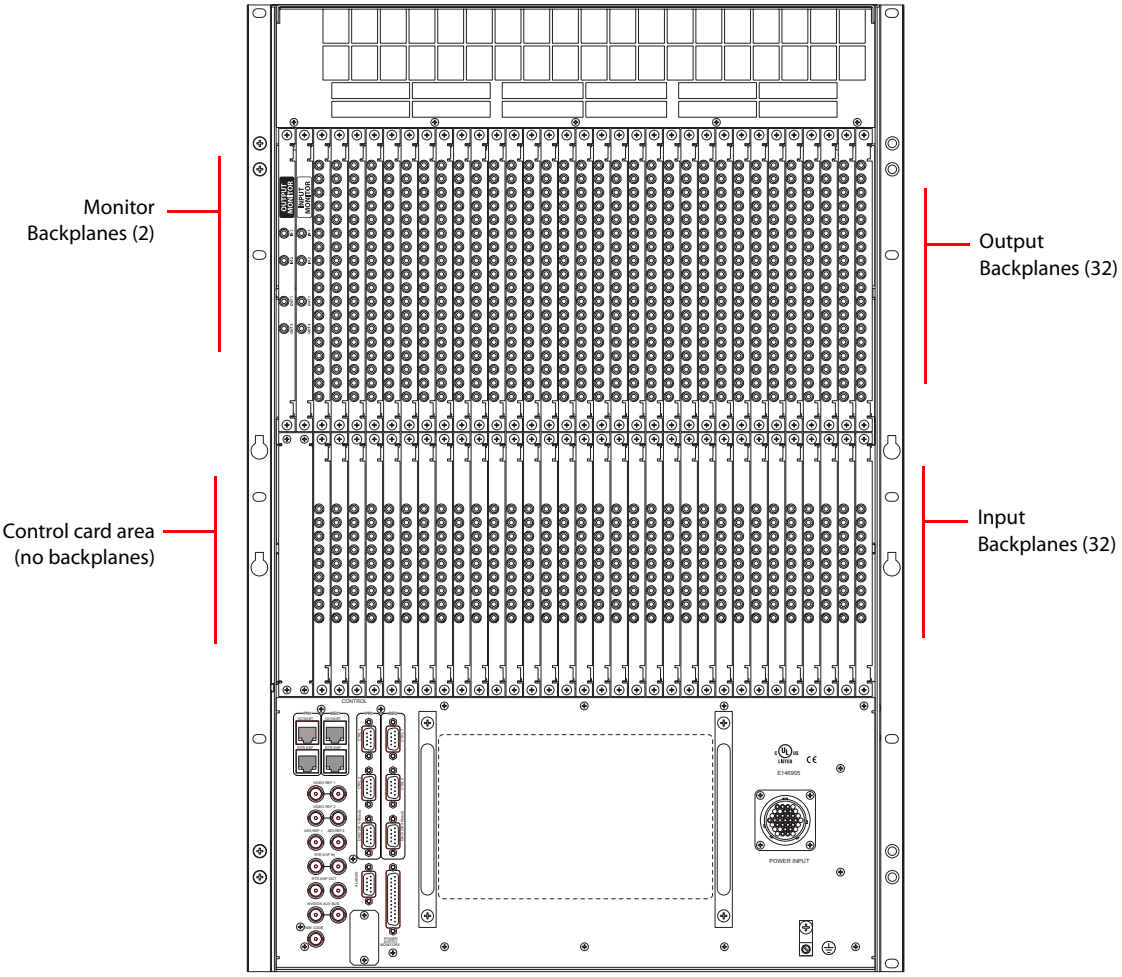


Figure 2-2. NV8280 Frame with Backplanes (Rear View)

Figure 2-3 shows the backplane locations at the rear of an NV8144 router.

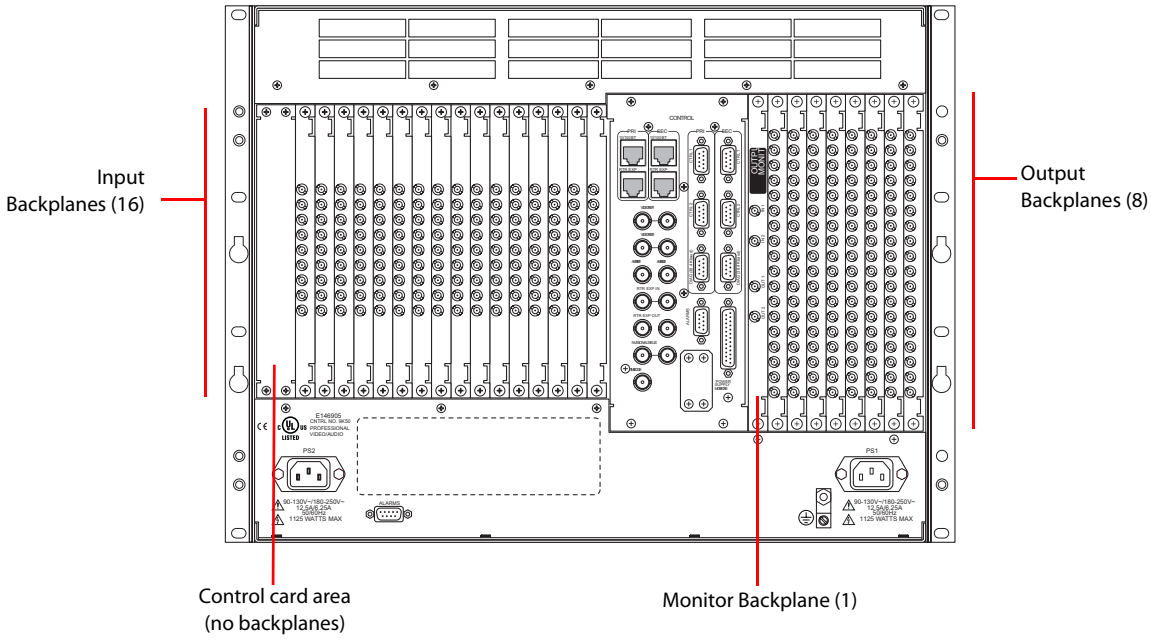


Figure 2-3. NV8144 Frame with Backplanes (Rear View)

How to Install a Backplane

1 Facing the rear of the router, locate the slot into which a backplane is to be installed. If you are reconfiguring the router, relocate backplanes as needed.

2 Insert the backplane into the frame being sure to align the printed circuit board with the stamped guides in the frame. Use gentle pressure at the top of the backplane to ensure the backplane connector is fully mated with the motherboard.

The NV8576 and the NV8576-Plus frames have upper and lower regions that mirror each other. This means that the backplanes must also mirror each other when installed. Backplanes installed in the upper region are “right side up” such that the print screen label is at the top. Backplanes installed in the lower region are rotated 180° such that the backplanes are “upside down” and the print screen label is at the bottom, as shown.

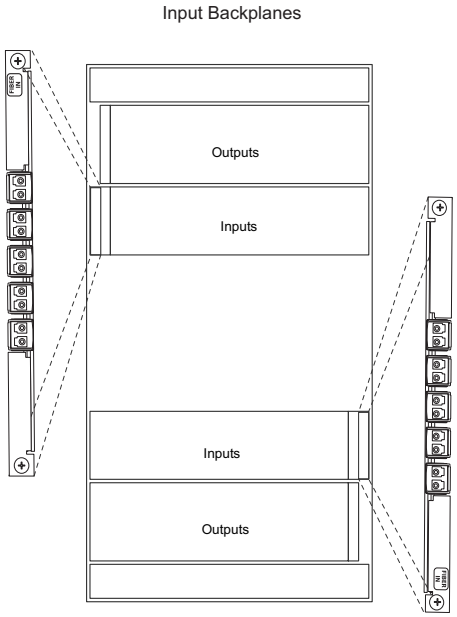


Figure 2-4. Example of input backplanes in NV8576 frame (rear view)

3 Tighten the two spring-loaded backplane retention screws.

To maintain proper airflow for cooling, all backplane slots must have a backplane or cover plate installed.

Installing Cards

Routers in the NV8500 family use a number of active cards that manage incoming signals, forwarding of control system commands, signal switching, distribution of outgoing signals, and the monitoring of signal switching. Cards slide into a card guide and connectors on the rear of the card interface with the motherboard. Each card is color-coded with an ejector lever that matches the color of the card guide into which the card is installed. For a description of active cards, see Overview of Active Cards on page 33.

For each card installed, a corresponding backplane must also be installed. The backplane contains the connectors that connect to cabling that receive and distribute signals. (See Installing Backplanes on page 72.) As you install cards, check the corresponding backplane. If the red LED on the backplane lights, the card and backplane do not match. If the green LED on the backplane lights, the card and backplane are a correcting pairing. (See Indicator LEDs on page 121.)

How to Install Active Cards in the NV8144

Caution Do not drop, roughly handle, or stack circuit boards. If you cannot easily insert or remove a board, stop and contact Miranda Technical Support.

1 Insert cards into the frame by sliding them into card guides from the front of the router. Insert the card in designated card guides, as shown:

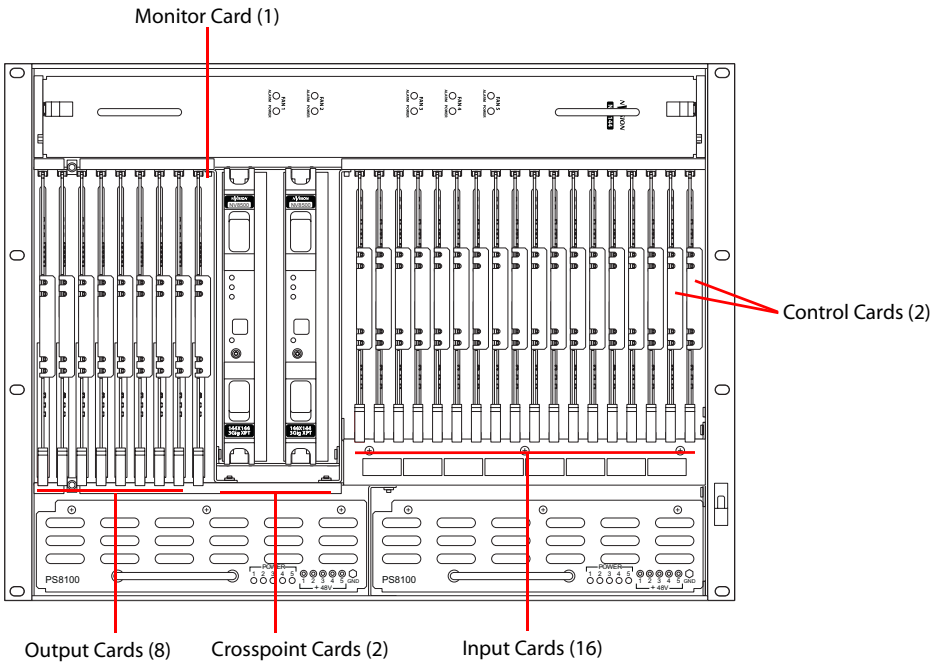


Figure 2-5. NV8144 Frame (Front View)

2 Insert **input** cards in slots with red card guides. The card's red ejector lever is located at the bottom.

3 Insert **output** cards in slots with white card guides.The card's white ejector lever is located at the bottom of the slot.

4 Insert **control** cards in slots with yellow card guides.The card's yellow ejector lever is located at the bottom.

5 Insert **crosspoint** cards in slots with black card guides. The crosspoint card slots are located between the output card and input card slots, in the middle of the frame. Levers are located at the top and bottom.

6 Insert the **monitor** card in the slots the with blue and gray card guides located to the right of the output card slots. The card's ejector lever is located at the bottom.

7 For each card, press the ejector lever(s) inward, making sure each card is fully seated in its slot.

8 Reinstall and close the frame door after all cards have been installed. The door must be closed for the router cooling system to work properly.

How to Install Active Cards in the NV8280

Caution Do not drop, roughly handle, or stack circuit boards. If you cannot easily insert or remove a board, stop and contact Miranda Technical Support.

1 Insert cards into the frame by sliding them into card guides from the front of the router. Insert the card in designated card guides, as shown:

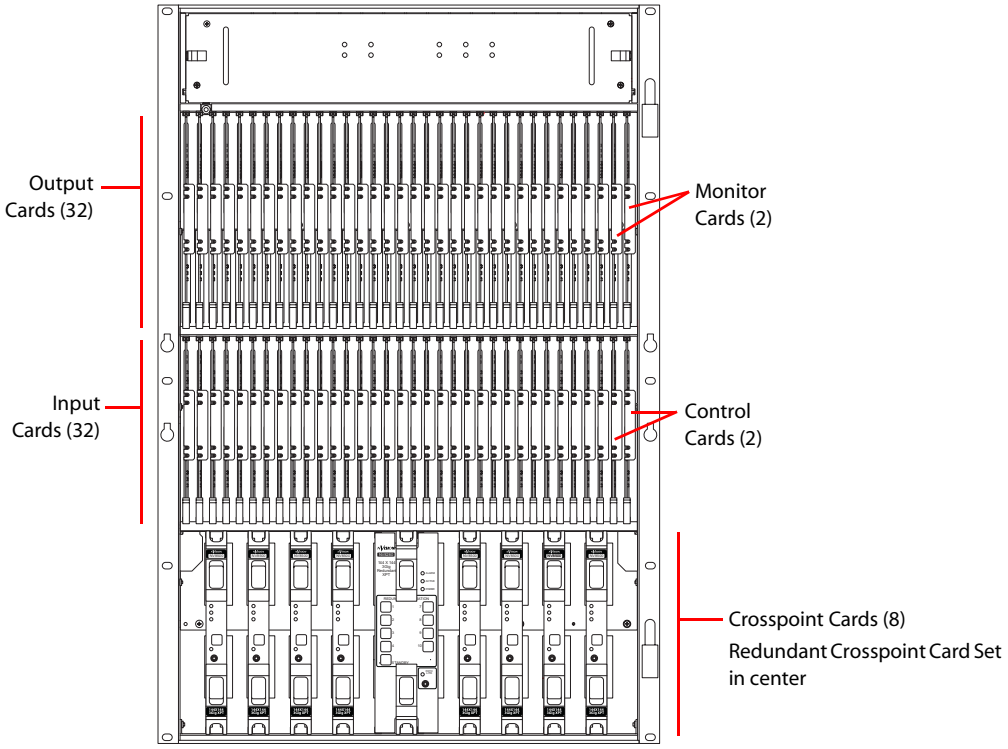


Figure 2-6. NV8280 Router Frame

2 Insert **input** cards in slots with red card guides. The card's red ejector lever is located at the bottom.

3 Insert **output** cards in slots with white card guides.The card's white ejector lever is located at the bottom.

4 Insert **control** cards in slots with yellow card guides.The card's yellow ejector lever is located at the bottom.

5 Insert **crosspoint** cards in slots with black card guides. The crosspoint card has two ejector levers located at the top and bottom. When facing the front of the router frame, the crosspoint card slots are numbered 1 through 10, from left to right.

Crosspoint cards *must* be installed in adjacent pairs. If you do not need a full complement of crosspoint cards, you must still install crosspoint cards in adjacent pairs. (See Crosspoint Slots and Signals Switched on page 67.) Install two crosspoint cards in each set of two adjacent slots, as follows:

- Slots 1 and 2
- Slots 3 and 4
- Slots 7 and 8

- Slots 9 and 10

6 Insert the optional redundant crosspoint cardset in crosspoint card slots 5 and 6. The redundant crosspoint cardset can take over active control from any crosspoint card installed. For more information, see Setting Redundant Crosspoint Switching on page 118.

7 Insert the **monitor** cards in the two slots with blue and gray card guides located to the right of the output cards. The card's ejector lever is located at the bottom. Both monitor cards are the same. However, the *output* monitor is always in the outside position; the *input* monitor is always in the inside position.

8 For each card, press the ejector lever(s) inward, making sure each card is fully seated in its slot.

9 Reinstall and close the frame door after all cards have been installed. The door must be closed for the router cooling system to work properly.

How to Install Active Cards in the NV8576 and NV8576-Plus

Important

When you install cards in the upper bays, their ejector levers are *down*. Cards in the lower bays slots are installed with their ejector levers *up*. Crosspoint cards have two ejectors, one at the top and one at the bottom.

Caution

Do not drop, roughly handle, or stack circuit boards. If you cannot easily insert or remove a board, stop and contact Miranda Technical Support.

1 Insert the cards into the frame by sliding them into card guides from the front of the router. Insert the card in designated card guides, as shown in Figure 2-7.

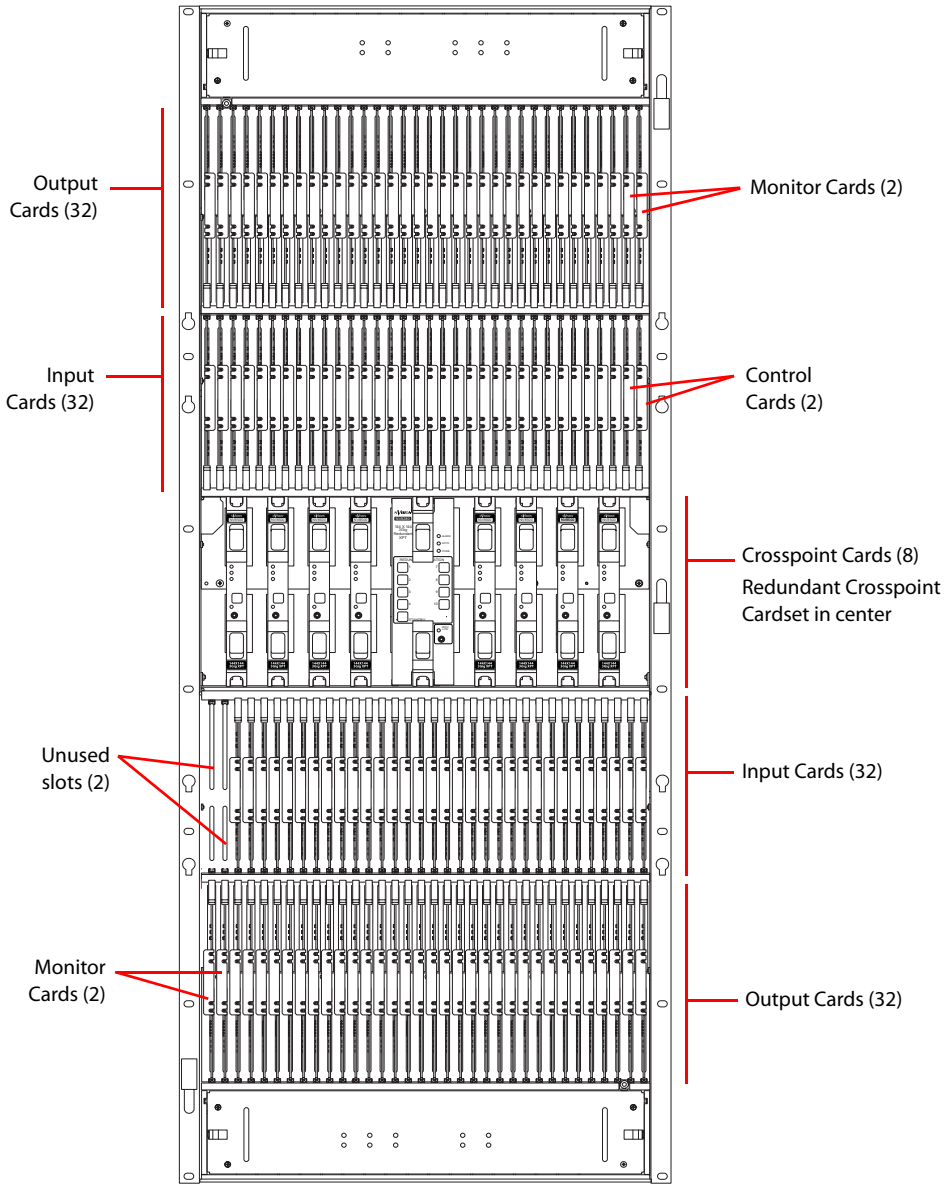


Figure 2-7. NV8576 and NV8576-Plus Router Frame

2 Insert **input** cards in slots with red card guides:

- In upper bay, the card's red ejector lever is located at the bottom.
- In lower bay, *the card is inverted*, and the card's red ejector lever is located at the top.

3 Insert **output** cards in slots with white card guides:

- In upper bay, the card's white ejector lever is located at the bottom.
- In lower bay, *the card is inverted*, and the card's white ejector lever is located at the top.

4 Insert **control** cards in slots with yellow card guides:

- In the upper bay, the card's yellow ejector lever is located at the bottom.
- In the lower bay, *the card is inverted*, and the card's yellow ejector lever is located at the top.

5 Insert **crosspoint** cards in slots with black card guides *in the center of the router frame*. Levers are located at the top and bottom of each card. When facing the front of the router, crosspoint card slots are numbered 1 through 10, from left to right.

   Crosspoint cards *must* be installed in adjacent pairs. If you do not need a full complement of crosspoint cards, you must still install crosspoint cards in adjacent pairs. (See Crosspoint Slots and Signals Switched on page 67.) Install two crosspoint cards in each set of two adjacent slots, as follows:

   - Slots 1 and 2
   - Slots 3 and 4
   - Slots 7 and 8
   - Slots 9 and 10

6 Insert the optional redundant crosspoint cardset in crosspoint card slots 5 and 6. The redundant crosspoint cardset can take over active control from any crosspoint card installed. For more information, see Setting Redundant Crosspoint Switching on page 118.

7 Insert the **monitor** cards in the two slots with blue and gray card guides, located next to the output cards. Both monitor cards are the same. However, the *output* monitor is always in the outside position; the *input* monitor is always in the inside position.

   - In the upper bay, the card's ejector lever is located at the bottom.
   - In the lower bay, *the card is inverted*, and the card's ejector lever is located at the top.

8 For each card, press the ejector lever(s) inward, making sure each card is fully seated in its slot.

9 Reinstall and close the frame door after all cards have been installed. The door must be closed for the router cooling system to work properly.

Making Signal Connections

For the NV8500 family of routers to manage incoming and outgoing signals properly, the inputs connectors and output connectors (collectively called I/O connections) at the rear of the router must be connected to cables that receive and distribute the signals. If you are connecting two expandable router frames, additional signal expansion connections must also be connected. (See Expansion Signal Connections on page 87.)

Local Signal Connections

Cables are connected to the I/O connections using DIN 1.0/2.3 connectors and Belden 1855A cable, or an equivalent, LC connectors and fiber optic cable, or WECO connectors and twisted pair cable. Depending on the signal type, not all connectors are used. For more information, see Signal Types and Backplane Connectors on page 23.

For DIN 1.0/2.3 installation, it is recommended that you use a connector tool designed for tightly spaced connectors. There are several DIN 1.0/2.3 connectors and cables suitable for use with the router. For a complete list of connectors and cables, contact Technical Support. (See Technical Support Contact Information on page iii.)

WECO output connectors have 5 pins. Each connector handles two outputs (two negative pins and two positive pins) that share a middle pin for shielding (or ground). WECO input connectors have

three pins with each positive and negative pin sharing a single shielding pin. The spacing on the pins is 3.5 mm. WECO connectors are provided with the router package.

LC backplanes are composed of modules each containing two LC connectors. The input backplane has 5 modules for a total of 10 possible connections. The output backplane has 9 modules totalling 18 LC connectors. When connecting inputs, do *not* connect to all 10 connections. You can only make a total of 9 connections. When connecting to LC connectors on the input backplane, make connections as follows:

- For the NV8144 and the NV8280, leave the bottom connector empty.
- For the NV8576, in the upper region of the frame, leave the bottom connector empty. In the bottom region of the frame the backplanes are rotated 180° from those in the upper portion and "face" in the opposite direction, therefore leave the top connector empty.

Figure 2-12 on page 86 illustrates the LC input backplane and which connector is left unused. The illustration also indicates how signal numbers are associated with individual connectors.

For a list of which signals are managed by each slot and the corresponding backplane and I/O connectors, see Signal Flow on page 50.

For monitor connections, see Making Monitor Connections on page 96.

How to Make Local I/O Connections

1 Locate the *input* connections at the rear of the router. Connectors are on backplanes containing 9 DIN 1.0/2.3, 9 LC or 9 WECO connectors each.

Figure 2-8 shows the backplane locations at the rear of an NV8576 router. For the NV8576-Plus, the backplane location is identical, but the output backplanes have unique connectors for connecting to a second NV8576-Plus router frame. (See Expansion Signal Connections on page 87.)

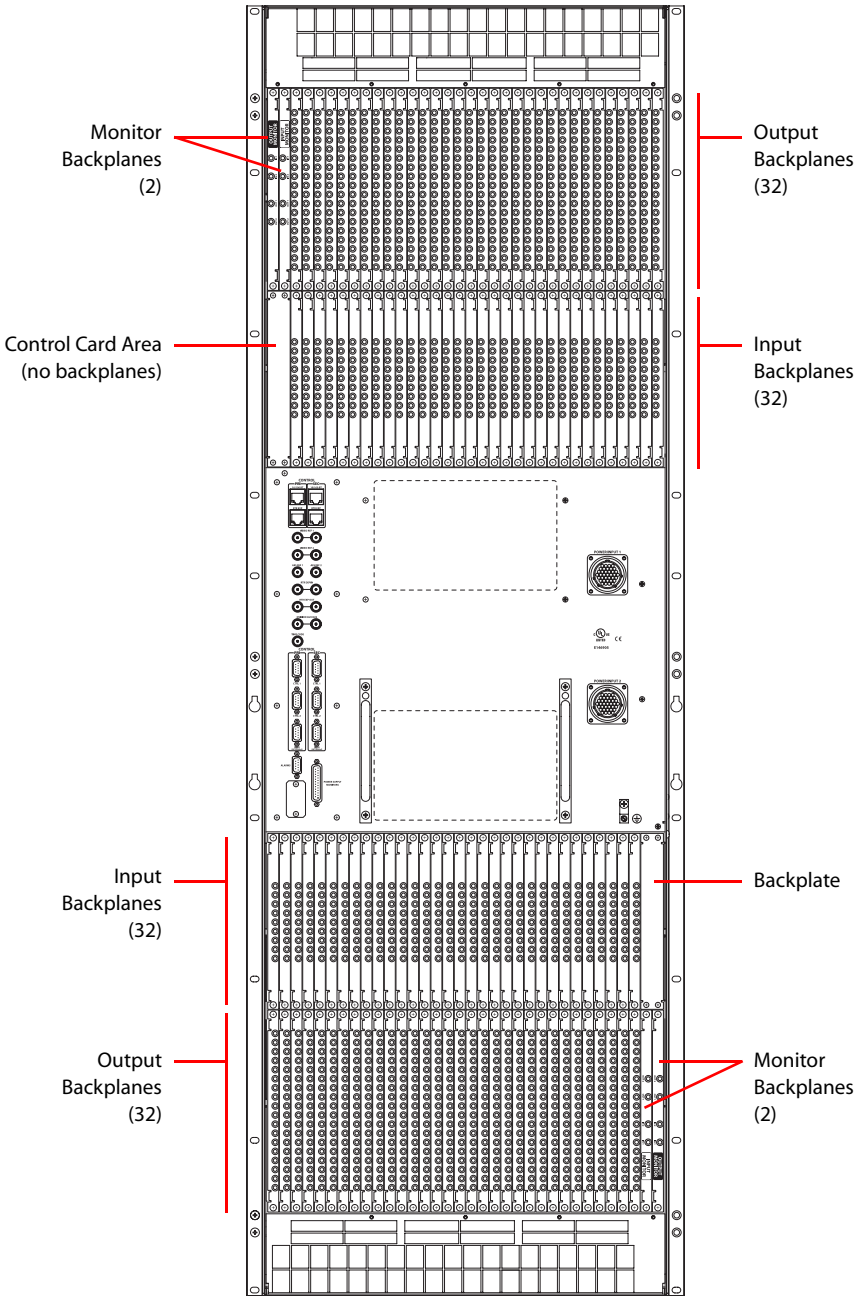


Figure 2-8. NV8576 Frame with DIN 1.0/2.3 Backplanes (Rear View)

Figure 2-9 shows the backplane locations at the rear of an NV8280 router.

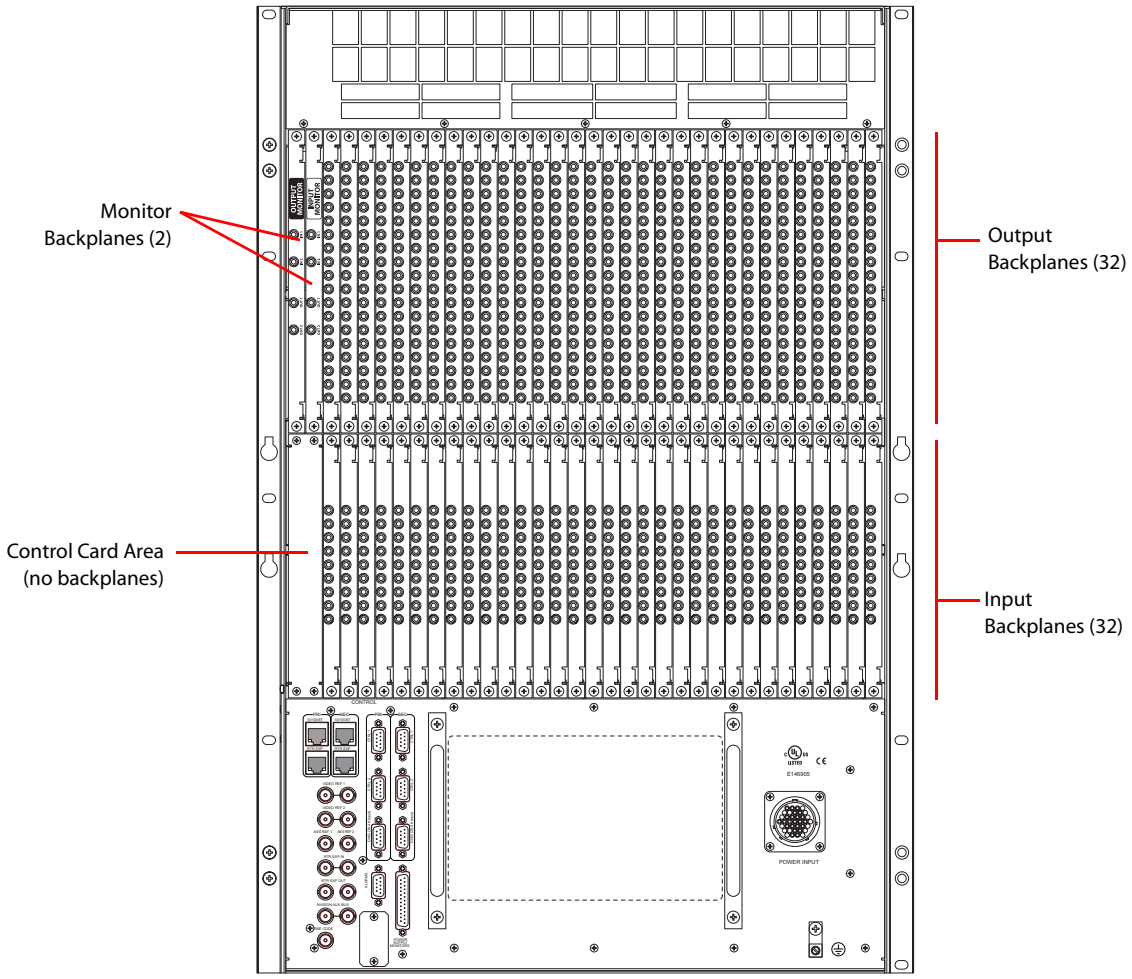


Figure 2-9. NV8280 Frame with DIN 1.0/2.3 Backplanes (Rear View)

Figure 2-10 shows the backplane locations at the rear of an NV8144 router.

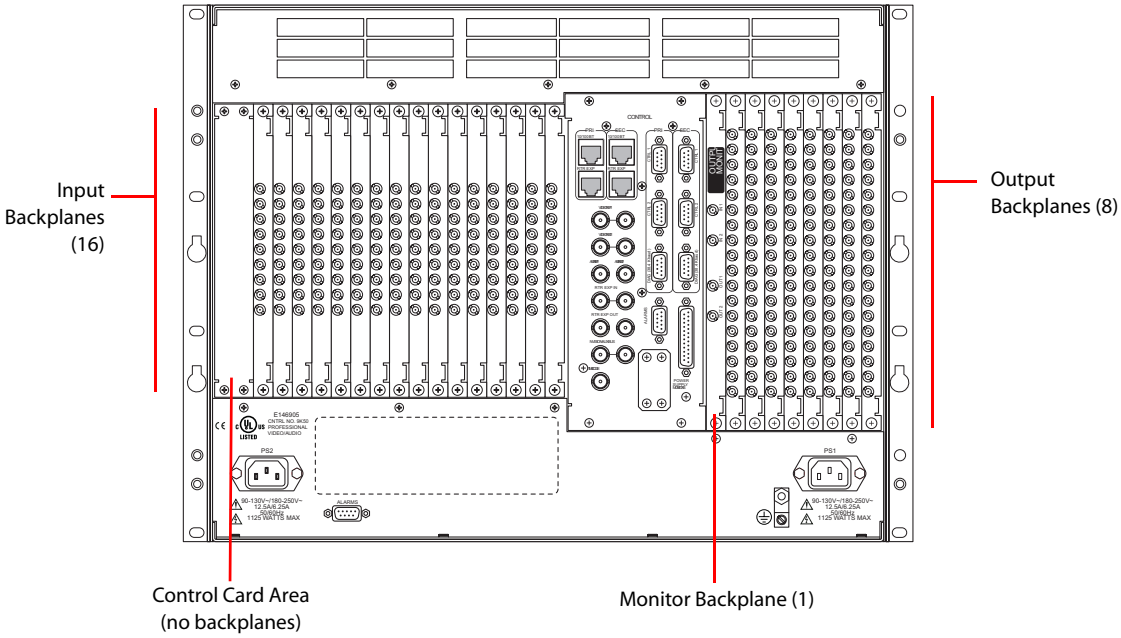


Figure 2-10. NV8144 Frame with DIN 1.0/2.3 Backplanes (Rear View)

2 For each input, connect to an input connector using a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent, or a LC connector and fiber optic cable, or a WECO connector and twisted pair cable. (See Signal Types and Backplane Connectors on page 23.)

Important! LC backplanes are composed of 5 modules of two connectors each for a total of 10 possible connections. Do *not* connect to all 10 connections. Only 9 of the connectors are used. Make LC connections as follows:

- For the NV8144 and the NV8280, the bottom connector is not used. Only connect to the first 9 connectors, starting at the top and connecting to each connector in turn, leaving the remaining bottom connector empty, as shown:

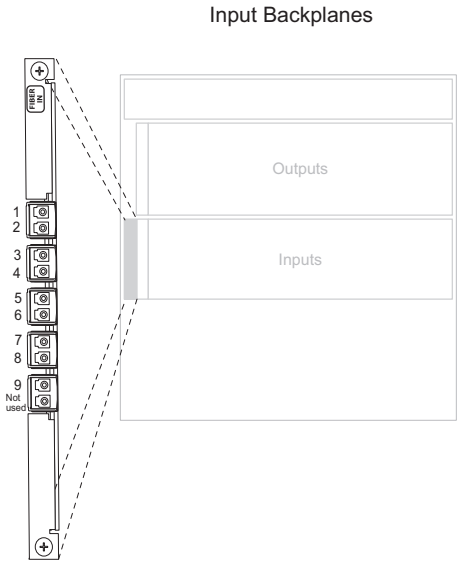


Figure 2-11. NV8280 LC Input Backplanes (Rear View)

- For the NV8576, in the upper region of the frame, only connect to the first 9 connectors. Start at the top and connect to each connector in turn, leaving the remaining bottom connector empty.

  In the lower region of the frame the backplanes are rotated 180° from those in the upper region and "face" in the opposite direction. Therefore, only connect to the *last* 9 connectors, starting at the *bottom* and connecting to each connector in turn, leaving the remaining top connector empty, as shown:

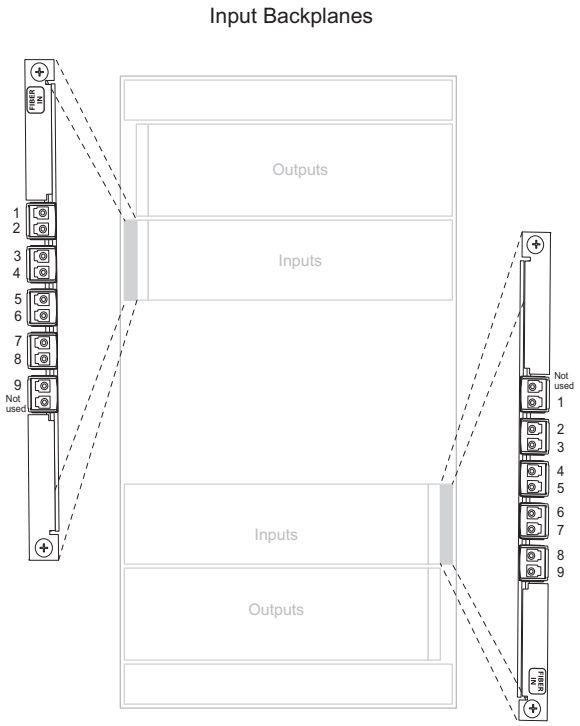


Figure 2-12. NV8576 LC Input Backplanes (Rear View)

3 Connect the other end of the cable to the source of the incoming signal.

4 Locate the *output* connections on the rear of the router.

  Backplanes in the standalone router frames (NV8144, NV8280, NV8576) contain 18 connectors each.

  Backplanes in the expansion router frames (NV8576-Plus) contain 9 connectors each *plus* two additional connectors used for expansion. See "Expansion Signal Connections" on this page.

5 For each output, connect to an output connector using a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent, or a LC connector and fiber optic cable, or a WECO connector and twisted pair cable. (See Signal Types and Backplane Connectors on page 23.)

6 Connect the other end of the cable to the distribution destination for the outgoing signal.

7 For expansion router frames (NV8576-Plus) being connected to a second router, make signal expansion connections. (See "Expansion Signal Connections" on this page.)

Expansion Signal Connections

Using expansion signal connectors, two routers can send signals between connected router frames creating a matrix of up to 1152 inputs and 1152 outputs (NV8576-Plus). The expansion connections use expansion cables (WC0121), available from Miranda. Connected routers must be situated physically near each other, side-by-side.

The connections that allow two expandable router frames to send signals between the frames are located on output expansion backplanes. Expansion (output) backplanes have either 9 coax connectors or 9 LC connectors for *local* signals and 2 high-density 28-pin connectors for *expansion* signals. (See Signal Types and Backplane Connectors on page 23.)

Important! LC expansion backplanes contain 5 modules of two LC connectors each for a total of 10 possible connections. Do *not* connect to all 10; only 9 of the connectors are used.

The two expansion connectors on each backplane are labeled ‘INPUT’ and ‘OUTPUT’. You connect the ‘INPUT’ of a backplane on one router to the ‘OUTPUT’ of the corresponding backplane on the other router — in the same location, upper region or lower region. For example, you connect the ‘INPUT’ at slot 12 on router 1 to the ‘OUTPUT’ at slot 12 on router 2. Similarly, you connect ‘OUTPUT’ at slot 12 on router 1 to the ‘INPUT’ at slot 12 on router 2.

Connections for outputs (the non-expansion connectors on the expansion backplane) are connected to devices as described in How to Make Local I/O Connections on page 82.

How to Make I/O Expansion Connections between NV8576-Plus Routers

1 Facing the rear of the **first router** (Router 1), locate the expansion connectors. There are two 28-pin connectors situated slightly apart from the output signal connectors on the backplane. For each expansion connector, connect using Miranda’s expansion connector/cable (WC0121).

2 Locate the *output* connectors on the expansion backplanes.

3 For each output, connect to each output connector using a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent, or a LC connector and fiber optic cable, or a WECO connector and twisted pair cable.

Important! LC expansion backplanes have 5 modules of two connectors each for a total of 10 possible connections. Do *not* connect to all 10 connections. You can only make a total of 9 connections. Make LC connections as follows. (See Figure 2-13.).

Note

Signals are numbered in ascending order from top-to-bottom. This is true for backplanes in both the upper region and in the lower region of the frame. Although the backplanes installed in the lower portion of the frame are rotated 180° from those in the upper portion and “face” in the opposite direction, the signal numbering is identical.

- In the upper region of the router frame, leave the bottom connector empty.

- In the lower region of the router frame, leave the top connector empty. (Backplanes installed in the lower region of the frame are rotated 180° from those in the upper region and “face” in the opposite direction.)

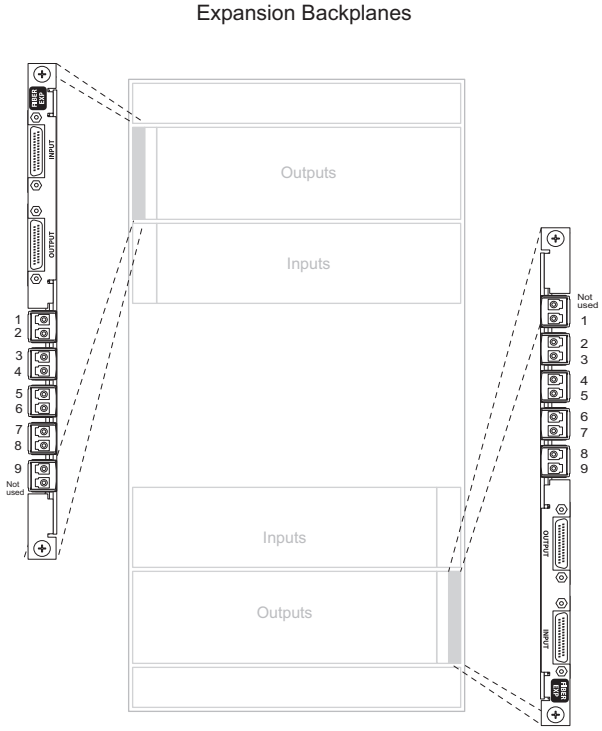


Figure 2-13. NV8576-Plus LC Expansion Backplane (Rear View)

4 Connect the other end of the cable to the distribution destination for the outgoing signal.

5 Make expansion connections. Starting with the left-most backplane, connect from the top connector of one backplane on the **first router** (Router 1) to the bottom connector of the corre-

sponding backplane on the **second router** (Router 2). Repeat until all expansion connectors are connected.

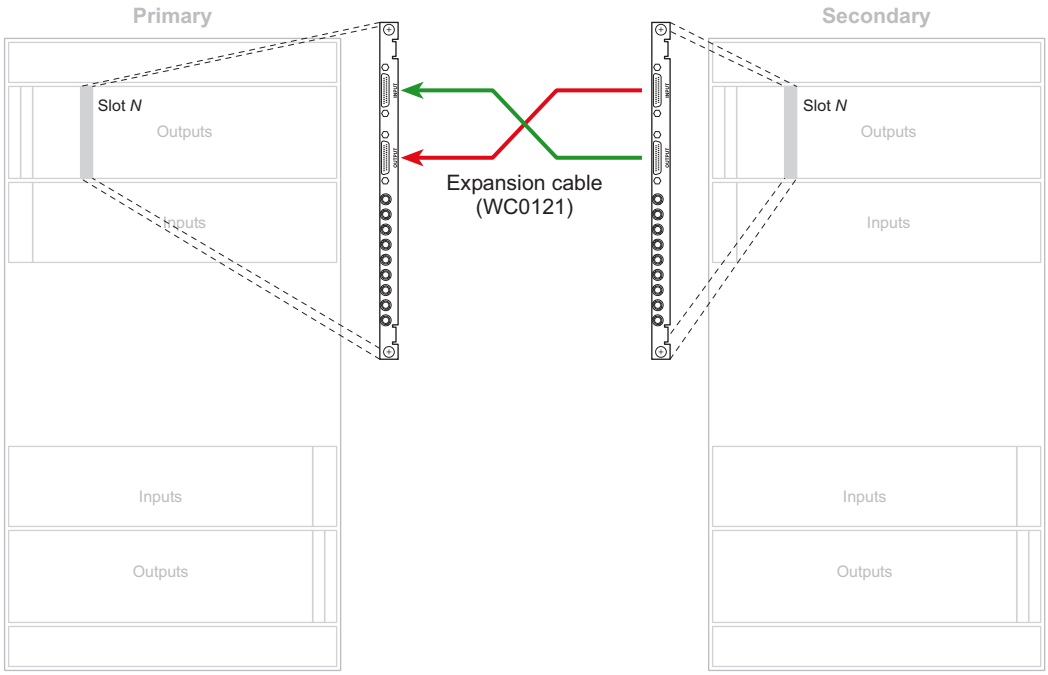


Figure 2-14. Illustration of Expansion Connections

Make sure that the connectors are positioned in the upper region of the router frame as follows:

- Black side of connector faces *right.*
- Silver side of connector faces *left.*

6 Repeat the process in step 5 for the lower region of the router frame.

Important	In the lower region, the backplanes are inverted. Consequently, the expansion connectors in the lower region face the opposite direction as those in the upper region of the frame.

Be sure when inserting the expansion connector into each expansion connection that the connector is positioned as follows:

- Black side of connector faces *left.*
- Silver side of connector faces *right.*

Caution	The connector pins are fragile and forcing the connector can cause damage.

Making Router Control System Connections

Routers in the NV8500 family must be connected to a router control system such as the NV9000. Different kinds of connections are possible:

- Serial Control — use to connect to a third-party router control system requiring serial control connections.
- Ethernet Control — use to connect to the Miranda NV9000 router control system and to create network connections.
- Miranda Aux Bus — use to connect to a third-party router control system requiring an Aux Bus connection. This connection is not supported at this time.

Important! If a redundant router control system is being used, *both* the serial and Ethernet connections must be used to properly send status information to both control systems.

If connecting two expandable router frames together (NV8576-Plus), only one router is directly connected to the router control system. This router acts as the *primary* router. Additional control system expansion connections are then made between the primary router and the secondary, connected router. This enables the router control system to communicate with both routers through the primary router. (See Control System Expansion Connections on page 93.)

For the router control system to communicate with the router, it must "see" the router. For information on configuring a router's IP address or serial control details, see the *Miranda Router Configurator User's Guide*.

Serial Control Connections

Serial control connections are used to connect a router to the router control system. Serial connections are often used for third-party control systems. Although serial connections can be used for the Miranda NV9000 control system, it is recommended that an Ethernet connection is used instead so that the control system can communicate as part of a network. (See Ethernet Control Connections on page 92.)

The serial control ports are divided into two sets that communicate with the primary control card or the secondary control card. Additional ports enable you to connect to an alternate control system (i.e., backup system) or to set up dual control, if desired. For a detailed description of the serial control connections, see Router Control System Connections on page 28.

In order for the router to communicate with the router control system through a serial connection, COM port and Baud rate settings need to be set in the control card. (See the *Miranda Router Configurator User's Guide*.)

Serial control connections use SMPTE 207M DE9 connectors and serial (RS-422/489) cable.

How to Make Serial Control System Connections

1 Locate the serial control connections on the rear of the router, as shown in Figure 2-15. Serial control connections are labeled ‘PRI’ for the primary control card and ‘SEC’ for the secondary control card.

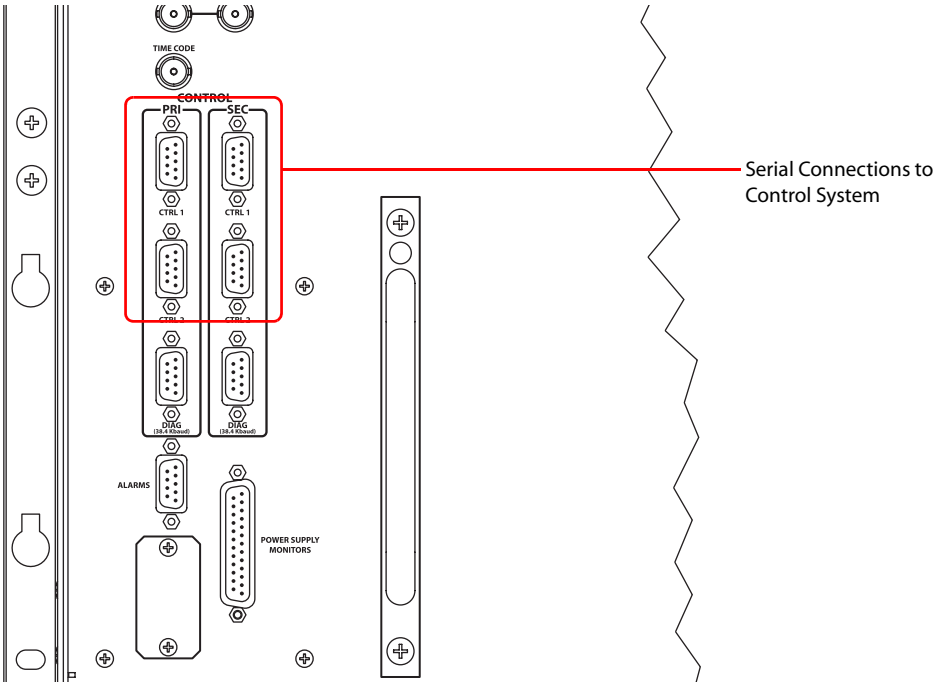


Figure 2-15. Serial Connections to Router Control System

2 Connect to the ‘CTRL 1’ connection in the ‘PRI’ section using a DE9 connector and serial cable.

3 Connect the other end of the serial cable to the (primary) router control system using a DE9 connector.

The following lists the pin wiring for the DE9 connectors:

Control End	Pins	Router End
Ground	1 ----------1	Ground
Rx–	2 ----------2	Tx–
Tx+	3 ----------3	Rx+
Tx Common	4 ----------4	Rx Common
N/C	5 ----------5	N/C
Rx Common	6 ----------6	Tx Common
Rx+	7 ----------7	Tx+
Tx–	8 ----------8	Rx–
Ground	9 ----------9	Ground

4 If a secondary control card (optional for redundancy) is installed, connect to the ‘CTRL 1’ connection in the ‘SEC’ section as described in Steps 2 and 3. (See Control Cards on page 48.)

5 If an alternate control system (e.g., for redundancy or dual control) is being used, make connections as follows:

a Connect to the ‘CTRL 2’ connection in the ‘PRI’ section using a DE9 connector and serial cable.

b Connect the other end of the serial cable to the *secondary* router control system using a DE9 connector. Wire connectors as described in Step 3.

c Connect to the ‘CTRL 2’ connection in the ‘SEC’ section using a DE9 connector and serial cable.

d Connect the other end of the serial cable to the *secondary* router control system using a DE9 connector. Wire connectors as described in Step 3.

6 If two expandable router frames (NV8576-Plus) are being connected together, connect the control system expansion connections. (See Control System Expansion Connections on page 93.)

Ethernet Control Connections

Ethernet control connections connect the router to the router control system using Ethernet connectors. Ethernet connections are especially helpful if the PC running the router control system is going to be on a network. An Ethernet connection is recommended for the Miranda NV9000 control system.

The Ethernet ports are divided into two sets that communicate with the primary control card or the secondary control card. (See Router Control System Connections on page 28.) Unlike serial control connections, there are no Ethernet connections to redundant control systems because redundant control systems can be connected through Ethernet network connections.

For the router to communicate with the router control system through an Ethernet connection, an IP address for the router must be set in the control card. Use the Miranda Router Configurator to make the setting. (See the *Miranda Router Configurator User’s Guide*.)

The Ethernet control system connections use RJ45 connectors and Cat5, or better, cable. The Ethernet port is 10/100baseT.

How to Make Ethernet Control System Connections

1 Locate the Ethernet connections on the rear of the router, as shown in Figure 2-16. Ethernet control connections are labeled ‘PRI’ and ‘SEC’.

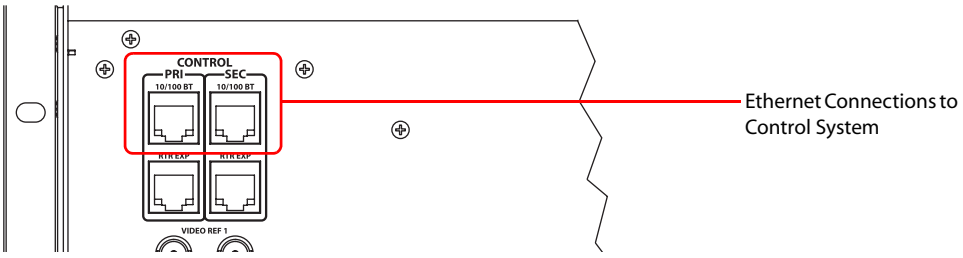


Figure 2-16. Ethernet Connections to Control System (Rear View)

2 Connect to the ‘10/100 B T’ Ethernet connection in the ‘PRI’ section using a RJ-45 connector and Cat5, or better, cable.

3 Connect the other end of the cable to an Ethernet hub or switch on the router control system using a RJ-45 connector.

4 If a secondary (optional for redundancy; see Control Cards on page 48) control card is installed, connect to the '10/100 B T' Ethernet connection in the 'SEC' section as described in Steps 2 and 3.

5 If two expandable router frames (NV8576-Plus) are being connected together, make the control system expansion connections. (See Control System Expansion Connections on page 93.)

Aux Bus Control Connections

The NV8500 family of routers have on Aux Bus connection, labeled 'AUX BUS'. However, at this time the connection is not supported. For details, contact Miranda. (See Technical Support Contact Information on page iii.)

Control System Expansion Connections

Control system expansion connections allow two connected expandable router frames to communicate with the router control system. Only one of the routers is connected directly to the router control system. This router is the *primary* router. A separate connection is made from the *primary* router to the *secondary* router. This connection allows the router control system to manage both routers through the connection on the primary router.

The control system expansion port is an RJ-45 port. The connection uses standard Ethernet cable.

How to Make Control System Expansion Connections

Note

Miranda provides the terminators (WC0084). They are small. Be careful not to overlook them.

1 Locate the 4 BNC connectors labeled 'RTR EXP IN' and 'RTR EXP OUT'. The input connectors are coupled and the output connectors are coupled.

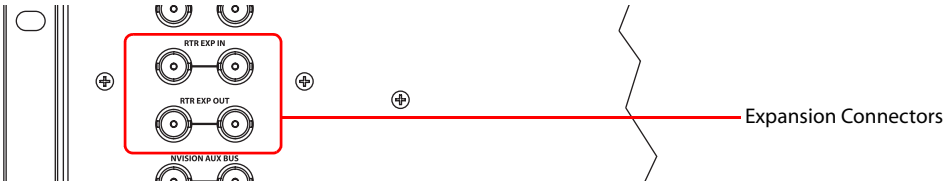


Figure 2-17. Expansion Control Connections

These are used only by the NV8576-Plus router so that the two frames can communicate.

2 Connect the 'Rtr Exp In' port of the primary frame to the 'Rtr Exp Out' port of the secondary frame. Then connect the 'Rtr Exp In' port of the secondary frame to the 'Rtr Exp Out' port of the primary frame.

Because the connectors are paired, you can have a redundant connection — in case one cable breaks.

Making Diagnostic Connections

The diagnostic connections enable routers in the NV8500 family to communicate with the Miranda Router Configurator (MRC) application. MRC is installed on a unit, separate from the router (e.g., PC), and is used to perform system setup tasks, and configure and monitor the router. For information about using MRC, see the *Miranda Router Configurator User's Guide*.

Diagnostic connections are made by connecting the router to the unit running the MRC application. Usually, an Ethernet connection enables communication between MRC and the router, however two serial diagnostic ports are provided on the rear of the router, labeled 'DIAG'. The diagnostic ports are fixed at 38400 baud, RS-232. For a detailed description of the serial connections, see Diagnostic Connections on page 30.

How to Make Diagnostic Connections

1 Locate the diagnostic connections on the rear of the router, as shown in Figure 2-18. The diagnostic connections are labeled 'DIAG'.

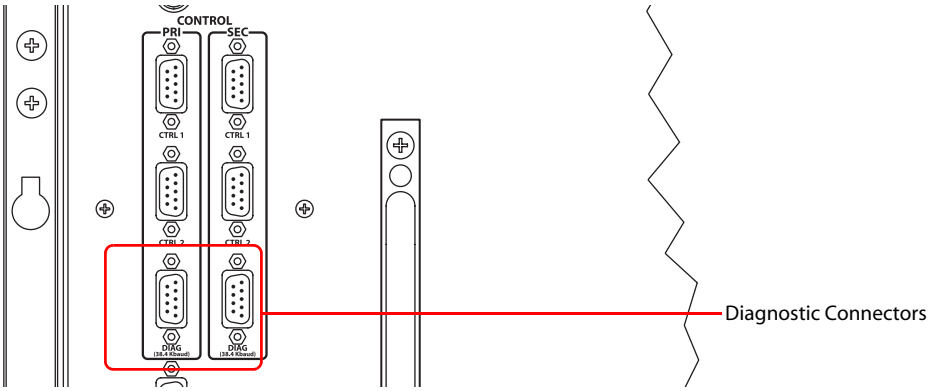


Figure 2-18. Diagnostic Connections (Rear View)

2 Connect to the 'DIAG' connection in the 'PRI' section using a DE9 connector and a serial cable. The ports are set for RS-232:

The following lists the DE9 pin connectors for RS-232:

PC End (DCE)	Pins	Router End (DTE)
DCD	1 ----------1	Ground
RXD	2 ----------2	TXD
TXD	3 ----------3	RXD
DTR	4 ----------4	DSR
Signal Ground	5 ----------5	Signal Ground
DSR	6 ----------6	DTR
RTS	7 ----------7	CTS
CTS	8 ----------8	RTS
Ground	9 ----------9	Ground

3 Connect the other end of the cable to the PC running the MRC application.

4 If a secondary (optional for redundancy) control card is installed, connect to the ‘DIAG’ connection in the ‘SEC’ section using a DE9 connector and a serial cable as described in Step 2 and Step 3. For more information, see Control Cards on page 48.

Making AES Reference Connections

The AES reference is used for clock generation and provides a timing reference for AES signals and for the control card’s timing circuits. For optimum audio output, signals must be clock-locked to the same reference.

The NV8500 family of routers have as two AES reference connections labeled ‘AES REF 1’ and ‘AES REF 2’. Both connections are used by the primary and the secondary (optional for redundancy) control card. This provides a backup reference source should one of the sources fail. The AES reference connection requires a stable signal source set at 48 kHz. For a detailed description of the AES reference connections, see AES References on page 30.

How to Make AES Reference Connections

1 Locate the AES reference connections on the rear of the router, as shown in Figure 2-19. AES reference connections are labeled ‘AES REF 1’ and ‘AES REF 2’.

Figure 2-19. AES Reference Connection (Rear View)

2 Connect to the ‘AES REF1’ connection using a BNC connector and 75 Ω cable.

3 Connect the other end of the cable to a stable source of 48 kHz AES audio signals.

4 For redundancy, connect to the ‘AES REF 2’ connection as described in Step 2.

5 Connect the other end of the cable to a stable source of 48 kHz AES audio signals.

Making Video Reference Connections

Routers in the NV8500 family provide timing reference connections for analog video signals, labeled ‘VIDEO REF 1’ and ‘VIDEO REF 2’. The control card uses these references to perform takes at the proper point in time (per SMPTE RP168), determining the router’s video frame switch points. The video reference connections require a stable source of PAL, NTSC or Tri-level sync. Both video reference connections use 75 Ω BNC connectors and coaxial cable. For a detailed description of the video reference connections, see Video Reference on page 31.

Each ‘VIDEO REF’ connection can use the same reference source (redundant) or two unique reference sources (dual). For more information, see Redundant and Dual Video References on page 31.

If a video reference is present, signals switch at the defined frame and line switch points. If a video reference is not present, the router performs takes using an internally generated reference signal and the control card displays a lit red LED. (See Indicator LEDs on page 121.) Switch point configuration is managed through the Miranda Router Configurator application. For detailed instructions, see the *Miranda Router Configurator User's Guide*.

How to Make Video Reference Connections

1 Locate the video reference connections on the rear of the router, as shown in Figure 2-20. Video reference connections are labeled 'VIDEO REF 1' and 'VIDEO REF 2'.

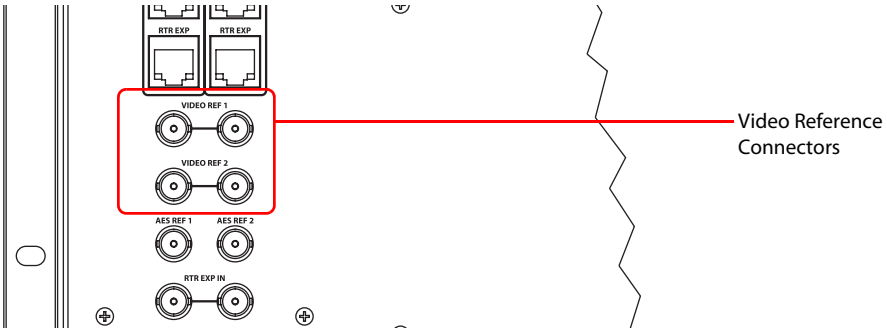


Figure 2-20. Video Reference Connections (Rear View)

2 Connect to the 'VIDEO REF 1' connection using a 75 Ω BNC connector and coaxial cable.

3 Connect the other end of the cable to a reference signal. Be sure the incoming signal is from a stable source. The signals can be:

- PAL
- NTSC
- Tri-Level Sync (1080i 50/59.94/60 and 720p 50/59.94/60)

4 On all unused video reference connections, be sure to terminate the loop-through by installing a 75 Ω BNC terminator.

5 Connect to the 'VIDEO REF 2' input connection, as described in Steps 2 through 4.

Making Monitor Connections

The NV8500 family of routers support the monitoring of output and input signals. Whether both outputs and inputs are monitored depends upon the control card currently installed in the router frame. Older control cards run an application that supports only output monitor signals. More recent control cards run an application that supports both output and input signal monitoring.

Control cards running the following application versions support the listed monitor signals:

- Versions 13.0.3.xx and older — The control card supports output monitor signals only (matching FPGA versions: SV0900-06, SV0901-05 and older).
- Versions 14.0.0.xx and newer — The control card supports both input and output monitor signals (matching FPGA versions: SV0900-07, SV0901-06 and newer).

To properly access and control monitor cards and signals, a Monitor Level must be configured using the Miranda Router Configurator (MRC). A level is an organizational partition in the router.

Levels are based on signal type, which for the Monitor Level is the monitor signal. A Monitor Level solely manages monitor signals. For details on creating router levels, see the *Miranda Router Configurator User's Guide*.

Each monitor backplane has 4 DIN 1.0/2.3 connectors. Using the proprietary cable provided with the product, connect the monitor backplanes as described for your router.

NV8144 has only one monitor backplane and card that monitor both inputs and outputs. The NV8280 has two monitor backplanes and cards: one for monitoring inputs and one for monitoring outputs. The NV8576 and NV8576-Plus each have four monitor backplanes and cards: two for monitoring inputs and two for monitoring outputs. Be sure to follow the procedure for your router type.

Monitor backplanes connectors have unique functions. It is strongly recommended that you review Monitor Backplanes on page 26 before making monitor connections.

Note Do not put terminators on unused 'In' connectors.

How to Make NV8144 Monitor Connections

1 Locate the monitor backplane located on the rear of the router frame, as shown in Figure 2-21.

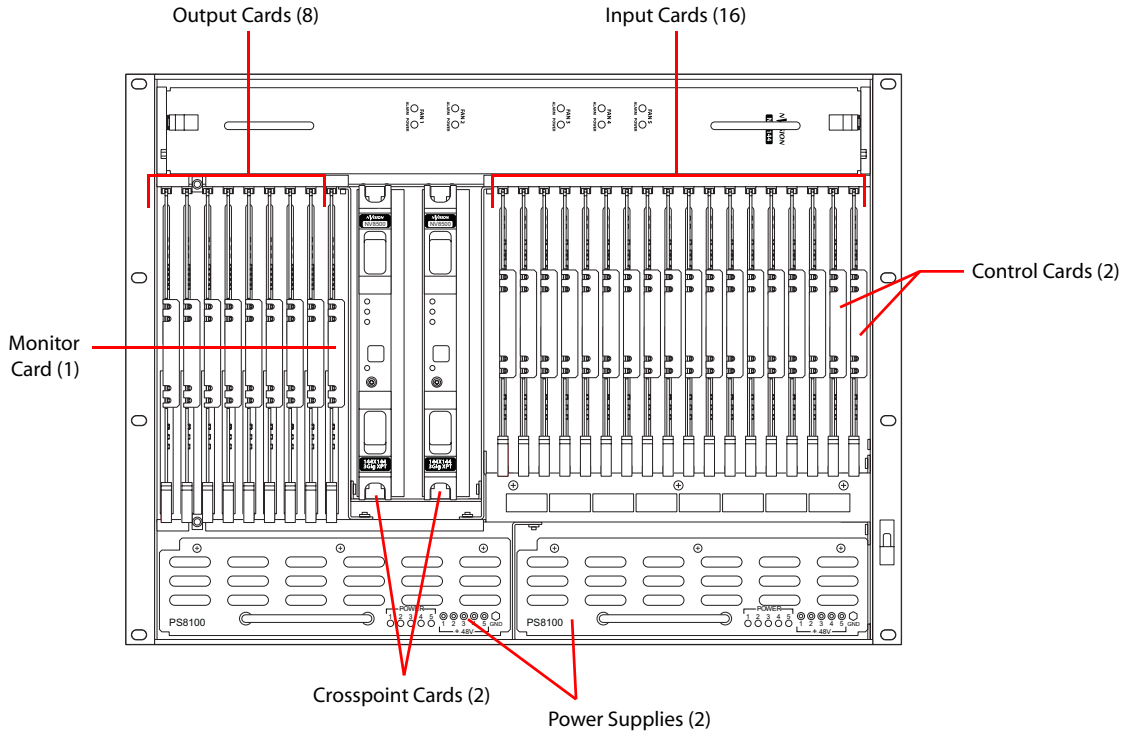
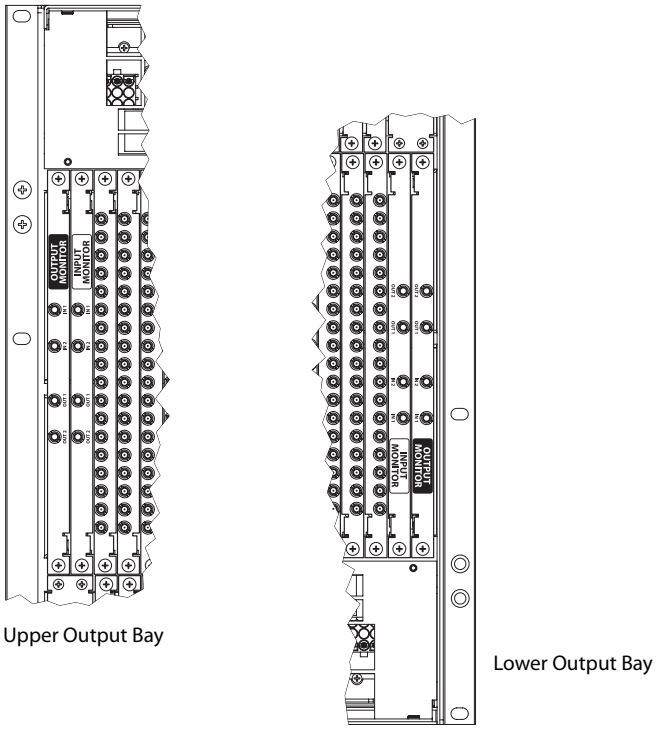


Figure 2-21. NV8144 with Door Removed (Front View)

2 For each connection, use a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent (provided with product package). Connect 'OUTPUT MON' and 'INPUT MON' on the monitor backplane to your monitoring equipment.

How to Make NV8280, NV8576, or NV8576-Plus *Output* Monitor Connections

1 Locate the output monitor backplanes. Figure 2-22 is an example of the NV8576 router:



Upper Output Bay

Lower Output Bay

Figure 2-22. Monitor Backplanes

Depending on the router frame, facing the rear of the router, the monitor backplanes are located as follows:

- NV8280 — there are two monitor backplanes located in the upper left-hand corner next to the output backplanes.
- NV8576 or NV8576-Plus — there are four monitor backplanes: two are located in the upper region to the left of the output cards; two are located in the lower region to the right of the output cards, as shown in Figure 2-22.

2 For each connection, use a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent (provided with product package), and make connections as follows:

- NV8280 — connect ‘OUT 1’ and ‘OUT 2’ on the output monitor backplane to your monitoring equipment.
- For NV8576 or NV8576-Plus, make connections as illustrated in Figure 2-23:

  Connect ‘OUT 1’ of the output monitor backplane in the lower region, to ‘IN 1’ of the output monitor backplane in the upper region.

  Similarly connect ‘OUT 2’ of the output monitor backplane in the lower region, to ‘IN 2’ of the output monitor backplane in the upper region.

e Connect ‘OUT 1’ and ‘OUT 2’ of the output monitor backplane in the upper region to your monitoring equipment.

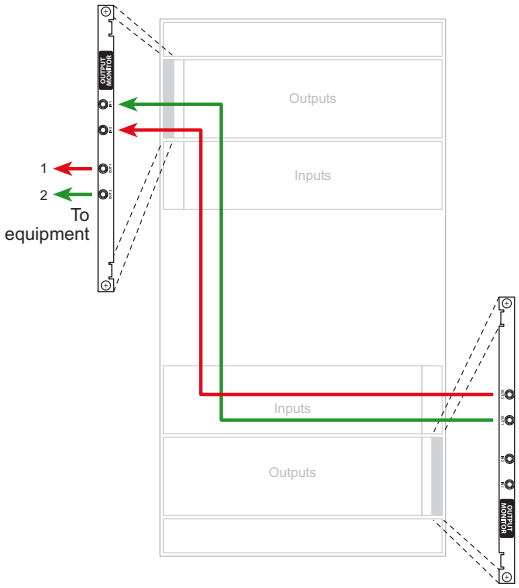


Figure 2-23. Monitor Connections for NV8576 (Rear View)

How to Make NV8280, NV8576 or NV8576-Plus *Input* Monitor Connections

1 Locate the input monitor backplanes as described in step 1 of the previous procedure.

2 For each connection, use a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent (provided with product package), and make connections as follows:

- NV8280 — connect ‘OUT 1’ and ‘OUT 2’ on the input monitor backplane to your monitoring equipment.
- For NV8576 or NV8576-Plus, make connections as illustrated in Figure 2-23:

a Connect ‘OUT 1’ of the input monitor backplane in the lower bay, to ‘IN 1’ of the input monitor backplane in the upper bay.

b Similarly connect ‘OUT 2’ of the input monitor backplane in the lower bay, to ‘IN 2’ of the input monitor backplane in the upper bay.

c Connect ‘OUT 1’ and ‘OUT 2’ of the input monitor backplane in the upper bay to your monitoring equipment.

Expansion Frame Monitor Connections

If you have connected two expandable router frames together (NV8576-Plus), only one router is connected directly to the monitoring equipment. This router acts as the primary router. Monitor expansion connections are then made between the primary router and the remaining, or secondary, router. This enables the monitoring equipment to sample all signals on both routers through the monitor connections on the primary router.

Note Do not put terminators on unused ‘IN’ connectors.

How to Make NV8576-Plus Output Expansion Monitor Connections

For each router frame, make connections as illustrated in Figure 2-24:

1 Connect ‘OUT 1’ of the output monitor backplane in the lower region to ‘IN 1’ of the output monitor backplane in the upper region.

2 Connect ‘OUT 2’ of the output monitor backplane in the lower region to ‘IN 2’ of the output monitor backplane in the upper region.

3 Connect ‘OUT 1’ of the output monitor backplane in the upper region on the *secondary* frame to ‘IN 1’ of the output monitor backplane in the lower region of the *primary* frame.

4 Connect ‘OUT 2’ of the output monitor backplane in the upper region of the *secondary* frame to ‘IN 2’ of the output monitor backplane in the lower region of the *primary* frame.

5 Connect ‘OUT 1’ and ‘OUT 2’ of the output monitor backplane in the upper region of the *primary* frame to your monitoring equipment.

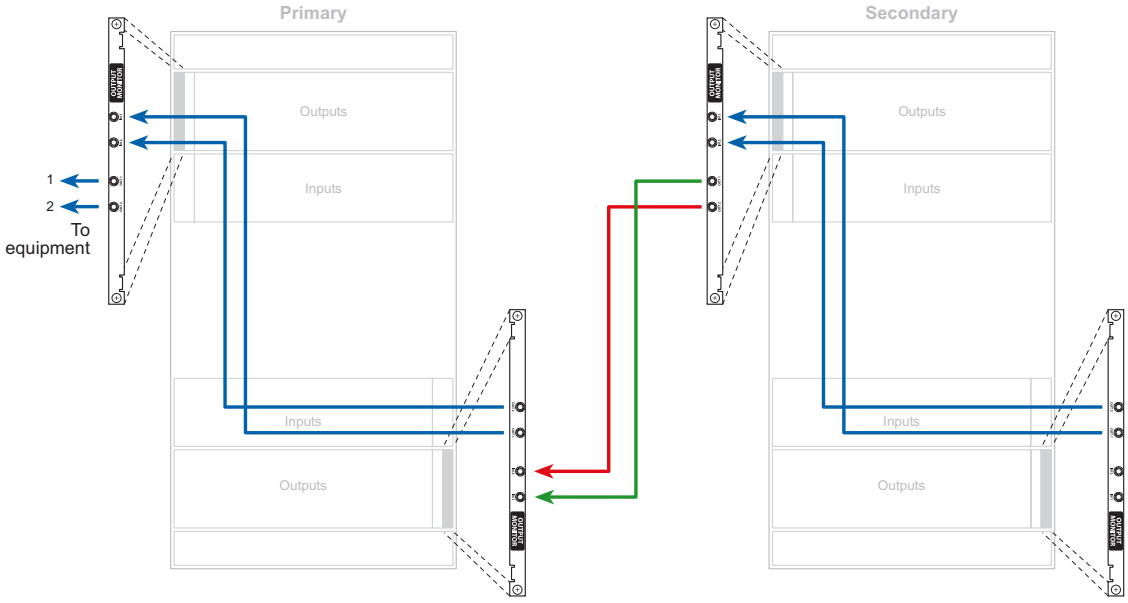


Figure 2-24. NV8576-Plus Connections (Rear View)

Making Alarm Connections

Routers in the NV8500 family provide system alarms that notify you of a malfunction, such as when a fan or power supply is not functioning properly. Alarms can be connected to an external alarm indicator that displays visual cues when an alarm is activated. For the router frames that use the NV8000 or the NV8300 power supply, the power supply frame has additional alarm connections. Miranda does not provide external indicator equipment, but does provide instructions on wiring the alarm connections. See Alarm Indicator Equipment on page 101.

Both the router frames and the NV8000 or the NV8300 power supply send status information to the router control system. For more information on the alarm connections, see System Alarm on page 32.

How to Make Router Alarm Connections

1 On the rear of the router, locate the ‘ALARMS’ connection, as shown in Figure 2-25.

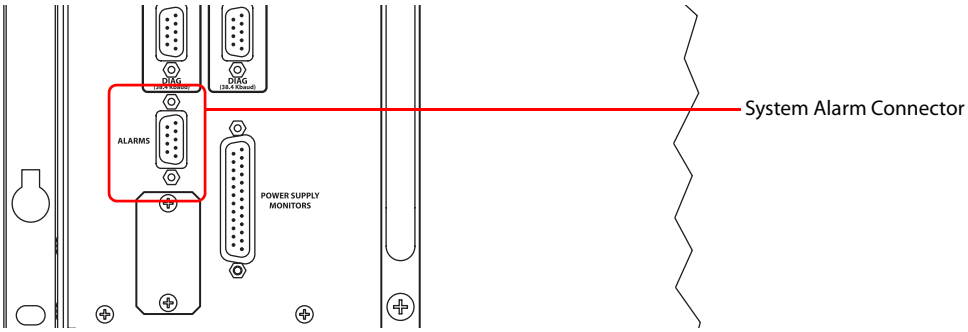


Figure 2-25. System Alarm Connection on Router (Rear View)

2 Connect to the ‘ALARMS’ connection using a DE9 connector and cable.

3 Connect the other end of the cable to an external alarm indicator. (See Router Alarms on page 102 for information on wiring the DE9 connector.)

How to Make Power Supply Frame Alarm Connections

1 On the rear of the NV8000 or NV8300 power supply, locate the ‘Alarms’ connection.

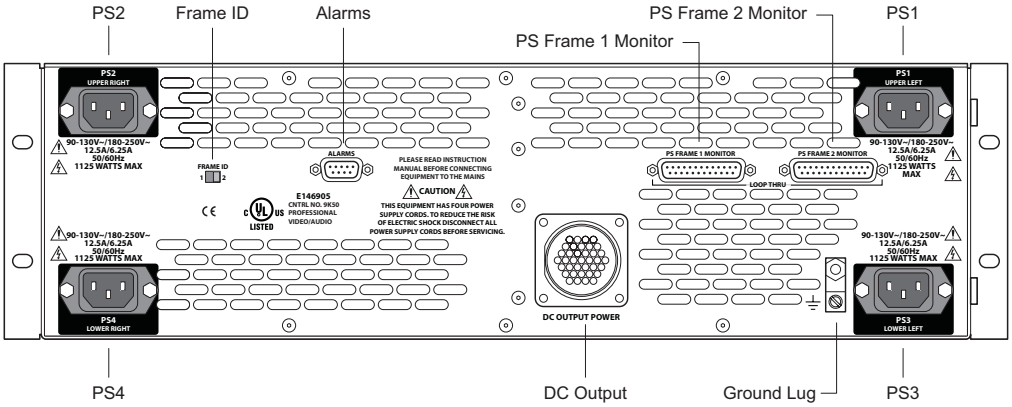


Figure 2-26. NV8000 Power Supply (Rear View)

2 Connect to the ‘Alarms’ connection using a DE9 connector and cable.

3 Connect the other end of the cable to an external alarm indicator. See “Alarm Indicator Equipment” on this page for information on wiring the DE9 connector.

Alarm Indicator Equipment

An external alarm indicator can be created to display visual cues when a failure has occurred on the NV8000 power supply, NV8300 power supply, or a NV8500 family router frame. LEDs can be wired to specific pins on a DE9 connector. Each LED indicates what specific router module has failed.

- For NV8000 or NV8300 power supply alarms, see NV8000 or NV8300 Power Supply on page 102.
- For NV8500 family router alarms, see Router Alarms on page 102.

NV8000 or NV8300 Power Supply

The ‘Alarms’ connection on the rear of the NV8000 or the NV8300 uses a DE9 connector. An “alarm” or ON condition occurs when the connection between an alarm pin and Alarm_COM (common) opens. The alarm turns OFF when the connection between Alarm_COM and the alarm pin closes again. If a PS8100 or PS8300 power supply module is removed, the alarm circuit remains open.

For an external alarm indicator box, connect to the ‘Alarms’ connection using a DE9 female connector, wiring as shown in Figure 2-27. Each pin monitors a specific function and activates a specific alarm.

Figure 2-27. Power Supply Alarms Connection

Caution The power supply for the alarm circuit must not exceed 30 VDC. Load resistor values depend on power supply voltage.

Router Alarms

The ‘ALARM’ connection on the rear of the NV8500 family router frame uses a DE9 connector. An “alarm” or ON condition occurs when the connection between an alarm pin and Alarm_COM (common) opens. The alarm turns OFF when the connection between Alarm_COM and the alarm pin closes again.

To create an indicator box, connect to the ‘ALARM’ connection using a DE9 female connector, wiring as shown in Figure 2-28. Each pin monitors a specific function and activates a specific alarm.

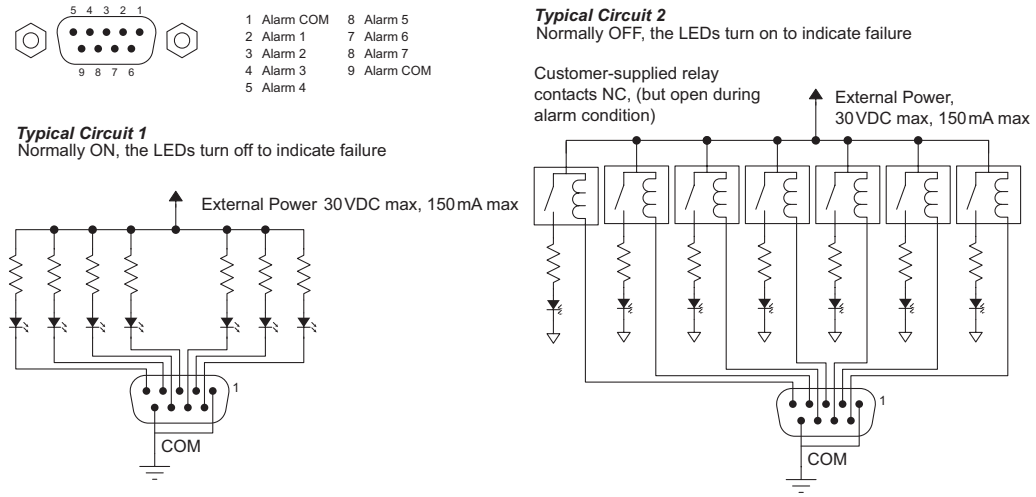


Figure 2-28. Alarm Connections and On/Off Switches

The following lists each DE9 pin and the associated alarm. The pin number listed corresponds to the pin numbers in Figure 2-28 on page 102:

PIN	Signal	Description	Possible Conditions Causing the Alarm
1, 9	Alarm_COM	Common	Common connection for all alarm pins.
2	Alarm_1	Major Alarm	Indicates missing reference inputs, or missing power supplies.
3	Alarm_2	Minor Alarm	Alarm_3, or Alarm_4, or Alarm_5, or Alarm_6
4	Alarm_3	Power Supply	Missing power supply module.
5	Alarm_4	Video Ref	Missing Video Ref 1 or Video Ref 2.
6	Alarm_5	AES Ref	Not used in NV8500 family.
7	Alarm_6	Fans or Temperature	Indicates a fan failure or module over temperature.
8	Alarm_7	Control Module Health	Any control module not “healthy.”

Connecting to Power

Routers in the NV8500 family use power supply modules to power the router frames. There are two power supply modules: PS8100 (875 Watts) and PS8300 (1,350 Watts). The NV8144 uses two power supply modules, which are installed directly into the router frame. The NV8280, NV8576 and NV8576-Plus routers use Miranda’s NV8000 or NV8300 power supply, an external frame that holds up to four power supply modules: two primary and two for redundancy.

The NV8000 uses the PS8100 power supply modules. The NV8300 uses the PS8300 power supply modules. The router frame and I/O cards installed determine the type of power supply module required and how many.

The following table lists the power requirements for a fully loaded router frame with either coax, fiber optic, or hybrid I/O cards:

Router Frames	Total Wattage Needed	NV8000 or NV8300 Frame	Total PS8100 Modules Required (for NV8000)	Total PS8300 Modules Required (for NV8300)
NV8144 (coax)	850	NA	1 required, 1 optional for redundancy	NA
NV8144 (fiber optic)	900	NA	1 required, 1 optional for redundancy	NA
NV8144 (hybrid)	900	NA	NA	1 required, 1 optional for redundancy
NV8280 (coax)	1,750	1, NV8000	2 required, 2 optional for redundancy	
NV8280 (fiber optic)	2,100	1, NV8300	NA	2 required, 2 optional for redundancy
NV8280 (hybrid)	2,700	1, NV8300	NA	2 required, 2 optional for redundancy

Router Frames	Total Wattage Needed	NV8000 or NV8300 Frame	Total PS8100 Modules Required (for NV8000)	Total PS8300 Modules Required (for NV8300)
NV8576 (coax)	3,400	2, NV8000	4 required, 4 optional for redundancy	NA
NV8576 (fiber optic)	4,250	2, NV8000	NA	4 required, 4 optional for redundancy
NV8576 (hybrid)	5,400	2, NV8300	NA	4 required, 4 optional for redundancy
NV8576-Plus (coax)	3,400	2, NV8000	4 required, 4 optional for redundancy	
NV8576-Plus (fiber optic)	4,250	2, NV8000	NA	4 required, 4 optional for redundancy
NV8576-Plus (hybrid)	5,400	2, NV8300	NA	4 required, 4 optional for redundancy

For details about power requirements, see Technical Details on page 127.

When setting up the NV8000 or the NV8300 power supply, connections are made to a power source and for monitoring the power. To create those connections, Miranda provides the following cables:

- Two power supply cable.
- Two monitor cables.

Depending on the power requirements, different cables from the power source to the power supply frame, and from the power supply frame to the router frame are used, as follows:

Part Number	Description
PS8100	Power supply module (875 Watts)
PS8300	Power supply module (1,350 Watts)
WC0046-00	Power supply monitor cable for the NV8000 or NV8300 power supply frame.
WC0123-00	Power supply cable from NV8000 to router frame.
WC0154-00	Power supply cable from NV8300 to router frame.
WC0109-00	Cable from NV8000 to power source or cable from NV8144 to power source.
WC0157-00	Twist lock cable from NV8300 to power source. **Note:** Requires 20 A.

The NV8500 family router frames have a ground lug on the back of the router. We recommend you connect the ground lug to earth ground. Failure to connect the ground does not affect normal operation. However, grounding helps protect you and your equipment in case of a power anomaly such as a lightning strike.

Power Supply Monitor and Alarm Connections

The NV8000 and the NV8300 power supply have two DB25 connectors, located at the rear. One connection, labeled 'Power Supply Monitor' carries alarm and temperature signals to the router. When a NV8576 or NV8576-Plus router frame is connected to two power supplies, a loop-through connection passes monitoring information between the two power supply frame. Monitor connections can be made at the same time power is connected. (See How to Connect to Power to NV8576 or NV8576-Plus on page 109.)

The other DB25 connector, labeled 'Alarms' presents isolated alarm signals that can be connected to an external alarm indicator. For information on connecting NV8000 alarms connections, see Making Alarm Connections on page 100.

Branch Circuits

For added protection in the event of a main power failure, we recommend that the main power supply connection and the redundant power supply connection to the NV8000 or NV8300 power supply be connected to separate branch circuits. A wire retainer should be used to hold the power cable in place, reducing the possibility of an accidental disconnection.

The power cords are the only means of disconnecting AC power. It is recommended that you clearly mark the line side power connection with its function so that in the event of an emergency, power can be disconnected quickly.

Making Power Connections

Depending on the NV8500 family router frame, power supply modules are installed in either the router frame directly or in an external power supply frame. For the NV8576 or NV8576-Plus, two power supply frames are required. (See Connecting to Power on page 103 for a list of router frame and power supply requirements.) To connect one router frame to two power supplies, Miranda provides two special power cables (DC, WC0096-01 and AC, WC0157-00) and monitor cable (WC0046-00)

Caution Insert PS8100 or PS8300 power supply modules *after* connecting the router to an AC power source.

The following is a list of what you need to make power connections for each router frame. For details on which power supply modules and which power supply frames to use, see Connecting to Power on page 103.

Router	Power Supply Modules (PS8100 or PS8300)	Power Supply Frame (NV8000 or NV8300)	Power cord to power source	Power cord from power supply frame to router	Cable for power supply monitor	Copper wire for ground lug (optional)
NV8144	2	—	2	—	—	1
NV8280	2	1	1	1	1	1
NV8576 or NV8576-Plus	4	2	2	2	2	2

How to Connect Power to the NV8144

1 Locate the power cords and PS8100 or PS8300 power supply modules.

2 Facing the rear of the router, connect power cords (WC0109) from AC power sources (90–230 VAC, 50–60 Hz) to power supply connections ‘Power Input 1’ and ‘Power Input 2’, as shown:

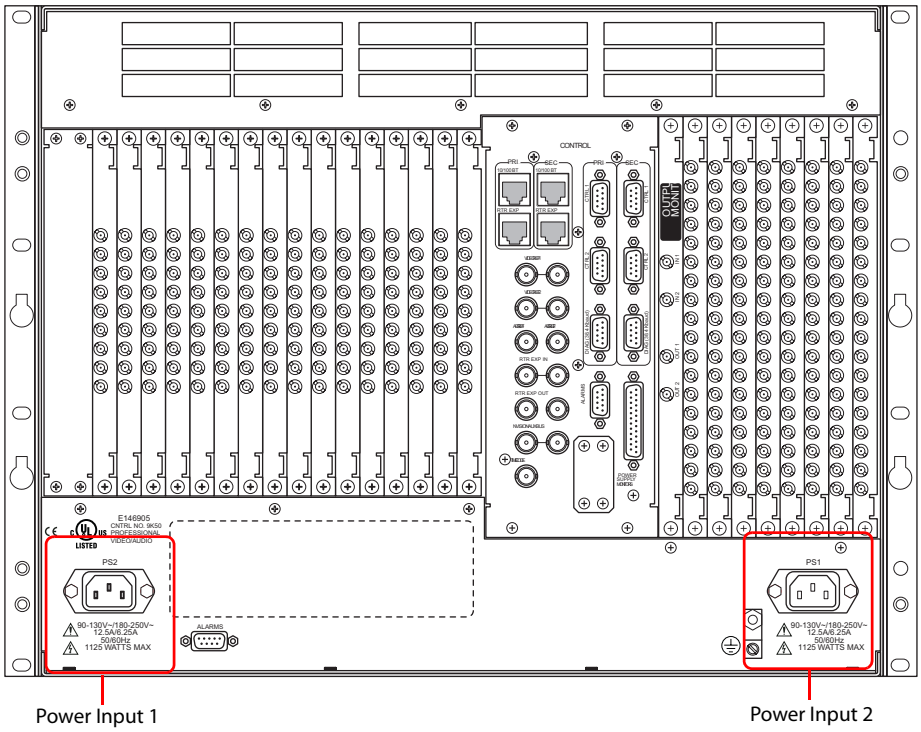


Figure 2-29. NV8144 Power Supply Connections on Router

3 Install the PS8100 or PS8300 power supply modules as follows:

a At the front of the router, install a *primary* power supply module in slots 1, as shown in Figure 2-30.

b Optionally, install a *redundant* power supply module in slot 2, as shown:

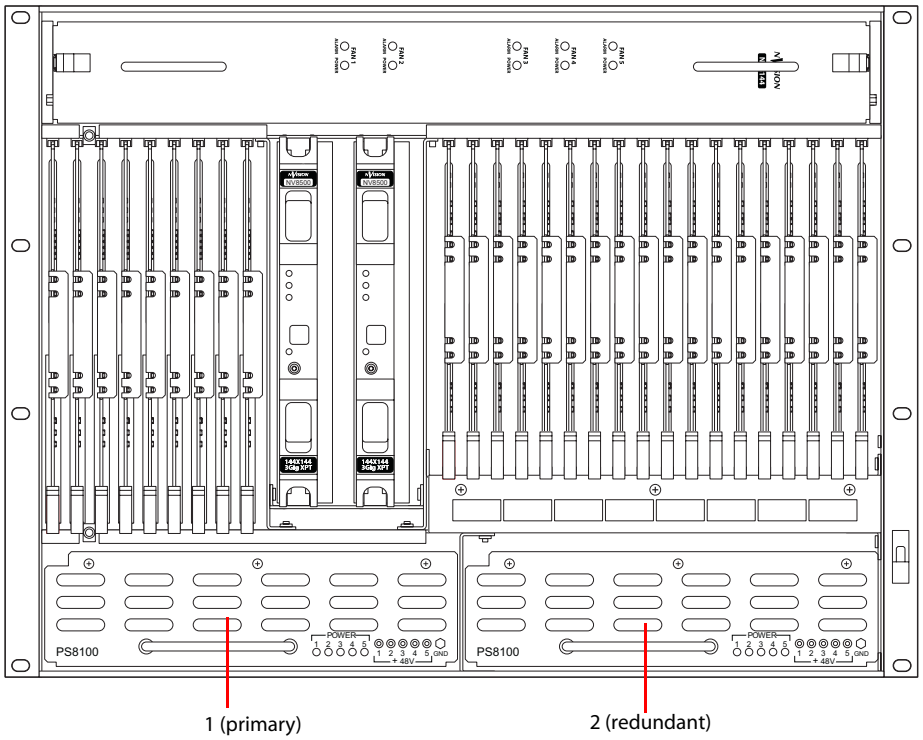


Figure 2-30. NV8144 (Front View)

4 Connect the router's ground lug to earth ground using a copper wire from 14 to 6 AWG. The ground lug is located in the lower right corner of the frame.

How to Connect Power to the NV8280

1 Locate the power cords and PS8100 or PS8300 power supply modules.

2 Facing the rear of the **NV8000** or **NV8300** power supply frame, connect one end of the power cable (WC0109 for NV8000; WC0157 for NV8300) to 'DC Output', as shown:

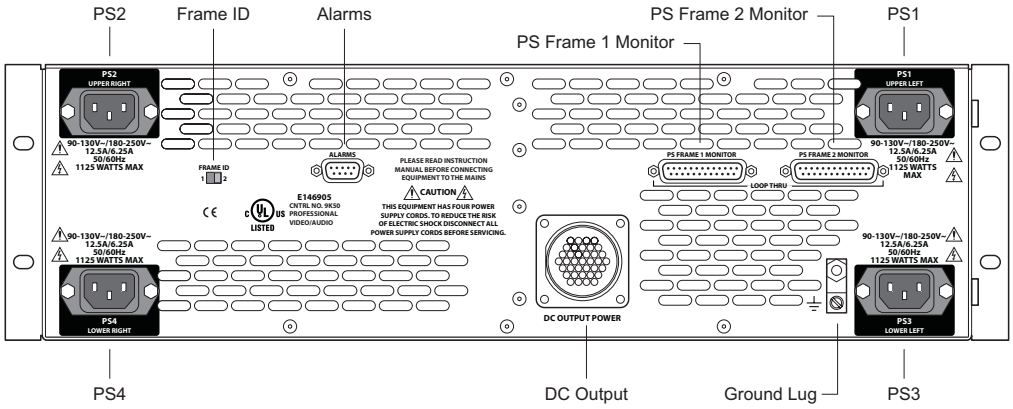


Figure 2-31. Power Supply Frame (Rear View)

3 Facing the rear of the **router**, connect the other end of the power cable to ‘Power Input 1’, as shown in Figure 2-32.

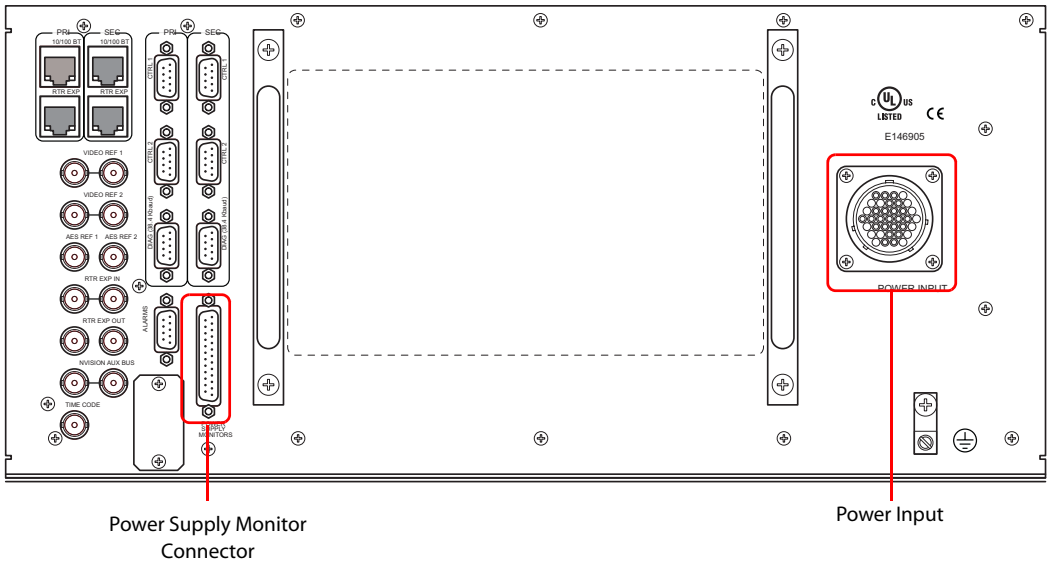


Figure 2-32. NV8280 Power Supply Monitor and Power Supply Connections

4 Using a WC0046 cable (DB25), connect ‘PS Frame 1 Monitor’ on the NV8000 or NV8300 power supply frame to ‘Power Supply Monitor’ on the router frame.

5 Connect power cords from AC power sources (90–230 VAC, 50–60 Hz) into power supply connections PS 1 through PS 4, as shown in Figure 2-33. Connect one power cord for each PS8100 or PS8300 power supply module you will install.

6 Install the PS8100 or PS8300 power supply modules as illustrated in Figure 2-33:

a At the front of the NV8000 or NV8300, install *primary* power supply modules in slots 1 and 3.

b Optionally, install *redundant* power supply modules in slots 2 and 4.

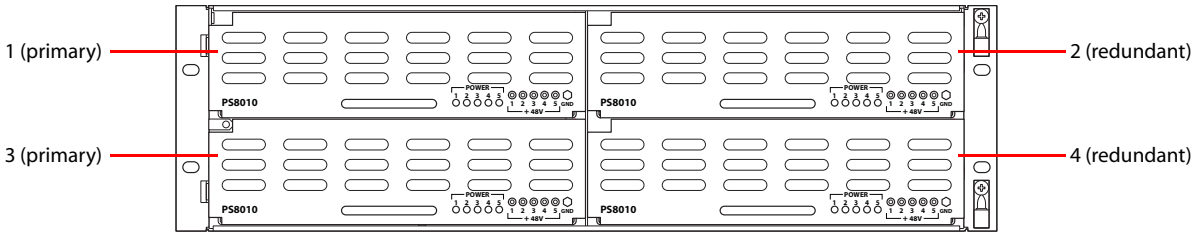


Figure 2-33. Power Supply (Front View)

7 Connect the **router’s** ground lug to earth ground using a copper wire from 14 to 6 AWG. The ground lug is located in the lower right corner of the frame.

How to Connect to Power to NV8576 or NV8576-Plus

1 Locate the power cords and PS8100 or PS8300 power supply modules.

2 Facing the rear of one of the **NV8000** or **NV8300** frames (Power Supply 1), connect one end of a power cable (WC0109 for NV8000; WC0157 for NV8300) to 'DC Output', as shown:

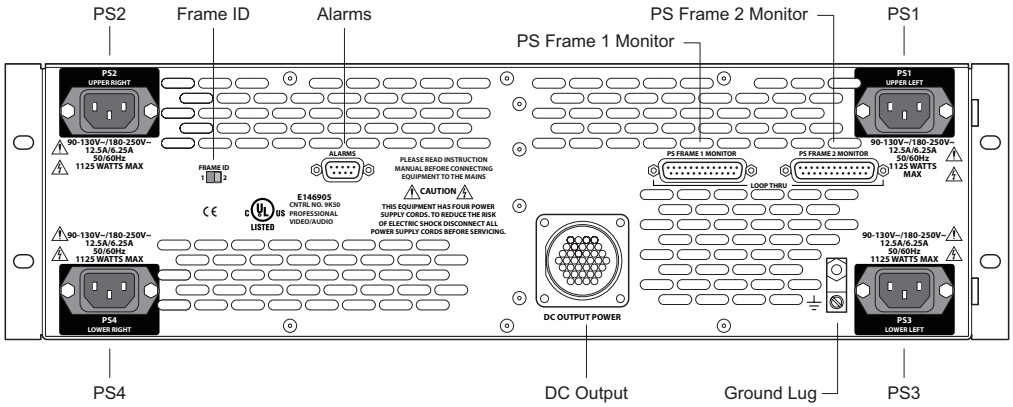


Figure 2-34. Power Supply (Rear View)

3 Facing the rear of the **router**, connect the other end of the power cable to 'Power Input 1', as shown:

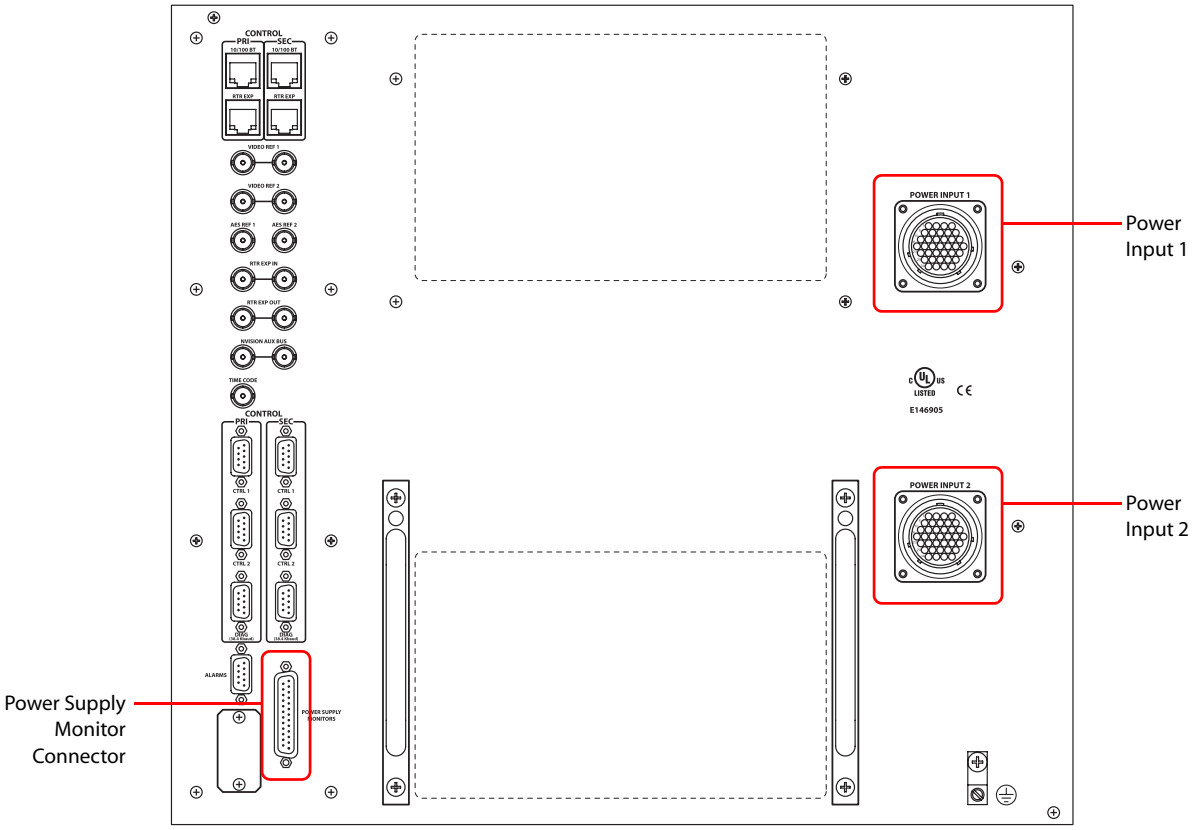


Figure 2-35. NV8576 Power Supply Monitor and Power Supply Connections on Router

4 Similarly, connect the second **NV8000** or **NV8300** frame (Power Supply 1) to 'Power Input 2' using the WC0096 power cable.

5 Using a WC0046 cable (DB25), connect ‘PS Frame 1 Monitor’ on power supply 1 to ‘Power Supply Monitor’ on the router frame.

6 Using a second WC0046 cable (DB25), connect ‘PS Frame 2 Monitor’ on power supply 1 to ‘PS Frame 2 Monitor’ on power supply 2.

7 Set the frame ID switch of power supply 1 to ‘1’ and set the Frame ID switch of power supply 2 to ‘2’.

8 Connect power cords from AC power sources (90–230 VAC, 50–60 Hz) into power supply connections PS 1 through PS 4. (See Figure 2-34.) Connect one power cord for each PS8100 or PS8300 power supply module you will install.

9 Install the PS8100 or PS8300 power supply modules as illustrated in Figure 2-36:

a At the front of the NV8000 or NV8300, install *primary* power supply modules in slots 1 and 3.

b Optionally, install *redundant* power supply modules in slots 2 and 4.

c Repeat this step for the other power supply.

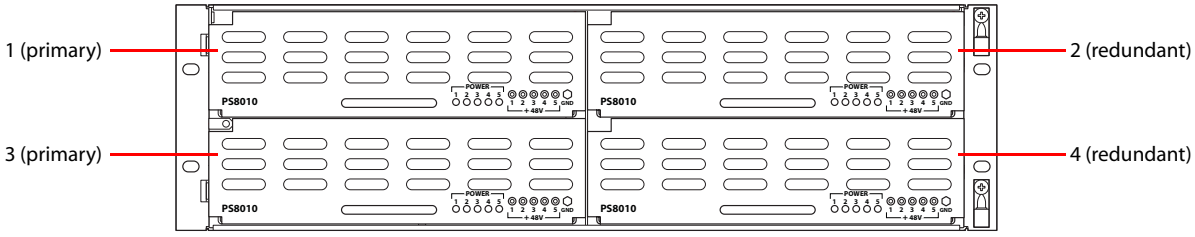


Figure 2-36. Power Supply (Front View)

10 Connect the **router’s** ground lug to earth ground using a copper wire from 14 to 6 AWG. The ground lug is located in the lower right corner of the frame.

11 If you have two NV8576-Plus expanded frames connected together, connect power similarly for both frames. Four NV8000 or four NV8300 power supply frames are required to power two NV8576-Plus frames.

Verification

When installation is complete, perform the following checks to make sure the router is operating properly:

- If using a NV8000 or NV8300 power supply frame, check that all 5 green power LEDs on the front of each PS8100 or PS8300 power supply module are lit. If any or all LEDs are off:
  - Check that the PS8100 or PS8300 power supply module is fully seated in its slot.
  - Check for +48 volts at each of the 5 front test points.
- On the router frame, check that the LEDs on the input cards, crosspoint cards, control cards, and output cards are lit and indicating a “healthy” system. See Indicator LEDs on page 121 for a list of normal and alert LED states.
- Make sure that the flow of air through the front of the router is unimpeded and the door is properly installed and closed. For more information, see Air Flow on page 123.

3. Configuration

Before being placed into service, the NV8500 family of routers must be configured for your particular router control system and settings. Most configuration tasks are managed through the Miranda Router Configurator (MRC), which resides on a PC and is separate from the router. For information on using MRC, see the *Miranda Router Configurator User's Guide*.

The exception to configuring using MRC is the hybrid I/O cards. For standard input and output cards and hybrid input and output cards to coexist and function properly in an NV8500 Series frame, the control card needs to determine whether an input or output slot contains a standard card or a hybrid card. Currently this control card configuration is accomplished through the *console* serial port (at the front of the control card).

Each control card must be individually configured.

Configuring Control Cards Using Console Port

To configure a control card through the console port, you will need the following equipment:

A PC running ProComm (configured 9600, N, 8, 1).
USB to RS-232 serial adapter.
10 ft.+ serial cable — DE9 to 3-pin Phoenix.

The serial cable must be wired as follows:

3-Pin Phoenix Connector	9-pin Serial Connector
1 (top)	2 (Rx/Tx)
2 (middle)	3 (Tx/Rx)
3 (bottom)	5 (GND)

Console Commands

There are 6 related console commands:

`cnfgOcTypeUpdate` — Configures all output card types to match the currently installed output cards. The command takes no parameters.

`cnfgOcTypeSet <type>, <startoc>, <endoc>` — Configures the specified range of output cards to the given type.

Param	Desc	Attribute(s)
`<type>`	Card type	0 = standard; 1 = embedder; 2 = MADI
`<startoc>`	First output card slot #	See note 1, following
`<endoc>`	Last output card slot #	See note 1, following

`cnfgOcType [<oc> [ , <num> ]]` — Tallies the specified range of output cards.

Param	Desc	Attribute(s)
`<oc>`	First output card slot #	See note 1, following
`<num>`	Number of slots to tally	

The `cnfgOcType` command returns output card type: 0 = standard; 1 = embedder; 2 = MADI.

`cnfgIcTypeUpdate` — Configures all input card types to match the currently installed input cards. The command takes no parameters.

`cnfgIcTypeSet <type>, <startic>, <endic>` — Configures the specified range of input cards to the given type.

Param	Desc	Attribute(s)
`<type>`	Card type	0 = standard; 1 = embedder; 2 = MADI
`<startic>`	First input card slot #	See note 1, following
`<endic>`	Last input card slot #	See note 1, following

`cnfgIcType [<ic> [ , <num> ]]` — Tallies the specified range of input cards.

Param	Desc	Attribute(s)
`<ic>`	First input card slot #	See note 1, following
`<num>`	Number of slots to tally	

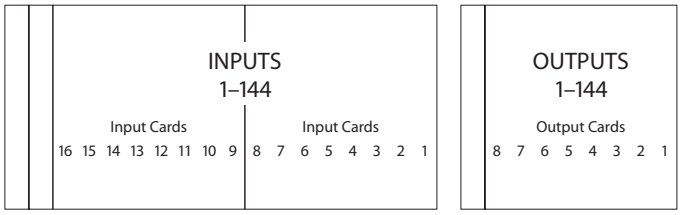
The `cnfgIcType` command returns output card type: 0 = standard; 1 = embedder; 2 = MADI.

Note 1: The input and output card numbering follows sets of 8 slots and does ***not*** match the numbering of slots at the rear of the router.

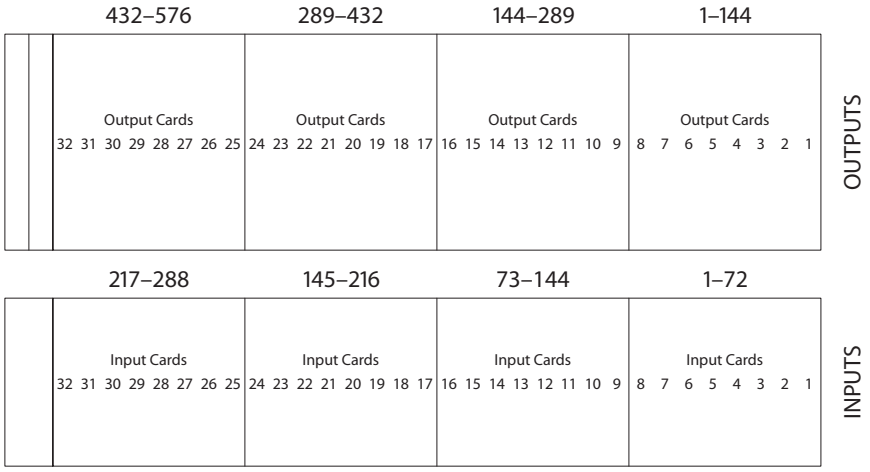
Slot Numbering

The following diagrams show the slot numbering used by the console application. All slots are viewed from the rear of the router frame.

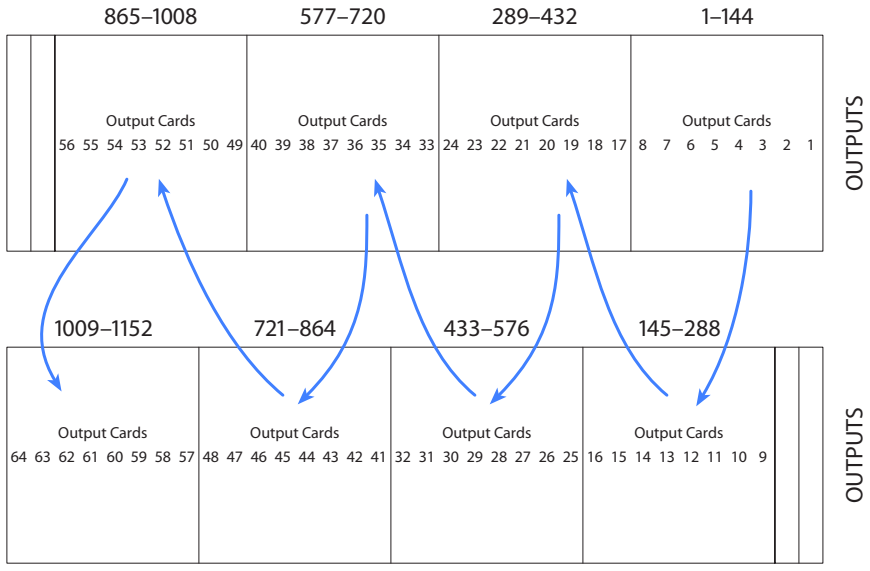
For the NV8144, slots are numbered consecutively:



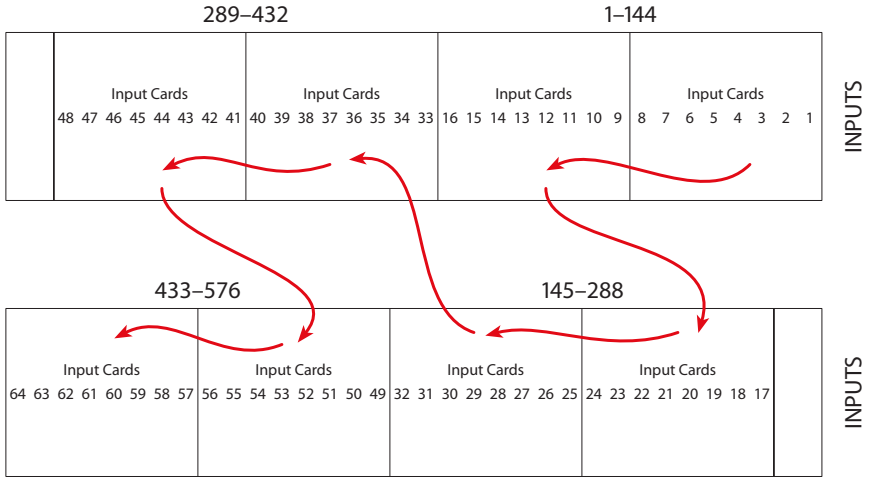
For the NV8280, there are 4 sets of 8 input cards and 4 sets of 8 output cards. The slots are numbered 1–32, consecutively:



For the NV8576, there are 8 sets of 8 output cards. The sets alternate consecutively between the upper output bay and the lower output bay:

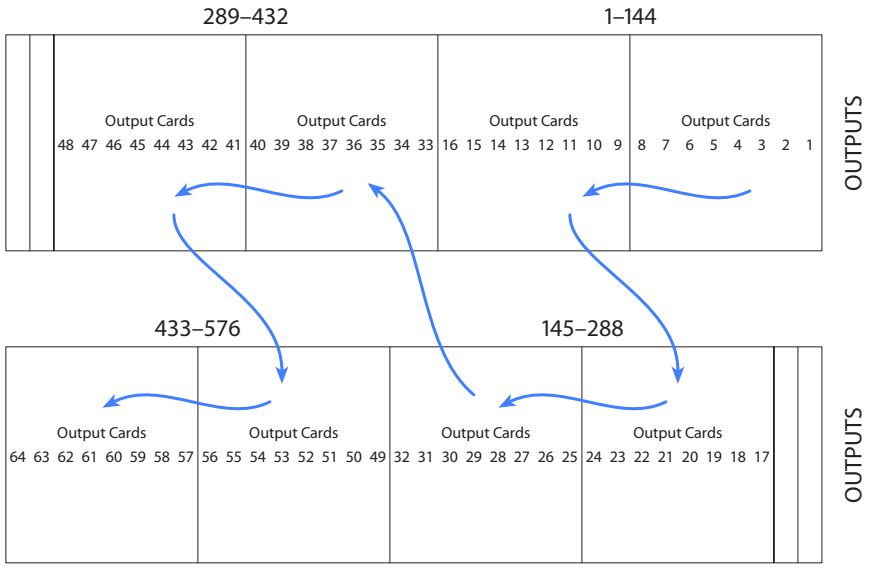


There are also 8 sets of 8 input cards. The inputs also alternate between the upper and lower bays:

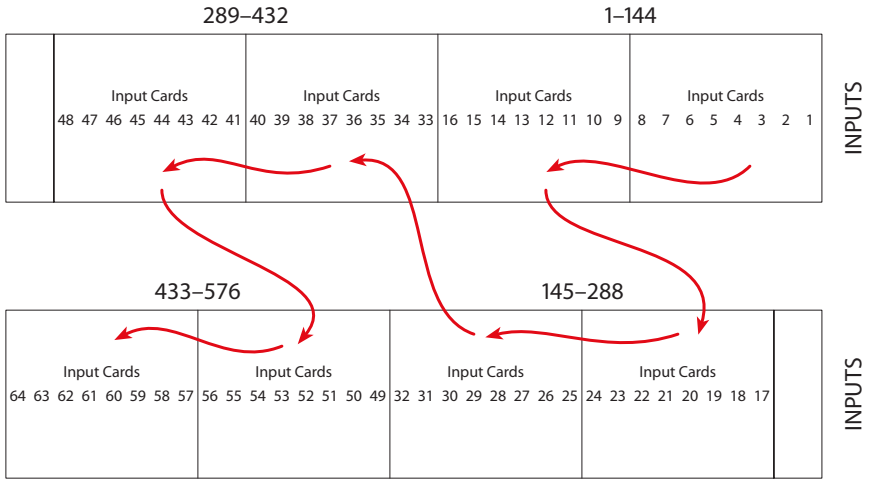


The slots in the NV8576 scheme number from 1 to 64, for inputs and for outputs.

For the NV8576-Plus, there are 8 sets of 8 output cards in each of two frames. The sets vary between the upper output bay and the lower output bay in each frame. This illustrates the first frame:



There are 8 sets of 8 inputs. The inputs also alternate between the upper and lower bays. This illustrates the first frame:



The second frame uses the same numbering pattern, but of course the video connector numbers range from 577–1152, instead of from 1–576.

Examples

Set input cards 2 through 7 to use (dis)embedder cards:

```
-> cnfgIcTypeSet 1,2,7
```

Set output cards 17 through 19 to use standard cards:

```
-> cnfgOcTypeSet 0,17,19
```

Tally the 5 output cards beginning at card 3:

```
-> cnfgOcType 3,5
out cards: ..... types (0 = STD, 1 = EMB, 2 = MADI) .....
        1:       1 0 1 1 2
```

The results indicate that output cards 3, 5, and 6 are embedder cards. Card 4 is a standard card and card 7 is a MADI card.

4. Operation

A router control system is required to use routers in the NV8500 family. The control system provides an interface for operations and maintenance personnel. Through the control system, signal switching can be actively configured, reference inputs selected, partitions for organizing signal switching created, and certain system functions monitored.

The NV8500 family of routers are designed to partner with the Miranda NV9000 control system. However, Miranda routers are designed with a degree of flexibility and can be used with certain third-party control systems. For detailed information on using the Miranda NV9000 control system, see the associated User's Guide. For information on using third-party control systems, see the third-party vendor literature. For more information on compatible control systems. Contact Miranda technical support, see Technical Support Contact Information on page iii.

Miranda Control Systems

Most facilities require multi-level switching capability (audio follow video, for example) and intuitive device naming capabilities. The control system used dramatically affects how operators use the routers and the ease with which devices are accessed.

Miranda's control system runs on an NV9000 system controller that is separate from the router. The router control system can be loaded (a) on a primary controller only or (b) on both primary and secondary (redundant) controllers, creating a fail-over backup. The control system includes control panels for managing routers and other network equipment.

Miranda's control systems offer a variety of control surfaces, support redundancy, and facilitate expansion as routing needs change. The control system is also capable of interfacing with third-party signal routing equipment. Because of the variety of features, capabilities and limitations of other manufacturers' equipment, users are urged to work closely with Miranda's technical staff and with the supplier of the third-party equipment when integrating it into an NV9000 control system.

Third-Party Control Systems

Miranda provides assistance to users wanting to configure Miranda products to function with third-party control systems. However, because Miranda does not manufacture or warrant control systems from other vendors, we cannot guarantee overall performance or answer all possible configuration-related questions. For assistance, contact the manufacturer of the control system in use.

In many cases, router features and functionality are limited when using a third-party control system. For example, the third-party system may not optimally manage mono routing, while the NV9000 control system easily manages this function.

Please consult with Miranda if you are considering using a third-party interface to control an NV8500 family router. For contact information, see Technical Support Contact Information on page iii.

Setting Redundant Crosspoint Switching

The NV8280, NV8576 and NV8576-Plus of routers' redundant crosspoint cardset has nine function buttons, as shown in Figure 4-1.

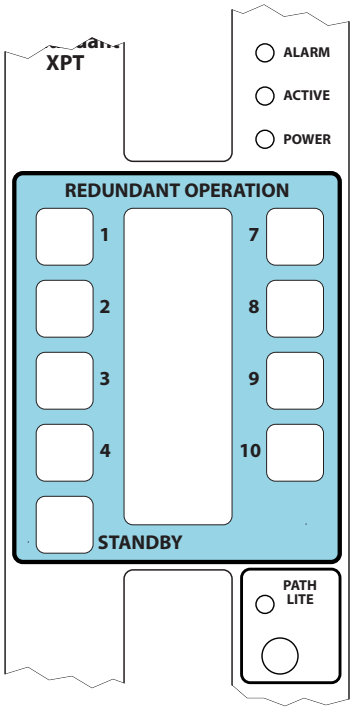


Figure 4-1. Redundant Crosspoint Cardset Function Buttons

Each of the buttons is labeled. Labels 1–4 and 7–10 refer to crosspoint cards in slots 1–4 and 7–10. The label 'Standby' refers to the redundant crosspoint itself. The buttons essentially select which crosspoint card is in stand-by mode.

When the operator presses button 1, for instance, the crosspoint in slot 1 goes to stand-by mode and the redundant crosspoint becomes active.

When the operator presses 'Standby', the redundant crosspoint goes to stand-by mode and any other crosspoints return to active mode.

The brightness of the button indicates the button state:

- Off. The crosspoint is not available.
- Dim. The crosspoint is available and active (not in stand-by mode).
- Bright. The crosspoint is in stand-by mode.

How to Change Redundant Crosspoint Settings

1 Open the door. at the front of the router.

2 Press a crosspoint button to place the crosspoint in stand-by mode. The redundant crosspoint becomes active.

3 Press the ‘Standby’ button to place the redundant crosspoint in stand-by mode and revert all other crosspoints to active mode.

Note

You cannot switch another crosspoint to stand-by mode without first pressing the ‘Standby’ button.

4 Close the door when you are finished. The air cooling system requires the door to be closed.

5. Maintenance

Routers in the NV8500 family do not require any periodic electrical or physical maintenance. Other than cleaning the fan air intake filter, all that is required is periodic inspection of the system to make sure no failures have occurred.

It is recommended that the system's indicator LEDs be checked on a regular basis to ensure that the system is operating properly. (See Indicator LEDs on page 121.) It is also a good idea to regularly make sure cooling air flow to the power supply fans is unobstructed.

Caution	Only qualified service personnel should perform procedures in this section.

Fuse Replacement

There are no user-serviceable fuses.

Indicator LEDs

Indicator LEDs indicate whether DC power is present and if a card is operating normally. LEDs are visible when the router front door is closed. In the following sections, LEDs are listed in the order they appear on the cards, from top to bottom.

Power Supplies

The five green LEDs on the front of the power supply modules indicate presence of the five +48 VDC outputs of the five branch circuits. All five LEDs should be lit at all times when AC power is present. If any LED is off, either the power supply has failed or the branch circuit is shorted.

Backplanes

Each backplane has indicator LEDs. If the red LED on the backplane lights, the card and backplane do not match. If the green LED on the backplane lights, the card and backplane are a correcting pairing. (See About Backplanes on page 23.)

Control Cards

The LEDs on the control cards can be monitored to determine whether the card is operating normally. The meanings of the LED indicators are as follows:

LED Indicator	Function
Red (low battery)	Normally OFF. If lit, indicates that the battery needs replacing. See Battery Replacement on page 123.
Red (alarm)	Normally OFF. If lit, indicates a problem or fault. Check the external reference signals. If that does not resolve the problem, refer to the system status window in the Miranda Router Configurator (MRC) for additional information. If you cannot resolve the problem, call Miranda Technical Support. For contact information, see Technical Support Contact Information on page iii.
Yellow (active card)	Normally ON. Indicates the card is the active control card. On the standby control card, this LED should be OFF.
Green (health, power)	Normally ON. Indicates the card has power and is operating normally.

Input Cards and Output Cards

The LEDs on the input and output crosspoint cards can be monitored to determine whether the cards are operating normally. The LEDs indicate the following:

LED Indicator	Function
Red (alarm)	Normally OFF. If lit, it indicates a problem. Replace the card or call Miranda Technical Support. For contact information, see Technical Support Contact Information on page iii.
Green (Power)	Normally ON. Indicates the card has power and is operating normally.
Yellow (health)	Normally ON. Indicates software has loaded and the card is operating normally.
Green (good communication)	Normally ON. Indicates good communication with the control card.
Red (bad communication)	Normally OFF. If lit, indicates that communication is not working properly with the control card; the communication is “bad.”

Crosspoint Cards

The LEDs on the crosspoint cards can be monitored to determine whether the cards are operating normally. The LEDs indicate the following:

LED Indicator	Function
Red (alarm)	Normally OFF. If lit, it indicates a problem. Replace the card or call Miranda Technical Support. For contact information, see Technical Support Contact Information on page iii.
Green (Power)	Normally ON. Indicates the card has power and is operating normally.
Yellow (health)	Normally ON. Indicates software has loaded and the card is operating normally.

Air Flow

Routers in the NV8500 family draw cooling air from the front of the router, through the door, and exhausts heated air through the rear of the frame. The router must have the door properly installed and closed for proper airflow through the chassis. For maximum air flow, regularly inspect router fans and filters.

Caution | If airflow is impeded overheating may occur.

Fan Cleaning and Replacement

Two fan trays each containing five cooling fans are located at the top and bottom of the router frame. The tray can be removed for inspection or cleaning by opening the frame front door, sliding the latches that hold the fan module in place, and pulling the module out of the frame. If the fans become dusty or clogged with lint, use a vacuum or compressed air to clean the dust off. Also check the openings at the back of the frame where air enters and exits to be sure dust and lint have not accumulated.

Each fan tray is easily replaced simply by sliding it out of the front of the frame and inserting a new tray.

Intake Filter Screen Cleaning

The NV8500 family of routers have an air filter mounted in the door.

To remove the filter, open the router door by releasing the two thumbscrews. Locate the filter enclosure on the inside of the door. Tabs on the bottom of the filter act as hinges and tabs at the top of the filter lock it in place.

The router can be operated safely with the door opened for short periods of time. If the filter is only lightly contaminated, clean the filter by vacuuming loose debris or by blowing air from the inside outward. Rinse filters badly loaded with debris with cold water or wash them with warm water and mild detergent. Be sure the filter is completely dry before re-installing it.

Battery Replacement

If the red Low Battery LED indicator on the control card is lit, the battery located on the front edge of the card needs replacing. Grasp the exposed edge of the battery with your fingers and pull it towards you to remove it.

Important | Do not use a metallic tool to remove the battery.

Call Miranda for replacement battery information. For contact information, see Technical Support Contact Information on page iii.

When you insert the new battery, be careful to observe the correct polarity.

Caution

To prevent explosion of the battery and possible equipment damage or harm to personnel, be sure the battery is oriented with the correct polarity. Polarity markings are visible on the card's battery housing.

Troubleshooting

Many system issues are caused by easily corrected errors, such as poor quality or missing input or reference signals, incorrect configuration, and so on. This section lists common problems and their solutions in the most likely order of occurrence. Refer also to the Introduction on page 1 for an overview of the system and its major components. Try troubleshooting the system yourself, and if you are not successful, call Miranda Technical Support as explained near the front of this manual.

In the event that a problem is caused by a bad circuit board, swapping the bad board with a replacement circuit board is the quickest solution. To order replacement boards or other components, contact Miranda. For contact information, see Technical Support Contact Information on page iii.

Symptom	Possible Causes and Solutions
System not powering up.	Verify that the power cord(s) are plugged into the frame and the AC power source. Use a voltmeter to verify the presence of power.
One or a few cards or PS8100/PS8300 power supply modules are not powering up or not operating properly.	Check that the card or module is fully seated in the frame. Reset the card or module by reseating it in the frame. Check that all five green LEDs on the front of the PS8100 or PS8300 power supply modules are lit. If an LED is not lit, it indicates a branch circuit may be faulty, which could affect only certain modules in the frame. Replace the power supply module.
Intermittent signal on one or two outputs.	Check input and output cable continuity and cable terminations. Swap each card in the signal path with another card to see if the problem moves with the card. If so, replace the card. If all cables, terminations, and cards check out OK, call Technical Support. (See Technical Support Contact Information on page iii.)
Intermittent or missing signals on all outputs.	Check the control card, which processes the references to produce sync. A synchronous system requires an operational control card in order to pass signals. An asynchronous system will operate in its last state even if the control card is removed. Change over to the reserve control card to see if the problem goes away. Possible low voltage on PS8100 or PS8300 power supply module. Check power test points on the module. Voltages at power supply test points may be slightly high in lightly loaded systems. Replace the power supply module if any test points indicate low voltage.

Obtaining Service

For service advice, warranty exchange, warranty repair, or out-of-warranty repair:

1 Call Miranda Customer Support at the telephone number in the front of this manual under Technical Support Contact Information on page iii. Our Customer Service Personnel will help you resolve any service issues.

2 If you need an exchange or repair, Miranda will assign you a Return Material Authorization (RMA) number. **Do not return equipment without first receiving an RMA number.** Miranda uses the RMA to track receipt of the equipment and to record repair or replacement information.

3 For out-of-warranty equipment, the Miranda Technical Support Engineer estimates the cost of repair when you call and requests a purchase order payable to Miranda.

4 If repair or exchange is required, package the assembly in an antistatic bag and place it in a shipping box with plenty of padding to prevent damage.

5 Address the package using the Shipping Address listed in the front of this manual under Technical Support Contact Information on page iii, and ship the equipment to Miranda at your company's expense.

6 When repair or replacement of in-warranty equipment is complete, Miranda return ships the items at our expense. For out-of-warranty equipment Miranda charges a shipping and handling fee. The standard shipping method is second day.

7 For out-of-warranty service, Miranda will send your company an invoice following the repair or replacement.

6. Technical Details

This section provides technical specifications for the NV8500 family of routers, the NV8000 and the NV8300 power supply, and the NV8900 converter.

Power Specifications (NV8000, PS8100)

For the NV8144, NV8280, NV8576, and NV8576-Plus power can be supplied through the PS8100 power supply module. For the NV8144, power supply modules are installed in the router frame. For the NV8280, NV8576, and NV8576-Plus, power supply modules are installed in a separate frame, the NV8000 Power Supply.

The following are power requirements for the NV8000 and the PS8100:

Note

The PS8010 has been replaced by the PS8100.

Installation of any hybrid I/O cards requires PS8300. Same is true for use of fiber optic I/O cards.

Type	Parameters
AC input	90–130/180–250 VAC, 50/60 Hz, automatic ranging
AC fuses	No user serviceable fuses
AC connectors	4, IEC 320 (one for each PS8100 module installed)
AC power	PS8100, 850 Watts, one IEC 320
AC power usage	Power based on PS8100 modules. **NV8144:** 850 Watts nominal (144 × 144), power factor corrected **NV8280:** 1,750 Watts nominal (288 × 576), power factor corrected **NV8576, NV8576-Plus:** 3,500 Watts nominal (576 × 1152, 576 × 576 expandable), power factor corrected (Each frame requires two NV8000 frames)
Modules and module slots	NV8144, NV8280: Required minimum number of PS8100 modules: 2 primary (2 optional redundant) NV8576, NV8576-Plus: Required minimum number of PS8100 modules: 4 primary (4 optional redundant)
Dimensions	3RUs high (5.25 inches, 133.35 mm) 19.0 inches (482.6 mm) wide 15.85 inches (402.6 mm) deep
Weight	24 lbs (10.9 kg); 50 lbs (22.7 kg) fully loaded
DC power	Miranda connector to NV8000, DC cable — WC0096

Power supply alarm connection	DE9; reads each PS8100 status
Power supply monitor connection	DB25, loop-through possible
Cabling	Power supply cable from NV8000 to router. WC123-00, 3 meters; WC123-10, 6 meters. WC0109-00 — Cable from NV8000 to power source; cable from NV8144 to power source
Environmental	Operating temperature: 0–40 °C Relative humidity: 0 to 90%, non-condensing
Regulatory compliance	UL listed and CE compliant

Power Specifications (NV8300, PS8300)

For the NV8144, NV8280, NV8576, and NV8576-Plus power can be supplied through the PS8300 power supply module. For the NV8144, power supply modules are installed in the router frame. For the NV8280, NV8576, and NV8576-Plus, power supply modules are installed in a separate frame, the NV8300 Power Supply.

For the NV8280, NV8576 and NV8576-Plus, installation of hybrid or fiber optic I/O cards requires the NV8300 and PS8300, except for the NV8144 which can use the PS8100 at all times.

The following are power requirements for the NV8300 and the PS3100:

Type	Parameters
AC input	90–130/180–250 VAC, 50/60 Hz, automatic ranging
AC fuses	No user serviceable fuses
AC connectors	4, IEC 320 (one for each PS8100 module installed)
AC power	PS8300, 1,350 Watts, one IEC 320
AC power usage	**NV8144:** 900 Watts nominal (144 × 144), power factor corrected; hybrid or fiber optic **NV8280:** Fiber optic: 2,100 Watts nominal (288 × 576), power factor corrected Hybrid: 2,700 Watts nominal (288 × 576), power factor corrected **NV8576, NV8576-Plus:** Fiber optic: 4,250 Watts nominal Hybrid: 5,400 Watts nominal (576 × 1152, 576 × 576 Expandable), power factor corrected (Each frame requires two NV8300 frames)
Modules and module slots	NV8144, NV8280, NV8280-Plus: Required minimum number of PS8100 modules: 2 primary (2 optional redundant) NV8576, NV8576-Plus: Required minimum number of PS8100 modules: 4 primary (4 optional redundant)
Dimensions	3RUs high (5.25 inches, 133.35 mm) 19.0 inches (482.6 mm) wide 15.85 inches (402.6 mm) deep

Weight	19.2 lbs (8.71 kg) empty; 44.6 lbs (20.23 kg) fully loaded
DC power	AC cable: WC00157-00. DC cable: WC0123-10
Power supply alarm connection	DE9; reads each PS8300 status
Power supply monitor connection	DB25, loop-through possible
Cabling	WC0154-00 — power supply cable from NV8300 to router WC0157-00 — cable from NV8300 to power source, 20 A
Environmental	Operating temperature: 0 to 40 °C Relative humidity: 0 to 90%, non-condensing
Regulatory compliance	UL listed and CE compliant

Mechanical Specifications

Type	Parameter
Dimensions	**NV8144:** 8RU (13.97 inches, 354.8 mm) high 19.0 inches (483 mm) wide 17.2 inches (436.88 mm) deep **NV8280:** 16RU (27.97 inches, 710.4 mm) high 19.0 inches (483 mm) wide 17.2 inches (436.88 mm) deep **NV8576, NV8576-Plus:** 32RU (55.97 inches, 1,421.6 mm) high 19.0 inches (483 mm) wide 17.2 inches (436.88 mm) deep
Weight	NV8144: 65.4 lbs (29.7 kg) empty; 94.60 lbs (42.91 kg) fully loaded NV8280: 108.4 lbs (49.17 kg) empty; 149.00 lbs (67.58 kg) fully loaded NV8576, NV8576-Plus: 169.86 lbs (77.05 kg) empty; 308.80 lbs (140.07 kg) fully loaded
Mounting	EIA 310-C, 19.0 inches (483 mm)
Grounding terminal	Copper, accepts 14-6 AWG
Modules and module slots	NV8144: 16 Input cards, 9 signals each 8 Output cards, 18 signals each 2 Crosspoint cards (1 primary, 1 optional redundant) 2 Control cards (1 primary, 1 optional secondary) 1 Monitor card, 1 Fan module NV8280: 32 Input cards, 9 signals each 32 Output cards, 18 signals each 9 Crosspoint cards (8 primary, 1 optional redundant) 2 Control cards (1 primary, 1 optional secondary) 2 Monitor cards, 2 Fan modules NV8576: 64 Input cards, 9 signals each 64 Output cards, 18 signals each 9 Crosspoint cards (8 primary, 1 optional redundant) 2 Control cards (1 primary, 1 optional secondary) 4 Monitor cards, 2 Fan modules NV8576-Plus: 64 Input cards, 9 signals each 64 Output cards, 9 signals each plus 2 high density interconnects for expansion 9 Crosspoint cards (8 primary, 1 optional redundant) 2 Control cards (1 primary, 1 optional secondary) 4 Monitor cards, 2 Fan modules

Diagnostic	Type	Serial port
	Standard	SMPTE 207M, EIA-422/EIA-232, configurable
	Connector	2, DE9, female
Serial Control	Type	Serial port (2 per control card)
	Standard	SMPTE 207M, EIA-422
	Connector	4, DE9, female
Ethernet	Type	10/100 Base T
	Standard	IEEE 802.3
	Protocol	Miranda Ethernet protocol
	Connector	2, RJ45
GSC Node Bus/Aux Bus Control (Not Active)	Type	Serial
	Standard	Proprietary
	Connector	2, BNC, loop-through, non-terminating pair
	Impedance	75 ohms
Output Signal Monitor	Type	Standard definition and high definition digital video
	Standard	See related section of this specification for standard for each monitored signal type.
	Connector	DIN 1.0/2.3
	Impedance	75 ohms
	Signal Details	See related section of this specification for details for each monitored signal type, I/O levels, and return loss.
I/O Expansion	NV8576-Plus:	
	Type	Proprietary
	Standard	See related section of this specification for standard for each signal type sent between routers.
	Connector	128, proprietary
	Signal Details	See related section of this specification for details for each monitored signal type, I/O levels, and return loss.
Control Expansion	Type	10Base2 port
	Connector	2, BNC, loop-through
	Impedance	50
Redundant Crosspoint Control	NV8144:	
	Connector	DB25
Redundant Crosspoint Cardset (2 cards combined)	NV8280, NV8576, NV8576-Plus:	
	No connector	Internal
Power Supply Monitor	Connector	DB25

Environmental Specifications

Type	Parameter
Operating temperature	0 to 40 °C
Relative humidity	0 to 90%, non-condensing

Audio Specifications

Type	Parameter	
Audio reference input	Type	Serial digital audio
	Standard	AES3id
	Sample Rate	48 kHz
	Connector	2, BNC (redundant)
	Impedance	75 ohms
	Input Level	0.5 V pp to 2.0 V pp
AES3 inputs and outputs	Type	Balanced digital audio
	Standard	AES3
	Sample Rate	Synchronous, 48 kHz; asynchronous, 32–192 kHz
	Connector	WECO
	Impedance	110 ohms
	Input Level	200 mV to 10 V pp
	Output Level	2 V pp
AES3id inputs and outputs	Type	Unbalanced digital audio
	Standard	AES3id
	Sample Rate	Synchronous, 48 kHz; asynchronous, 32–192 kHz
	Connector	DIN 1.0/2.3
	Impedance	75 ohms
	Input Level	100 mV to 1.2 V pp
	Output Level	1 V ± 10%
AES10 (MADI) inputs and outputs	Type	Unbalanced digital audio
	Standard	AES10
	Sample Rate	Synchronous 48 kHz
	Channel Support	56 and 64
	Connector	DIN 1.0/2.3
	Impedance	75 ohms
	Input Level	150 mV to 600 mV
	Output Level	600 mV

Video Specifications

Type	Parameters	
Video reference input	Type	Analog video reference
	Standard	PAL, NTSC or tri-level sync
	Connector	Loop-through, BNC
	Impedance	75 ohms or Hi-Z (> 20,000), not selectable
	Input level	0.5 V pp to 2.0 V pp
	Input return loss	> 30 dB, to 5 MHz
3Gig (3.0 Gb/s, HD and SD) inputs and outputs. standard and hybrid — coax	Type	High definition serial digital video; embedded audio can be de-embedded and re-embedded.
	Standard	SMPTE 272M, 291M, 299M
	Data rates	Auto re-clocking at 270 Mb/s and 1.483, 1.485, 2.967, 2.970 Gb/s or auto bypass with pass-through from19 Mb/s to 3.0 Gb/s
	Connector	DIN 1.0/2.3
	Impedance	75 ohms
	Cable equalization	(for cables listed or equivalent cables) 400 m Belden 1694A, 250 m Belden 1855A at 270 Mb/s 150 m Belden 1694A, 100 m Belden 1855A at 1.5 Gb/s 100 m Belden 1694A, 45 m Belden 1855A at 3.0 Gb/s
	Router path	Non-inverting
	Input and output return loss	> 15 dB, 5 MHz to 1.5 GHz; > 10 dB, 1.5 GHz to 3.0 GHz
	Output level	800 mV pp ± 10%
	Output rise/fall time	≤ 135 ps
	Output overshoot	≤ 10% of amplitude max
	Output alignment jitter	≤ 0.3 UI pp from 100 kHz to 300 MHz
	Output timing jitter	≤ 2.0 UI pp from 10 Hz to 100 kHz

3Gig (3.0 Gb/s, HD and SD) inputs and outputs, standard only — fiber	Type	Fiber optic. High definition serial digital video; embedded audio is passed through
	Standard	SMPTE 297-2006
	Data rates	Auto re-clocking at 270 Mb/s and 1.483, 1.485, 2.967, 2.970 Gb/s or auto bypass with pass-through from 19 Mb/s to 3.0 Gb/s
	Connector	LC
	Cable	Single mode fiber
	Cable equalization	(Cable equalizers are not present on input cards managing fiber optic signals.)
	Router path	Non-inverting
	Output return loss	–14 dB
	Output rise/fall time	SMPTE 259M, < 1.5 ns SMPTE 292M, < 270 ps SMPTE 424M, < 135 ps
	Output transmission circuit fiber	SM (9.0/125 micrometer)
	Output light source type	Laser
	Output optical wavelength	1310 nm
	Output maximum spectral line width between half-power points	≤ 10 nm
	Output transmit (optical) power	Maximum, –3 dBm Minimum –12 dBm
	Input minimum power	SMPTE 259M, –20 dBm SMPTE 292M, –20 dBm SMPTE 424M, –17 dBm
	Input maximum power	–7.5 dBm
	Input detector damage threshold	+1 dBm (minimum)

NV8900 Specifications

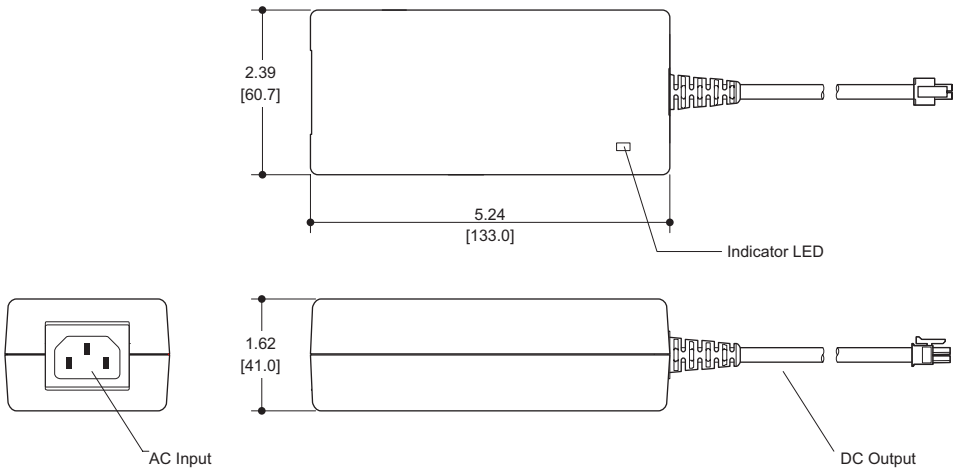
The following specifications are for the NV8900 converters.

Power Specifications

The NV8900 uses an external power supply and the PS0001-00 power supply module:

Type	Parameters
AC input/power	PS0001: 90–264 VAC (127–300 VDC), 47–447 Hz. Inrush current < 50 A at 230 VAC, cold start, at 25 °C, Input current < 2.0 A rms at 115 VAC; < 1.0 A at 230 VAC.
AC fuses	TBD
AC connectors	IEC 320; Molex 4-pin plug
AC power usage	< 10 W, all models.
Weight	**PS0001:** 1.06 lb (0.48kg)
DC power	NV8900: External power supply: 12 VDC ± 10%, 5 A. **PS0001:** ≤ 60 W, 12 VDC, 5 A (5.4 A peak), Regulation ± 2%. Ripple ≤ 120 mV.
Regulatory compliance	UL listed and CE compliant

The power supply is a Miranda PS0001-00:



The power output has Molex 4-pin plug.

Environmental Specifications

Type	Parameter
Operating temperature	0 to 40 °C
Relative humidity	0 to 90%, non-condensing
Cooling	No fan required

Video Reference Specifications.

Detail		
Connectors: 2 BNC (1 pair, loop-through), non-terminating, 75Ω characteristic impedance.		
Acceptable video reference rates:		
NTSC	(30/1.001) Hz frame rate	525 lines/frame
PAL	25 Hz frame rate	625 lines/frame
HD trilevel	(24/1.001) Hz frame rate	1080p
	24 Hz frame rate	1080p
	25 Hz frame rate	1080i
	(30/1.001) Hz frame rate	1080i
	30 Hz frame rate	1080i
	50 Hz frame rate	1080p, 720p
	(60/1.001) Hz frame rate	1080p, 720p
	60 Hz frame rate	1080p, 720p
Input level range: 500 mV p-p to 2 V p-p		
Input return loss: > 40 dB, to 6 MHz		

Mechanical Specifications

Specification	Detail
Dimensions	Height: 1.72″ (43.7 mm), fits EIA 1 RU (1.75″ or 44.5 mm). Width: 19.0″ (482.6 mm). Depth: 1.53 ± 0.01″ (38.7 mm), enclosure; 2.19″ (55.6 mm) overall, including connectors.
Weight	MADI to AES, balanced: 1.65 lb (0.748 kg) MADI to AES, coax: 2.15 lb (0.977 kg) AES to MADI, balanced: 1.65 lb (0.748 kg) AES to MADI, coax: 2.15 lb (0.977 kg)
Connectors	Power: 2 connectors, Molex 4-pin, keyed. Ethernet: 1 connector, 10/100 BaseT, RJ-45 jack. RS-422: 1 connector, 9-pin D type, usage determined by software, SMPTE 207M. Video reference: 2 connectors, BNC, 75 Ω. Coax: 35 BNC, 75Ω, connectors. Balanced: 4 DB25, 110 Ω, and 3 BNC, 75 Ω
Grounding terminal	Copper, accepts 14–6 AWG.

AES Coax Specifications

Specification	Detail
Signal inputs	Signal type: AES-3id (2 “mono” channels per input). Sample rate: 48 kHz. Input level: 1V p-p ± 20% into 75 Ω. Input range: 320 mV p-p to 1V p-p into 75 Ω. Input return loss: < –15 dB, from 100 kHz to 6 MHz. Input connectors: BNC, 75Ω.
Signal outputs	Signal type: AES-3id (2 “mono” channels per input). Sample rate: 48 kHz. Output level: 1 V pp ± 20% into 75 Ω. Output return loss: < –15 dB, from 100 kHz to 6 MHz. Output connectors: BNC, 75Ω.

AES Balanced Specifications

Specification	Detail
Signal inputs	Signal type: AES-3 (2 “mono” channels per input). Sample rate: 48 kHz. Input level: 1V p-p nominal into 110 Ω. Input range: 200 mV p-p to 10 V p-p into 110 Ω. Input connectors: DB25, 110 Ω.
Signal outputs	Signal type: AES-3 (2 “mono” channels per input). Sample rate: 48 kHz. Output level: 2–7 V pp into 75 Ω. Output rise/fall time: 5 ns–30 ns. Output return loss: < –25 dB, from 100 kHz to 6 MHz. Output connectors: BNC, 75Ω.

MADI Specifications

Specification	Detail
Connector	BNC
Impedance	75Ω
Input level	150 mV to 600 mV
Output level	600 mV

A. Catalog Numbers

This appendix provides a list of parts provided by Miranda for the NV8500 family of routers, the power supply frames and power supply modules. Unless otherwise noted, catalog numbers apply to all routers in the NV8500 family.

Part Numbers

Power Supply

Part Number	Description
PS8100	Power supply module (875 Watts)
PS8300	Power supply module (1,350 Watts)
WC0046-00	Power supply monitor cable
WC0123-10	DC Power supply cable
WC0123-00	Power supply cable from NV8000 to router
WC0154-00	Power supply cable from NV8300 to router
WC0109-00	Cable from NV8000 to power source; cable from NV8144 to power source
WC0157-00	AC cable from NV8300 to power source, 20 Amp

Frame

Part Number	Description
FR0045-03	NV8144 frame
FR0044-03	NV8280 frame
FR0043-08	NV8576 frame
FR0073-06	NV8576-Plus frame
FR0034-01	NV8000 frame
FR0111-00	NV8300 frame

Frame Expansion

Part Number	Description
WC0121	Expansion cable (4 meters)
WC0084	Terminator

Input Cards and Backplanes

Input Card Part Number	Hybrid or Standard	Signal Types	Standard	Rates	Corresponding Backplane
8500-AES-ASYNC-IN	Standard	Asynchronous digital audio, unbalanced	AES3	Sample rates 32 to 96 kHz (passed through)	EM0791 (coax)
8500-AES-ASYNC-IN	Standard	Asynchronous digital audio, balanced	AES3	Sample rates 32 to 96 kHz (passed through)	EM0828 (WECO)
8500-3GIG-IN-COAX	Standard	3Gig, HD, SD	SMPTE 259M 344M 292M 424M	Video rates from 19 Mb/s to 3 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking bypassed at other rates.	EM0791 (coax)
8500-3GIG-IN-FIBER	Standard				EM0696 (fiber optic)
8500H-IP-3G-DEM-CX	Hybrid	3Gig, HD, SD	SMPTE 259M 344M 292M 424M	Video rates from 19 Mb/s to 3 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking bypassed at other rates. Embedded audio de-embedded.	EM0791 (coax)
8500H-IP-3G-TDM-CX	Hybrid	3Gig without embedded audio and MADI synchronous digital audio, unbalanced	SMPTE 259M	Video rates from 19 Mb/s to 3 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking bypassed at other rates. Audio: 1 stream of 64 channels each, 24 bits at 48 kHz, locked to reference.	EM0791 (coax)

Output Cards and Backplanes

Output Card Part Number	Hybrid or Standard	Category	Signal Types	Standard	Rates	Corresponding Backplane
AES async signals (unbalanced and balanced)						
8500-AES-ASYNC-OUT	Standard	Standalone	Unbalanced	AES3	Audio sample rates 32 to 96 kHz (passed through)	EM0793 (18 coax)
	Standard					
8500-AES-ASYNC-OUT-EXP	Standard	Expansion				EM0789 (9 coax, 2 expansion)
8500-OUT-FILLER-EXP	Standard	Filler				EM0789 (9 coax, 2 expansion)
8500-AES-ASYNC-OUT	Standard	Standalone	Balanced	AES3	Audio sample rates 32 to 192 kHz (passed through)	EM0829 (18 WECO)
8500-AES-ASYNC-OUT-EXP	Standard	Expansion				EM0830 (9 WECO, 2 expansion)
8500-OUT-FILLER-EXP	Standard	Filler				EM0830 (9 WECO, 2 expansion)
Video signals (coaxial cable)						
8500-3GIG-OUT-COAX	Standard	Standalone	3Gig, HD, SD	SMPTE 259M 344M 292M 424M	Video rates from 19 Mb/s to 3 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking bypassed at other rates.	EM0793 (18 coax)
8500-3GIG-OUT-COAX-EXP	Standard	Expansion				EM0789 (9 coax, 2 expansion)
8500-OUT-FILLER-EXP	Standard	Filler				EM0789 (9 coax, 2 expansion)
8500H-3G-OP-EMB-CX	Hybrid	Standalone	3Gig, HD, SD	SMPTE 259M 344M 292M 424M	Video rates from 19 Mb/s to 3 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking bypassed at other rates. De-embedded audio re-embedded	EM0793 (18 coax)
8500-OUT-FILLER-EXP	Hybrid	Filler (no Expansion)				

Output Card Part Number	Hybrid or Standard	Category	Signal Types	Standard	Rates	Corresponding Backplane
Video and MADI signals						
8500H-OP-3G-TDM-CX	Hybrid	Standalone	3Gig, HD, SD	SMPTE 259M 344M 292M 424M MADI	Video rates from 19 Mb/s to 3 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking; bypassed at other rates. MADI: Sample rate 48kHz, locked to reference	EM0793 (18 coax)
8500-OUT-FILLER-EXP	Hybrid	Filler (no Expansion)				
Video signals (fiber optic cable)						
8500-3GIG-OUT-FIBER	Standard	Standalone	3Gig, HD, SD	SMPTE 259M 344M 292M 424M	Video rates from 19 Mb/s to 3 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking bypassed at other rates.	EM0694 (18 coax)
8500-3GIG-OUT-FIBER-EXP	Standard	Expansion				EM0698 (9 coax, 2 expansion)
8500-OUT-FILLER-EXP	Standard	Filler				EM0789 (9 coax, 2 expansion)

Crosspoint Cards

Crosspoint Card Part Number	Standard or Hybrid?	Type	Corresponding Backplane
288-3GIG-XPT	Standard	3Gig 288×288 crosspoint for NV8576/NV8576-Plus	None
288-3GIG-XPT-RED	Standard	Redundant 288×288 crosspoint for NV8576/ NV8576-Plus	None
8500H-XPT-288	Hybrid	3Gig 288×288 crosspoint for NV8576/NV8576-Plus	None
8500H-RXPT-288	Hybrid	Redundant 288×288 crosspoint for NV8576/ NV8576-Plus	None
144-3GIG-XPT	Standard	3Gig 144×144 crosspoint for NV8144 and NV8280	None
144-3GIG-XPT-RED	Standard	Redundant 144×144 crosspoint for NV8280. No redundant 144×144 crosspoint for NV8144	None
8500H-XPT-144	Hybrid	3Gig 144×144 crosspoint for NV8144 and NV8280	None
8500H-RXPT-144	Hybrid	Redundant 144×144 crosspoint for NV8280. No redundant 144×144 crosspoint for NV8144	None

Control Cards

Control Card Part Number	Standard or Hybrid?	Type	Corresponding Backplane
8500-NV	Standard	NV8576/NV8576-Plus, NV8280 and NV8144	None
8500H-NV	Hybrid	NV8576/NV8576-Plus, NV8280 and NV8144	None

Monitor Cards

Monitor Card Part Number	Standard or Hybrid?	Type	Corresponding Backplane
8500-MNTR	Standard & Hybrid	3Gig monitor for NV8576/NV8576-Plus, NV8280	Input EM0715 Output EM0846
8500-MNTR	Standard & Hybrid	NV8144	EM0846

B. Glossary

3Gig	A term that represents the ability to send and receive any SD, HD and 3.0 Gb/s video signal. Rates 270, 1,483, 1,485, 2,996, 2,970 Mb/s up to 3.0 Gb/s.
AC	Alternating Current.
AES	The digital audio standard frequently called AES/EBU, officially known as AES3, is used for carrying digital audio signals between various devices. It was developed by the Audio Engineering Society (AES) and the European Broadcasting Union (EBU).
Async	Asynchronous. A system where various signals are unlocked (not synchronized).
CE	Conformité Européenne. European health and safety product label.
dBu	Unit of audio level where 0 dBu is 0.775 V rms.
DC	Direct Current.
EIA	Electronic Industries Alliance. A trade organization for electronics manufacturers in the United States. The organization helps develop standards on electronic components, consumer electronics, electronic information, telecommunications, and Internet security.
ESD	Electrostatic discharge.
HD	High Definition (HD-SDI). Video signal rates: SMPTE 259M at 1.483 and 1.485 Gb/s.
IEC	International Electrotechnical Commission. An international standards organization dealing with electrical, electronic and related technologies.
IEEE	Institute of Electrical & Electronics Engineers. An international non-profit, professional organization for the advancement of technology related to electricity.
IMD	Inter-modulation distortion.
I/O	Input/Output.
LAN	Local Area Network.
LC	Small form factor connector for optic signals.
LED	Light Emitting Diode.
MADI	Multichannel Audio Digital Interface. An industry-standard electronic communications protocol that defines the data format and electrical characteristics of an interface carrying multiple channels of digital audio. The AES standard for MADI is currently documented in AES10-2003. The MADI standard includes a bit-level description and has features in common with the two-channel format of AES3. Serial digital transmission over coaxial cable or fibre-optic lines of 28, 56, or 64 channels is supported, with sampling rates of up to 96 kHz and resolution of up to 24 bits per channel.
MRC	Miranda Router Configurator. An application that configures routers.
RU	Rack Unit. A standard measure or size for frames (1.75 inches).
SD	Standard Definition (SD-SDI). Video signal rates: SMPTE 259M at 143, 177, 270 and 360 Mb/s and SMPTE 344M at 540 Mb/s.

SMPTE	Society of Motion Picture and Television Engineers. www.smpte.org. An international professional association, based in the United States of America, of engineers working in the motion imaging industries.
TDM	Time Domain Multiplexing (TDM). TDM technology enables multiple signals to travel on a single cable by placing the incoming signals in a continuous stream. This enables signals to be sent between input cards and output cards, and between frames, using a significantly fewer number of crosspoint connections. In turn, this reduces the amount of physical space required to house the router frame. In addition, the crosspoint card is able to store and switch AES3 synchronous channels separately for mono switching.
UL	Underwriters Laboratory Incorporated. Develops standards and test procedures for materials, components, assemblies, tools, equipment and procedures, chiefly dealing with product safety and utility.
Unbalanced signals	Balance is defined in terms of the impedance of the two signal conductors with respect to a reference, which is usually ground. If these impedances are equal and non-zero, the system is balanced. If the impedances are unequal (including a signal conductor with a grounded return) the system is unbalanced.
V	Volts.
VAC	Volts, Alternating Current.
VDC	Volts, Direct Current.
WECO	Connector for AES asynchronous balanced signals. WECO output connectors have 5 pins. Each connector handles two outputs (two negative pins and two positive pins) that share a middle pin for shielding (or ground). WECO input connectors have three pins with each positive and negative pin sharing a single shielding pin. The spacing on the pins is 3.5 mm. WECO (matching pair) connectors are provided with the router package.

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