NV8500 Series

Hybrid Digital Video/Audio Routers

User's Guide

UG0034-08

30 May 2014

grass valley
A BELDEN BRAND

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Title	NV8500 Series Routers User's Guide
Part Number	UG0034-08
Revision	3.3 (15 May 14)

Change History

Rev.	Date	ECO	Description	Approved
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
3.0	13 Apr 12	18179	Hybrid cards and functionality. NV8300 and PS8300. Changes to I/O cards. Removal of NV8280-Plus. Connector numbering. Expansion hybrid cards. Expansion connections. Hybrid de-embedders and embedders support SMPTE 274M and 296M; Detection of Dolby E, MADI DIP switch. Reorganization of manual	D.Cox
3.1	25 Apr 13	18826	Added DEM/EMB cards, NV8140 HD input card; misc. changes	D.Cox
3.2	03 Feb 14	19133	Conforms to firmware release 3.5.2.	D.Cox
3.3	15 May 14	19241	Fixes for alarm connections. Phase 3 of frame sync. M3 cards, rears, cables.	D.Cox

Safety Compliance

Korean Compliance (KCC) Statement

KCC-REM-XEI-NV8500

A 급 기기
(업무용 방송통신 기자재)
Class A Equipment
(Commercial Broadcasting & Communication Equipment)

이 기기는 업무용 (A 급) 전자파적합기기로서 판
매자 또는 사용자는 이 점을 주의하시기 바라
며 , 가정외의 지역에서 사용하는 것을 목적으로
합니다 .

Please note this is a Class A device. Sellers or users need to take note of this and should not use this equipment in a domestic environment.

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.

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

Software License Agreement and Warranty Information

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

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.

Restriction on Hazardous Substances (RoHs)

Grass Valley 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.

Grass Valley has a substantial program in place for RoHS compliance that includes significant investment in our manufacturing process, and a migration of Grass Valley 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 Grass Valley is available from Grass Valley Customer Support at

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

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 Grass Valley 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 Grass Valley 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 outlet that is easily accessible.
- To reduce the risk of electrical shock, plug each power supply cord into a separate branch circuit having a separate service ground.

Table of Contents

1 Introduction

NV8500 series routers offer a highly flexible switching architecture. A single router can switch both audio and video signals. NV8500 series routers receive and send audio and video signals on a single I/O card. The hybrid architecture of the NV8500 routers can disembed audio from its video inputs, recombine audio from multiple inputs, and re-embed audio at its video outputs. The NV8500 series routers can also switch MADI channels and embed the channels in video outputs.

NV8500 series routers, as do all of Grass Valley's NVISION series routers, employ a fully non-blocking architecture.

The NV8500 series includes these routers:

NV8144 — 144 inputs × 144 outputs, nominally

NV8140 — 144 inputs × 288 outputs, nominally

NV8280 — 288 inputs × 576 outputs, nominally

NV8576 — 576 inputs × 1152 outputs, nominally

NV8576-Plus — 576 inputs × 576 outputs, nominally

Expanded NV8576-Plus — 1152 inputs × 1152 outputs, nominally

The matrix sizes represent the number of *standard* outputs the routers support.

Topics

About the NV8500 Series Routers

Each NV8500 series router, with the exception noted, can switch these signal types:

- SDI (SD, HD, and 3Gig) [1]

  The router's 3Gig inputs can also receive HD and SD signals. Similarly, the router's 3Gig outputs can also transmit HD and SD signals.

- MADI

  The routers receive and transmit MADI signals, but extract the audio from the MADI streams and perform the switching on the audio signals internally.

- AES async

  The NV8140 does not switch AES async at this time.

1. NV8500 series routers can transport DVB-ASI and similar formats.

An NV8500 router can be classified as a *standard* router or a *hybrid* router. A router is considered a *hybrid* router if it has a *hybrid* control card. A hybrid control card is required if any I/O card is a hybrid card. A router is considered a *standard* router if it has a *standard* control card. If it has standard control card(s), it cannot have any hybrid I/O cards.

NV8500 series routers have multiple I/O slots and accept a number of different I/O card types that support the different signal types listed on the previous page. I/O cards can also be classified as *standard* or *hybrid*.

For *standard* I/O cards, the router passes embedded audio (audio embedded in video signals) through the router, with the video, unaltered. In contrast, *hybrid* I/O cards allow the independent routing of audio and video. This is accomplished by (1) de-embedding audio from a video stream, (2) re-combining or re-embedding audio in video output, (3) extracting audio from MADI streams, and (4) re-combining audio in outgoing MADI streams.

This flexible router architecture lets you realize these savings:

- Less facility space and power is needed because one NV8500 series router can perform routing functions that previously required multiple frames.
- There is considerably less need to power and house separate video/audio de-embedders and embedders.
- Increased flexibility give you more control over the signals routed.
- You can easily enlarge a switching matrix to meet future needs without investing in multiple routers, subject to the maximum matrix size of the router.

I/O modules for all NV8500 series router can be "hot swapped." Hybrid modules have green labeling for easy differentiation from standard modules.

Signal Types and Rates

The NV8500 series supports the follows signal types:

Signal Type	Standard	Card Class	Rates Supported
AES async (balanced or unbalanced)	AES3id	Standard	Sample rates 32 to 192 kHz (passed through)
Dolby E	Dolby E	Standard	Passed through
		Hybrid	Phase aligned
MADI synchronous streams (unbalanced)	AES10	Hybrid	A stream of 56 or 64 time-multiplexed channels (customer configurable) at 48 kHz, locked to reference
HD-SDI (SD or HD)	SMPTE 259M, 272M, 292M, 299M	Standard	Video rates from 19 Mb/s to 1.5 Gb/s. Outputs: automatic re-clocking at 270 Mb/s and 1.483 or 1.485 Gb/s. Automatic reclocker bypass, with pass-through, for other rates. Embedded audio passed through

Signal Type	Standard	Card Class	Rates Supported
3Gig (SD, HD, or 3Gig)	Coax: SMPTE 259M, 272M, 274M, 292M, 296M, 299M, 424M Fiber optic: SMPTE 297-2006	Standard	Video rates from 19 Mb/s to 2.97 Gb/s. Outputs: automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, or 2.970 Gb/s. Automatic reclocker bypass, with pass-through, for other rates. Embedded audio passed through
	Coax: SMPTE 259M, 272M, 274M, 292M, 296M, 299M, 424M (Fiber not supported)	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. Outputs: automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, or 2.970 Gb/s.

The NV8500 series routers support the following video formats:

1080p60	1080p29.97	720p60	525i59.94	*These video formats are support by all standard and hybrid cards.*
1080i60	1080psf29.97	720p59.94	625i50	
1080p59.94	1080p25	720p50		
1080p50	1080psf25	720p30		
1080i59.94	1080p24	720p29.97		
1080i50	1080psf24	720p25		
1080p30	1080p23.98	720p24		
1080psf30	1080psf23.98	720p23.98		

Standard vs. Hybrid

I/O modules are grouped into two categories: *standard* or *hybrid*.

Standard I/O can routes video signals (SDI) with or without embedded audio (up to 16 channels), or audio signals (AES pairs). For routers other than the NV8140, standard input cards have 9 inputs. For the NV8140, standard input cards have 18 inputs

Standard output cards have 18 outputs.

Note: Expanded NV8576-Plus routers are a special case. They comprise 2 router frames that are interconnected. The bulk of the interconnection is through "expansion output cards."

Standard expansion output cards have 9 outputs.

Hybrid I/O has video and audio signals on the same card. Disembedder (input) cards have 8 video signals with embedded audio. Embedder (output) cards have 16 video signals with embedded audio. Embedder expansion output card have 8 video signals with embedded audio.

MADI (a.k.a 3Gig/TDM) input cards have 8 video inputs and 1 MADI input (up to 64 channels). MADI output cards have 16 video outputs and 2 MADI outputs (56 or 64 channels each). The video, with embedded audio, of a MADI input card is passed through the router, with its audio unaltered. MADI expansion output card have 8 video signals and 1 MADI output (56 or 64 channels).

Standard I/O cards and hybrid I/O cards can be inter-mixed in the same router. The router is considered a hybrid router if at least one of the cards is a hybrid card. *A hybrid router requires that all control cards, crosspoint cards and redundant crosspoint cards also be hybrid.*

Hybrid crosspoint cards and hybrid control cards can be used with both hybrid I/O cards *and* standard I/O cards. In contrast, standard crosspoint cards and standard control cards ***cannot*** be used with hybrid I/O cards.

The following 3 illustrations show schematically how signals are routed in a frame with (1) only standard I/O cards, (2) only hybrid I/O cards, and (3) both standard and hybrid I/O cards installed.

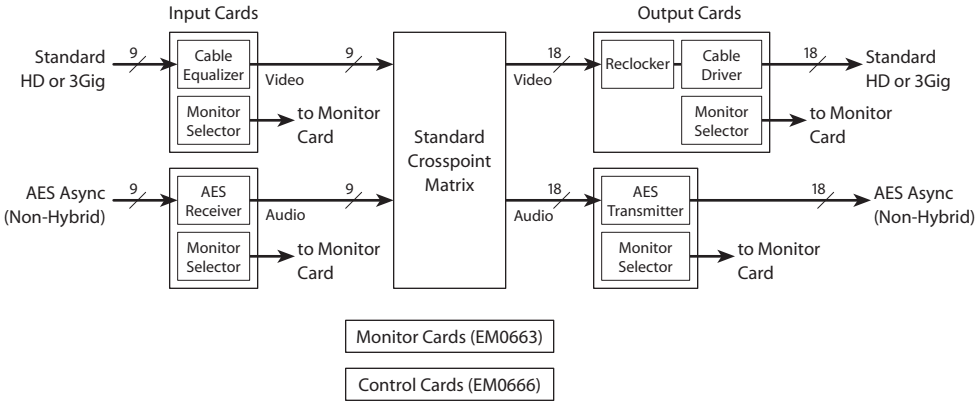


Fig. 1-1: Standard I/O Cards Only

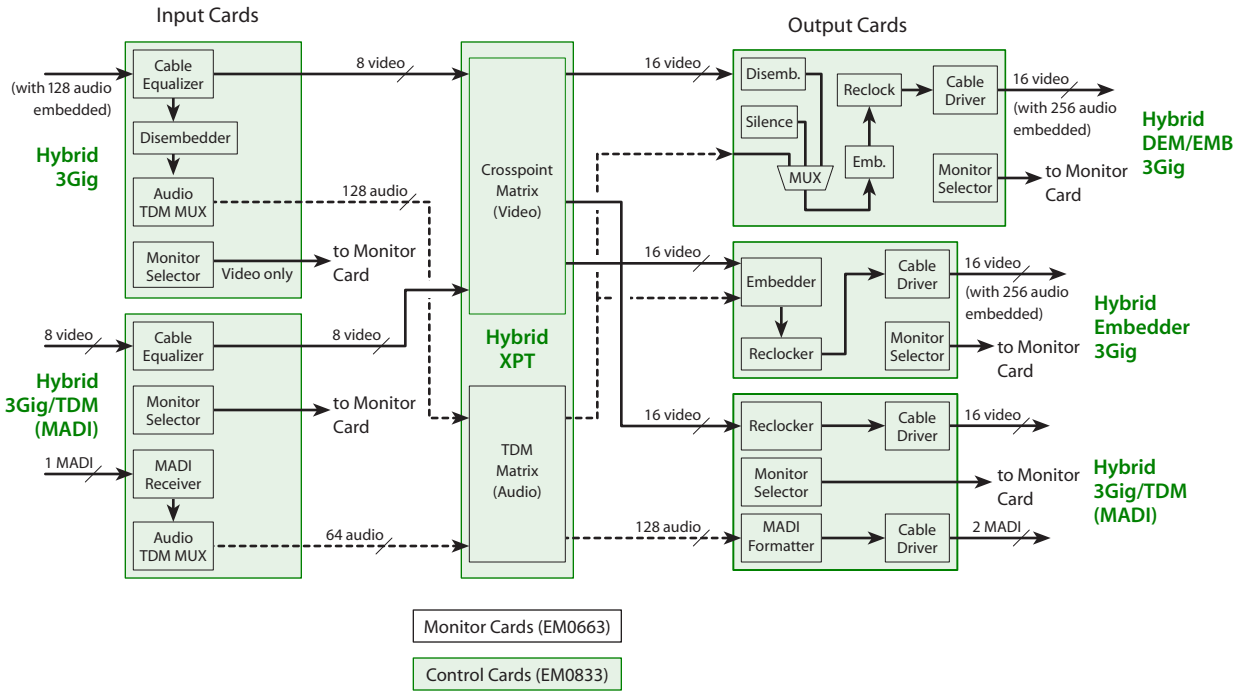


Fig. 1-2: Hybrid Cards Only

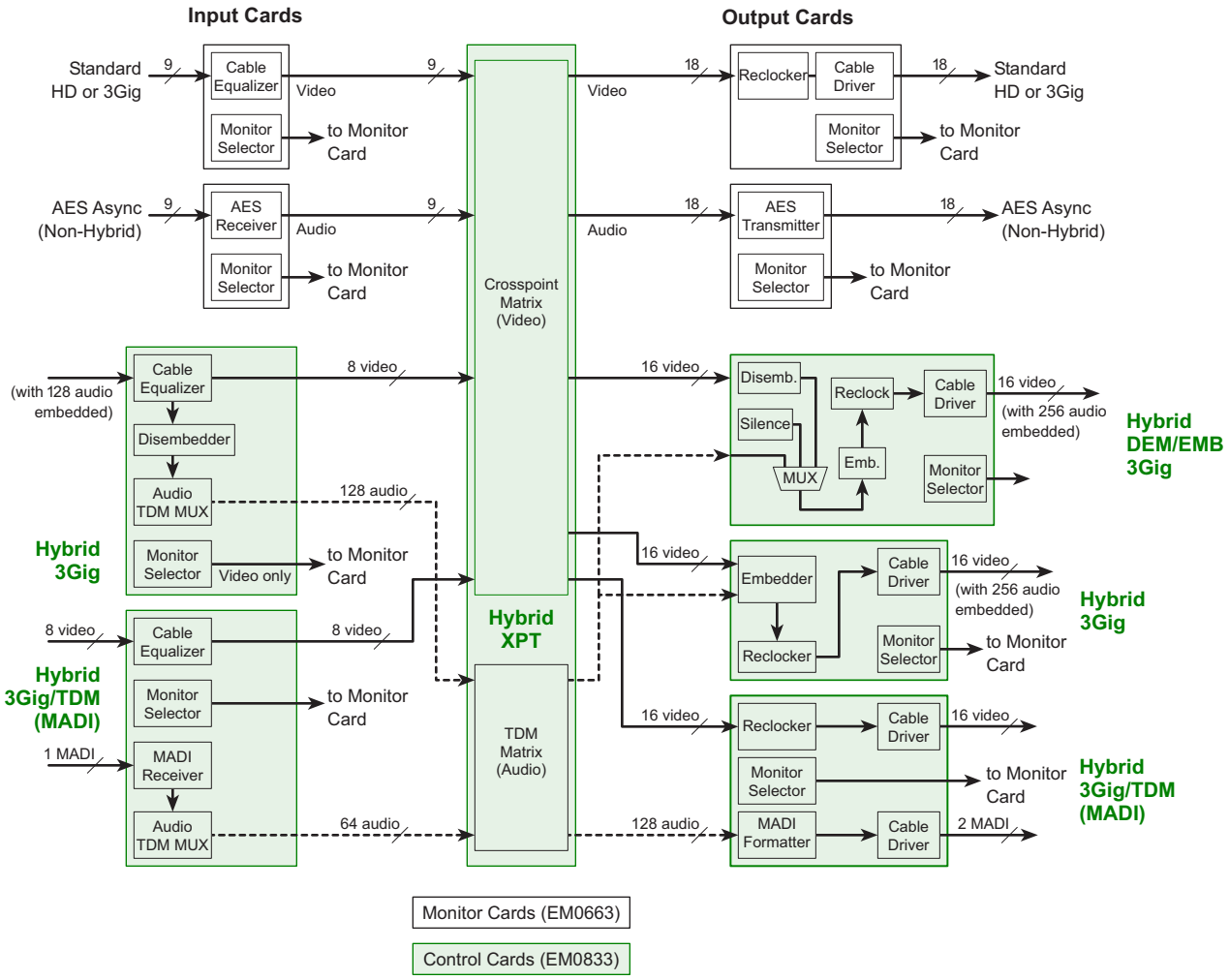


Fig. 1-3: Both Standard and Hybrid I/O Modules

Overview of the Routers

NV8500 series routers share common frame features. All I/O cards, crosspoint cards, monitor cards, and control cards are installed through the frame front. All system connections and back-plane modules are located at the rear of the frame.

The following is an overview of each router. For more information about any modules mentioned, see the related topic:

- Inputs and Outputs on page 21
- Crosspoints on page 61
- Monitoring on page 81
- Router Control on page 75
- Power on page 111

Frame Cooling

The routers have one or more fan trays providing forced air cooling through five speed-controlled fans. The fans draw air from the center and front of the router, through its door, and exhaust it through the rear of the frame.

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 at the inlet of each fan increase or decrease the speed of the fan as required. Because the fans rotate only as needed, fan noise is significantly reduced in partially loaded frames or in environments with lower ambient temperatures. Maintaining a constant temperature ensures the proper operation of router circuitry.

In the NV8144, NV8140, and the 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 frame. Each fan features two LEDs that indicate whether the fan is receiving power and whether there is a failure. For more information, see Indicator LEDs on page 165.

There is a removable air filter located on the inside of the door assembly. It is recommended that filter maintenance be performed on a regular basis. For more information, see Air Flow on page 169.

Fuses

The NV8500 series routers have no user-serviceable fuses.

NV8144

Figure 1-4 shows the front of the NV8144 (with the door removed). At the top of the frame is the fan tray. Directly below the fan tray are card slots. On the far left are 8 output card slots. 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 2 crosspoint card slots. The first slot holds the primary 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 input card slots. To the right of the input card slots are 2 additional slots for the primary and secondary control cards. Below the card slots, at the bottom of the frame, are 2 bays for PS8100 power supply modules.

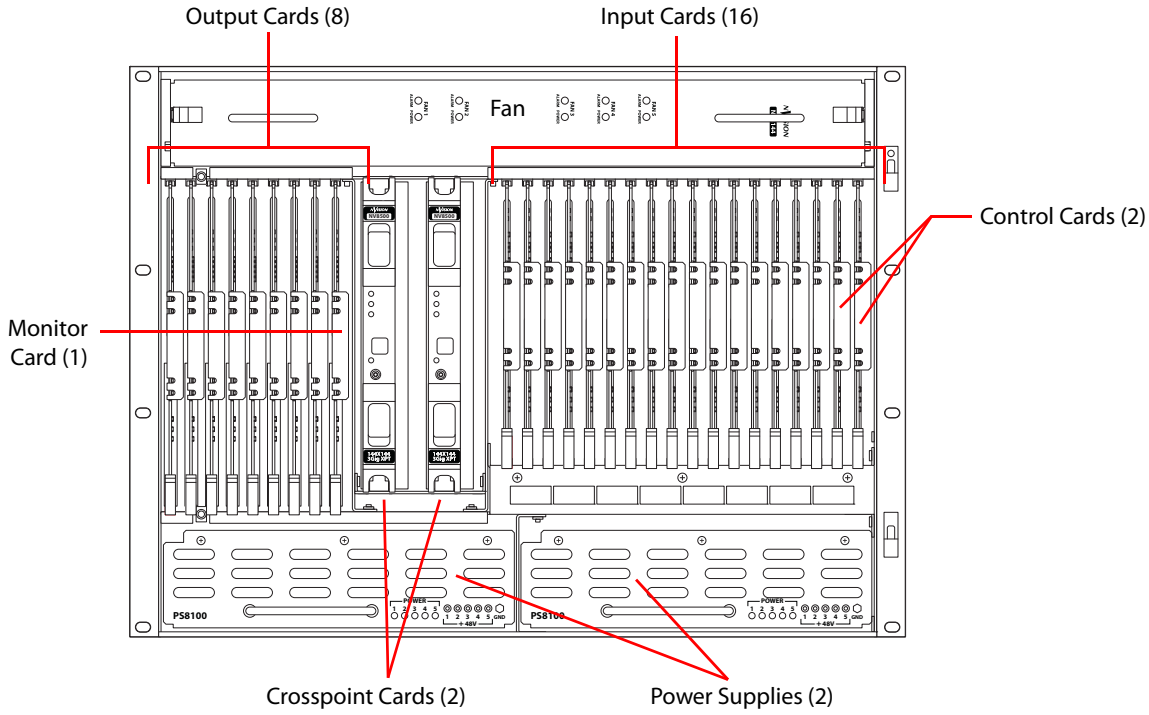


Fig. 1-4: NV8144 (Front View with Door Removed)

Figure 1-5 shows the rear of the NV8144. The farthest left-hand section is a blank plate that corresponds in position to the control cards. Next to the control card plate are 16 input backplane slots. A mixture of different input cards and their backplane modules can be placed in these slots.

The middle section contains system connections for audio reference, video reference, control system connections, and power supply alarms.

To the right of the system connectors is one monitor backplane slot.

To the right of the monitor backplane are 8 output backplane slots. A mixture of different output cards and their backplane modules can be placed in these slots.

At the very top of the frame is a grill for exhausting warm air dispersed by the fans. (See Frame Cooling on page 6.) Near the bottom of the frame are two AC power connectors. To the right of the left-hand power connection is a power supply alarm connector. (See Alarms on page 101.)

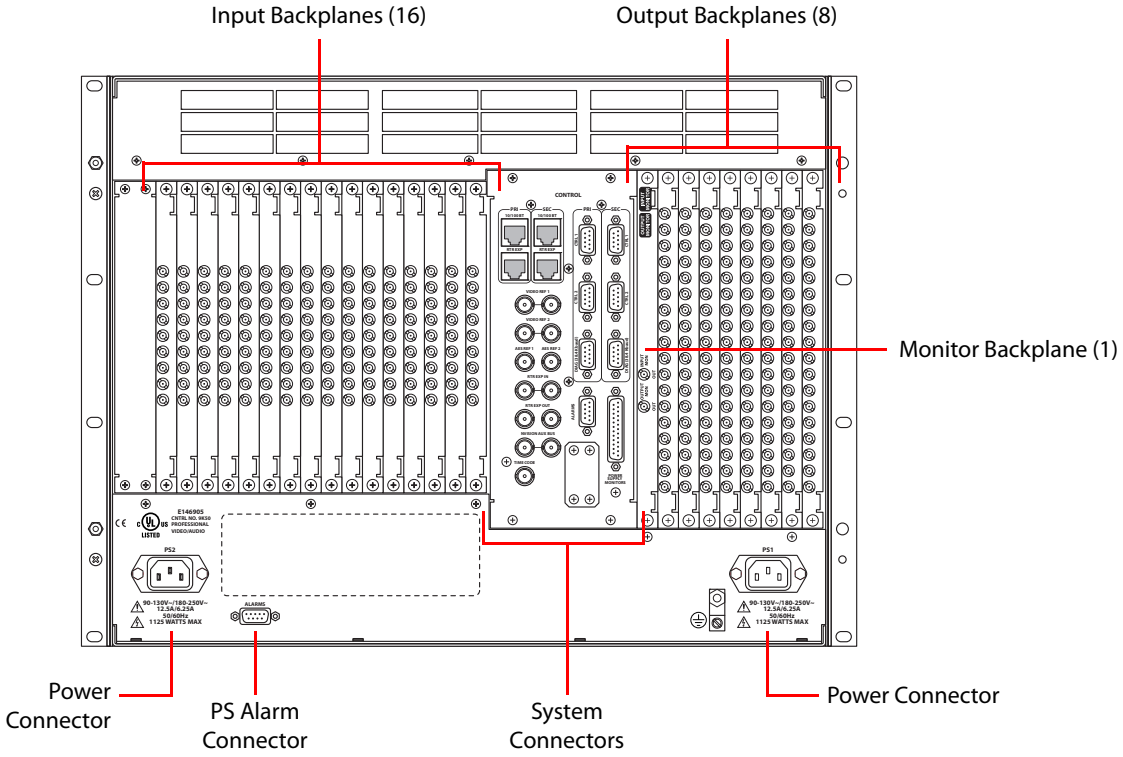


Fig. 1-5: NV8144 (Rear View)

NV8140

Figure 1-6 shows the front of the NV8140 (with the door removed). At the top of the frame is the fan tray. Directly below the fan tray are card slots. On the far left are 16 output card slots. Near the center of the frame, to the right of the output cards, are 3 crosspoint card slots. The first and third slots hold the regular crosspoint cards. The middle slot holds a optional redundant cross-point card.

To the right of the crosspoint card slots are 8 input card slots. To the right of the input card slots are 2 slots for the primary and secondary control cards. Below the card slots, at the bottom of the frame, are 2 bays for PS8300 power supply modules.

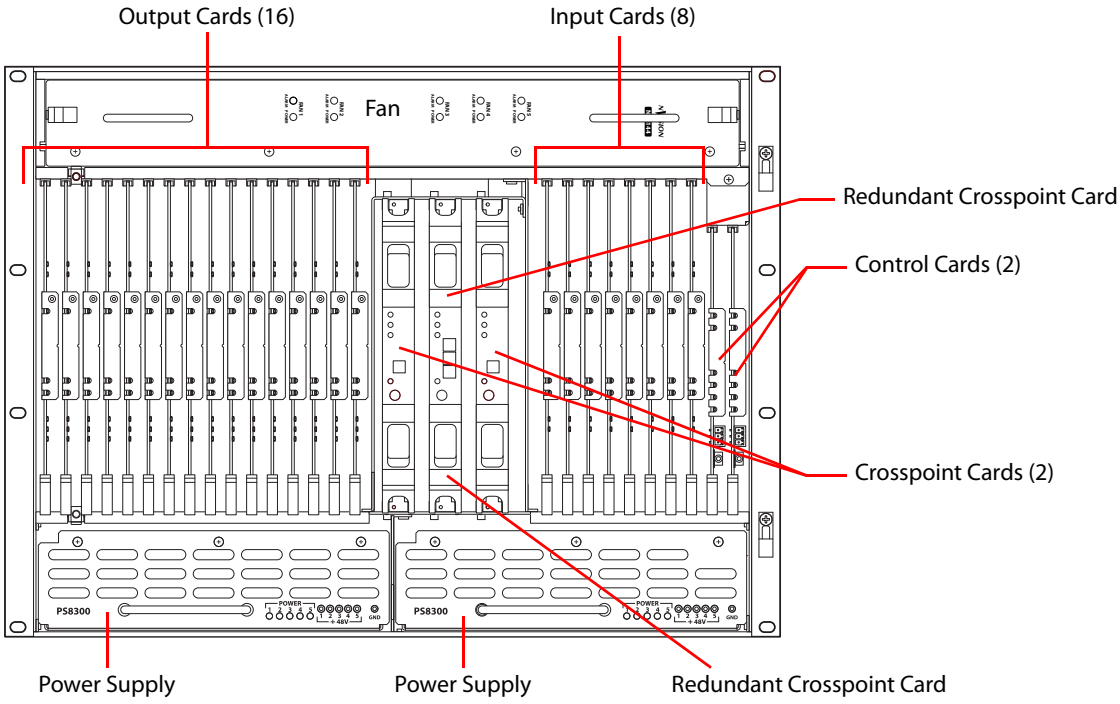


Fig. 1-6: NV8140 (Front View with Door Removed)

The NV8140 does not have a monitor card slot and does not support signal monitoring.

The NV8140 requires PS8300 power supplies, not PS 8100s.

The crosspoint card slots for the NV8140 are narrower than the crosspoint slots for the NV8144. Do not attempt to install the older (and now obsolete) EM0799 or EM0819 crosspoint cards in the NV8140. Physical damage will result.

▲ Frame sync input cards are not available for the NV8140.

Figure 1-7 shows the rear of the NV8140. The farthest left-hand section is a blank plate that corresponds in position to the control cards. Next to the control card plate are 8 input backplane slots. A mixture of different input cards and their backplane modules can be placed in these slots.

The middle section contains system connections for audio reference, video reference, control system connections, and power supply alarms.

To the right of the monitor backplane are 16 output backplane slots. A mixture of different output cards and their backplane modules can be placed in these slots.

At the very top of the frame is a grill for exhausting warm air dispersed by the fans. (See Frame Cooling on page 6.) Near the bottom of the frame are two AC power connectors. To the right of the left-hand power connection is a power supply alarm connector. (See Alarms on page 101.)

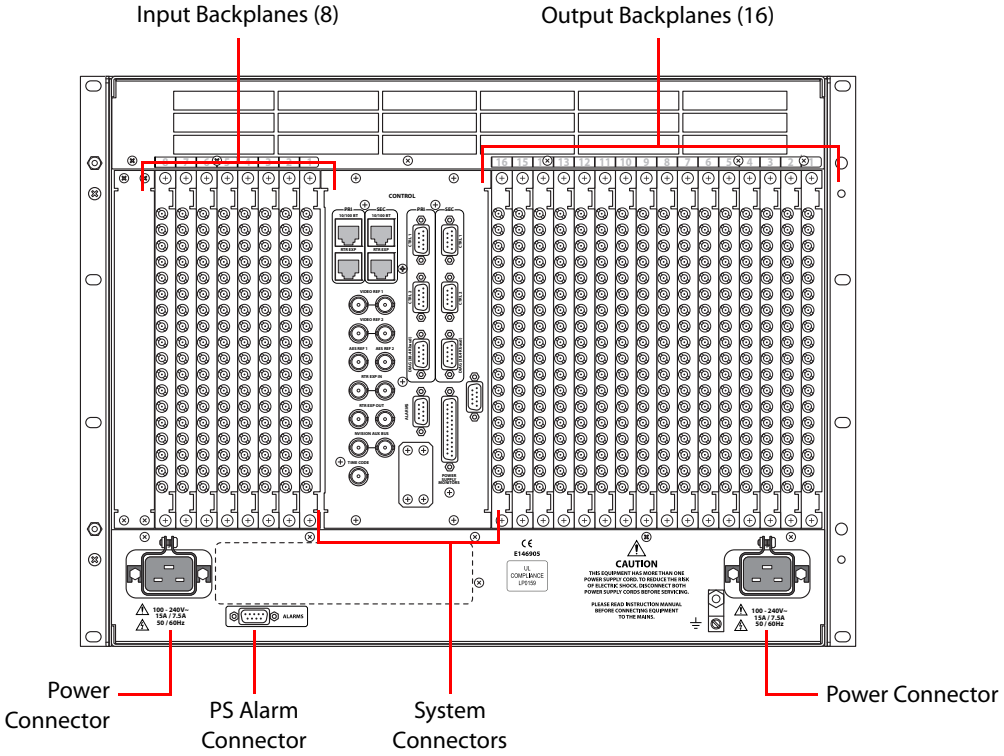


Fig. 1-7: NV8140 (Rear View)

The NV8140 uses PS8300 power supplies, not PS8100s. It has two C19 power connectors and require 20A plant lines. The cable supplied in North America has a NEMA L5-20P connector at the other end. For customers outside North America, we ship these power cords with the NEMA end cut off.

The input backplane modules of the NV8140 have 18 connectors, not 9 as for the other routers.

NV8280

Figure 1-8 shows the front of the NV8280 (with the door removed). At the top of the frame is the fan tray. Directly below are 32 output cards slots. Below the output cards are 32 input card slots. To the far right of the output card slots are two additional slots for monitor cards. Similarly, to the far right of the input card slots are two additional slots for the primary control card and secondary control card.

Below the input card slots, at the bottom of the frame, are 10 crosspoint card slots. The middle 2 crosspoint card slots are for an optional redundant crosspoint. The other 8 slots are for cross-point cards.

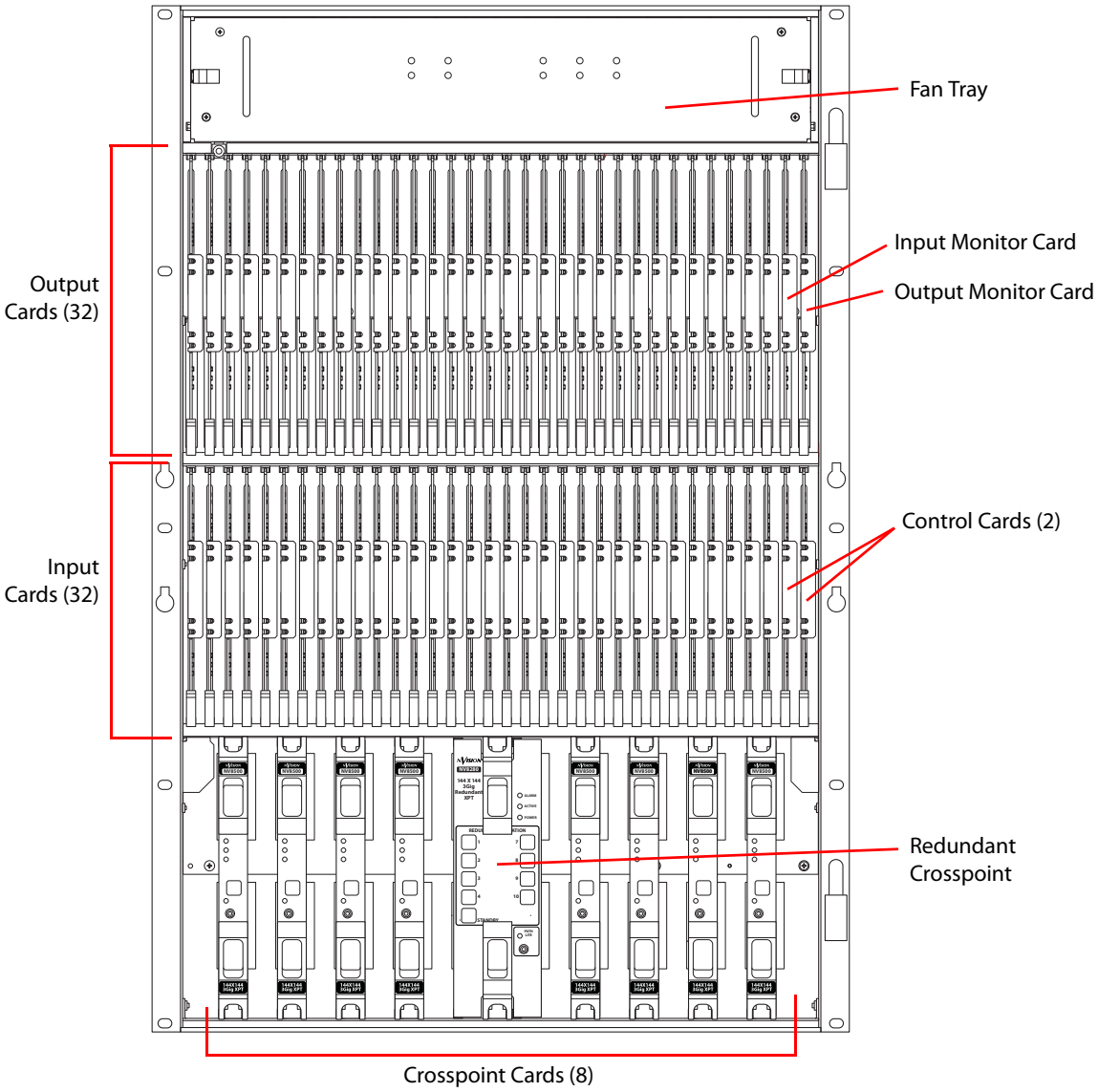


Fig. 1-8: NV8280 (Front View with Door Removed)

Figure 1-9 shows the rear of the NV8280. At the very top of the frame is a grill for exhausting warm air dispersed by the fans. Directly below the fan tray, starting from the left, are 2 monitor backplane slots. To the right of the monitor backplane slots are 32 output backplane slots. A mixture of different output cards and their backplane modules can be placed in these slots.

Directly below the output slots, starting from the left, is a blank back plate that corresponds in position to the control cards. Next to the blank back plate are 32 input backplane slots. A mixture of different input cards and their backplane modules can be placed in these slots.

At the very bottom of the frame, on the left-hand side, are system connections for audio reference and video reference, control system connectors, and alarm connectors. On the right-hand side is a single power connector that connects the router to an NV8300 power supply frame. For information about the NV8300, see Power Supply Distribution on page 113.

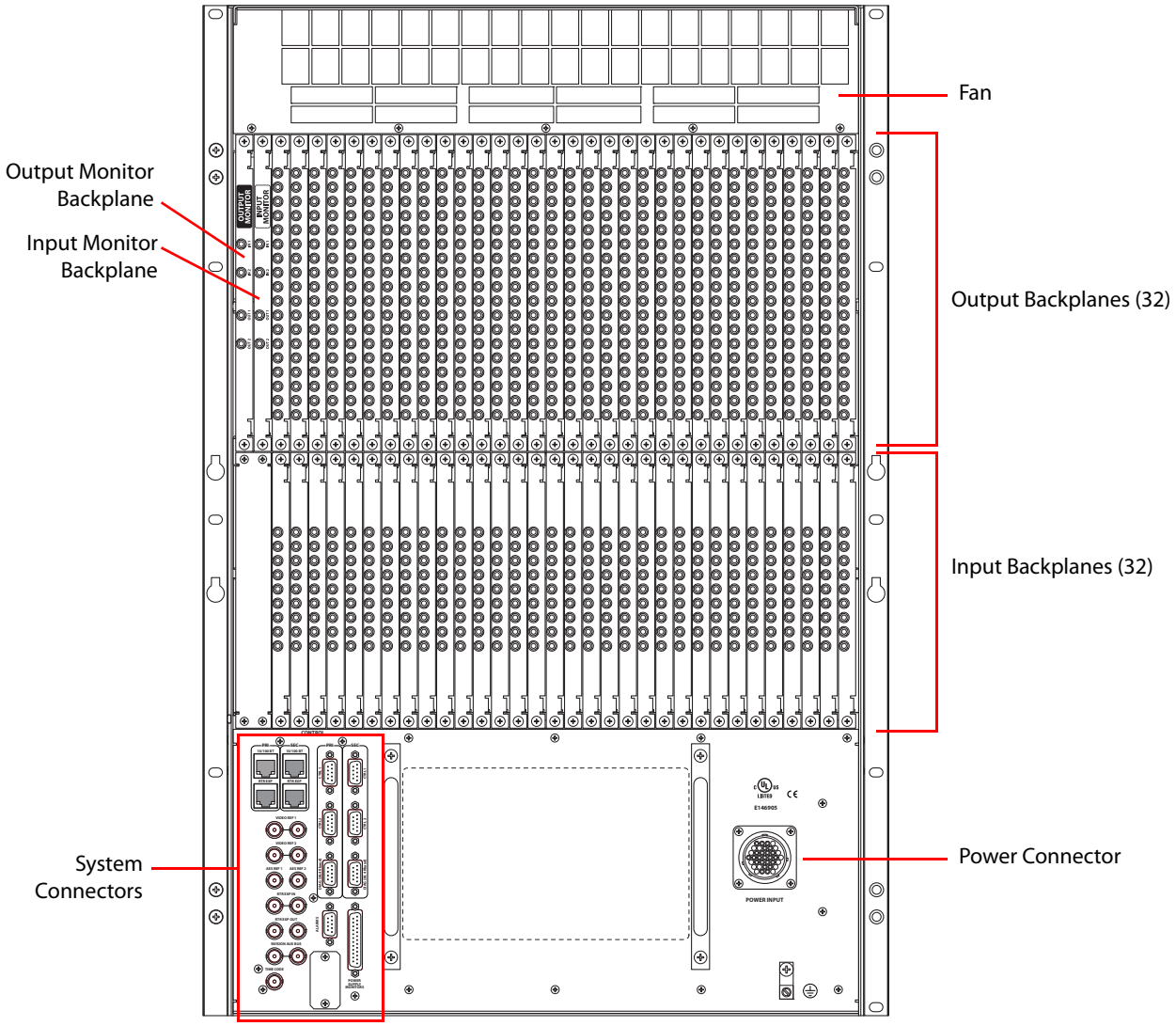


Fig. 1-9: NV8280 (Rear View)

NV8576

Figure 1-10, next page, shows the front of the NV8576.

The router is divided into three regions: upper, middle, and lower. The upper and lower regions each have 32 slots for output cards and 32 slots for input cards. The NV8576 thus has a total of 64 output card slots and 64 inputs card slots. Cards in the lower region of the frame are installed upside down (i.e., rotated 180° with respect to those in the upper region).

In the upper region, to the far right of the output card slots, are two monitor card slots. Similarly, to the far right of the input card slots are two slots for the primary control card and the secondary control card. The lower region has two more monitor card slots, at the far left of the output cards. (The lower region does not have control cards.)

In the middle region are 10 slots for crosspoint cards. The middle 2 crosspoint card slots hold an optional redundant crosspoint. The remaining 8 slots are for crosspoint cards.

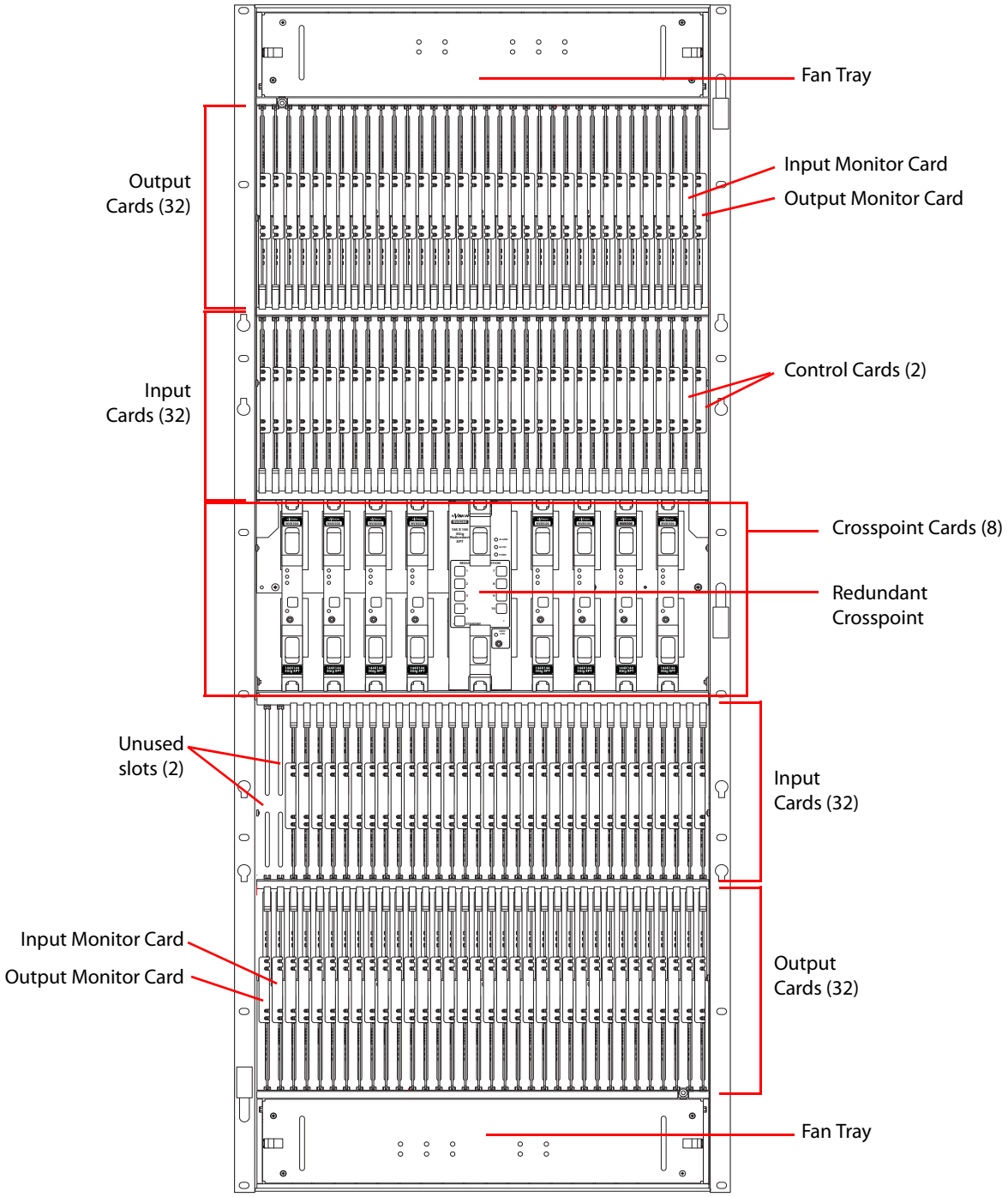


Fig. 1-10: NV8576 (Front View with Door Removed)

Figure 1-11, following, shows the rear of the NV8576. The upper and lower regions each have a 32 output slots and 32 input slots, for a total of 64 output slots and 64 input slots.

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 center of the frame, on the left-hand side, are system connections for audio and video references, control systems, and alarms. On the right-hand side are two power connections for connecting the router to two NV8300 power supply frames.

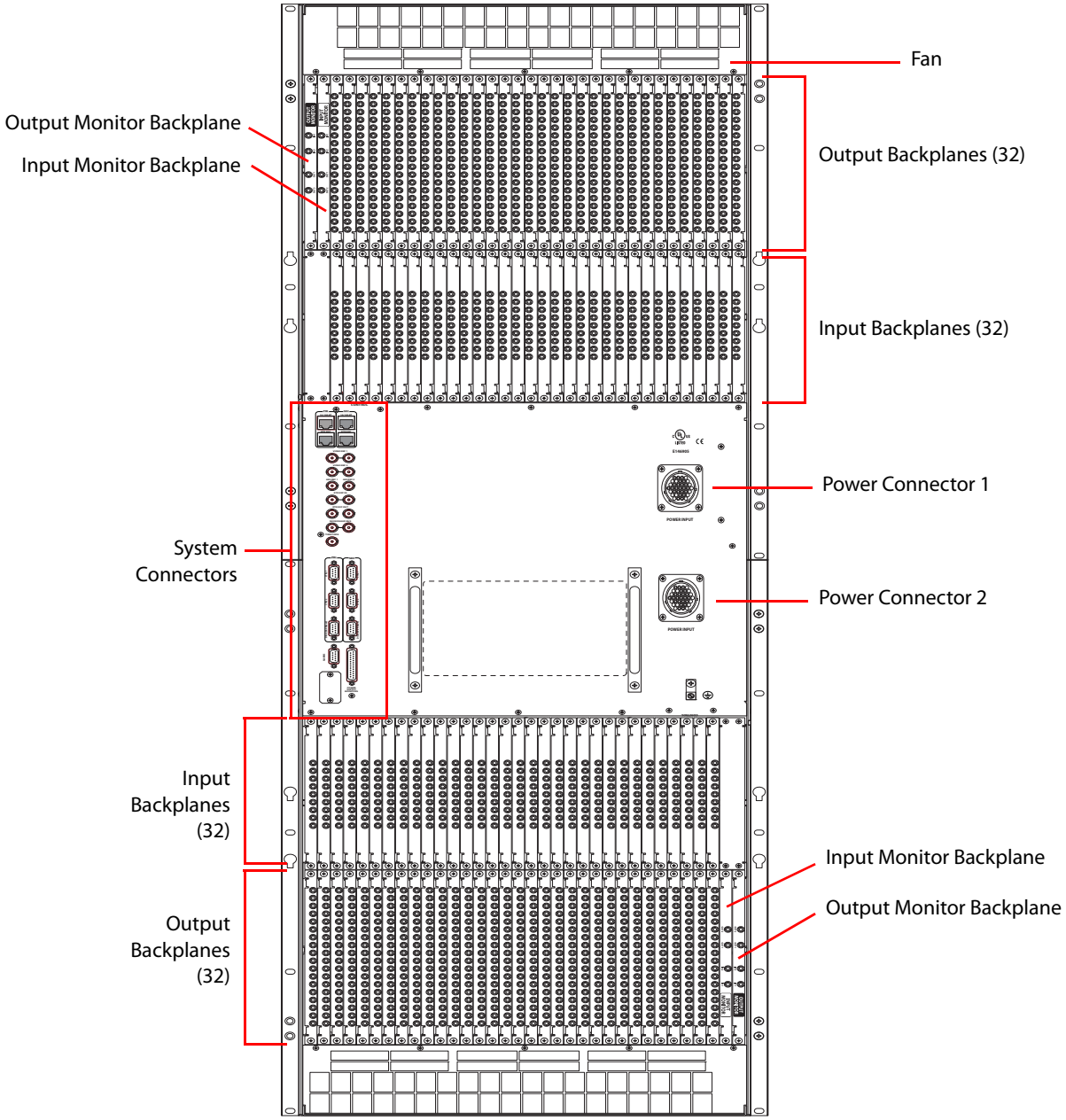


Fig. 1-11: NV8576 (Rear View)

Expanded NV8576-Plus

The expanded NV8576-Plus router comprises two 32RU frames that have the same structure as the NV8576 frames. Please refer to figures 1-10 and 1-11, preceding, to see NV8576-Plus frame structure.

Note that the expanded NV8576-Plus, consisting of 2 frames, will require 4 NV8300 power supply frames, two for each frame.

The NV8576-Plus, of course, will be populated with expansion output cards and backplanes instead of regular output cards and backplanes. Expansion output cards in one frame connect to *matching* expansion output cards in the other frame. An expansion output card in the first frame must match the expansion output card to which it is connected in the second frame in type and position. See Expansion I/O Cards on page 94 for details about matching card types.

NV8576-Plus (Stand-Alone)

A stand-alone NV8576-Plus is a single 32RU frame that have the same structure as the NV8576 frame. Please refer to figures 1-10 and 1-11, preceding to see the stand-alone NV8576-Plus frame structure.

The stand-alone NV8576-Plus requires 2 NV8300 power supply frames.

The stand-alone NV8576-Plus, of course, will be populated with expansion output cards. Because there is only one frame, expansion cables are not used.

Preparing for Installation

Before you set up the router, be sure to review the information in this section.

When your products arrive, immediately inspect the shipping container. 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.

Your shipment does not contain mounting racks, network cables, video cables, mounting screws, or grounding wire. If you have ordered an NV8280, NV8576, or NV8576-Plus, included in the shipment will be one or more NV8300 external power supply frames.

Shipments of the NV8576 and NV8576-Plus also include a rack-mounting kit, including a jack, lifting handles, and instructions.

You will need the following items for installation:

- ☐ A computer running Windows® 2000, Windows® XP Professional, or Windows® 7. This is required for installing the Miranda Router Configurator and other configuration software.

  Computer hardware requirements:

  - ☐ CD drive.
  - ☐ RS-232 serial COM port (DE9) capable of operating at 38.4 Baud.
  - ☐ 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.
- ☐ RS-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.

Installation Steps

Installation and (re)configuration tasks should be performed in a specific order to avoid possible complications.

1 Mount the router.

Before rack-mounting, remove all installed modules to make the router easier to lift into place. (NV8500 series routers ship with the cards and backplanes installed.)

Before making any connections or installing any modules, the router and other frames should be mounted in a rack so that the frame remains stable when you are connecting cables to the frame. See Rack Mount on page 18.

2 (Re)Install cards and backplanes.

These include I/O cards, monitor cards, I/O backplanes, monitor backplanes, crosspoint cards, and control cards.

NV8500 series routers ship with the cards and backplanes installed. You might have to remove the cards and backplanes initially to be able to lift the router into place in its rack.

For information about the modules and installation instructions, see the related section:

- Inputs and Outputs on page 21
- Crosspoints on page 61
- Monitoring on page 81

3 Make control connections.

Router control system connections allow the router and router control system to communicate. See Router Control on page 75.

4 Make expansion connections.

If you installing an NV8576-Plus, make the necessary expansion connections between the two frames. See Expanded NV8576-Plus on page 89.

5 Make (optional) alarm connections.

Alarm connections communicate system and power status to external indicators. Use the system alarm connector on the router frame.

If you are installing an NV8280, NV8576, or NV8576-Plus, you can use the power supply alarm connectors on the NV8300 power supply frame. (The NV8144 and NV8140 do not use

an external power supply and have their own power supply alarm connectors.) See Alarms on page 101.

6 Connect to power.

After all other modules are installed and connections are made, connect the router to AC power. The NV8144 and NV8140 connect directly to AC power. The NV8280, NV8576, and NV8576-Plus frames connect to the external NV8300 power supply frame which connects to AC power.

Note: be sure to insert PS8300 power supply modules in the NV8300 ***after*** all power connections are made. This is how you turn the router on and off. The PS8300s are hot-swappable. See Power on page 111.

Note: each PS8300 requires a 20 A circuit at 110 VAC. A 220 VAC line requires 10 A circuitry.

7 Launch the Miranda Router Configurator.

The Miranda Router Configurator (MRC) is used to configure the router and monitor system status. MRC should be installed on a PC in the same network as the router control system. See the *Miranda Router Configurator User's Guide*.

Rack Mount

NV8500 series router frames are designed to fit in a 19" (482.6 mm) EIA rack. The NV8280, the NV8576, and the NV8576-Plus use one or more NV8300 external power supply frames that also requires rack-mounting. It is not required that both the router and power supply frames be mounted in the same rack.

For details about power requirements and how to connect to power, see Power on page 111.

Before mounting frames in the rack, determine the placement of the router frame, and if applicable, 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:

- Vertical space for the router frame:

  NV8144 frames occupy 8 RUs.

  NV8140 frames occupy 8 RUs.

  NV8280 frames occupy 16 RUs.

  NV8576 frames occupy 32 RUs.

  Stand-alone NV8576-Plus frames occupy 32 RUs.

  Each of the two frames of an expanded NV8576-Plus occupies 32 RUs.

- Vertical space for the NV8300 power supply frame:

  The NV8144 and the NV8140 do not use external power supply frames.

  For an NV8280, only one power supply frame is required, totalling 3 RUs.

  For an NV8576 or a stand-alone NV8576-Plus, two power supply frames are required totalling 6 RUs.

  For an expanded NV8576-Plus, four power supply frames are required totalling 12 RUs.

- Vertical space for NV8900 MADI Interfaces, each of which requires 1 RU. See NV8900 MADI Interfaces on page 51. (NV8900s are optional.)

  Note: Grass Valley's NV8900 interfaces can concentrate AES signals in a MADI stream for connection to a MADI input or extract AES signals from a MADI output. For details, see NV8900

MADI Interfaces on page 51. Future MADI interfaces to analog audio are planned.

- AC power connects directly to the NV8144 frame and to the NV8140 frame. AC power connects to the NV8300 power supply frame used for the other NV8500 routers. The NV8144 requires a 15A circuit for each connection. The NV8140 requires a 20A circuit for each connection. The NV8300 requires a 20A circuit for each of its power supply modules in 110 VAC environments. (There are 4 modules in each NV8300 power supply frame.)

  In 220 VAC environments, a 10A circuit is required for NV8300 power supplies.
- If you are installing an expanded NV8576-Plus (two frames), the frames must be located near each other, side-by-side or back to back, so that you can make expansion connections between the frames. The distance between the frames is limited by the length of expansion cables (4 meters). See Connecting the NV8576-Plus Frames on page 96.
- To ensure proper cooling, leave space for unrestricted air flow through the front of the router, and a minimum of 6-inches of clearance at the rear where the cooling fans exhaust warm air.
- Allow space for cabling to the router's I/O connectors.

To Rack Mount the Router

1 Temporarily place the router frame near the rack in which it is to be installed.

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

Important: never use the front door handle to lift the frame.

3 The router was shipped with control cards, crosspoint cards, I/O cards, I/O backplanes, and fan trays installed. Remove them to make the frame lighter for installation. If you do remove the cards, 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.

4 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 persons 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.

Note: NV8576 frames are shipped with a rack-mounting kit, including a jack, a shelf for supporting the frame while it is still not secured with screws, handles for lifting the frame into place, and instructions for rack-mounting using the kit. An NV8576-Plus is also shipped with the rack-mounting kit. An NV8280 frame is shipped with a handle for lifting it into place.

5 Reinstall the fan trays in the fan tray bays. The fan tray openings face the interior of the router. In the NV8576 and NV8576-Plus frames, the openings of the upper fan tray face down and the openings in the lower fan tray face up.

6 Reinstall control cards, crosspoint cards, I/O cards, I/O backplanes, monitor cards, and monitor backplanes. Be sure to install them in the correct location. The router was configured at the factory with the cards in a specific location. If you install I/O cards in a different location, the router will have to be reconfigured before it can run properly.

7 If you are using NV8300 power supplies, perform the following steps:

   a If the NV8300 was shipped with the PS8300 power supply modules in the frame, remove the modules.

   CAUTION
   Do not re-insert the PS8300 power supply modules until after you have made all power connections. For more information, see Connecting to Power on page 118.

   b Lift the power supply frame into position and attach the power supply frame to the front of the rack with the appropriate screws. Place screws in all frame mounting screw holes.

   c Repeat steps **a** and **b** for additional power supply frames.

8 Re-mount the front door.

9 Wait until you have completed all installation tasks before you reinstall PS8300 power supply modules, powering up the router. (See Connecting to Power on page 118.)

2 Inputs and Outputs

I/O modules include input cards, output cards, and their backplanes. Input cards receive incoming signals through connectors on their backplanes and forward them to crosspoint cards. The crosspoint cards route the signals, as directed by the control card, to output cards. The signals are then distributed from the output card through connectors on their backplanes.

For a comprehensive list of I/O modules and corresponding backplanes with part numbers, see Part Numbers on page 183.

Topics

Types of Input and Output

Although this chapter discusses each card type and its signal numbering in detail, here it presents a tabular view of the cards:

Input Card Type	Signals	Remarks
Standard HD input	9 video. 18, video (NV8140)	Accepts HD or SD; coax
Standard 3Gig input	9 video; 18 video (NV8140)	Accepts 3Gig, HD, or SD; coax or fiber
AES async input[a]	9 audio	Accepts AES pairs; coax or shielded twisted pair (STP)
Disembedder	8 video; 16 video (NV8140)	Accepts 3Gig, HD, or SD, coax only; 16 embedded audio channels for each video port
Frame sync (disembedder)	8 video	Accepts 3Gig, HD, or SD, coax only; 16 embedded audio channels for each video port; RJ-45 port for configuring frame sync functions.
3Gig/TDM input	8 video + 1 MADI; 16 video + 2 MADI (NV8140)	Accepts 3Gig, HD, or SD and MADI stream(s) up to 64 channels; coax only

a. The NV8140 does not support AES async.

Output Card Type	Signals	Remarks
Standard HD output	18 video	Transmits HD or SD; coax
Standard 3Gig output	18 video	Transmits 3Gig, HD, or SD; coax or fiber
AES async output[a]	18 audio	Transmits AES pairs; coax or shielded twisted pair (STP)
M3	18 video	Transmits 3Gig, HD, or SD; M3 and coax
Embedder	16 video	Transmits 3Gig, HD, or SD, coax only; 16 embedded audio channels for each video port
Disembedder/Embedder	16 video	Transmits 3Gig, HD, or SD, coax only; 16 embedded audio channels for each video port; special functions
3Gig/TDM output	16 video + 2 MADI	Transmits 3Gig, HD, or SD and 2 MADI streams, 56 or 64 channels each; coax only

a. The NV8140 does not support AES async.

Expansion Output Card Type	Signals	Remarks
Standard HD output	9 video	Transmits HD or SD; coax
Standard 3Gig output	9 video	Transmits 3Gig, HD, or SD; coax or fiber
AES async output	9 audio	Transmits AES pairs; coax or shielded twisted pair (STP)
Embedder	8 video	Transmits 3Gig, HD, or SD, coax only; 16 embedded audio channels for each video port
Disembedder/Embedder	8 video	Transmits 3Gig, HD, or SD, coax only; 16 embedded audio channels for each video port; special functions
3Gig/TDM output	8 video + 1 MADI	Transmits 3Gig, HD, or SD and 1 MADI streams, 56 or 64 channels; coax only

Expansion cards are applicable only to the NV8576-Plus expanded router.

The expansion output cards all have two inter-frame connections, in addition to their output connectors.

The “special functions” of the disembedder/embedder cards are (1) null audio and (2) pass-through audio. See Null Audio and Pass-Through Audio, on page 69.

There is no M3 expansion output card and there is no M3 input card.

Backplanes

Backplane modules have signal connectors of 3 types, in general:

- Coax (DIN 1.0/2.3)
- Fiber optic (having SFP connector modules housing LC connectors)

  See Backplanes Having SFP Modules on page 41.
- WECO quick-release connectors (5-pin or 3-pin, for twisted pair wiring).
- M3 connectors. See M3 Cards on page 157.

Expansion backplanes, used for the NV8576-Plus only, have additional *expansion* connectors.

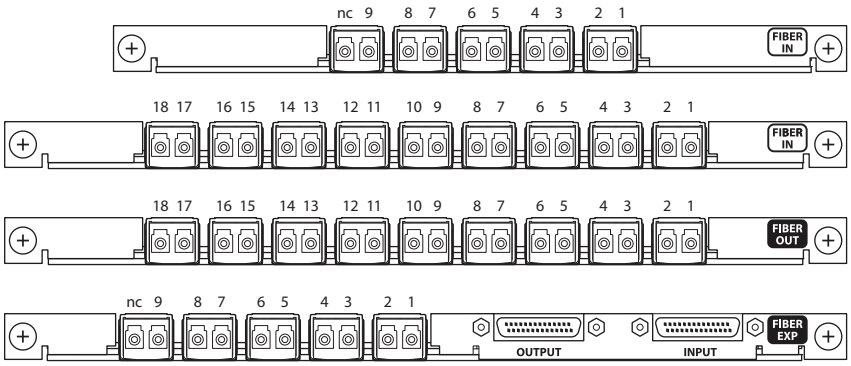
For routers other than the NV8140, input backplanes have 9 connectors. For the NV8140, input backplanes have 18 connectors.

For routers other than the NV8140, frame sync input backplanes have 9 connectors and an additional RJ-45 (Ethernet) connector for configuring frame sync functions. Frame sync cards and backplanes are not available for the NV8140.

All output backplanes have 18 connectors. All expansion output backplanes have 9 output connectors and two inter-frame connectors.

Backplanes with Fiber Optic Connectors

The SFP connectors of these backplane modules have two ports each:



Except for the NV8140, the fiber input backplanes have 9 ports. The 10th port is not connected.

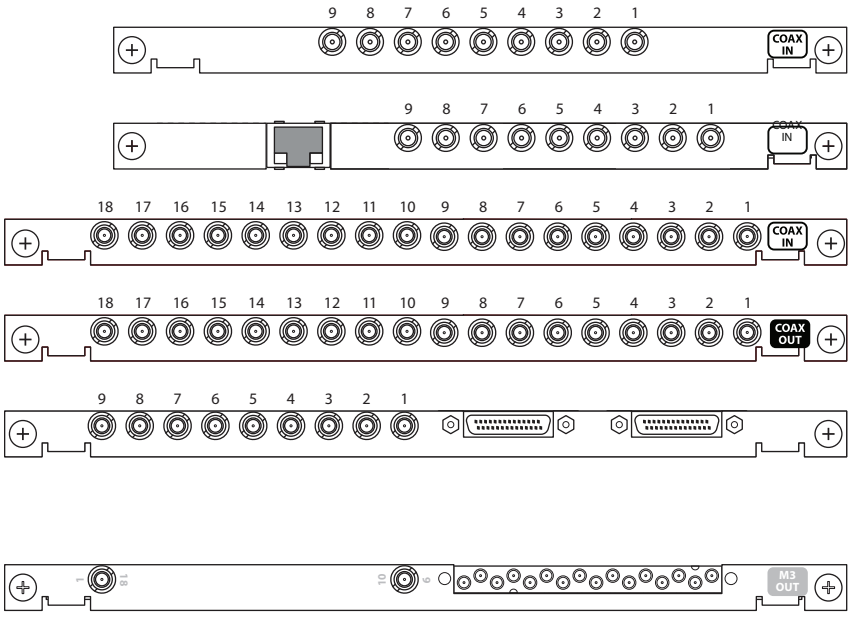
The output backplanes have 18 ports and the input card for the NV8140 has 18 ports.

The expansion output card has 9 ports and two 28-pin expansion connectors. (The 10th SFP port is not connected.)

When these backplanes are used with hybrid I/O cards, one or two of the ports remain unused.

Backplanes with Coax Connectors

These backplane modules have coax (Din 1.0/2.3) connectors:



The coax backplanes are used for standard I/O, disembedder cards, embedder cards, MADI cards (a.k.a, TDM cards), and AES async cards.

Generally, the coax input backplanes have 9 ports. The output backplanes have 18 ports. The expansion output card has 9 ports and two 28-pin expansion connectors.

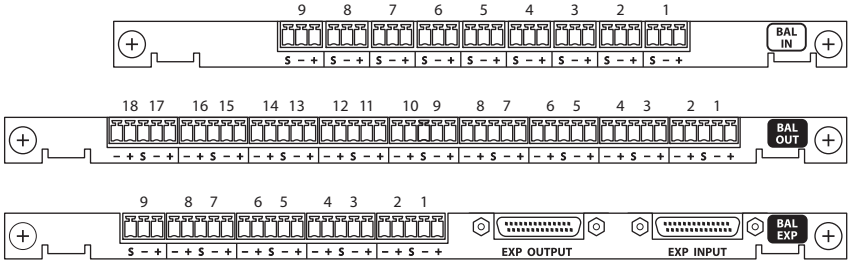
The frame sync input backplane has an additional Ethernet port for the configuration of the frame sync card.

When these backplanes are used with hybrid I/O cards, one or two of the ports remain unused.

The M3 output backplane module is unique. It has a single 16-port "M3" connector supporting 16 of the outputs of the M3 card. The two remaining ports are presented on two coax connectors. See M3 Cards on page 157.

Backplanes with WECO Connectors

These backplane modules have 3- and 5-pin WECO quick-release connectors:



Backplanes with WECO connectors are used for *balanced* AES async inputs and outputs. These backplanes are for asynchronous AES cards only.

The input backplanes have 9 ports. The output backplanes have 18 ports. The expansion output card has 9 ports and two 28-pin expansion connectors.

Backplanes for Hybrid Cards

For hybrid cards, the backplane connectors are used differently.

Card Type	Video	MADI	10GE	Unused	Remarks
Disembedder	8 16[a]	— —		1 2	16 embedded audio channels for each video
Frame sync (disembedder)	8	—		1	16 embedded audio channels for each video plus an RJ-45 port for configuring frame sync functions.
Embedder	16	—		2	16 embedded audio channels for each video
MADI input	8 16[a]	1 2		— —	Up to 64 MADI channels on 1 audio port
MADI output	16	2		—	56 or 64 MADI channels on each of the 2 audio ports

a. For the NV8140 only.

Figure 2-1 shows the hybrid port assignments of the coax I/O backplanes:

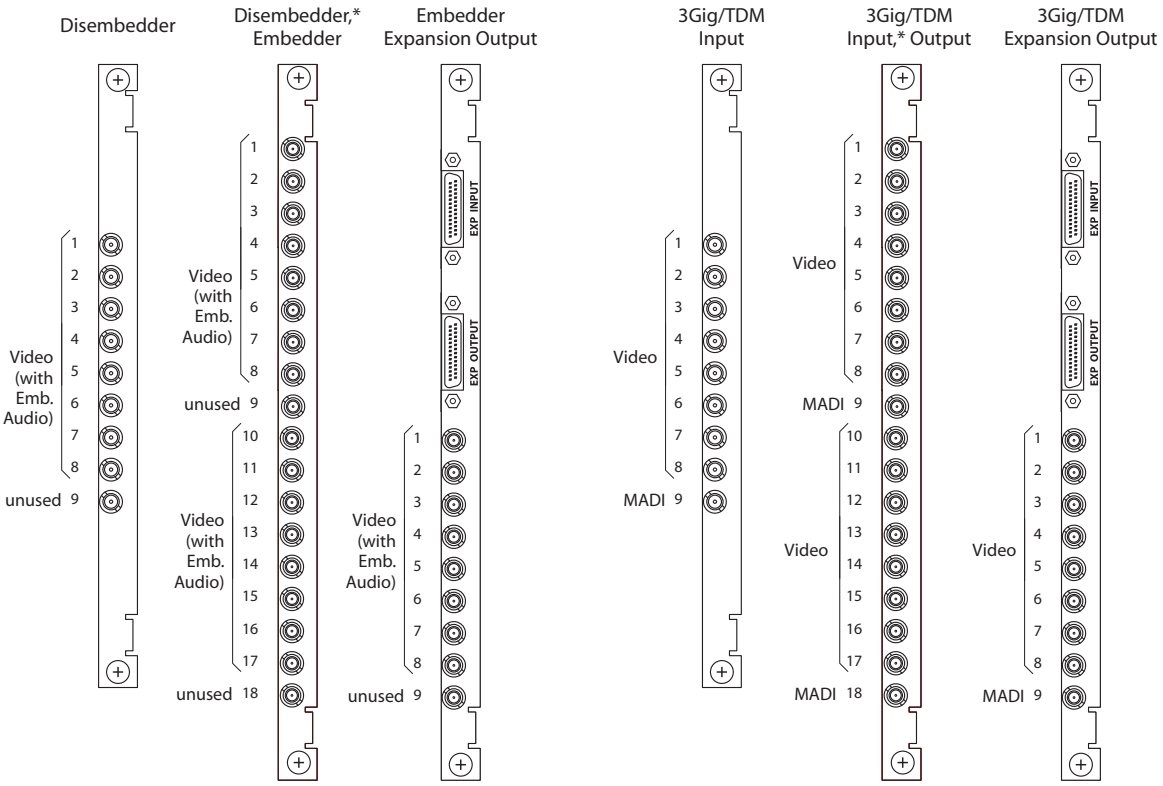


Fig. 2-1: I/O Backplane Modules As Used for Hybrid I/O

The fiber and WECO backplanes have the same port numbering method as the coax backplanes.

Note that the coax backplanes used for hybrid cards are also used for standard cards. If, for example, you exchange a standard card for a hybrid card in a particular slot, it is not necessary to change the backplane, as long as the card is a coax-compatible card.

The video ports of frame sync input backplane modules follow the same pattern as for the disembedder backplane modules.

The NV8140 is the only router in the NV8500 family that uses 18-connector disembedder (input) backplanes and 18-connector MADI (3Gig/TDM) input backplanes. (Frame sync input backplanes are not available for the NV8140.)

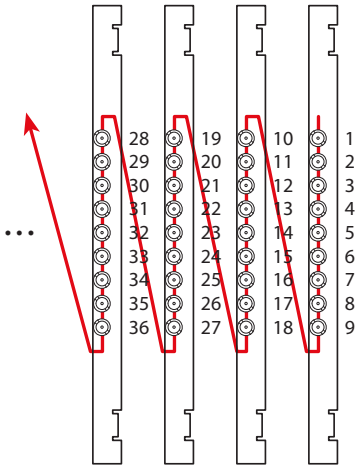
See M3 Cards on page 157 for M3 signal numbering and ordering.

Signal Numbering

When you are facing the rear of the router frame, where signal connections are made, signal numbers are assigned, in increasing order, from top-to-bottom and from right-to-left.

This is true even in the NV8576 and NV8576-Plus where I/O cards and their backplanes in the lower bays are rotated 180° from those in the upper bays.

See Figure 2-2, following.



Coax inputs shown. Fiber optic and WECO connectors are similar.

Outputs are similar, but each output card has 18 connectors.

Expansion outputs (used by the NV8576-Plus only) are similar and have 9 output connectors.

Fig. 2-2: Connector Ordering

Also, for the NV8576 and NV8576-Plus, slot numbers increase right-to-left, in sections. The sections are disjoint (non-contiguous). See Slot Order for Port Numbering on page 35.

For standard routers, each input and output connector has a unique signal number assigned to it. For standard video cards, and AES async cards, port numbering is straightforward: each connector supports one video signal or one AES pair, as the case may be.

For hybrid routers, there are two numbering sequences, one for video signals and one for audio signals. Keep this in mind when working with hybrid I/O cards that support both video and audio. For hybrid video and audio, a single connector represents multiple inputs (or outputs). Signal numbering is more complex.

I/O Space

Whether a router has standard cards or hybrid cards, each router has an I/O port "space" as listed in this table:

Router	Inputs[a]	Outputs[a]	Audio Inputs[b]	Audio Outputs
NV8144	144	144	2304	2304
NV8140[c]	144	288	2304	4608
NV8280	288	576	4608	9216
NV8576	576	1152	9216	18432
NV8576-Plus (stand-alone)	576	576	9216	9216
NV8576-Plus (expanded)[d]	1152	1152	18432	18432

a. Either video or AES async.
b. For hybrid routers.
c. The NV8140 does not support AES async.
d. The expanded NV8576-Plus has two frames.

However, hybrid routers do not have circuitry for all the port numbers in their port space.

Each video port and each AES async port is an element of the router's crosspoint matrix.

Hybrid audio ports are elements of a hybrid router's TDM audio switching "matrix."

Each I/O card also has an I/O port space within the port space of the router:

Card	Video Ports[a]	Audio Ports[b]
Input	9	144
NV8140 input	18	288
Output	18	288
Expansion output	9	144

a. Either video or AES async.
b. For hybrid cards.

The port numbers assigned to cards in successive slots increment by the numbers in this table.

However, hybrid cards do not have circuitry for all the port numbers in their port space.

Embedder and Disembedder Cards

For all NV8500 routers except the NV8140, a (hybrid) disembedder card has only 8 video ports. Each of the 8 carries 16 embedded audio channels (or audio ports) for a total of 128 audio ports. The 9th video port and the 16 audio ports it would have ***do not exist.*** Therefore, the 9th connector on the disembedder card's backplane goes unused.

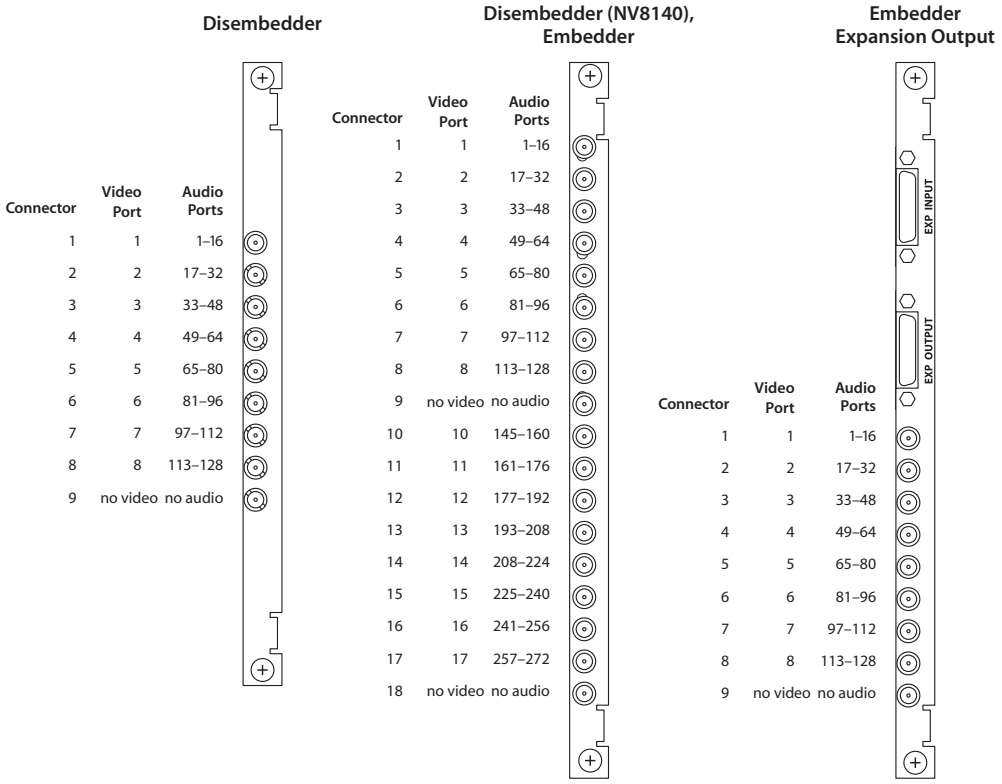
That is true for the frame sync input cards and backplanes, which are essentially disembedder cards whose backplanes have an additional RJ-45 port.

For the NV8140, a (hybrid) disembedder card has 16 video ports. Each of the 16 carries 16 embedded audio channels (or audio ports) for a total of 256 audio ports. The 9th and 18th video ports and the 16 audio ports each of those ports would have ***do not exist.*** The 9th and 18th connector on the card's backplane go unused.

A (hybrid) *embedder* card and a (hybrid) *disembedder/embedder* card each have 16 video ports. The 9th and 18th video ports and the 16 audio ports each of those ports would have ***do not exist.*** The 9th and 18th connector on the card's backplane go unused.

Nevertheless, nonexistent video and audio ports and their unused connectors are counted in the port numbering.

Similarly, an embedder expansion output card has only 8 video ports. The 9th video port and the 16 audio ports it would have ***do not exist.*** Therefore, the 9th connector of its backplane is unused:



Connector	Video Port	Audio Ports
1	1	1–16
2	2	17–32
3	3	33–48
4	4	49–64
5	5	65–80
6	6	81–96
7	7	97–112
8	8	113–128
9	no video	no audio

Connector	Video Port	Audio Ports
1	1	1–16
2	2	17–32
3	3	33–48
4	4	49–64
5	5	65–80
6	6	81–96
7	7	97–112
8	8	113–128
9	no video	no audio
10	10	145–160
11	11	161–176
12	12	177–192
13	13	193–208
14	14	208–224
15	15	225–240
16	16	241–256
17	17	257–272
18	no video	no audio

Connector	Video Port	Audio Ports
1	1	1–16
2	2	17–32
3	3	33–48
4	4	49–64
5	5	65–80
6	6	81–96
7	7	97–112
8	8	113–128
9	no video	no audio

Fig. 2-3: Embedder and Disembedder Port Numbering

Audio port ordering for frame sync input cards is the same as for disembedder cards.

MADI Cards

For all NV8500 routers except the NV8140, a MADI (i.e., 3Gig/TDM) input card has 8 video ports and 1 MADI input; the 9th connector of its backplane is for MADI, up to 64 channels. For these cards, only 64 audio ports of the 144 in the card's space exist.

For the NV8140, a MADI (i.e., 3Gig/TDM) input card has 16 video ports and 2 MADI inputs. The 9th and 18th connectors of its backplane carry MADI, up to 64 channels for each connector. For these cards, only 128 audio ports of the 288 ports in the card's space exist.

A MADI (3Gig/TDM) output card has 16 video ports and 2 MADI outputs. The 9th and 18th connectors of its backplane carry MADI, 56 or 64 channels for each connector. For these cards, only 128 audio ports of the 288 ports in the card's space exist.

A MADI (3Gig/TDM) expansion output card has 8 video ports and 1 MADI output; the 9th connector of its backplane is for MADI, up to 64 channels. For these cards, only 64 audio ports of the 144 in the space of the card exist.

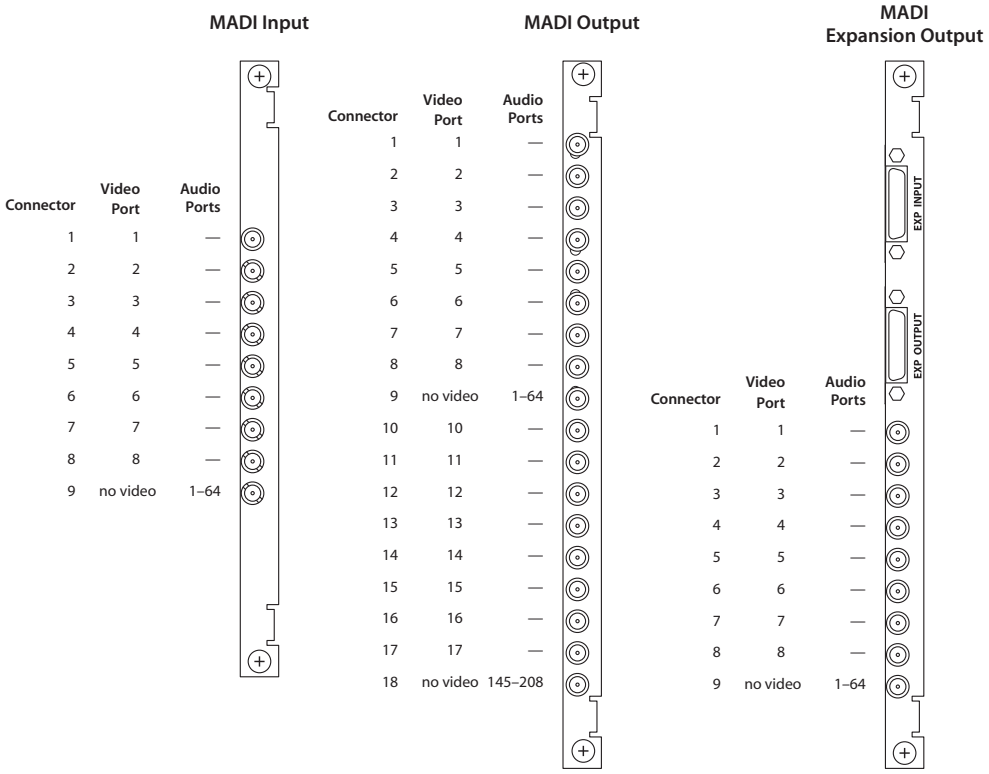


Fig. 2-4: MADI Port Numbering

Port Ordering

Port ordering is a function of slot ordering. The slots of an NV8140, NV8144, or NV8280 are ordered from right-to-left, as labeled at the rear of the router. However, for the NV8576 frames and NV8576-Plus frames, there are two orderings: one labels the slots on the router in right-to-left order (from 1 to 32 and from 33 to 64). The other slot ordering, that pertains to port ordering, is a different ordering. See Slot Order for Port Numbering on page 35.

Because video and audio port numbering for hybrid I/O is complex, Grass Valley has released several reference documents that enumerate the router's port numbers exhaustively for standard I/O, disembedder and embedder I/O, and 3Gig/TDM (MADI) I/O. This table lists the available reference documents:

Router	Reference Document
NV8144	RF0272-01
NV8140	RF0334-00
NV8280	RF0273-01
NV8576	RF0274-03
NV8576-Plus, frame 1	RF0275-02
NV8576-Plus, frame 2	RF0276-02

We recommend that you obtain a copy of these documents. Contact Miranda Customer Service.

Standard I/O

Standard I/O cards support 3Gig, HD, SD, and AES async signal types.

For all NV8500 routers except the NV8140, standard input cards accept 9 signals, either video or AES pairs, depending on the card type.

For the NV8140, standard input cards accept 18 video signals. (The NV8140 does not support AES async.)

Standard output cards transmit 18 signals, either video or AES pairs, depending on the card type.

Standard expansion output cards, used for the NV8576-Plus only, transmit 9 signals, either video or AES pairs, depending on the card type. Expansion output cards have, additionally, 2 expansion connectors for cabling between the two frames of the NV8576-Plus.

Embedded audio, when it present, is passed through the router, with its video, unmodified.

Hybrid I/O

All hybrid cards support 3Gig, HD, and SD video rates.

Disembedder Input

For the NV8140

The hybrid disembedder card can disembed 16 audio channels from each of its 16 video inputs. Each disembedder card thus has 256 audio inputs. However, input backplanes used for disembedder cards have 18 connectors. Sixteen of the connectors are used for the video and two connectors — the 9th and the 18th — are ***unused.*** Nevertheless, the unused connectors are counted in the port numbering sequence as if they were additional video inputs with 16 embedded audio channels.

The router's port numbering scheme associates 16 audio port numbers with each video port. Video port 1 carries audio ports 1–16, video port 2 carries audio ports 17–32, and so on.

This numbering applies to a disembedder card in any slot. A disembedder card in slot 1 provides video ports 1–16 and audio channels 1–128 and 145–272. The 9th and 18th connectors are unused and the corresponding ports (video ports 9 and 18 and audio ports 129–144 and 273–288) ***do not exist***. Thus, a disembedder card in slot 2 supports video ports 19–26 and 28–35 and audio channels 289–416 and 433 –560. Its 9th and 18th connectors are also not used. A disembedder card in slot 3 supports video ports 37–44 and 46–53 and audio channels 577–704 and 721–833, and so on.

Consecutive disembedder cards increment by 18 video ports and 288 audio channels. Consecutive cards follow the slot ordering for port numbers. See Slot Order for Port Numbering on page 35.

For Other Routers

For all NV8500 routers except the NV8140, the hybrid disembedder card can disembed 16 audio channels from each of its 8 video inputs. Each disembedder card thus has 128 audio inputs.

However, input backplanes used for disembedder cards have 9 connectors. Eight of the connectors are used for the video and the 9th connector is ***unused.*** Nevertheless, the 9th connector is counted in the port numbering sequence as if it were another video input with 16 embedded audio channels.

(Frame sync input cards (and backplanes) can be considered disembedder cards that have an additional RJ-45 port for configuring frame sync functions.)

The router's port numbering scheme associates 16 audio port numbers with each video port. Video port 1 carries audio ports 1–16, video port 2 carries audio ports 17–32, and so on.

This numbering applies to a disembedder card in any slot. A disembedder card in slot 1 provides video ports 1–8 and audio channels 1–128. The 9th connector is unused and the corresponding ports (video port 9 and audio ports 129–144) ***do not exist***. Thus, a disembedder card in slot 2 supports video ports 10–17 and audio channels 145 through 272. Its 9th connector is not used. A disembedder card in slot 3 supports video ports 19–26 and audio channels 289–416, and so on.

Consecutive disembedder cards increment by 18 video ports and 288 audio channels. Consecutive cards follow the slot ordering for port numbers. See Slot Order for Port Numbering on page 35.

Embedder Output

The hybrid embedder card and the hybrid disembedder/embedder card can each embed 16 audio signals into each of 16 video streams. Each card thus has 256 audio outputs. However, output backplanes used for embedder and disembedder/embedder cards have 18 connectors. Sixteen of the connectors are used for the video and the two connectors — the 9th and the 18th — are ***unused.*** Nevertheless, the unused connectors are counted in the port numbering sequence as if they were additional video outputs with 16 embedded audio channels.

The router's port numbering scheme associates 16 audio port numbers with each video port. Video port 1 carries audio ports 1–16, video port 2 carries audio ports 17–32, and so on.

This numbering applies to an embedder card or disembedder/embedder card in any slot. A card in slot 1 provides video ports 1–8 and 10–17 and audio channels 1–128 and 145–272. The 9th and 18th connectors are unused and the corresponding ports (video ports 9 and 18 and audio ports 129–144 and 273–288) ***do not exist***. Thus, a card in slot 2 supports video ports 19–26 and 28–35 and audio channels 289–416 and 433 –560. Its 9th and 18th connectors are also not used. A card in slot 3 supports video ports 37–44 and 46–53 and audio channels 577–704 and 721–833, and so on.

Consecutive embedder or disembedder/embedder cards increment by 18 video ports and 288 audio channels. Consecutive cards follow the slot ordering for port numbers. See Slot Order for Port Numbering on page 35.

The numbering scheme for hybrid expansion embedder output cards and disembedder/embedder output cards (used by the expanded NV8576-Plus only) is like the numbering scheme for disembedder input cards. (Expansion embedder output cards and disembedder/embedder output cards have 8 outputs.)

Differences

Disembedder/embedder output cards differ from embedder output cards because the disembedder/embedder cards support what is called *pass-through audio*. See Pass-Through Audio on page 69.

3Gig/TDM Input

For the NV8140

The 3Gig/TDM (i.e., MADI) input card supports 16 video signals and 2 separate MADI streams. If the video has embedded audio, it is not disembedded, but passed through the router. Each MADI input can receive up to 64 audio channels.

The router's port numbering scheme associates 128 audio port numbers *with a card*.

This numbering applies to a MADI input card in any slot.

The input backplane supports the 16 video signals on 16 of its connectors and the MADI streams on its 9th and 18th connectors.

A MADI input card in slot 1 provides audio ports 1–128 and video ports 1–16. The card in slot 2 provides audio ports 289–352 and video ports 19–26, and so on. Other audio channels in the "space" of the card ***do not exist.***

Consecutive MADI input cards increment by 18 video ports and 288 audio channels. Consecutive cards follow the slot ordering for port numbers. Slot Order for Port Numbering on page 35.

For Other Routers

The 3Gig/TDM (i.e., MADI) input card supports 8 video signals and a separate MADI stream. If the video has embedded audio, it is not disembedded, but passed through the router. Each MADI input can receive up to 64 audio channels.

The router's port numbering scheme associates 64 audio port numbers *with a card*, unlike the disembedder/embedder cards which associate audio ports *with video ports*.

This numbering applies to a MADI input card in any slot.

The input backplane supports the 8 video signals on 8 of its connectors and the MADI stream on its 9th connector.

Thus, a MADI input card in slot 1 provides audio ports 1–64 and video ports 1–8. The card in slot 2 provides audio ports 145–208 and video ports 10–17, and so on. Other audio channels in the "space" of the card ***do not exist.***

Consecutive MADI input cards increment by 9 video ports and 144 audio channels. Consecutive cards follow the slot ordering for port numbers. Slot Order for Port Numbering on page 35.

3Gig/TDM Output

The 3Gig/TDM (i.e., MADI) output cards support 16 video signals and 2 MADI streams. The video might have embedded audio, but it will have been passed through the router with the video. Each MADI output can transmit 56 or 64 audio channels, switch-selectable.

The router's port numbering scheme associates 128 audio port numbers *with a card*, unlike the disembedder/ cards which associate audio ports *with video ports*.

This numbering applies to a MADI output card in any slot.

The output backplane supports the 16 video signals on 16 of its connectors and the 2 MADI streams on its 9th and 18th connectors.

A 3Gig/TDM output card in slot 1 provides video ports 1–8 and 10–17 and audio channels 1–64 and 145–208. For this card, other audio channels ***do not exist.***

Thus, a MADI output card in slot 2 supports video ports 19–26 and 28–35 and audio channels 289–352 and 433–496. A 3Gig/TDM card in slot 3 supports video ports 37–44 and 46–53 and audio channels 577–640 and 721–784, and so on. Other audio channels in the "space" of the card ***do not exist.***

Consecutive MADI output cards increment by 18 video ports and 288 audio channels. Consecutive cards follow the slot ordering for port numbers. Slot Order for Port Numbering on page 35.

The number scheme for MADI expansion output cards (used by the expanded NV8576-Plus only) is like the numbering scheme for MADI input cards. (MADI expansion output cards have 8 video outputs and 1 MADI outputs.)

Embedded Group Control

An NV8500 router can force embedded audio channels to be null. If all 4 channels of an embedded audio group are null, the group is null too. That is,

If a single channel is null, the output's embedder inserts silence for that channel.

If all 4 channels of an audio group are null, the embedder will omit the group from its outgoing data stream.

Routing null sources to an output is under operator control (or under control of automation).

Two conditions are required for the router to be able to do this:

- In MRC, you must define a "null audio source" for the router's synchronous audio level.
- An operator must perform takes of the designated null source(s) to the selected audio channels of the intended destination.

A "null audio source" can be any of the inputs in a synchronous audio partition of the router. It is recommended that you use a port number of one of a disembedder card's unused video ports (one where the video port number is a multiple of 9).

Nothing of the audio port's signal is used. The "null audio source" is an artifice that tells router firmware to handle the destination's targeted audio channel(s) in a certain way.

A port designated as the "null audio source" cannot also be used as a normal audio source.

- The use of embedded group control is not compatible with DHP.
- If a null source is routed to a MADI output, the take is rejected.
- Only NV8500 hybrid routers at v3.1.2 and later support embedded group control.
- In MRC, router levels that are not 'Synchronous Audio' do not support null audio sources. In the 'Router Levels' page of MRC, the 'Null Audio Source' field for these levels is not enabled.
- Whether an audio channel is null is a factor in the logic of disembedder/embedder output cards.

Slot Numbering

Physical slot ordering is primarily right-to-left (as you face the rear of the router.)

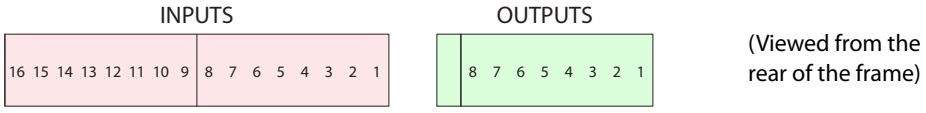
For the NV8576 frame and the NV8576-Plus frame, there is a different slot ordering for port numbers.

Physical Slot Ordering

When you face the rear of the router, the slots are numbered incrementally from right-to-left.

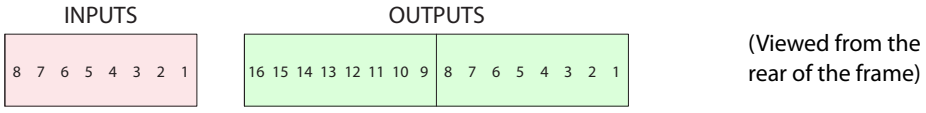
- NV8144

  Slot numbers increment from right-to-left:



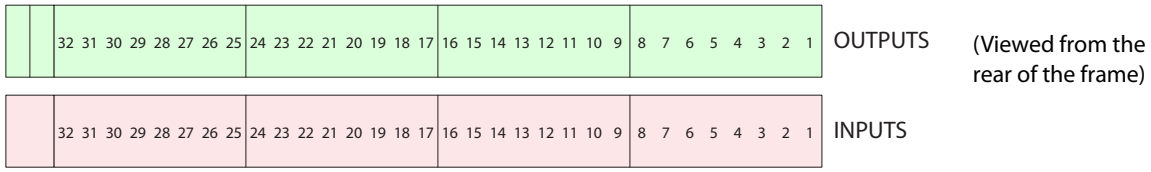
- NV8140

  Slot numbers increment from right-to-left:



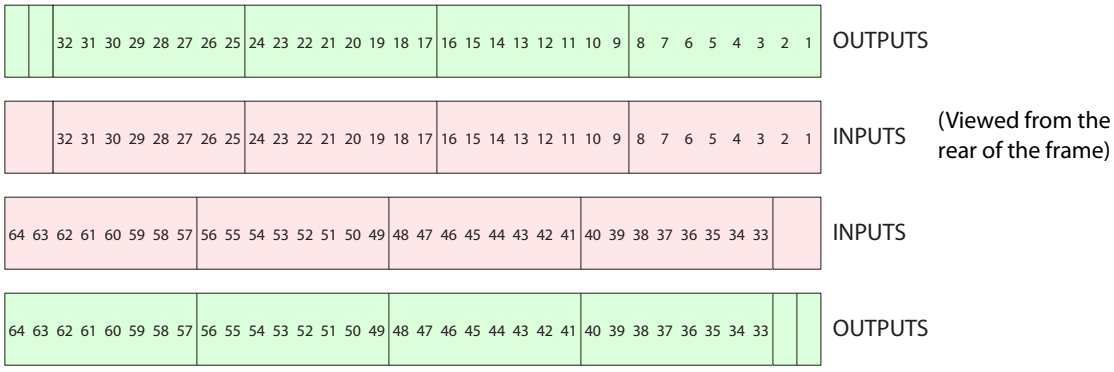
- NV8280

  Slot numbers increment from right-to-left.



- NV8576, NV8576-Plus

  Slot numbers increment from right-to-left in each bay:



  The slots are numbered from 1 to 64, both for inputs and for outputs.

  For the NV8576-Plus, slots in both frames have this same numbering.

The labels on the rear of the NV8576 and NV8576-Plus frames reflect this numbering. ***However, slots are ordered differently with respect to port numbering.***

Slot Order for Port Numbering

Port numbers increase with consecutive slots in the ordering for port numbers.

NV8140, NV8144 or NV820

Port numbering for the NV8140, NV8144, and the NV8280 follows the physical slot numbers.

NV8576

Slot ordering (for ports) for the NV8576 follows the ordering[1] shown in figures 2-5 and 2-6. An NV8576 has 64 output slots (32 upper and 32 lower) and 64 input slots (32 upper and 32 lower).

This is the ordering of slots for input port numbering, as viewed from the rear:

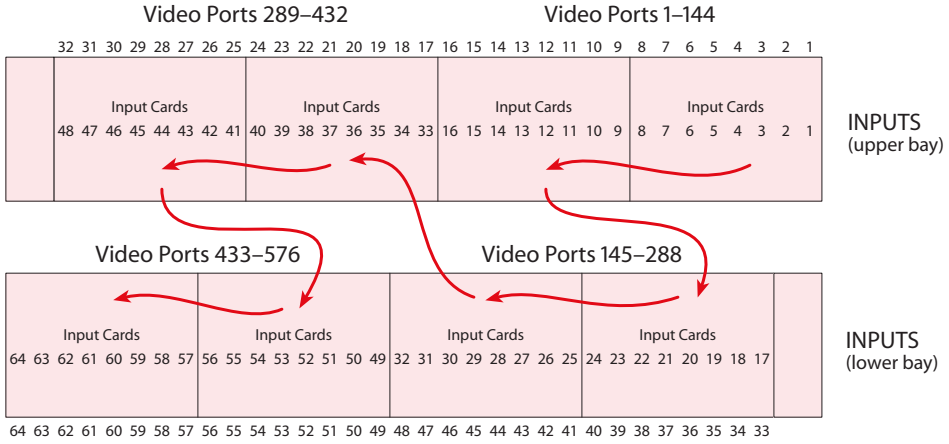


Fig. 2-5: NV8576 Slot Order for Input Port Numbering

1. The ordering places the ports in proximity to the crosspoint cards that service them.

This is the ordering of slots for output port numbering:

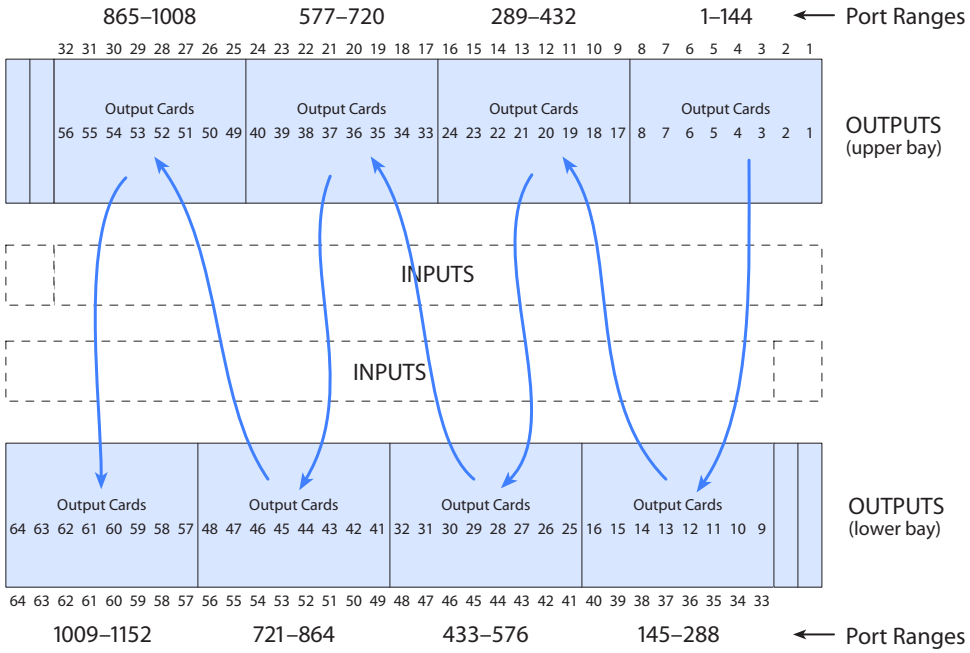


Fig. 2-6: NV8576 Slot Order for Output Port Numbering

NV8576-Plus

Port numbering for the NV8576-Plus follows the slot ordering shown in figures 2-7 and 2-8. An NV8576-Plus has 64 output slots (32 upper and 32 lower) and 64 input slots (32 upper and 32 lower).

This is the ordering of slots for input port numbering, as viewed from the rear:

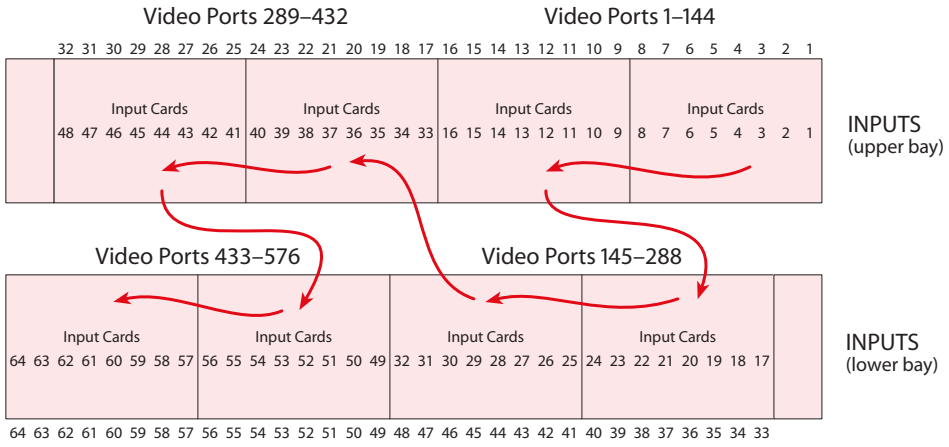


Fig. 2-7: NV8576-Plus Slot Order for Input Port Numbering

This is the ordering of slots for output port numbering:

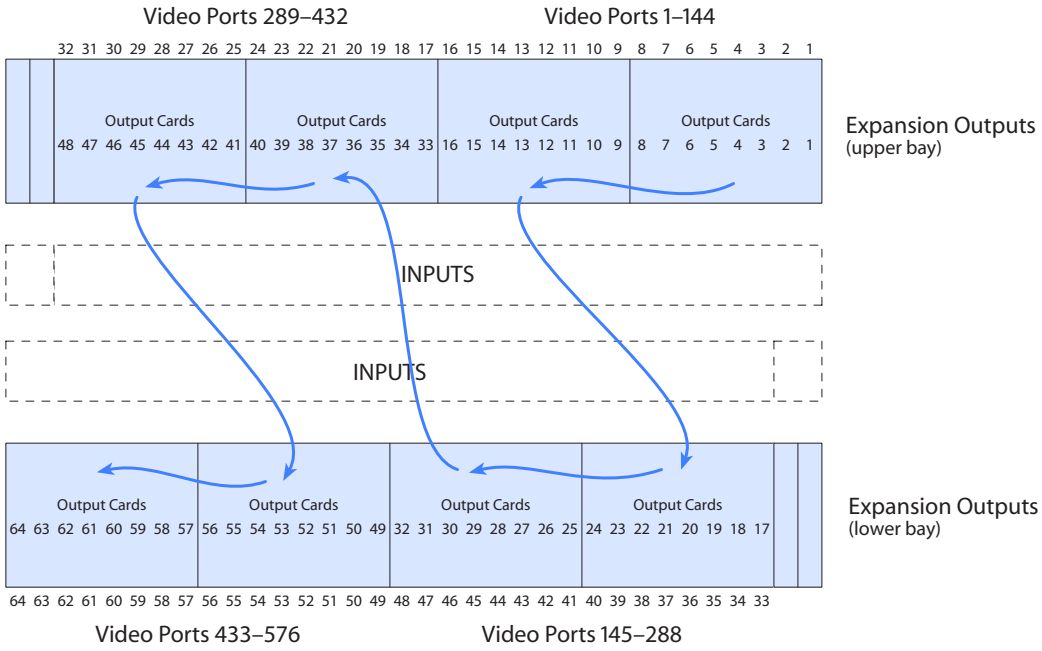


Fig. 2-8: NV8576-Plus Slot Order for Output Port Numbering

The video port ordering is the same for frame 2 of an expanded NV8576-Plus, but the video port numbering ranges from 577 to 1152 instead of from 1 to 576.

I/O Backplanes

Signals are received and distributed through backplanes installed in the rear of the router frame. For proper operation, each backplane must match its corresponding input card or output card. That means a coax backplane must match a coax I/O card and a fiber optic backplane must match a fiber optic I/O card.

However, a coax input backplane can match a standard input card (video or AES), a disembedder card, or a 3Gig/TDM (MADI) card, as long as the card is also designated "coax."

Standard and hybrid I/O cards can use the same backplanes for similar signals.

Fiber optic cards and backplanes are not used for hybrid I/O.

See Chapter 5, Monitoring on page 81 for information about monitor cards and their backplanes.

This table lists all I/O backplanes except the expansion backplanes used by the NV8576-Plus.

Backplane and Signal Type	Card Class	Input Connectors	Output Connectors	Cable
AES async[a] (coax, unbalanced)	Standard	9 DIN 1.0/2.3	18 DIN 1.0/2.3	Coax
AES async (twisted pair, balanced)	Standard	9 WECO	18 WECO	Twisted pair
HD (coax) (SD or HD)[b]	Standard	9 DIN 1.0/2.3	18 DIN 1.0/2.3	Coax
3Gig (coax) (SD, HD, or 3Gig)	Standard	9 DIN 1.0/2.3 18 DIN 1.0/2.3[c]	18 DIN 1.0/2.3	Coax
3Gig (fiber optic) (SD, HD, or 3Gig)	Standard	9 LC 18LC[c]	18 LC	Fiber optic
3Gig/TDM (coax) (SD, HD, or 3Gig, with MADI)	Hybrid	9 DIN 1.0/2.3 (8 used for video, 1 used for MADI) 18 DIN 1.0/2.3 (16 used for video, 2 used for MADI)[c]	18 DIN 1.0/2.3 (16 used for video, 2 used for MADI)	Coax
3Gig (coax) (SD, HD, or 3Gig) Audio disembedded or embedded w.r.t. the video stream	Hybrid	9 DIN 1.0/2.3 (1 unused) 18 DIN 1.0/2.3 (2 unused)[c]	18 DIN 1.0/2.3 (2 unused)	Coax
Frame sync[d] 3Gig (coax) (SD, HD, or 3Gig) Audio disembedded	Hybrid	9 DIN 1.0/2.3 (1 unused); 1 RJ-45	—	Coax
M3 (output only)	Standard	—	One 16-pin M3, 2 DIN 1.0/2.3	M3, Coax

a. The NV8140 does not support AES async.
b. The NV8140 does not have HD backplanes specifically. It uses 3Gig backplanes for HD signals.
c. The NV8140 uses 18-connector input backplanes.
d. Frame sync cards and backplanes are not available for the NV8140.

For information about the expanded NV8576-Plus, see Chapter 6, *Expanded NV8576-Plus* on page 89.

Figure 2-9 shows I/O backplanes, except for the expansion output backplanes used by the NV8576-Plus. For information about the expanded NV8576-Plus, see Chapter 6, Expanded NV8576-Plus on page 89:

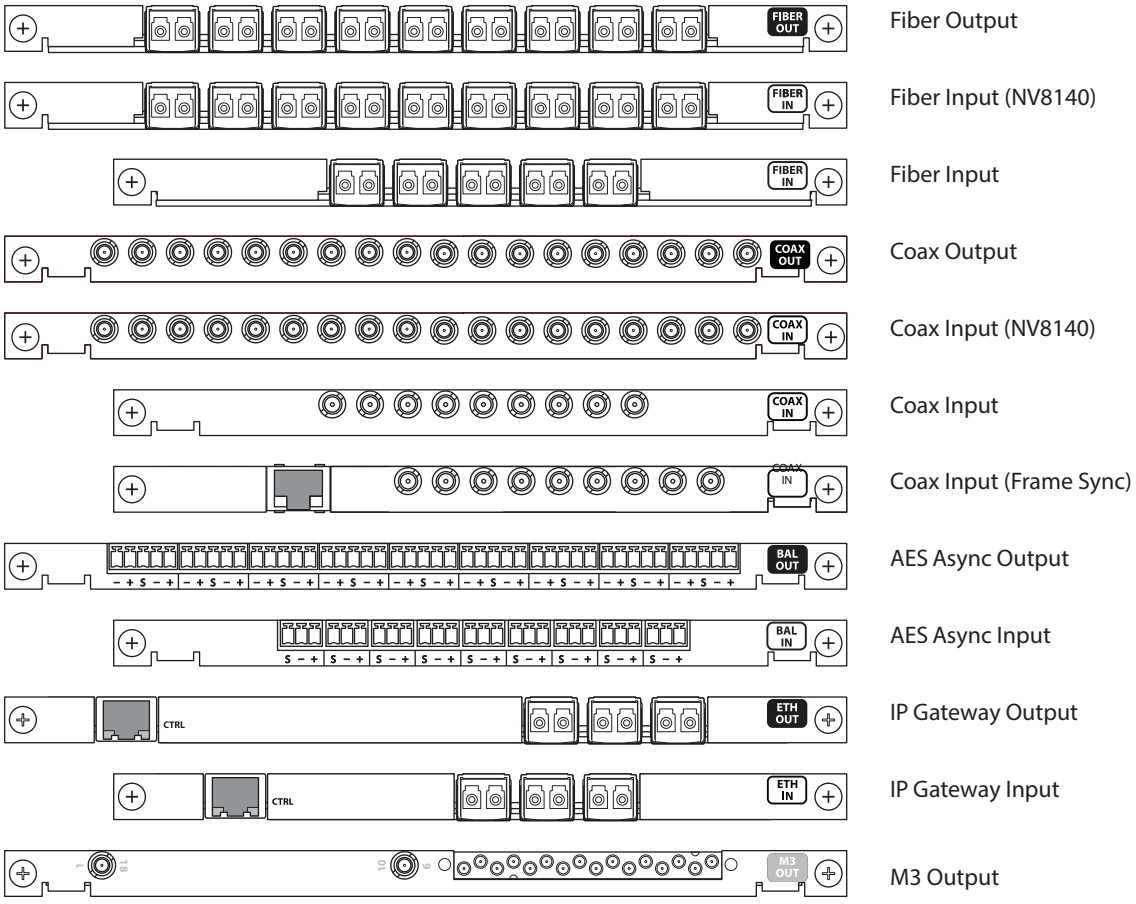


Fig. 2-9: I/O Backplanes

Note that backplanes using DIN 1.0/2.3 or WECO connectors are passive; backplanes using SFP (fiber optic) connectors have active circuitry.

Installing I/O Backplanes

Routers are delivered with all backplane modules installed. However, at some point you may need to change backplanes. Before doing so, consult with Grass Valley Technical Support to ensure proper operation.

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

To Install an I/O Backplane

1 Facing the rear of the router, locate the slot into which the backplane is being installed.

2 Insert the backplane into the frame being sure to align the backplane's printed circuit board with the 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 frame and NV8576-Plus frame have upper and lower regions that mirror each other:

- Install backplanes in the upper region “right side up” so that the label is at the top.
- Install backplanes in the lower region rotated 180° so that the backplanes are “upside down” and the label is at the bottom.

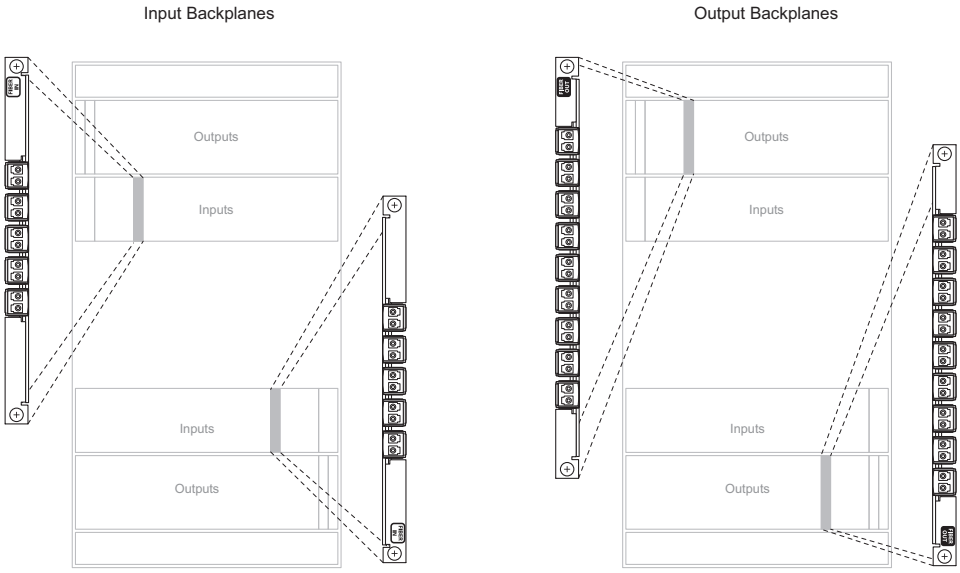


Fig. 2-10: Example of Input Backplanes in NV8576 Frame (Rear View)

3 Tighten the two spring-loaded backplane retention screws. Repeat for other backplanes.

Backplanes Having SFP Modules

Fiber-optic backplane modules use 2-port SFP connectors:

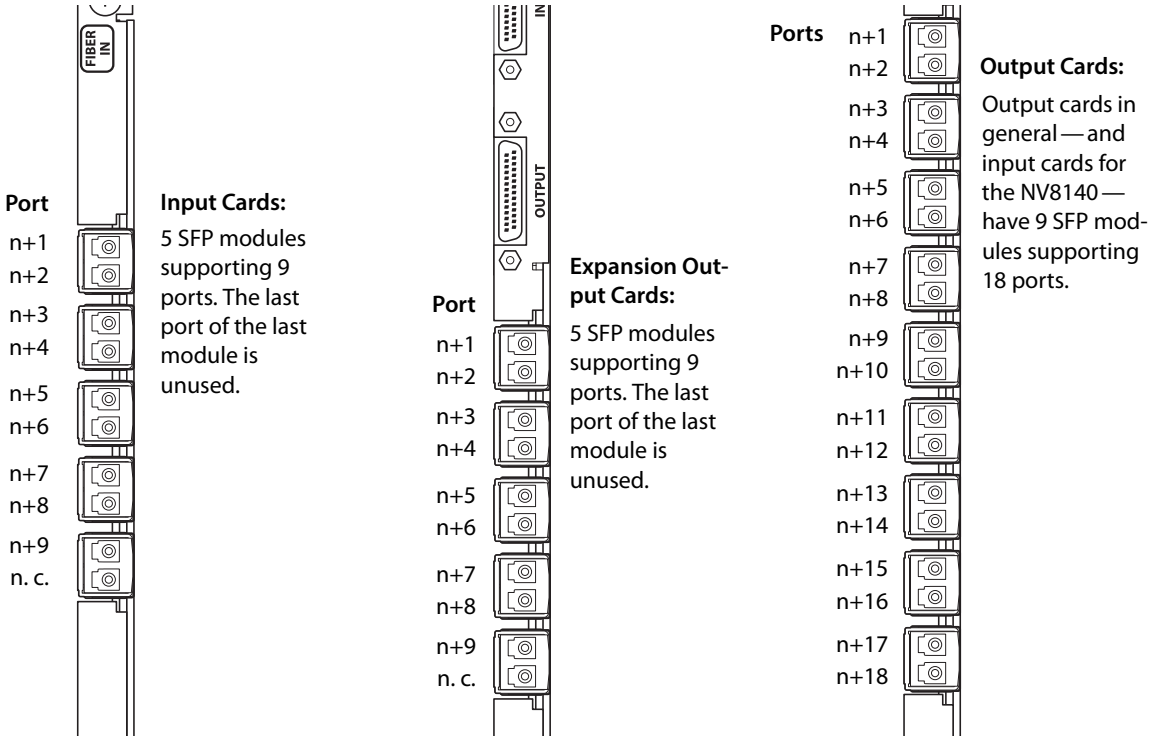


Fig. 2-11: SFP Connectors

Interchangeable SFP modules fit in SFP cages on the backplane modules. The standard SFP module has 2 ports that operate at 1310 nanometers. These are receivers on the input backplane modules, or transmitters on the output and expansion output backplane modules.

The output and expansion output backplane modules can also accept SFP modules whose ports have differing wavelengths. When a backplane module is populated with such SFP modules, it can support connection to one or more CWDM multiplexers. The CWDM multiplexers accept up to 18 fiber-optic signals. The signals must each have a different wavelength. The range of wavelengths accepted is 1271 nm to 1611 nm.

SFP Modules in NV8576 Frames

Because output cards in the lower bays of the NV8576 frames are rotated 180° with respect to the output cards in the upper bays, the orientation of SFP modules in the lower bays is likewise rotated 180° with respect to those in the upper bays.

The SFP modules in the upper bay face left and have the “B” port at the top whereas the SFP modules in the lower bay face right and have the “B” port at the bottom. Figure 2-12 shows this:

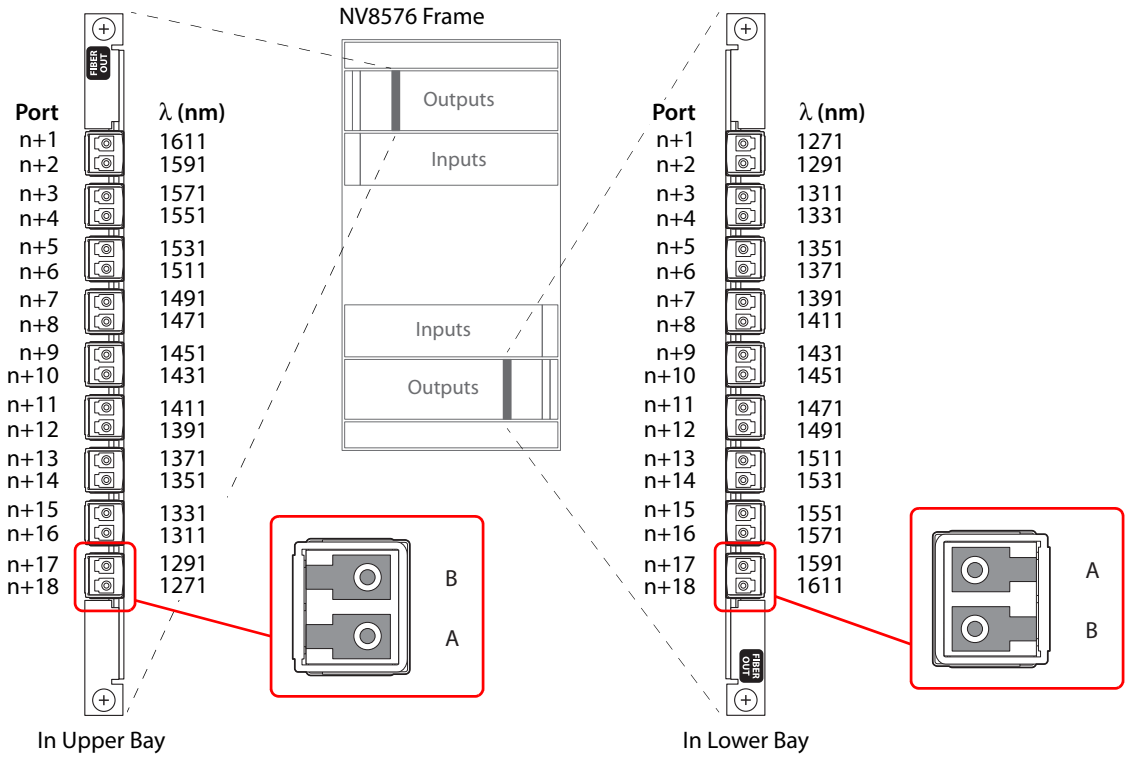


Fig. 2-12: SFP Modules in Output Backplanes

Persons who connect SFP modules to CWDM multiplexers should be aware of the difference in orientation.

Figure 2-12 also shows a suggested ordering for the SFP wavelengths. It is not the only ordering possible, but it has the advantage of being uniform and identical in both orientations. A fiber-optic backplane module thus populated can be used in either the upper or lower bays.

- The orientation of SFP modules in input backplane modules is not an issue. Input cards can use standard SFP modules having two 1310 nm ports in all cases.

SFP Modules in NV8576-Plus Frames

NV8576-Plus frames use expansion output cards and backplane modules. Expansion output backplane modules have 5 SPF modules supporting 9 SFP ports. The last port of the last module is not used.

The SFP modules in the upper bay face left and have the "B" port at the top whereas the SFP modules in the lower bay face right and have the "B" port at the bottom. Figure 2-13 shows this:

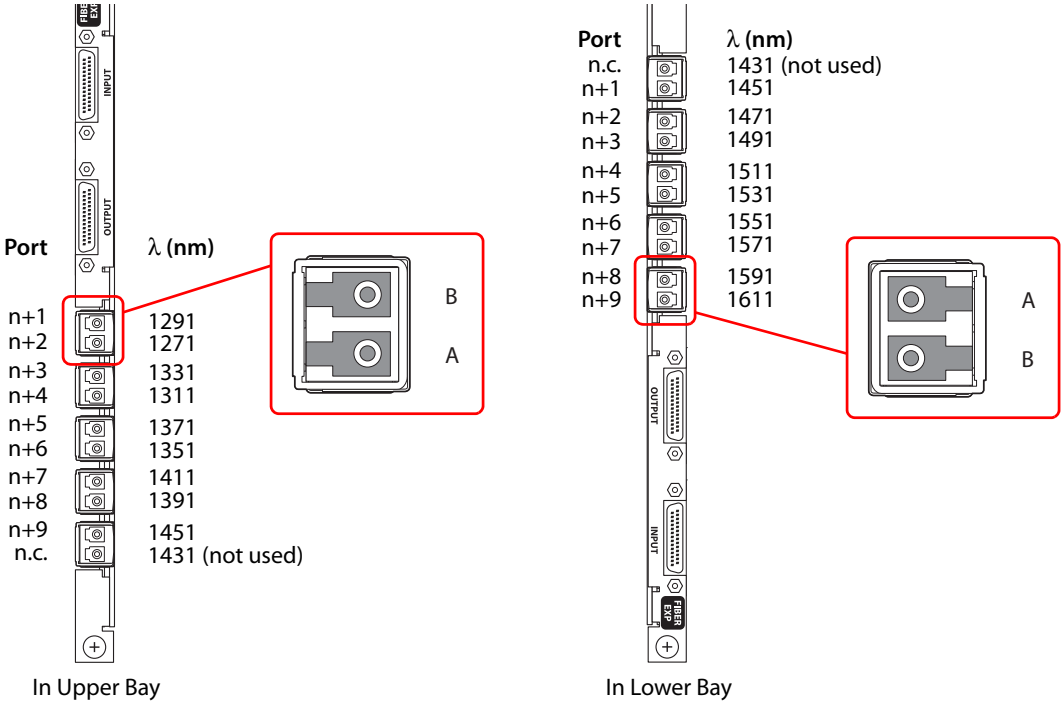


Fig. 2-13: Expansion Output Backplanes

The wavelength of the unconnected port of the last SFP module on the backplane cannot be used.

The CWDM multiplexer can receive signals from any of the (live) ports of the router. However, its use with 9-port expansion output cards is slightly less efficient than with the 18-port output cards.

SFP Modules in NV8280, NV8140, and NV8144 Frames

The SFP modules for these routers are oriented as shown in Figure 2-12 for the *upper bays*.

In addition, the ports of fiber-optic output backplanes are numbered as shown in Figure 2-12.

I/O Cards

Different types of input cards and output cards can be inter-mixed in a single frame. For each I/O card installed, a corresponding backplane must also be installed. (See I/O Backplanes on page 37.)

All input cards and output cards have a circuit that reports status (to the router's control card) and drives the card's functions. LEDs on the front of the card also indicate the card's status. See Indicator LEDs on page 165.

These are the I/O cards for all routers except the NV8140:

Input Card Type	Signals	Remarks
Standard HD input	9 video	Accepts HD or SD; coax
Standard 3Gig input	9 video	Accepts 3Gig, HD, or SD; coax or fiber
AES async input	9 audio	Accepts AES pairs; coax or twisted pair (STP)
Disembedder	8 video	Accepts 3Gig, HD, or SD, coax only; can disembed 16 embedded audio channels for each video port
Frame sync (disembedder)	8 video + 1 RJ-45	Accepts 3Gig, HD, or SD, coax only; can disembed 16 embedded audio channels for each video port. Additional RJ-45 port for configuring frame sync functions.
3Gig/TDM input	8 video + 1 MADI	Accepts 3Gig, HD, or SD and a MADI stream up to 64 channels; coax only

Output Card Type	Signals	Remarks
Standard HD output	18 video	Accepts HD or SD; coax
Standard 3Gig output	18 video	Accepts 3Gig, HD, or SD; coax or fiber
M3	18 video	Accepts 3Gig, HD, or SD; M3 and coax
AES async output	18 audio	Accepts AES pairs; coax or twisted pair (STP)
Embedder	16 video	Accepts 3Gig, HD, or SD, coax only; can re-embed 16 audio channels for each video port
Disembedder/embedder	16 video	Accepts 3Gig, HD, or SD, coax only; can re-embed 16 audio channels for each video port; special functions
3Gig/TDM output	16 video + 2 MADI	Accepts 3Gig, HD, or SD and 2 MADI streams, 56 or 64 channels each; coax only

Expansion Output Card Type[a]	Signals	Remarks
Standard HD output	9 video	Transmits HD or SD; coax
Standard 3Gig output	9 video	Transmits 3Gig, HD, or SD; coax or fiber
AES async output	9 audio	Transmits AES pairs; coax or shielded twisted pair (STP)
Embedder	8 video	Transmits 3Gig, HD, or SD, coax only; can re-embed 16 embedded audio channels for each video port
Disembedder/embedder	8 video	Transmits 3Gig, HD, or SD, coax only; can re-embed 16 audio channels for each video port; special functions
3Gig/TDM output	8 video + 1 MADI	Transmits 3Gig, HD, or SD and 1 MADI streams, 56 or 64 channels; coax only

a. Applies only to the NV8576-Plus routers.

These are the input and output card types for the NV8140

NV8140 Card Type	Signals	Remarks
Standard 3Gig input	18 video	Accepts 3Gig, HD, or SD; coax or fiber
Standard HD input	18 video	Accepts HD or SD, coax only
Disembedder	16 video	Accepts 3Gig, HD, or SD, coax only; can disembed 16 embedded audio channels for each video port
3Gig/TDM input	16 video + 2 MADI	Accepts 3Gig, HD, or SD and 2 MADI streams up to 64 channels each; coax only
Standard 3Gig output	18 video	Accepts 3Gig, HD, or SD; coax or fiber
Embedder	16 video	Accepts 3Gig, HD, or SD, coax only; can re-embed 16 audio channels for each video port
Disembedder/embedder	16 video	Accepts 3Gig, HD, or SD, coax only; can re-embed 16 audio channels for each video port; special functions
3Gig/TDM output	16 video + 2 MADI	Accepts 3Gig, HD, or SD and 2 MADI streams, 56 or 64 channels each; coax only

The expansion output cards all have two inter-frame connections, in addition to their output connectors.

For signal reclocking rates, see Signal Types and Rates on page 2.

NV8500 series routers can transport DVB-ASI and similarly formats.

AES Async

AES async cards are standard cards, not hybrid.

AES async signals are AES pairs (normally stereo pairs). In NV8500 series routers, they do not require an AES reference signal.

For instructions on making AES reference connections, see Audio and Video References on page 57.

▲ The NV8140 does not support AES async.

Input

The AES async input card receives up to 9 balanced or unbalanced signals through local I/O connectors: DIN 1.0/2.3, for unbalanced signals or WECO, for balanced signals. An incoming signal can be distributed to any or all AES outputs.

Each input card has 9 AES receivers. The AES receiver distributes the signal to the motherboard. The motherboard forwards the signal to the crosspoint cards for distribution to output cards. The input card also sends its signals to a monitor selector for forwarding to the monitor card. (See Monitoring on page 81.)

Output

The AES async output card receives 18 signals from the crosspoint card (via the motherboard). The card contains 18 transmitters. Each transmitter creates 2 copies of the outgoing signal, feeding one copy to a connector and one copy to a monitor selector. The monitor selector sends

one output to the motherboard, which in turn forwards the signal to a monitor card. (See Monitoring on page 81.)

The following diagram shows the flow through AES async I/O cards. The crosspoint card uses its crosspoint matrix for routing AES signals to AES output cards. The TDM matrix (shown for reference) is used only for hybrid audio signals.

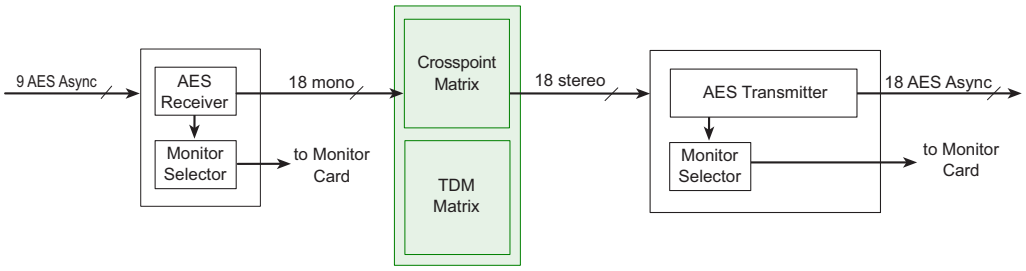


Fig. 2-14: AES Async Signal Flow

HD or 3Gig (Standard)

Standard 3Gig I/O cards are available in coax or fiber versions.

Standard HD cards are available in coax versions only.

Video signals require a video reference for proper switching. See Making Reference Connections on page 58.

Any embedded audio signals are passed, unmodified, through the router to output.

Reclockers on the output card may be turned "on" or "off" using the **Miscellaneous Settings** page in MRC. Reclockers are only available for coax signals, not for fiber optic signals. For more information, see the *Miranda Router Configurator User's Guide*.

Input

For all NV8500 routers except the NV8140, the standard HD input card and the standard 3Gig input card can receive 9 video signals. For the NV8140, the standard 3Gig input card can receive 18 video signals.

Ports on the HD card can receive either SD or HD; ports on the 3Gig card can receive SD, HD, or 3Gig. Each card has a cable equalizer for each port that distributes the signal to the motherboard. The motherboard forwards the signal to the crosspoint cards for distribution to output cards. An incoming signal can be distributed to any or all video outputs, except that 3Gig signals cannot be routed to HD outputs. The card also distributes the signal to a monitor selector for forwarding to a monitor card. (See Monitoring on page 81.)

Output

Ports of the standard HD output card accept either SD or HD; ports of the 3Gig output card accept SD, HD, or 3Gig signals. Each output card receives 18 signals from a crosspoint card (via the motherboard). Each of the 18 ports has a re-clocker. The re-clocker creates two copies of the signal, feeding one copy to a cable driver and one copy to a monitor selector. The cable driver

forwards the signal to a connector. The monitor selector forwards the signal, via the motherboard, to a monitor card. (See Monitoring on page 81.)

Note

Cable drivers are not present on fiber optic output cards

The following diagram shows the flow of a signal through HD or 3Gig standard I/O cards.

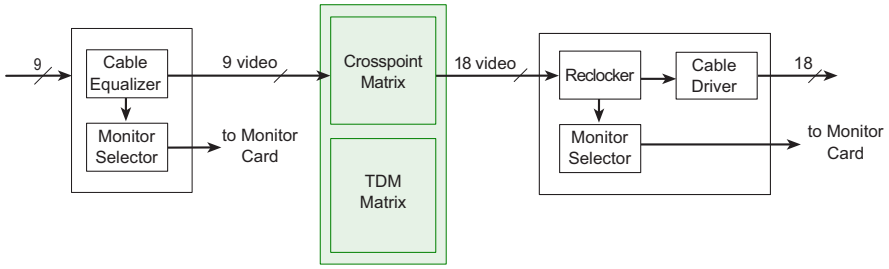


Fig. 2-15: Block Diagram of HD or 3Gig I/O Signal Flow

Hybrid (3Gig)

Note: Most hybrid cards require coax connectors. They do not use fiber backplanes.

With 3Gig hybrid I/O cards, the router can switch embedded audio channels independently.

Hybrid cards in this classification are the *disembedder* (input) card, the *embedder* (output) card, and the *disembedder/embedder* (output) card. For NV8500 routers other than the NV8140, a disembedder card has 8 disembedders, one for each video input. For the NV8140, a disembedder card has 16 disembedders, one for each video input.

An embedder output card and a disembedder/embedder output card each have 16 embedders, one for each output.

A disembedder on an input card extracts the embedded audio from its video stream. The audio is then forwarded to the TDM audio "matrix" for routing.

Frame sync input card can be considered disembedder cards that have an additional RJ-45 port for configuring frame sync functions.

Embedders on an output card re-integrate audio signals from up to 16 sources into the outgoing video stream.

The disembedder/embedder output card has a disembedder and 16 audio multiplexers, in addition to the embedder, for each output. Router logic can select for each audio channel of each output one of the following sources: (1) the equivalent audio channel from the video at the output, (2) generated silence, or (3) audio from other sources, via the TDM audio matrix.

If a disembedder detects a Dolby E pair in its video stream, the disembedder instantly phase-aligns the channel pair. Long-term phase alignment is provided for all other channels. If the Dolby E signal is off-rate, the router adds or drops samples in the Dolby E guard band to maintain Dolby signal integrity.

Hybrid I/O cards require the installation of hybrid control cards and hybrid crosspoint cards in the router.

Embedder State for Embedder Output Cards

Embedders can receive video and audio from a standard video input card. In such a case, the embedder card passes the video and audio unmodified through to output, *bypassing the embedder* for that output. In such a case, we say the embedder is "off."

However, when the embedder receives audio from (one or more) audio sources such as a disembedder card or a MADI input card, the embedder passes the audio from the TDM matrix to the embedder which multiplexes the different audio streams into its video output. In this case, we say the embedder is "on."

The router turns an output's embedder on or off automatically according to *switching rules*. (See Switching Rules on page 73). However, every input has a "force" attribute (that can be set in MRC).

When the "force" attribute is ON, the output's embedder is forced on.

When the "force" attribute is "Use Switching Rules," the output's embedder is ***not*** forced, but left in its automatically generated state.

Note: This attribute is specified in MRC's 'Input Attributes' page.

Note: if your router uses DHP, the setting for all inputs should be "Use Switching Rules."

State of Disembedder/Embedder Output Cards

The disembedder/embedder output card has a disembedder and 16 audio multiplexers, in addition to the embedder, for each output. Router logic can select for each audio channel of each output one of the following sources: (1) the equivalent audio channel from the video at the output, (2) generated silence, or (3) audio from other sources, via the TDM audio matrix.

Each multiplexer is controlled by its audio channel's 'null' flag and 'pass-through' flag. If the 'null' flag is set, the channel is null. The channel carries silence unless all 4 channels in a group are null, in which case, the entire group is omitted from the output.

If the channel is not null, it receives audio from the same channel of the video at the output if its pass-through flag is set. Otherwise, it receives audio from another source through the TDM matrix.

- Embedders of disembedder/embedder output cards are not affected by the "force" attribute as are the embedders of embedder cards. The embedders of disembedder/embedder cards are always on.
- The use of pass-through audio is not compatible with DHP. Thus, disembedder/embedder output cards are not compatible with DHP.

Combining Standard and Hybrid

DHP (dynamic hybrid pathfinding) is an NV9000 service that allows NV8500 series routers to disembed and embed audio signals in video streams with relatively few hybrid 3Gig cards installed. With DHP, the router passes standard 3Gig inputs through an internal pool of disembedder and embedder cards. The audio from several standard input cards can be recombined and re-embedded on output.

DHP allows you to populate the router with several relatively inexpensive standard I/O cards and just a few hybrid I/O cards and still have the benefits of hybrid routing.

For more information about using DHP, see the *DHP Reference Manual*.

Input

For NV8500 routers other than the NV8140, the hybrid disembedder card and the frame sync input card receive up to 8 video streams composed of either SD, HD or 3Gig signals.

For the NV8140, the hybrid disembedder card receives up to 16 video streams composed of either SD, HD or 3Gig signals. (The NV8140 does not have frame sync cards.)

Each stream can carry up to 16 embedded audio channels for a total of 128 audio channels or, in the case of the NV8140, up to 256 audio channels.

Each video stream is forwarded to a cable equalizer and then to a disembedder. The card automatically detects whether the video format has embedded audio. Embedded audio channels are forwarded to an audio TDM MUX and then to the motherboard for distribution to the crosspoint cards. Similarly, the video signals are forwarded to the motherboard, which distributes the signals to the crosspoint cards.

With the exception of the NV8140, the input card also distributes one signal to a monitor selector for distribution to a monitor card. (See Monitoring on page 81). The NV8140 does not support monitoring.

Output of Embedder Cards

The hybrid embedder card receives 16 video signals (SD, HD or 3Gig) from the crosspoint cards (via the motherboard). It accepts 256 audio signals from the TDM matrix. The card has 16 embedders. Each embedder embeds 16 audio (AES or Dolby E) channels from multiple sources into a video stream. The embedder then forwards the output to a reclocker. The card's reclockers sends one copy of each signal to the monitor selector and another copy to the cable drivers, ultimately to the output connectors. Except in the NV8140, the monitor selector is 16×1 MUX that sends its output to a monitor card. The NV8140 does support monitoring. (See Monitoring on page 81.)

Note: Hybrid embedder cards mute during a control card fail-over.

Note: It is possible in MRC to cause the reclockers on the output card either to be used or to be bypassed individually for each output of the router. These attributes are specified in the 'Output Attributes' page of MRC.

The following diagram shows the flow of a signal through hybrid embedder cards. Video signals are routed through the crosspoint matrix. Audio signals are routed through the TDM matrix.

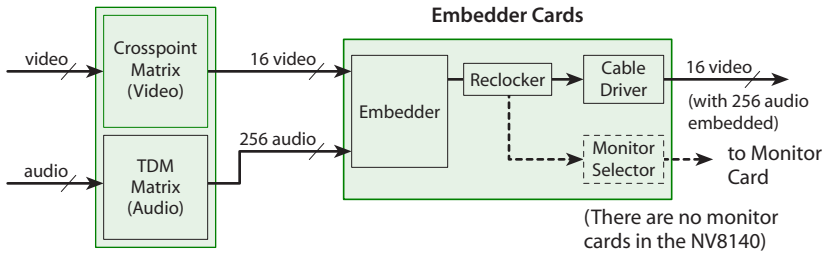


Fig. 2-16: Block Diagram of Hybrid 3Gig Signal F low

Output of Disembedder/Embedder Cards

The disembedder/embedder card receives 16 video signals (SD, HD or 3Gig) from the crosspoint cards (via the motherboard). It accepts audio signals from the TDM matrix. The card has 16 embedders. Each embedder embeds 16 audio (AES or Dolby E) channels from multiple sources into a video stream. The embedder then forwards the output to a reclocker. The card's reclockers

sends one copy of each signal to the monitor selector and another copy to the cable drivers, ultimately to the output connectors. Except in the NV8140, the monitor selector is 16×1 MUX that sends its output to a monitor card. The NV8140 does support monitoring. (See Monitoring on page 81.)

The following diagram shows the flow of a signal through hybrid disembedder and embedder cards. Video signals are routed through the crosspoint matrix. Audio signals are routed through the TDM matrix.

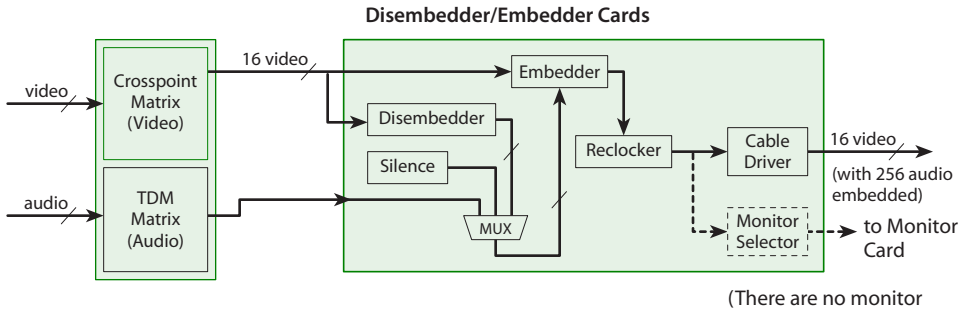


Fig. 2-17: Block Diagram of Hybrid 3Gig Signal F low

The disembedder/embedder output card has — for each embedder — a disembedder and 16 audio multiplexers. Router logic selects for each audio channel of each output one of the following sources: (1) the equivalent audio channel from the video at the output, (2) generated silence, or (3) audio from other sources, via the TDM audio matrix.

Each multiplexer is controlled by its audio channel's 'null' flag and 'pass-through' flag. If the 'null' flag is set, the channel is null. The channel carries silence unless all 4 channels in a group are null, in which case, the entire group is omitted from the output.

If the channel is not null, it receives audio either from the same channel of the video at that output if its pass-through flag is set. Otherwise, it receives audio from another source through the TDM matrix.

▲ **Note:** Hybrid disembedder/embedder cards mute during a control card fail-over.

Hybrid (3Gig/TDM)

For routers other than the NV8140, hybrid 3Gig/TDM input cards receive 8 video stream plus 1 MADI stream. For the NV8140, hybrid 3Gig/TDM input cards receive 16 video stream plus 2 MADI streams. The input cards accept MADI streams of up to 64 channels. Audio embedded in the video streams is not disembedded and passes through the router unchanged. The audio channels carried in the MADI stream are routed through the TDM matrix. MADI signals are locked to 48 kHz. (See Audio and Video References on page 57.)

Hybrid 3Gig/TDM output cards (1) receive 24-bit PCM audio with AES channel status (C), user (U) and validity (V) bits preserved, (2) insert 24-bit silence with valid C, U, V bits on inactive channels, and (3) perform phase alignment of all channels.

Note: the routers can receive and transmit Dolby E as a pair of channels in a MADI stream.

Hybrid I/O cards require the installation of hybrid control cards and hybrid crosspoint cards in the router. Although the installation of one or more hybrid 3Gig/TDM output cards is recommended, it is possible to switch outgoing audio signals from MADI inputs to hybrid embedder cards.

An NV8900 interface can be used with MADI (3Gig/TDM) cards to convert your facility's AES signals or analog audio signals into a MADI stream, or to convert an outgoing MADI stream into discrete AES signals or analog audio signals.

NV8900 MADI Interfaces

The NV8900 MADI interfaces convert discrete audio signals to MADI and vice versa. There are 6 NV8900 models:

AES, balanced to MADI	MADI to AES, balanced	DB25 connectors
AES, unbalanced to MADI	MADI to AES, unbalanced	Coax connectors
Analog audio to MADI	MADI to analog audio	DB25 connectors

All are 1RU interfaces.

The MADI converters allow you to (1) concentrate discrete audio signals in a MADI stream, conserving router inputs and outputs, and (2) pass discrete audio signals through a router's TDM switching matrix, where they can be re-combined. (Signals on AES async cards are not passed through the TDM matrix.)

The NV8900 AES-to-MADI converters receive 32 AES pairs and multiplex them into one MADI stream.

The NV8900 AA-to-MADI converter receives 64 analog signals pairs and multiplexes them into one MADI stream.

The NV8900 MADI-to-AES converters extracts 32 AES pairs from a MADI stream.

The NV8900 MADI-to-AA converters extracts 64 analog signals from a MADI stream.

Input

For all NV8500 routers except the NV8140, the 3Gig/TDM input card receives 8 3Gig video signals (SD, HD or 3Gig) and one MADI stream composed of up to 64 (mono) channels through 9 DIN 1.0/2.3 connectors. Each card has 8 cable equalizers, one for each of the 8 video signals.

For the NV8140, the 3Gig/TDM input card receives 16 3Gig video signals (SD, HD or 3Gig) and 2 MADI streams, each composed of up to 64 (mono) channels through 9 DIN 1.0/2.3 connectors. Each card has 16 cable equalizers, one for each of the 16 video signals.

Each cable equalizer distributes the video signal to the motherboard. The motherboard forwards the signal to the hybrid crosspoint cards for distribution to output cards. An incoming signal can be distributed to any or all hybrid output cards. The card's video inputs can also be distributed to any standard output card. The card also distributes a video signal to a monitor selector for distribution to a monitor card. (See Monitoring on page 81.)

Any embedded audio in the video stream is passed through the router with the video signal. The audio is not disembedded.

One MADI stream is received though one input connector at a sample rate of 48 kHz (i.e., samples per second). The router can receive any number of MADI channels (up to 64) in a stream.

The MADI input stream can carry Dolby E pairs as well as AES pairs. Because the MADI stream is locked to your house reference, Dolby E signals coming in faster or slower than the house reference will have samples added or dropped to match your house reference rate.

Each MADI signal is transformer-coupled to remove "noise" and forwarded to a MADI receiver. The receiver extracts clock and data, removing any unnecessary synchronization information.

The signal is then forwarded to an audio TDM MUX and onward to the motherboard for forwarding to the crosspoint cards.

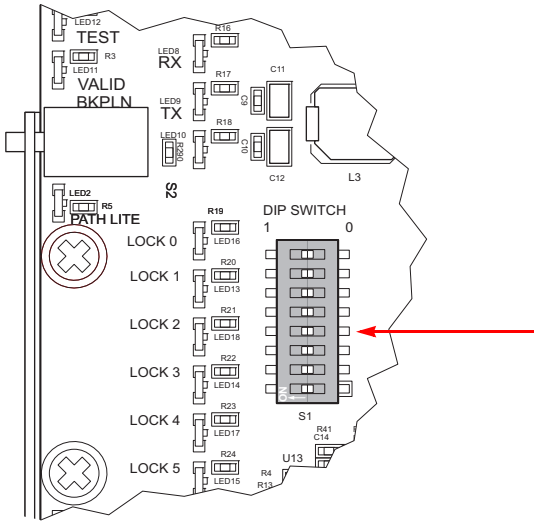
Setting the MADI Input Card's EQ State

You can configure the MADI input card so that it performs equalization (EQ) on the card's MADI signals. Normally EQ is turned off. Some installations might, however, require equalization depending on the length of cables for the video signals. To set the EQ state for MADI input cards:

1 Locate the MADI input card to change.

2 Remove the card from the router frame.

3 Locate DIP switch 4:



Switch 4 is near the front of the board, in the 4th position on the DIP labeled S1.

4 Using a small, pointed object, such as a ball point pen, slide the switch to **ON** or **OFF** to configure the equalization state:

ON — EQ is on.

OFF — EQ is off.

5 Repeat for other MADI input cards you want to change.

Note that this is not required for MADI *output*.

Output

The MADI output card receives 16 video signals (SD, HD or 3Gig) from the crosspoint matrix and up to 128 audio signals from the TDM matrix (via the motherboard) and forwards the signals to its backplane's connectors. The audio is multiplexed into two MADI streams, each stream and the channel within the stream is selected based on the destination of the audio channel.

The output card's TDM selector combines the audio channels into a single output and then forwards the output to a MADI transmitter. The transmitter's cable driver forwards the MADI signal to its connector.

The video signals received from the crosspoint card are sent to a reclocker and then a cable driver for distribution to backplane connectors. Embedded audio in the video streams is passed through the router with its video.

A copy of the MADI and video signals are sent to a monitor card. (See Monitoring on page 81.)

The following diagrams shows the flow of a signal through MADI I/O cards. The hybrid crosspoint card uses a TDM matrix to switch audio signals from hybrid I/O cards. Video signals are managed by a crosspoint matrix.

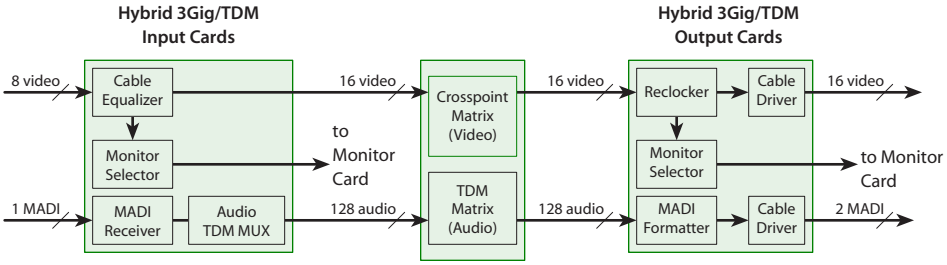


Fig. 2-18: Flow for Routers other than the NV8140

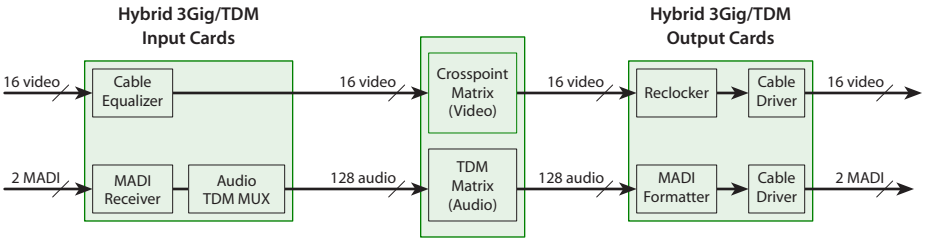


Fig. 2-19: Flow for the NV8140

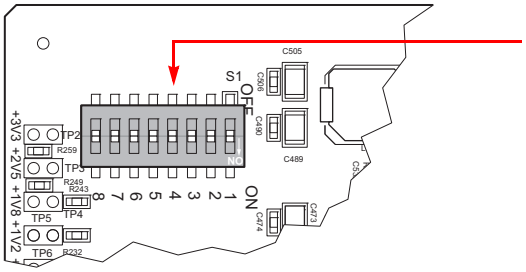
Setting the Number of MADI Channels

You can configure the MADI output card for 56 or 64 channels (at 48 kHz). To set the number of MADI channels:

1 Locate the MADI output card to change.

2 Remove the card from the router frame.

3 Locate DIP switch 4:



Switch 4 is at the top left corner of the board, in the 4th position on the DIP labeled S1.

4 Using a small, pointed object, such as a ball point pen, slide the switch to **ON** or **OFF** to configure the channel mode:

ON — 56 channel mode.

OFF — 64 channel mode.

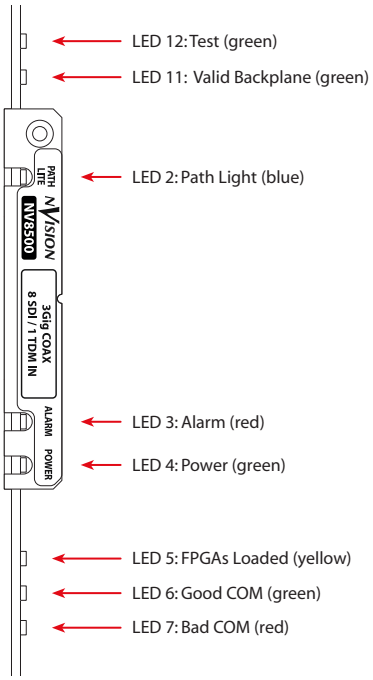
5 Repeat for other MADI output cards you want to change.

Note that this is not required for MADI *input*.

Installing I/O Cards

I/O cards slide into a (color-coded) card guide. Connectors at the rear of the card mate with connectors on the motherboard. The ejector lever of each card is color-coded to match the color of the card guides into which the card is to be inserted.

As you install cards, observe their LEDs:



This illustration shows the front of a hybrid 3Gig/TDM (MADI) input card.

In general, there are many LEDS of different colors across the circuit board. It is recommend that you look only at the few LEDs at the very front of the I/O card.

If the 'Valid Backplane' LED on the card lights, the card and the backplane in the same slot match correctly. You will probably want to verify that the 'Good COM' LED is on and the 'Bad COM' LED is off. (For more details about LEDs, Indicator LEDs on page 165.)

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

Installing I/O Cards in the NV8144 or NV8280

1 Facing the front of the router frame, locate the card bays.

For the NV8144, see Figure 1-4 on page 7.

For the NV8280, see Figure 1-8 on page 11.

2 Insert input cards into the input card bay of the frame. Insert output cards into the output bay. Use the card guides for reference:

- Input cards go in slots with *red* card guides.
- Output cards go in slots with *white* card guides.

It is not possible to install an I/O card in the wrong bay. Input cards and output cards are of different size.

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

4 Close the frame door after all cards have been installed. The door must be closed for the router cooling system to work properly.

Installing I/O Cards in the NV8140

1 Facing the front of the router frame, locate the card bays. See Figure 1-6 on page 9.

2 Insert input cards into the input card bay of the frame. Insert output cards into the output bay. Use the card guides for reference:

- Input cards (with red ejector levers) go in slots with *red* card guides.
- Output cards (with white ejector levers) go in slots with *white* card guides.

It is not possible to install an I/O card in the wrong bay. Connectors for Input cards and output cards have different orientations.

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

4 Close the frame door after all cards have been installed. The door must be closed for the router cooling system to work properly.

Installing I/O cards in the NV8576 or NV8576-Plus

1 Facing the front of the router frame, locate the card bays. (see Figure 1-10 on page 14.)

2 Insert input cards into an input card bay of the frame. Input card guides are red and the cards' ejector levers are also red:

- In the upper bay, the card is right-side up, that is, its *red* ejector lever is at the bottom.
- In the lower bay, the card is *rotated 180°* and the card's *red* ejector lever is at the top.

3 Insert output cards into an output bay. Output card guides are white and the cards' ejector levers are also white:

- In the upper bay, the card is right-side up, that is, its *white* ejector lever is at the bottom.
- In the lower bay, the card is *rotated 180°* and the card's *white* ejector lever is at the top.

It is not possible to install an I/O card in the wrong bay. Input cards and output cards are of different size. I/O cards will not go into the upper bays unless they are right-side up and they will not go into the lower bays unless they are upside down.

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

5 Close the frame door after all cards have been installed. The door must be closed for the router cooling system to work properly.

Making I/O Signal Connections

After backplanes are installed, cables are connected to the I/O connections using one of three connector types and cables:

- Coax (DIN 1.0/2.3) connectors and Belden 1855A cable (or an equivalent).
- SFP connectors and fiber optic cable.
- WECO connectors and twisted pair cable.

The type of signal determines the backplane connector. Before making signal connections, review the following:

- Disembedder input cards, embedder output cards, and disembedder/embedder output cards (coax only)

  For NV8500 routers other than the NV8140, the disembedder (input) backplane has 9 video connectors, of which only the first 8 are used.

  For the NV8140, the disembedder (input) backplane has 18 video connectors, of which the 9th and 18th are unused.

  The embedder (output) backplane has 18 video connectors, of which the 9th and 18th are unused.

  The expansion output () backplane has 9 video connectors, of which only the first 8 are used.

  Each video signal has up to 16 embedded audio channels.

- MADI (3Gig/TDM) cards (coax only)

  For NV8500 routers other than the NV8140, the input backplane has 8 video connectors. Its 9th connector receives one MADI stream containing 64 time slots (or channels).

  For the NV8140, the input backplane has 16 video connectors and two MADI connectors. Both MADI connectors (numbered 9 and 18) receive a MADI stream containing 64 time slots (or channels).

  The output backplane has 16 video connectors and two MADI connectors. Both MADI connectors (numbered 9 and 18) emit a MADI stream containing either 56 or 64 time slots (or channels).

  The expansion output backplane has 8 video connectors. Its 9th connector emits one MADI stream containing either 56 or 64 time slots (or channels).

- AES async cards (coax or WECO)

  AES backplanes have either coax connectors for unbalanced signals or WECO connectors for balanced signals. Each connector supports one AES pair.(WECO pins are on 3.5 mm centers.)

  The input backplane has 9 connectors.

  The output backplane has 18 connectors.

  The expansion output backplane has 9 output connectors.

  ▲ The NV8140 does not support AES async.

- Standard 3Gig fiber optic

  Backplanes for fiber optic signals are composed of SFP modules each containing two LC connectors. (SFP modules are sold separately.)

  For NV8500 routers other than the NV8140, the input backplane has 5 modules for a total of 10 LC connectors. The backplane accepts 9 inputs; the 10th connector is not used.

  For the NV8140, the input backplane has 9 modules for a total of 18 LC connectors.

  The output backplane has 9 modules for a total of 18 LC connectors.

  Like the input backplane, the expansion output backplane has 5 modules for a total of 10 LC connectors. The backplane emits 9 outputs; the 10th connector is not used.

Audio and Video References

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

AES REF 1
AES REF 2
VIDEO REF 1
VIDEO REF 2
(Internal free-running clock)

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. On the rear of the router frames are two AES reference connections. The primary control card and the secondary control card share the AES reference.

The AES reference connections are redundant and should use the same reference signal. When both references are connected, if one reference fails, the control card automatically fails over to the redundant reference.

AES reference connections require a stable audio signal source set at 48 kHz. See Making Reference Connections on page 58.

Video References

Located on the rear of the router, four BNC connectors provide video reference input. If a video reference is present, signals switch at the defined frame rate and line switch points. If a video reference is not present, the router still performs the switch, but according to an internal reference. If a video reference is not connected, the control card illuminates its (red) alarm LED. (For details about LEDs, see Indicator LEDs on page 165.)

Video reference connections require a stable source of PAL, NTSC, or tri-level sync. The control card uses these references to perform takes at the proper point in time (according to SMPTE RP168). See Making Reference Connections on page 58.

Redundant and Dual Video References

The same reference can be used for both reference connections or different references can be applied at the two connectors. If you apply the same reference, the connection is termed redundant. If one reference fails, the control card fails over to the redundant reference.

If you have different references (e.g., NTSC and PAL), or *dual* references, switches can take place according to one or the other reference.

You can specify, in MRC, whether your video reference connection is redundant or dual.

(See the *Miranda Router Configurator User's Guide*.)

> Note
> Dual references are currently not available for hybrid routers.

Switch points use references based on priority, as follows:

Reference	First	Second	Third
Redundant	VIDEO REF 1	VIDEO REF 2	Internal free running. Such signals are passed through the router even though not locked to a reference.
Dual	VIDEO REF 1 or VIDEO REF 2	Internal free running	-n/a-

Making Reference Connections

AES reference connections require a stable audio signal source set at 48 kHz. Video reference connections require a stable source of PAL, NTSC, or tri-level sync. The control card uses these references to perform takes at the proper point in time (according to SMPTE RP168).

Making AES reference Connections

1 Locate the AES reference connections on the rear of the router, as shown in Figure 2-20. AES reference connections are labeled **AES REF 1** and **AES REF 2**.

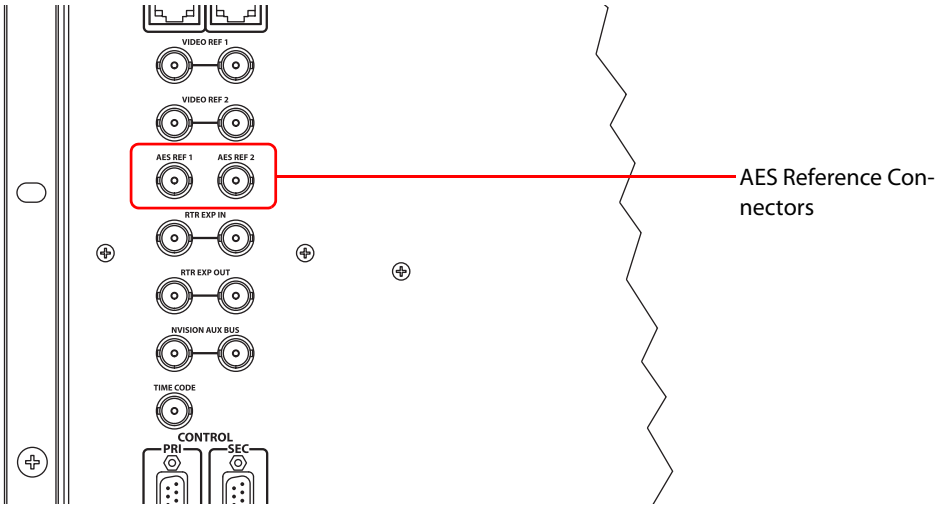


Fig. 2-20: AES Reference connection (Rear View

2 Connect **AES REF 1**, using a 75 Ω BNC cable, to a stable 48 kHz audio source.

3 For redundancy, also connect **AES REF 2** to a stable 48 kHz audio source.

Making Video Reference Connections

1 Locate the video reference connections on the rear of the router, as shown in Figure 2-21. Video reference connections are labeled **VIDEO REF 1** and **VIDEO REF 2**.

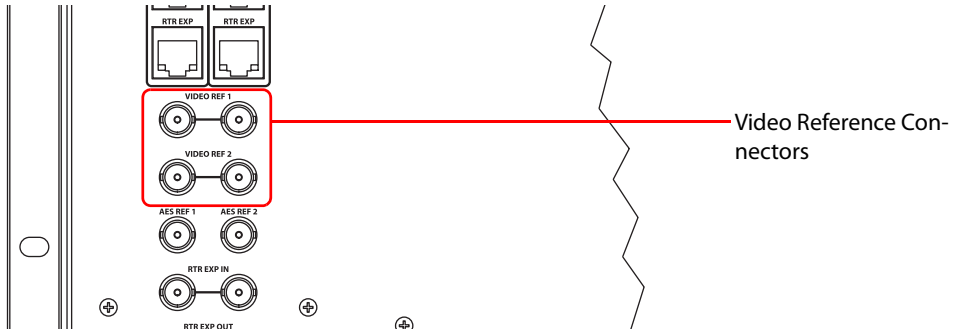


Fig. 2-21: Video Reference Connections (Rear View)

2 Connect **VIDEO REF 1**, using a 75 Ω BNC cable on one or the other connector, to a video reference signal. The signals can be:

PAL

NTSC

Tri-level sync

3 Either use the other connector to continue the reference signal to another device or terminate the reference signal by installing a 75 Ω BNC terminator on this connector.

4 Connect to **VIDEO REF 2** as described in steps 2 and 3.

Time Code

There is one connection for time code signals (labeled **TIME CODE**). Time code signals are not supported at this time.

3 Crosspoints

The crosspoint cards of the router form the switching matrix of the router.

The matrix sizes for *standard* routers are the following:

NV8144	144×144
NV8140	144×288
NV8280	288×576
NV8576	576×1152
NV8576-Plus, stand-alone	576×576
NV8576-Plus, expanded	1152×1152.

The router matrix is distributed across one or more crosspoint cards.

Hybrid routers have the same video crosspoint matrix as do standard routers, and additionally a TDM "matrix" for switching synchronous audio. The TDM "matrix" can be as large as 18432×18432.

Hybrid I/O does not use the entire port space of the router. Some ports in the space go unused.

The crosspoint card(s) receive signals from input cards and switch the signals to the appropriate output cards as directed by the router's control card.

Standard crosspoint cards can be used only with standard I/O cards. Hybrid crosspoint cards can be used with both hybrid I/O cards and standard I/O cards. If the router has at least one hybrid card, all crosspoint cards must also be hybrid and the control cards must be hybrid. A frame can only have one type of crosspoint installed, either all standard or all hybrid.

For a list of crosspoint cards available and their part numbers, see Crosspoint Cards on page 188.

Topics

Overview of Crosspoints

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 crosspoint card switches all inputs to all outputs. The redundant crosspoint card takes over switching should the primary crosspoint card fail.

The NV8140 has 3 slots for crosspoint cards: two primary and one redundant for backup. The redundant card uses the middle crosspoint card slot. All signals pass through the primary (active) crosspoint cards. Together, the crosspoint cards switch any input to any output. One of

the crosspoint cards target the upper 9 outputs of output cards. The other crosspoint card targets the lower 9 outputs of output cards. The redundant crosspoint card takes over switching should one of the primary crosspoint cards fail.

- The crosspoint card slots for the NV8140 are narrower than the crosspoint slots for the NV8144. Do not attempt to install the older (and now obsolete) EM0799 or EM0819 crosspoint cards in the NV8140. Physical damage will result.

The NV8280, NV8576, and NV8576-Plus have a slightly different crosspoint architecture because they are larger routers. Each router has 10 crosspoint slots: 8 for crosspoint cards and 2 for an optional redundant crosspoint module. The optional redundant crosspoint module acts as a backup for any of the other 8 crosspoint cards.

When a redundant crosspoint module is present in an NV8280, NV8576, or NV8576-Plus frame, function buttons located on the front of the module are active. By selecting a button, the redundant crosspoint cardset can be set either to take over active control from another crosspoint card or to act as a "hot" backup in stand-by mode. If it is configured to take active control, the redundant crosspoint takes over the current functions of the selected crosspoint card. For details, see Setting Redundant Crosspoint Functions on page 68.

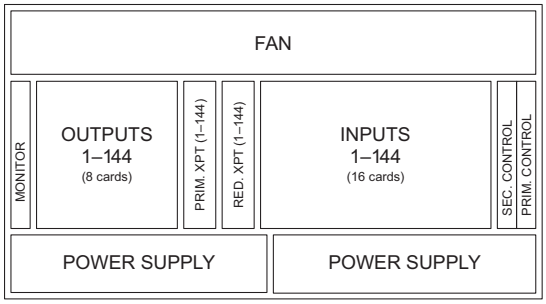
The crosspoint cards and the redundant crosspoint have status reporting circuitry. Five LEDs on the front of the card or cardset indicate the card's status: alarm (red), power good (green), software is loaded (amber), and whether there is good (green) or bad (red) communication with the control card. For more information, see Indicator LEDs on page 165.

Signal Flow Through Crosspoint Cards

As a reminder, standard input cards have 9 inputs and standard output cards have 18 outputs. Hybrid disembedder cards have 8 inputs, the 9th connector being unused. Hybrid embedder cards have 16 outputs, the 9th and 18th connectors being unused. Hybrid MADI input cards have 8 video inputs and 1 MADI input. Hybrid MADI output cards have 16 video outputs, their 9th and 18th ports being MADI ports. See Chapter 2, Inputs and Outputs on page 21, for details.

NV8144

In a fully loaded NV8144 (i.e., one with all cards installed, including a redundant crosspoint), both the primary crosspoint and the redundant crosspoint receive all inputs. The redundant crosspoint does nothing unless the primary crosspoint fails.



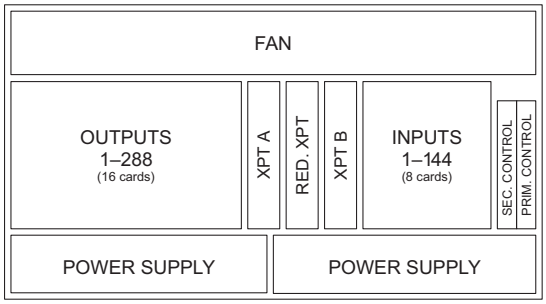
The active crosspoint (primary or redundant) receives its inputs from inputs cards sends its outputs to output cards.

NV8140

In a fully loaded NV8140 (i.e., one with all cards installed, including a redundant crosspoint), both the primary crosspoint and the redundant crosspoint receive all inputs. The redundant crosspoint does nothing unless one of the primary crosspoint fails.

The active crosspoint (primary or redundant) receives its inputs from inputs cards sends its outputs to output cards.

The redundant crosspoint is installed in the middle crosspoint slot:



Inputs 1–144 are received by crosspoint cards A and B.

Crosspoint card A distributes the upper 9 outputs of all the output cards. (Those are outputs 1–9, 19–27, and so on.)

Crosspoint card B distributes the lower 9 outputs of all the output cards. (Those are outputs 10–18, 28–36, and so on.)

NV8280

In a fully loaded NV8280, the router's switching matrix (or matrices, in the case of hybrid crosspoints) are distributed across up to 8 crosspoint cards. Each card switches a specific subset of the inputs or outputs. Crosspoint cards are installed in crosspoint slots 1–4 and 7–10. The optional redundant crosspoint is installed in slots 5 and 6:

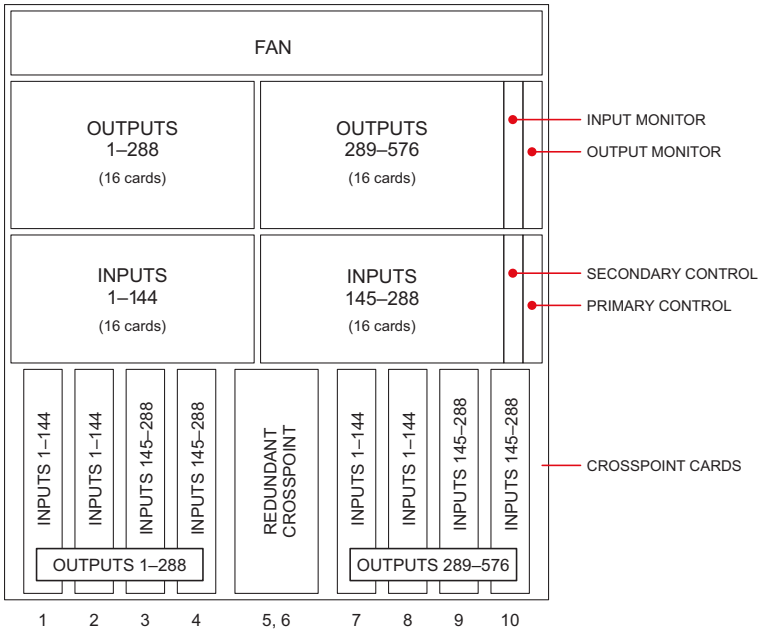


Fig. 3-1: NV8280 (Front View)

Inputs 1–144 are received by crosspoint cards 1, 2, 7, and 8.

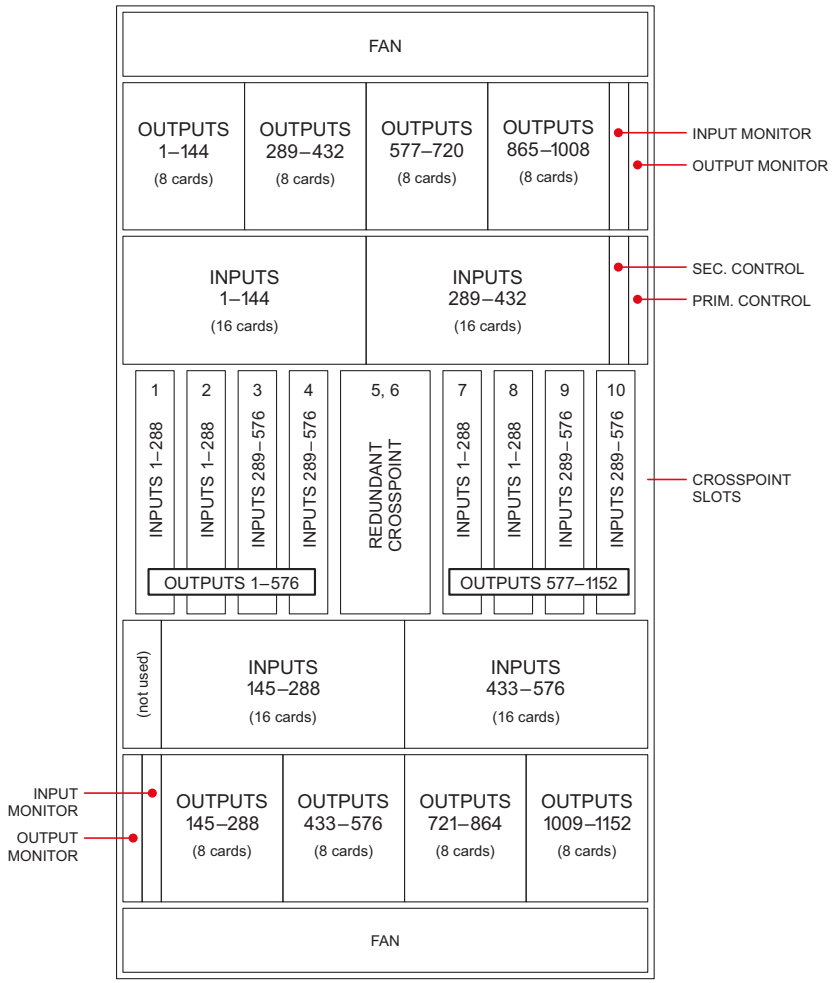
Inputs 145–288 are received by crosspoint cards 3, 4, 9, and 10.

Outputs 1–288 are distributed by crosspoint cards 1–4.

Outputs 289–576 are distributed by crosspoint cards 7–10.

NV8576

In a fully loaded NV8576, the router's switching matrix (or matrices, in the case of hybrid crosspoints) are distributed across up to 8 crosspoint cards. Each card switches a specific subset of the inputs or outputs. Crosspoint cards are installed in crosspoint slots 1–4 and 7–10. The optional redundant crosspoint is installed in slots 5 and 6:



Inputs 1–288 are received by crosspoint cards 1, 2, 7, and 8.

Inputs 289–576 are received by crosspoint cards 3, 4, 9, and 10.

Outputs 1–576 are distributed by crosspoint cards 1–4.

Outputs 577–1152 are distributed by crosspoint cards 7–10.

Fig. 3-2: NV8576 (Front View)

Expanded NV8576-Plus

(See Chapter 6, Expanded NV8576-Plus on page 89, for details of the NV8576-Plus.)

In a fully loaded NV8576-Plus, the router's switching matrix (or matrices, in the case of hybrid crosspoints) are distributed across up to 8 crosspoint cards in each of two frames. Crosspoint cards are installed in crosspoint slots 1–4 and 7–10 of each frame. The optional redundant crosspoint is installed in slots 5 and 6 of each frame.

Each card switches a specific subset of the inputs or outputs. The frames exchange signals on their expansion cabling.

Figure 3-3 shows the regions of the NV8576-Plus that correspond to the crosspoint cards:

Frame 1 ***Frame 2***

Fig. 3-3: Expanded NV8576-Plus Frames (Front View)

Inputs 1–288 are received by crosspoint cards 1, 2, 7, and 8 in frame 1.

Inputs 289–576 are received by crosspoint cards 3, 4, 9, and 10 in frame 1.

Inputs 577–864 are received by crosspoint cards 1, 2, 7, and 8 in frame 2.

Inputs 865–1152 are received by crosspoint cards 3, 4, 9, and 10 in frame 2.

Outputs 1–288 are distributed by crosspoint cards 1–4 in frame 1.

Outputs 289–576 are distributed by crosspoint cards 7–10 in frame 1.

Outputs 577–864 are distributed by crosspoint cards 1–4 in frame 2.

Outputs 865–1152 are distributed by crosspoint cards 7–10 in frame 2.

Installing Crosspoint Cards

NV8144

The NV8144 has one (primary) crosspoint card slot and one redundant crosspoint card slot. The cards are installed in the two available slots. If you are facing the front of the router, the primary slot is on the left, the redundant slot is on the right.

Installing Crosspoint Cards in the NV8144

1. Face the front of the router frame. The crosspoint card slots are located between the output card slots and input card slots, in the middle of the frame. See Figure 1-4 on page 7.
2. Insert the primary crosspoint card in the left slot of the two. The slots have black card guides. The redundant crosspoint card is optional. For each card, press the ejector levers inward, making sure each card is fully seated in its slot.
3. Close the door after the cards have been installed. The door must be closed for the router cooling system to work properly.

NV8140

The NV8140 has 2 (primary) crosspoint card slots and one redundant crosspoint card slot. The redundant crosspoint card goes in the middle slot.

Installing Crosspoint Cards in the NV8140

1. Face the front of the router frame. The crosspoint card slots are located between the output card slots and input card slots, in the middle of the frame. See Figure 1-6 on page 9.
2. Insert primary crosspoint cards in the left and right crosspoint slots. The slots have black card guides. The redundant crosspoint card is optional and goes in the middle slot. For each card, press the ejector levers inward, making sure each card is fully seated in its slot.
3. Close the door after the cards have been installed. The door must be closed for the router's cooling system to work properly.

▲ The crosspoint card slots for the NV8140 are narrower than the crosspoint slots for the NV8144. Do not attempt to install the older (and now obsolete) EM0799 or EM0819 crosspoint cards in the NV8140. Physical damage will result.

NV8280, NV8576, or NV8576-Plus

Crosspoint cards in the NV8280 and NV8576 must be installed in pairs: slots 1 and 2, slots 3 and 4, slots 7 and 8, or slots 9 and 10. For example, you could install crosspoint cards in slots 1 and 2, but not in slots 1 and 3.

For a stand-alone NV8576-Plus, the requirements are different. You need only those crosspoint cards that support the slots in which I/O cards are installed.

However, if your router is an expanded NV8576-Plus (i.e, two frames), then crosspoint cards must be paired to support inter-frame communication.

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

Install Crosspoint Cards in the NV8280, NV8576, or NV8576-Plus

1 Face the front of the router frame.

For the NV8280, the crosspoint card slots are at the bottom of the frame. See Figure 1-8 on page 11.

For the NV8576 and the two frames of the NV8576-Plus, the crosspoint card slots are located in the middle of the frame. See Figure 1-10 on page 14.

2 Insert crosspoint cards in slots. The slots have black guides. From the front of the router frame, the crosspoint card slots are numbered 1 through 10, from left to right.

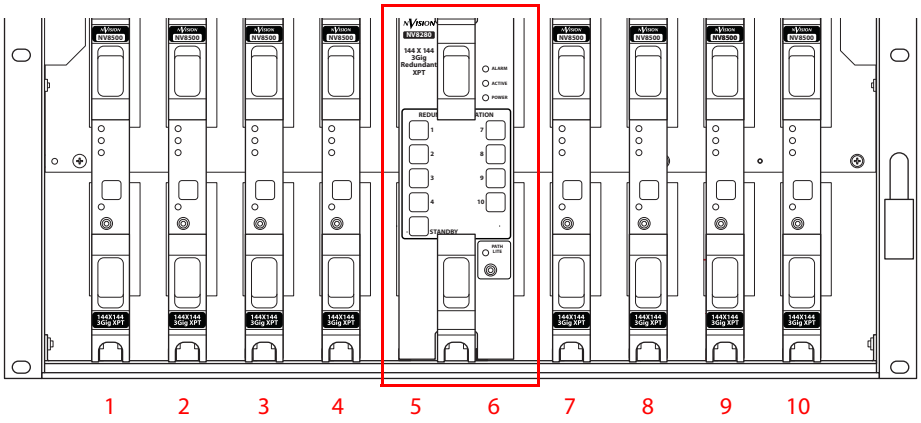


Fig. 3-4: NV8280 Crosspoint Card Slots (Front View)

3 Crosspoint cards *must* be installed in adjacent pairs (In the NV8280 and NV8576). If your NV8280 or NV8576 is not fully populated with I/O cards, you might not need a full complement of crosspoint cards. Install crosspoint cards in adjacent pairs:

Slots 1 and 2

Slots 3 and 4

Slots 7 and 8

Slots 9 and 10

according to the I/O cards they must switch.

For a stand-alone NV8576-Plus, you need only those crosspoint cards that support the slots in which I/O cards are installed. If your router is an expanded NV8576-Plus (i.e, two frames), then crosspoint cards must be paired to support inter-frame communication

4 Insert the optional redundant crosspoint in crosspoint card slots 5 and 6. (The redundant crosspoint has two cards.)

5 For all cards, press the ejector levers inward, making sure each card is fully seated in its slot.

6 Close the frame door after the cards have been installed. The door must be closed for the router cooling system to work properly.

Setting Redundant Crosspoint Functions

By default, the redundant crosspoint operates in standby mode. It is intended to assume the operation of any single crosspoint card that fails. However, an operator can choose, at any time, to have one of the crosspoint card slots placed in standby mode and have the redundant crosspoint card take over active control. The operator might, for example, want to swap out a crosspoint card.

On the front of the redundant crosspoint installed in the NV8280, NV8576, or NV8576-Plus are nine function buttons, as shown in Figure 3-5.

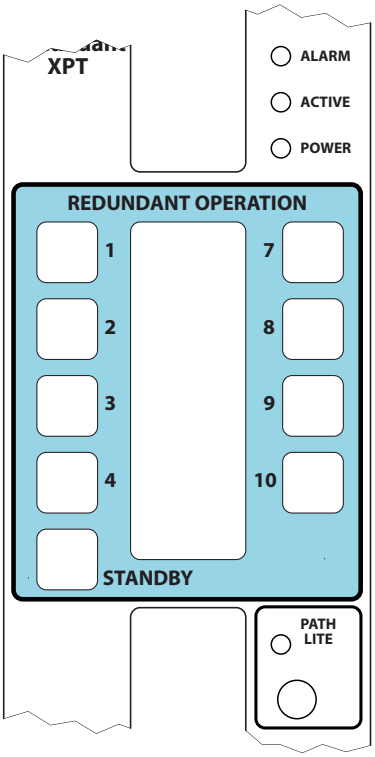


Fig. 3-5: Redundant Crosspoint's Function Buttons

Each numbered button represents a crosspoint card slot. The brightness of the button indicates the state of the crosspoint card:

- Off. The crosspoint is not available.
- Dim. The crosspoint is in standby mode.
- Bright. The crosspoint is active.

Changing Redundant Crosspoint Settings

1 Open the door of the router.

2 Press a numbered button to select the crosspoint card to place in standby mode.

3 Press **Standby**. The selected crosspoint card slot is placed in stand-by mode.

4 To return the crosspoint card to active status and place the redundant crosspoint card back in standby mode, press **Standby** again. You cannot switch another crosspoint card to standby mode without first pressing the **Standby** button.

5 Close the router door.

Null Audio

When a router configuration includes "null" audio sources, control panel operators can control whether embedded audio channels are null. Individually, null channels carry silence. When all 4 channels in an audio group are null, the output embedder does not emit the group in the output.

Note that although a null audio source is called a source, it ***does not*** actually carry audio. It is an artificial port. Using that port signals to the router's control card that generated silence should be applied at the output.

See Embedded Group Control on page 33 for more information.

Pass-Through Audio

When a router configuration includes "pass-through" audio sources, control panel operators can route the embedded audio from a standard video input to a hybrid (disembedder/embedder) output directly and with little effort.

Two forms of pass-through audio exist:

- Basic — a single source that governs all 16 audio channels of a video source as a unit.

  When a control panel operator specifies the basic audio source, all 16 audio channels of the disembedder/embedder output are taken from the video routed to that output.

- Extended — defines 16 individual pass-through audio sources, one for each audio output channel.

  When a control panel operator specifies one (or more) of the pass-through audio sources, the audio source channel specified by the pass-through selection is sent to the selected audio channel of the output.

  For example, if audio source 131 is specified as pass-through channel 3, when a panel operator "takes" audio port 131 to the output, what happens is that audio channel 3 of the video routed to the output is taken (or "passed through") to the chosen audio channel of the output.

  The disembedder on the output cards makes those audio channels available. The multiplexer on the output card does the individual channel selection.

Note that although pass-through audio sources are called sources, they ***do not*** actually carry audio. They are artificial ports. Using these ports signals to the router's control card that audio should be taken from the video at the output.

Nevertheless, the control panel operator treats the pass-through sources as if they were actual sources, but knowing that the effect of using a pass-through source is to obtain the audio from the video already present at the output.

Techniques for configuring and using pass-through audio are discussed under *Configuring Pass-Through* on page 71.

Pass-Through Audio Sources

"Pass-through" is a concept designed with respect to the disembedder/embedder output cards of NV8500 family routers.

The concept of pass-through was created to allow panel operators to take audio from standard input cards to hybrid output without an extraordinary amount of effort. It is the disembedder/embedder output card that performs pass-through.

Each output of a disembedder/embedder card has logic that allows "pass-through" (as well as null audio). Figure 3-6 illustrates one such output:

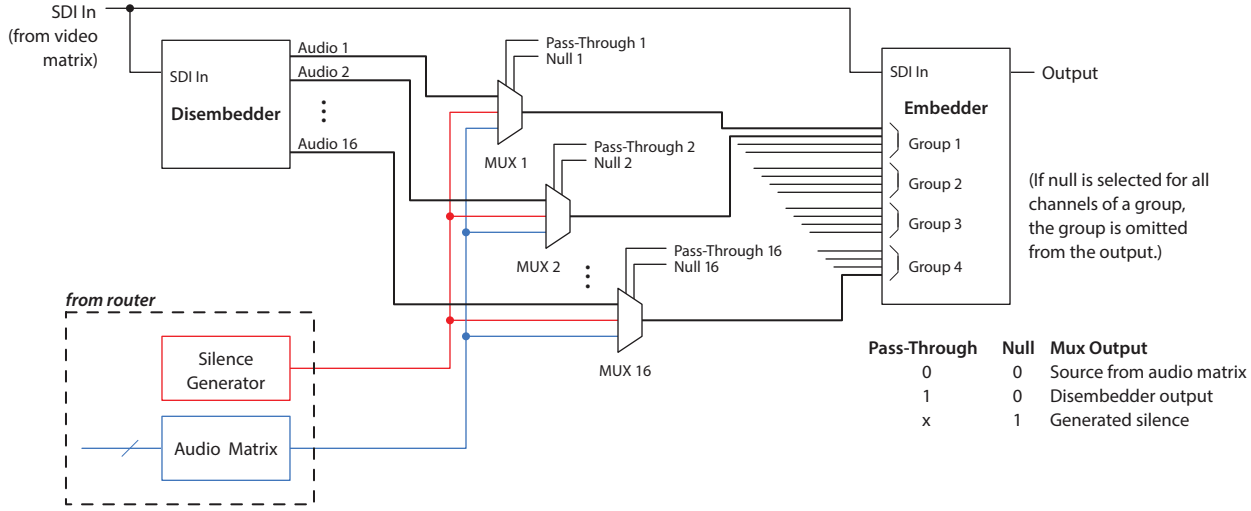


Fig. 3-6: Output of Disembedder-Embedder Card

The output path has a disembedder that extracts the audio from the video source and an embedder. Each audio channel, ***i***, of the embedder receives one of 3 multiplexed inputs:

- Audio channel ***i*** from the disembedder.
- Silence.
- An audio signal from the router's audio matrix.

Each embedder channel has a 'null' flag (i.e., the 'Insert Silence' flag) set by the logic of embedded group control. (See Embedded Group Control on page 33.) If the channel's null bit is set, the EGC logic will drop the entire group if all its null bits are set. Otherwise, the channel carries generated silence.

If the embedder's audio channel is not null, the audio comes from the disembedder if the channel's pass-through bit is set. Otherwise, the audio comes from the router's audio matrix.

Basic and Extended Pass-Through

Panel operators are given the choice of basic pass-through and extended pass-through:

- Basic. The operator routes an audio source designated as the basic pass-through source to an output. The result (given a correct NV9000-SE Utilities configuration) is that all 16 audio output channels are taken from the video at the output.
- Extended. The operator can route up to 16 audio sources configured as "extended" pass-through sources to the output. The audio outputs represented by those pass-through sources are taken from the video at the output.

The panel operator must be aware of the names (configured in NV9000-SE Utilities) of the basic pass-through source and the individual "extended" pass-through sources.

Configuring Pass-Through

Pass-through configuration is performed in MRC and in NV9000-SE Utilities. Pass-through sources can then be used as often as required by panel operators.

To configure pass-through in MRC, go to the 'Router Levels' page. Specify (1) a basic pass-through source in the 'Pass-Thru Audio Source' field and (2) up to 16 extended pass-through sources in the 'Pass-Thru Shuffle Audio Sources' table. These sources will be sacrificed: you cannot use the pass-through source as a normal audio source. Therefore, choose unused audio port numbers for pass-through sources.

Basic Pass-Through Source

In NV9000-SE Utilities, create an audio source device whose port number is the same as the basic port number you entered in MRC's router levels page. This source should ***not*** have a video level. Name the source "passthru" or something similar that is acceptable to panel operators.

After the router and the NV9000 control system are configured and running, control panel operators may use the designated pass-through source to perform pass-through routes.

Panel operators make a *basic* pass-through route by taking the pass-through audio source to the desired destination.

When the router detects that the pass-through source was selected, it does ***not*** route audio from the pass-through source, but sets the pass-through flags for all 16 audio channels. These flags tell the output to use the corresponding disembedder channel output in the output stream. Refer to Figure 3-6.

Extended Pass-Through Sources

There are several ways to configure pass-through audio sources in NV9000-SE Utilities. The different methods are used in different ways and have different purposes.

Method 1

Create a (single) source device whose individual audio port numbers are the same as the numbers you entered in the 'Pass-Thru Shuffle Audio Sources' table of MRC's router levels page.

This source should have as many audio levels as your video signals carry. It does not matter whether the source has a video level. Name the source something that is acceptable to panel operators as a pass-through source.

After the router and the NV9000 control system are configured and running, control panel operators may use the designated pass-through source to perform pass-through routes.

Thus, if the MRC pass-through list is . . .

1	129	5	133	9	137	13	141
2	130	6	134	10	128	14	142
3	131	7	135	11	138	15	143
4	132	8	136	12	140	16	144

. . . then your source, defined in NV9000-SE Utilities, would have levels

Audio 1 = 129
Audio 2 = 130,
. . .
Audio 16 = 144.

Taking this source (directly) to an output (of a disembedder/embedder card) will route all the audio channels of the video at the output straight through to the output without shuffle.

A shuffle could be accomplished if the panel operator is willing to perform a level mapping.

The second method, discussed next, addresses shuffling.

Method 2

Create multiple source devices whose individual port numbers are the same as the numbers you entered in the 'Pass-Thru Shuffle Audio Sources' table of MRC's router levels page.

You should create a source device for each of the pass-through audio sources in the table. Each source device has just one level that matches a pass-through source you defined in MRC. Name these sources in a way that is acceptable to panel operators. We recommend you create a category for these sources. A panel operator will then be able to select any pass-through channel with just 2 button presses.

After the router and the NV9000 control system are configured and running, control panel operators may use the designated pass-through sources to perform pass-through routes with shuffle.

Panel operators make an *extended* pass-through route by creating a breakaway of the individual pass-through audio channels from the defined pass-through source to the desired destination.

Thus, if the MRC pass-through list is . . .

1	129	5	133	9	137	13	141
2	130	6	134	10	128	14	142
3	131	7	135	11	138	15	143
4	132	8	136	12	140	16	144

. . . then your 16 sources, defined in NV9000-SE Utilities, would have levels

Source Name	Level	Port
Pass1	Audio 1	129
Pass2	Audio 2	130
. . .		
Pass16	Audio 16	144

and the category could perhaps be named PASSTHRU.

The general procedure for performing pass-through takes (with shuffle) is:

1 Selects a destination.

2 Select a destination level (say Audio 3).

3 Choose a pass-through source (say Pass12).

(Taking pass12 to audio 3 of the destination means that audio channel 12 of the video at the input is taken to audio channel 3 of the output.)

4 Repeat steps 2 and 3 for any other portions of the overall audio shuffle you want to achieve.

5 Press 'Take'.

This method gives operators independent control of all pass-through channels (or as many pass-through channels as you want your system to have).

Notes

When the router detects that the pass-through source was selected, it does ***not*** route audio from the pass-through source, but sets the pass-through flags for the chosen audio levels. Each flag tells the output to use the corresponding disembedder channel output in the output stream. Refer to Figure 3-6.

- A port designated as the "pass-through source" cannot also be used as a normal source.
- "Pass-through" audio is ***not*** compatible with DHP.
- If a pass-through source is "taken" to an output that is not on a disembedder/embedder card, the take is rejected (with an error message).
- Only NV8500 family routers (at firmware version 3.3.1 or later) support pass-through audio.

Switching Rules

There are presently 4 aspects involved in what are called "switching rules."

- Embedded group control (and "null" audio).
- Pass-through audio.
- Obsolete 'AFV' partition.
- Input attribute — force embedder on.
- Tally — effective status versus actual status.

AFV Partition

The routers' switching rules accommodate 'AFV' partitions, but AFV partitions are not supported by recent releases of MRC.

- If your router has an AFV partition and you want to continue to use it, do not delete it. You cannot recreate it in the newer versions of MRC.

Force Embedder On

MRC allows you to specify a "force embedder on" attribute for any and all inputs. When the attribute is off, the output embedder obeys general switching rules. When the attribute is on, the embedder is forced on, regardless of other factors.

- Embedders on disembedder/embedder output cards are always on.

Tally

There are two forms of tally: "effective" status and actual status.

"Effective status" applies to standard input cards. Audio sources from standard input cards are tallied as if they were from a disembedding input card.

"Actual status" applies to disembedder cards or MADI input cards. Here, audio tally consists of actual audio sources.

Understanding How the Rules Combine

The rules are complex and mutually contradictory. The easiest way to understand how the rules work is to follow the algorithm that implements the rules. The algorithm to determine whether to bypass the embedder is portrayed in simple terms here.

```
IF video matrix take
  Set video source
  IF level is AFV                      // 'AFV level' is an obsolete feature
    Flag = TRUE                        // Flag referenced at end of procedure
  ELSE -- not AFV level
    IF input is 'force embedder on'
      Flag = FALSE
    ELSE
      IF standard or MADI input to EMB output
        Flag = TRUE
      ELSE
        Flag = FALSE
      ENDIF
    ENDIF -- force embedder
  ENDIF -- AFV level
ELSE -- audio matrix take
  IF null audio source                  // do "embedder group control"
    IF MADI destination
      Return "Invalid Destination"      // no nulls to MADI output
    ELSE
      Set audio source
      Set 'Insert Silence' flag
      Flag = TRUE
    ENDIF
  ELSE -- regular audio source
    IF standard input
      Return "Invalid Source"           // can't route audio from std source
    ELSE
      IF standard or "!EM" output       // !EM a special output card
        Return "Invalid Destination"    // can't route audio to such dests
      ELSE
        Set audio source
        Clear 'Insert Silence' flag
        IF DIS or MADI input to EMB or MADI output
          Flag = FALSE
        ELSE
          Flag = TRUE
        ENDIF
      ENDIF -- valid dest
    ENDIF -- valid source
  ENDIF -- null or not
ENDIF video or audio
IF Flag
  bypass embedder and tally effective status
ELSE
  use embedder and tally actual status
ENDIF
```

Notes:

1 The objective of this logic is to determine whether to bypass the embedder and whether to set the 'Insert Silence' flag. The 'Insert Silence' flag governs whether the null audio source is used.

(The 'Insert Silence' flag — or 'null' flag — is part of the pass-through logic of disembedder/embedder outputs.

2 The "force embedder" attribute is specified in MRC's 'Input Attributes' page.

4 Router Control

The routers' control cards receive commands from an external router control system (typically, the NV9000) and in turn send commands to the input, output, crosspoint, and monitor cards for execution. The control card also sends the status of the router, its power supply, fans, and video reference to the router control system.

There are two control cards available: the EM0666 card for router frames with only standard I/O cards installed and the EM0833 card for frames with at least one hybrid I/O cards installed. The installation of any hybrid I/O card requires that all crosspoint cards and all control cards also be hybrid.

Each router frame has two control card slots: one is for an active control card and the other is for a stand-by control card. Both control cards must be either standard or hybrid.

For a list of control cards available and part numbers, see Control Cards on page 189.

Topics

Overview of Control Cards

Every router has a primary control card. An optional secondary control card can be installed as a redundant, standby card. Both control cards receive commands from the router control system, but only the active control card responds. Because both cards receive commands, if the active control card fails, the standby control card automatically takes over without interruption. In addition, the primary control card and secondary control card communicate with each other so that should a card fail, the remaining card communicates the failure to the router control system.

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 (yellow), and operating normally (green). For more information, see Indicator LEDs on page 165.

Installing Control Cards

The card slots that house control cards are associated with specific router control system connections. If you are installing only a primary control card, you must install the card in the slot associated with the primary router control system connection. If you are installing both a primary and secondary control card, both card slots are used and there is no need to distinguish.

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

There are no backplanes associated with control cards. All communication is through the router control system connections.

Installing Control Cards

1 Face the front of the router frame. The control card slots are located at the far right of the frame, next to the input cards, and have yellow card guides.

For the NV8144, see Figure 4-1.

For the NV8140, see Figure 4-2, next page.

For the NV8280, see Figure 4-3, next page.

For the NV8576 or NV8576-Plus, see Figure 4-4 on page 78. The control cards are installed only in the upper region of the frame. No control cards are installed in the lower region of the frame.

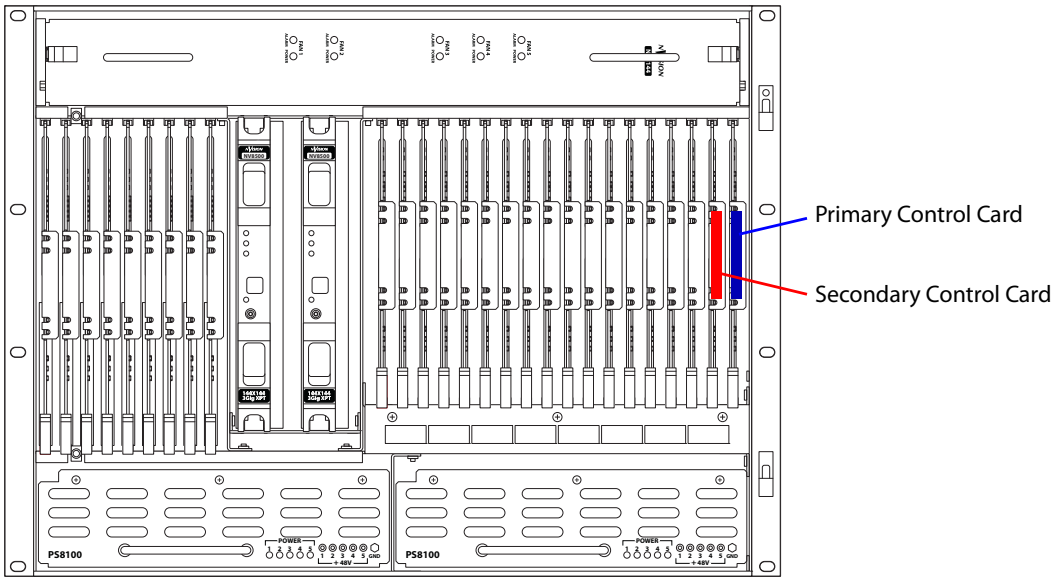


Fig. 4-1: NV8144 control card slots (Front View)

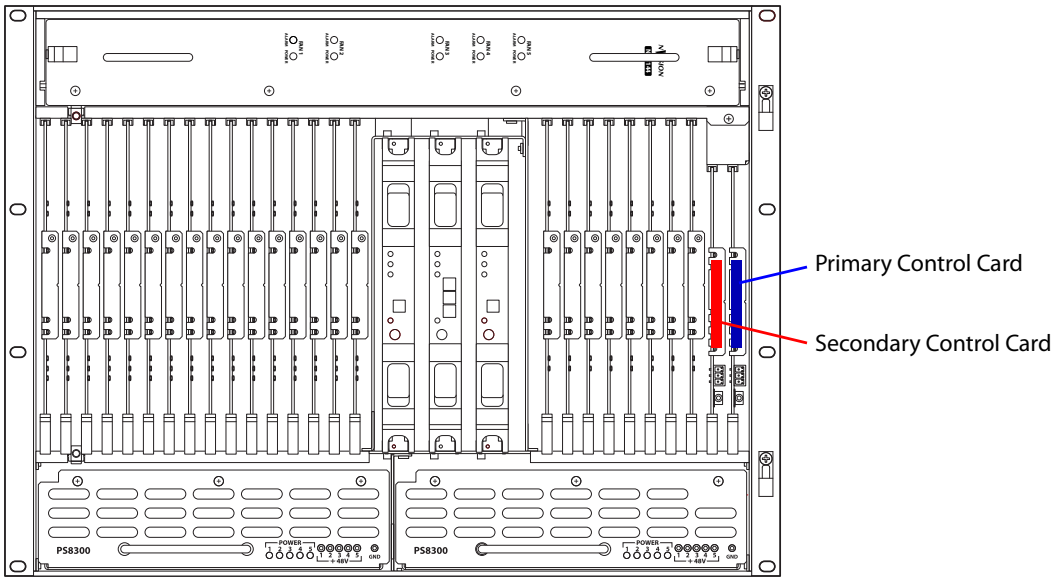


Fig. 4-2: NV8140 Control Card Slots (Front View)

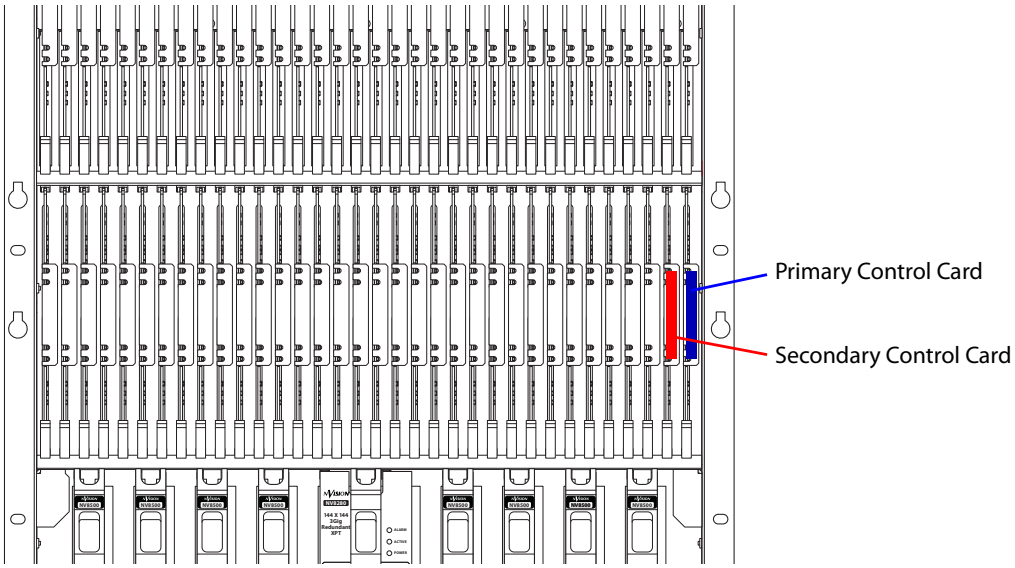


Fig. 4-3: NV8280 Control Card Slots (Front View)

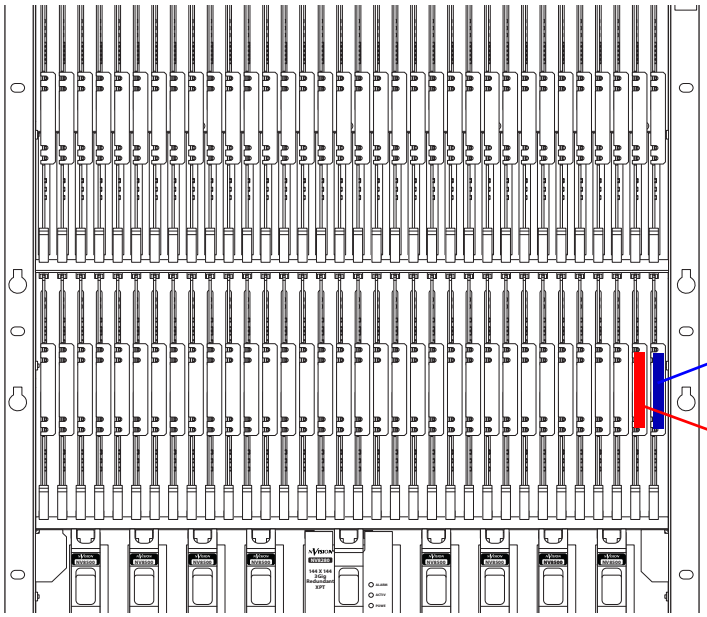


Fig. 4-4: NV8576 and NV8576-Plus Control Card Slots (Front View)

2 If you are installing only a single control card, the card must be installed in the primary control card slot. This is the slot farthest to the right in the frame, nearest to the outside of the frame.

3 (Optional) install the secondary control card in the remaining slot.

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

5 Close the frame door. The door must be closed for the router cooling system to work properly.

Note: install control cards in each frame of the NV8576-Plus as shown for the NV8576.

Making Router Control System Connections

The router control system exists on a frame separate from the router. To communicate with the router, connections need to be made from the router frame to the router control system frame.

Frame connections can be:

- Serial — Connects to a third-party router control system requiring serial control connections.
- Ethernet — Connects to Grass Valley's NV9000 router control system.

In order for the router control system to communicate with the router, it must "see" the ports. This requires entering settings on the control card for the serial port (COM port and Baud rate) or Ethernet port (IP address). Serial and Ethernet settings are set using the *Miranda Router Configurator* (see the *Miranda Router Configurator User's Guide)*.

Make Ethernet Control System Connections

1 Face the rear of the router frame. The Ethernet connections are at the top of the RJ-45 connector group, as shown in Figure 4-5. The Ethernet control connections are labeled **PRI** and **SEC**, one for the primary control card and one for the secondary control card.

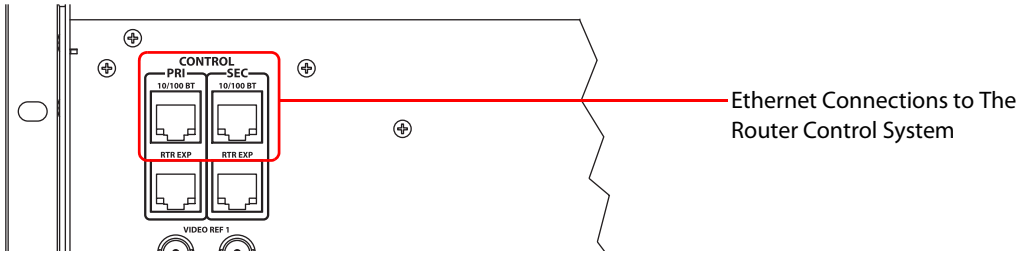


Fig. 4-5: Ethernet connections to the router control system (Rear View)

2 To establish communication with the primary control card, connect **PRI**, using an RJ-45 cable to an Ethernet switch on the router control system's router network. If your router control system is an NV9000, the switch is on one of the NV9000's *router and panel* networks.

3 If a secondary control card is installed, connect **SEC** to an Ethernet switch of the router control system's router network.

Making Serial Router Control System Connections

1 Face the rear of the router frame. The serial connector are in the 'Control' connector group, as shown in Figure 4-6.

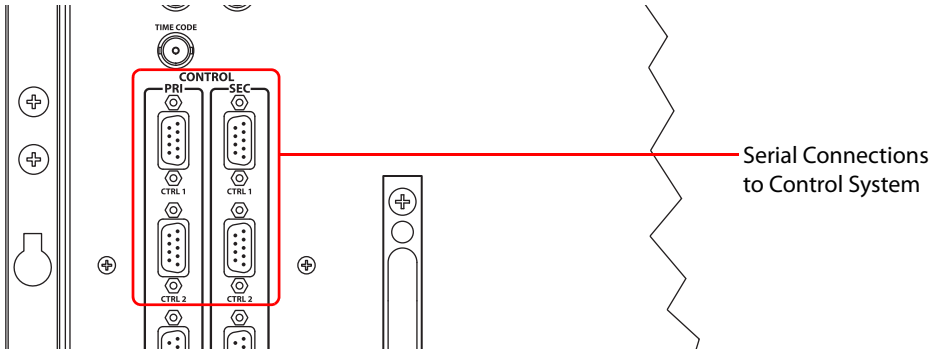


Fig. 4-6: Serial connections to the router control system (Rear View)

2 To establish communication with the primary control card, connect **CTRL 1** in the **PRI** section, using a DE9 cable, to the router control system.

The following lists the NV9000's pin wiring for the DE9 connectors:

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

Other router control systems might have different connector pinouts.

3 If a secondary control card is installed, connect to the **CTRL 1** connection in the **SEC** section as described in steps 2.

4 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 cable to the *alternate* router control system. The pinout of the **CTRL 2** connector is the same as for **CTRL 1**.

a Connect to the **CTRL 2** connection in the **SEC** section, using a DE9 cable to the *alternate* router control system. The pinout of the **CTRL 2** connector is the same as for **CTRL 1**.

5 Monitoring

Monitor cards allow an operator to assess the presence and quality of signals within the router.

Topics

Overview of Monitoring

The monitor card for the NV8280, NV8576, and NV8576-Plus sample two signals. The same monitor card is used for inputs and outputs. In an output monitor slot, the monitor card samples two outputs. In an input monitor slot, the monitor card samples two inputs. These are the monitor backplanes for the NV8280, NV8576, and NV8576-Plus:

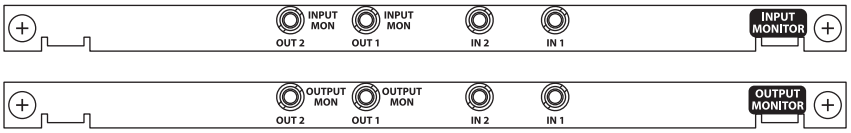


Fig. 5-1: Monitor Backplanes for NV8280, NV8576, and NV8576-Plus

The monitor card for the NV8144 is different from the monitor cards used for the NV8280, NV8576, and NV8576-Plus. The monitor card for the NV8144 samples one input signal and one output signal. This the NV8144's monitor backplane:

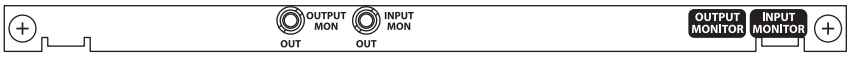


Fig. 5-2: Monitor Backplane for the NV8144

The NV8140 has no monitor card slot and does not support monitoring.

A router can send one signal from any input (or output) card to the monitor card. Under control of the router control system, the monitor card selects which of many cards to sample.

Each monitor card produces two signals that can be sent to monitoring equipment. You can use MRC (or UniConfig) to select the inputs and outputs to monitor.

Monitor cards can sample either video with or without embedded audio or AES async signals.[1]

For a list of monitor cards available and part numbers, see Monitor Cards on page 189.

1. It is not possible to select a MADI signal for monitoring, although MADI channels can be embedded in a a video signal which can be monitored.

NV8144

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

The backplane for the NV8144 monitor card has 2 connectors. An operator can select any 2 signals (1 router input and 1 router output) for monitoring.

For installation and cabling instructions, see Making Monitor Signal Connections on page 86.

NV8280

The NV8280 has two monitor card slots: one to monitor inputs and one to monitor outputs. These slots are at the right of the output bay if you are viewing the router from the front. The router uses the same monitor card in each slot.

An operator can select any 2 router inputs and any 2 router outputs for monitoring as long as the signals are from different input cards and different output cards.

For installation and cabling instructions, see Making Monitor Signal Connections on page 86.

NV8576

The NV8576 has 4 monitor card slots, 2 cards in the upper output bay, and two in the lower output bay.

The output monitor card in the upper bay samples output signals in the upper bay.

The input monitor card in the upper bay samples input signals in the upper bay.

The output monitor card in the lower bay samples output signals in the lower bay.

The input monitor card in the lower bay samples input signals in the lower bay.

The NV8576 uses the monitor backplanes shown in Figure 5-1. An operator can select any 2 inputs and any 2 outputs for monitoring as long as the signals are from different input cards and different output cards.

Your monitoring equipment receives samples from the monitor cards in the upper bay. The monitor cards in the upper bay receive samples from the monitor cards in the lower bay. A MUX in the monitor card allows it to choose whether to sample signals from the I/O cards in the upper bay (and from which card) or from the monitor card in the lower bay.

For installation and cabling instructions, see Making Monitor Signal Connections on page 86.

NV8576-Plus (Stand-Alone)

A stand-alone NV8576-Plus has the same monitor connections as an NV8576.

For installation and cabling instructions, see Making Monitor Signal Connections on page 86.

NV8576-Plus (Expanded)

The expanded NV8576-Plus has 8 monitor card slots, 2 cards in the upper output bay, and two in the lower output bay of each frame.

For each frame . . .

The output monitor card in the upper bay samples output signals in the upper bay.

The input monitor card in the upper bay samples input signals in the upper bay.

The output monitor card in the lower bay samples output signals in the lower bay.

The input monitor card in the lower bay samples input signals in the lower bay.

The monitor cards in the upper bay of each frame receive samples from the monitor cards in the lower bay.

The monitor cards in the lower bay of frame 1 receive samples from the monitor cards in the upper bay of frame 2.

Your monitoring equipment receives samples from the monitor cards in the upper bay of frame 1 (the "primary" frame).

A MUX in each monitor card allows it to choose whether to sample signals from the I/O cards in its own bay (and from which card) or from its link to another monitor card.

Thus, your monitoring equipment can sample any 2 outputs and any 2 inputs from either frame.

The NV8576 uses the monitor backplanes shown in Figure 5-1. An operator can select any 2 inputs and any 2 outputs for monitoring as long as the signals are from different input cards and different output cards.

For installation and cabling instructions, see Making Monitor Signal Connections on page 86.

MRC

Operators can select inputs and outputs to monitor either using *MRC* or at NV9000 control panels. *See* the *Miranda Router Configurator User's Guide* or the *NV9000-SE Utilities User's Guide*.

Note: older control cards support only output monitor signals. More recent control cards support both output and input signal monitoring.[2]

(Routers always ship with the latest of released software and firmware.)

To access and control monitor cards and signals properly, the router must be configured with a 'Monitor' level. Use MRC to do so. See the *Miranda Router Configurator User's Guide*.

2. Control cards running the following application versions support the listed monitor signals:
SV0900-06, SV0901-05 and older — the control card supports output monitor signals only.
SV0900-07, SV0901-06 and newer — The control card supports both input and output monitor signals.

Installing Monitor Backplanes and Cards

NV8500 series routers ship with all cards and backplanes installed. You might have occasion to install new cards or re-install existing cards.

You install monitor cards the same way you install any I/O card. See Chapter 2, Inputs and Outputs on page 21 for installation instructions.

For the NV8280, NV8576, and NV8576-Plus, the same monitor card is installed for both inputs and outputs. It is the slot in which the card is installed that determines whether the card monitors outputs or inputs.

CAUTION

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

Monitor Cards

Installing a Monitor Card in the NV8144

1 Face the front of the router. The monitor slot has a gray card guide and is located at the right end of the output card bay. (See Figure 1-4 on page 7.)

2 Insert the card in the slot.

3 Press the ejector lever(s) inward, making sure each card is fully seated in its slot.

4 Close the frame door. The door must be closed for the router cooling system to work properly.

Installing Monitor Cards in the NV8280

1 Face the front of the router. The two monitor card slots have gray card guides and are located at the right end of the output bay. (See Figure 1-8 on page 11.)

2 Insert the output monitor card in the right-most slot. Insert the input monitor card in the slot immediately to the left of the output monitor card.

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

4 Close the frame door. The door must be closed for the router cooling system to work properly.

Installing Monitor Cards in the NV8576

1 Face the front of the router. The 4 monitor card slots have gray card guides. Two slots are located at the right end of the upper output bay and two slots are located at the left end of the lower output bay. (See Figure 1-10 on page 14.)

2 Insert the monitor cards in the monitor card slots:

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

Insert the output monitor cards in the outermost slots of their respective bays. Insert the input monitor cards in the slots next to the output monitor cards.

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

4 Close the frame door. The door must be closed for the router cooling system to work properly.

Installing Monitor Cards in the NV8576-Plus

Follow the procedure for installing monitor cards for the NV8576 for each frame of the NV8576-Plus (expanded or stand-alone).

Monitor Backplane Locations

NV8144

If you are facing the rear of the router, the monitor's one backplane slot is just to the left of the output cards and just to the right of the system connectors. (See Figure 1-5 on page 8.)

NV8280

If you are facing the rear of the router, the monitor backplanes slots at the left end of the output bay: There are two slots: one for the output monitor backplane and one for the input monitor backplane. The input monitor backplane is just to the right of the output monitor backplane, as shown here:

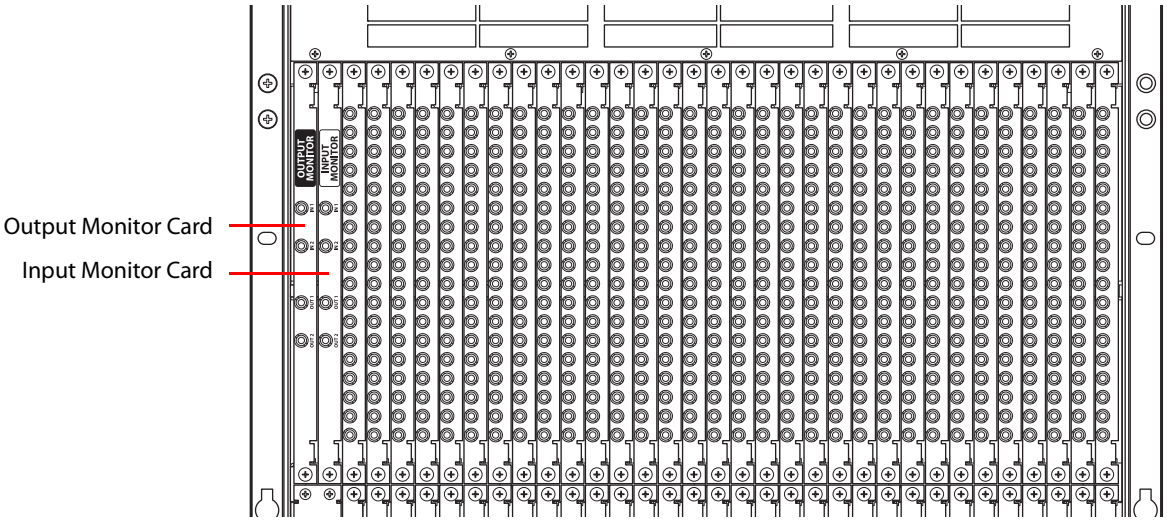


Fig. 5-3: Monitor Backplanes in NV8280

NV8576, Stand-Alone NV8576-Plus

If you are facing the rear of the router frame, the monitor backplane slots are at the left end of the upper output bay and at the right end of the lower output bay. There are 4 slots: 2 for output monitor backplanes and 2 for input monitor backplanes:

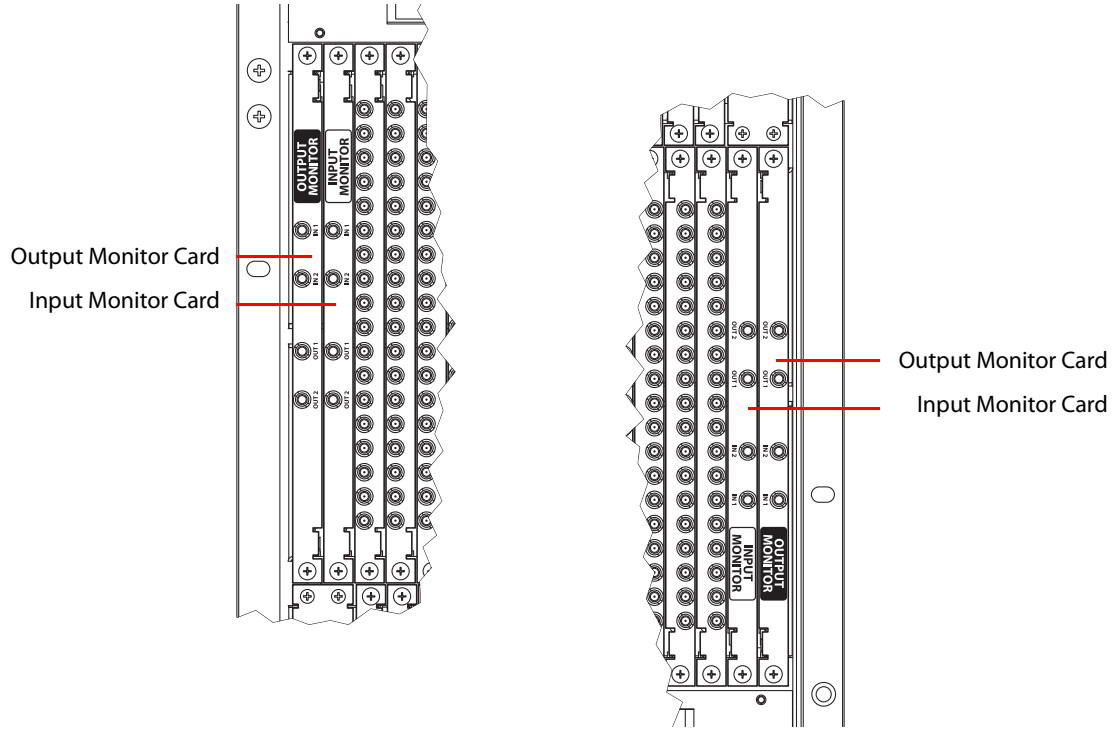


Fig. 5-4: Monitor Backplanes in the NV8576 and NV8576-Plus Frames

Expanded NV8576-Plus

Monitor backplanes are located, for each frame of the NV8576-Plus, as they are for the NV8576.

Making Monitor Signal Connections

If all monitor backplanes and cards have been installed, connections between the backplane connectors and monitoring equipment can be made. Monitor connectors are coax (DIN 1.0/2.3) and use 1855A Belden cable or equivalent.

Making NV8144 Monitor Connections

1 Face the rear of the router. The monitor backplane is at the left end of the output section. (See Figure 1-5 on page 8.) The card has 2 connectors.

2 Connect **OUTPUT MON** to the section of your monitoring equipment that monitors output.

3 Connect **INPUT MON** to the section of your monitoring equipment that monitors input.

Making NV8280 Monitor Connections

1 Face the rear of the router. The output monitor backplane and the input monitor backplane are located at the left end of the output bay. (See Figure 1-9 on page 12.) The monitor backplanes are marked as output and input. Each monitor backplane has two input connectors and two output connectors, labeled **IN 1**, **IN 2**, **OUT 1**, and **OUT 2**.

2 Ignore the input connectors, **IN 1** and **IN 2**.

3 Connect **OUT 1** and **OUT 2** on the *output* monitor backplane to the section of your monitoring equipment that monitors output.

4 Connect **OUT 1** and **OUT 2** on the *input* monitor backplane to the section of your monitoring equipment that monitors input.

Making NV8576 Monitor Connections

1 Face the rear of the router. The 4 monitor backplane slots are located at the left end of the upper output bay and at the right end of the lower output bay. (See Figure 1-11 on page 15.) The monitor backplanes are marked as output and input. Each monitor backplane has two input connectors and two output connectors, labeled **IN 1**, **IN 2**, **OUT 1**, and **OUT 2**.

2 Connect **OUT 1** and **OUT 2** of the *input* monitor backplane in the *lower* bay to **IN 1** and **IN 2**, respectively, of the input monitor backplane in the *upper* bay.

3 Connect **OUT 1** and **OUT 2** of the *output* monitor backplane in the *lower* bay to **IN 1** and **IN 2**, respectively, of the output monitor backplane in the *upper* bay.

4 Connect **OUT 1** and **OUT 2** on the *input* monitor backplane in the *upper* bay to the section of your monitoring equipment that monitors output.

5 Connect **OUT 1** and **OUT 2** on the *output* monitor backplane in the *upper* bay to the section of your monitoring equipment that monitors input.

Figure shows the monitor connections for the NV8576, for output monitoring:

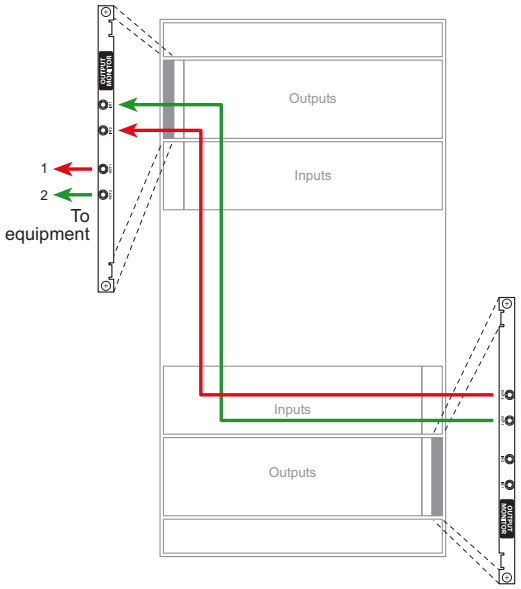


Fig. 5-5: Monitor connections for NV8576 (Rear View)

Making NV8576-Plus Monitor Connections

The NV8576-Plus has two frames. Each frame can have 4 monitor cards. The 4 monitor backplane slots in each frame are located at the left end of the upper output bay and at the right end of the lower output bay of the frame.

(See Chapter 6, Expanded NV8576-Plus on page 89 for more information on the NV8576-Plus.)

Repeat these steps for each frame.

1 Face the rear of the router. The 4 monitor backplane slots are located at the left end of the upper output bay and at the right end of the lower output bay. (See Figure 1-11 on page 15.) The monitor backplanes are marked as output and input. Each monitor backplane has two input connectors and two output connectors, labeled **IN 1**, **IN 2**, **OUT 1**, and **OUT 2**.

2 Connect **OUT 1** and **OUT 2** of the *input* monitor backplane in the *lower* bay to **IN 1** and **IN 2**, respectively, of the input monitor backplane in the *upper* bay.

3 Connect **OUT 1** and **OUT 2** of the *output* monitor backplane in the *lower* bay to **IN 1** and **IN 2**, respectively, of the output monitor backplane in the *upper* bay.

Connecting frame 2 to frame 1 . . .

4 Connect **OUT 1** and **OUT 2** on the output monitor backplane in the *upper* bay of frame 2 to **IN 1** and **IN 2**, respectively, of the output monitor backplane in the *lower* bay of frame 1.

5 Connect **OUT 1** and **OUT 2** on the input monitor backplane in the *upper* bay of frame 2 to **IN 1** and **IN 2**, respectively, of the input monitor backplane in the *lower* bay of frame 1.

Finally . . .

6 Connect **OUT 1** and **OUT 2** on the *output* monitor backplane in the *upper* bay of frame 1 to the section of your monitoring equipment that monitors output.

7 Connect **OUT 1** and **OUT 2** on the *input* monitor backplane in the *upper* bay of frame 1 to the section of your monitoring equipment that monitors input.

Figure 5-6 shows the monitor connections for the NV8576-Plus, for output monitoring.

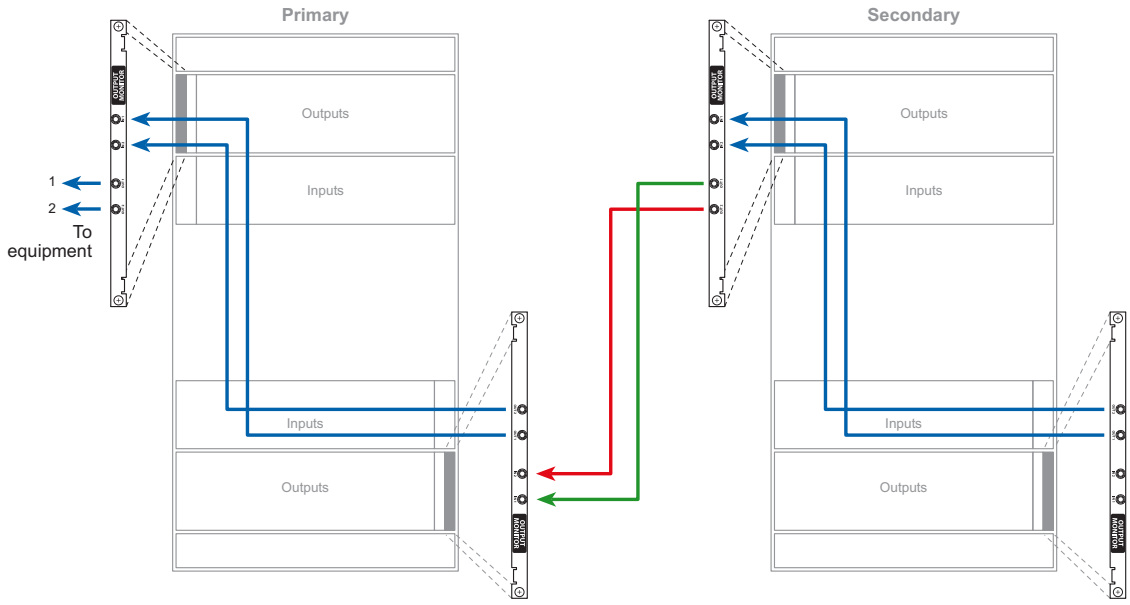


Fig. 5-6: NV8576-Plus monitor connections (Rear View)

6 Expanded NV8576-Plus

Two NV8576-Plus frames are interconnected to form an *expanded* NV8576-Plus router. Whereas an NV8576 router has a 576×1152 crosspoint matrix, the expanded NV8576-Plus has an 1152×1152 crosspoint matrix.

A single NV8576-Plus frame can be used as a *stand-alone* NV8576-Plus router.

Topics

Overview of the NV8576-Plus

The two frames of the NV8576-Plus are called frame 1 and frame 2, or alternatively the primary and secondary (or master and slave) frames. It is the primary frame that connects to and communicates with the router control system. The secondary frame connects to, and communicates with, the primary frame.

It is in MRC that you designate a router as primary or secondary. See the *Miranda Router Configurator User's Guide*.

The NV8576-Plus router uses "expansion" cabling to interconnect its two frames.

Expansion cabling includes the following:

- 28-pin "TDP" cables for video and audio signals. (They have flat D-shaped connectors that are nickel-plated on one side and black on the other side.)

  These are 4 meter cables that connect "expansion" output cards of one frame to expansion output cards of the other frame.

- RJ-45 or BNC cross-connect cables for communication between the frames.

  An NV8576-Plus router with EM0666 control cards (i.e., *standard* router) the cross-connection uses RJ-45 cables with terminators.

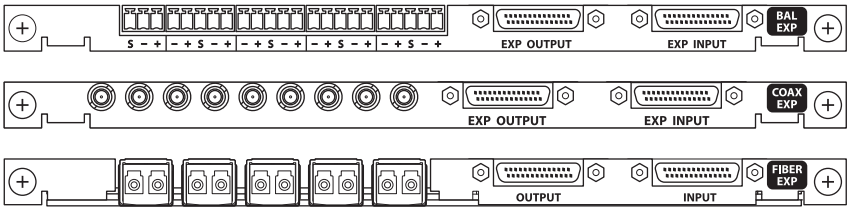
  An NV8576-Plus router with EM0833 control cards (i.e., *hybrid* router) the cross-connection uses BNC cables ***without*** terminators.

- Monitor feeds.

  If the router uses monitor cards, monitor cards in the primary frame relay monitor information from the secondary frame to external monitoring equipment. Coax (DIN 1.0/2.3) cabling is required for the monitor connections.

Power and alarm connections apply to each individual frame. For more information, see Power on page 111.

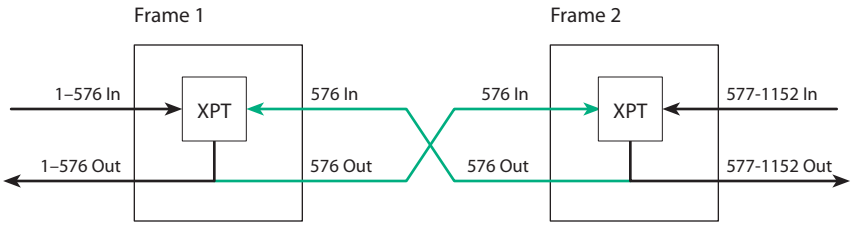
The principal different between an NV8576 frame and an NV8576-Plus frame is that the NV8576-Plus frame is populated with expansion output cards, while the NV8576 frame is populated with regular output cards. Expansion output cards are characterized by having 9 signal connectors and two 28-pin "TDP" connectors for expansion cables:



For a list of expansion output cards available and their part numbers, see Appendix B, Part Numbers on page 183.

Signal Flow and Signal Numbering

In the expanded NV8576-Plus, each of the two frames has a 576×576 crosspoint. Expansion cabling allows signals in one frame to reach the other frame:



Any input signal can reach any output signal in either frame. Effectively, the pair of frames is an 1152×1152 router.

The illustration above shows standard signal numbering. The structure is similar for hybrid I/O but uses different and more complex signal numbering. (Hybrid I/O requires hybrid crosspoints cards and hybrid control cards.)

For standard I/O, frame 1's inputs are 1–576 and its outputs are 1–576. Frame 2's input are 577–1152 and its outputs are 577–1152.

For hybrid I/O, the port space for frame 1 and frame 2 are:

Frame	Video	Audio
1	1–576	1–9216
2	577–1152	9217–18432

Hybrid I/O *does not use all the ports in the space* of the router (or in the spaces of the I/O cards).

I/O slots are numbered from right to left as you face the rear of the router frame. In both frames, the slots in the upper bays are numbered 1–32. In both frames, the slots in the lower bays are numbered 33–64.

However, I/O port numbers depend on a *different* slot ordering.

Port Ordering in Frame 1

This is the ordering of slots for input port numbering, as viewed from the rear:

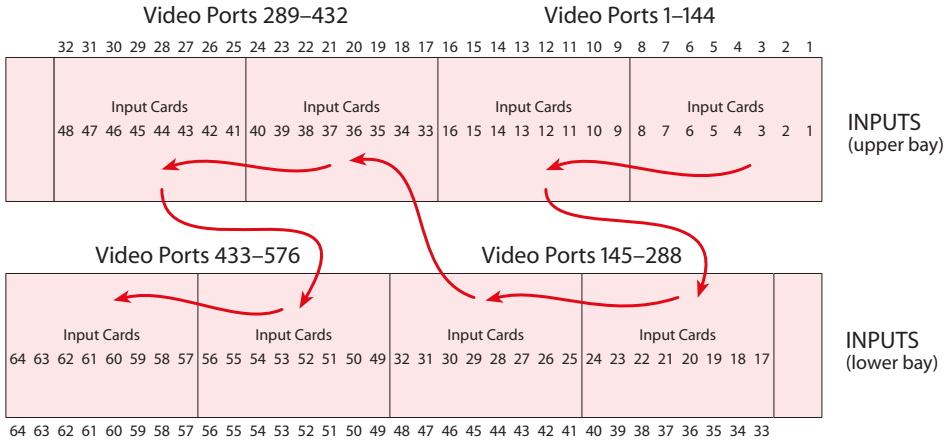


Fig. 6-1: NV8576-Plus Slot Order for Input Port Numbering

This is the ordering of slots for output port numbering:

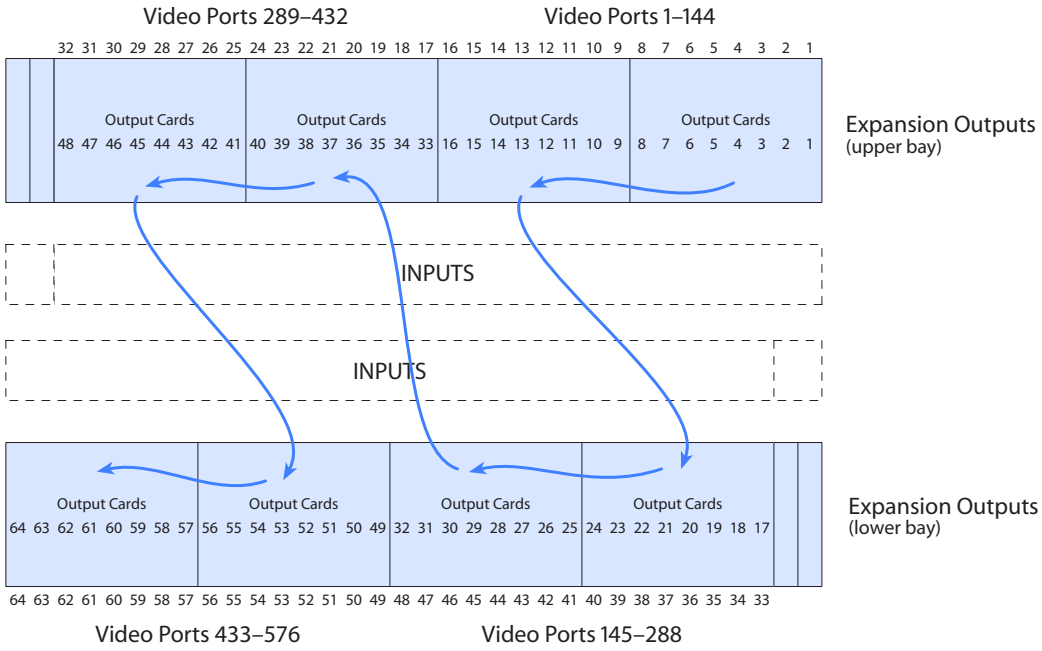


Fig. 6-2: NV8576-Plus Slot Order for Output Port Numbering (Frame 1)

Cards and backplanes in the lower bays are installed "upside down," that is rotated 180° with respect to the cards and backplanes in the upper bays.

Regardless of the cards' orientation, port numbering increases from the top to the bottom in each slot and then for each consecutive slot in the slot ordering for ports. For standard I/O the card in slot 1 of frame 1 has ports 1–9, the card in slot 2 has ports 10–18, and so on. This is true for input cards and (expansion) output cards.

Port Ordering in Frame 2

Both input and output ports in frame 2 start at 577 and end at 1152. Thus the card in slot 1 of frame 2 has port space 577–585.

However, I/O port numbers depend on a different slot ordering. This is the ordering of slots for input port numbering, as viewed from the rear:

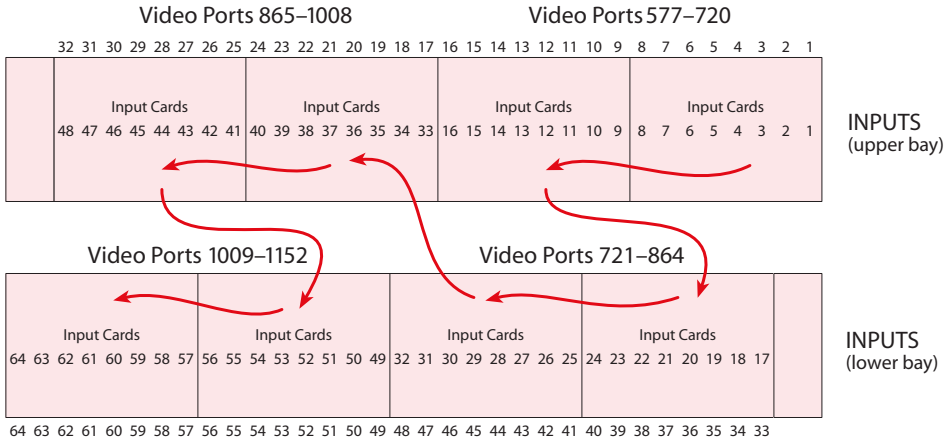


Fig. 6-3: NV8576-Plus Slot Order for Input Port Numbering

This is the ordering of slots for output port numbering:

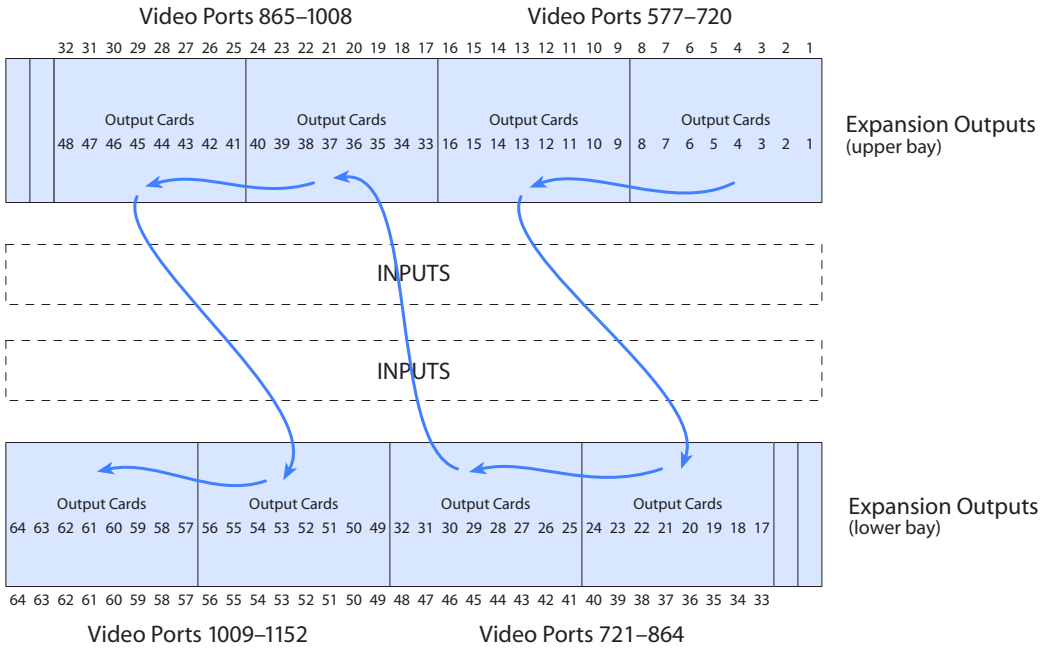


Fig. 6-4: NV8576-Plus Slot Order for Output Port Numbering (Frame 1)

Here too, cards and backplanes in the lower bays are installed “upside down,” that is rotated 180° with respect to the cards and backplanes in the upper bays.

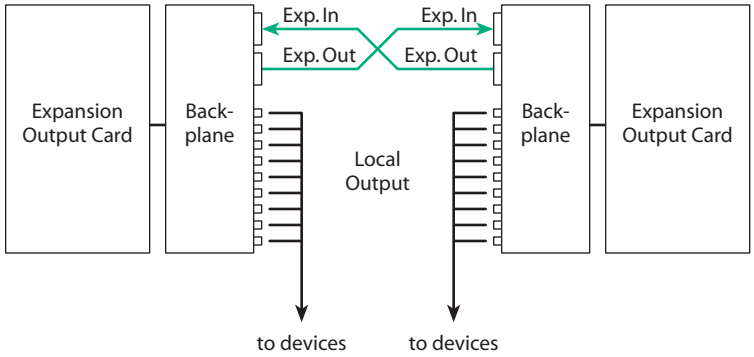
Figure 6-5 shows the different regions of the NV8576-Plus router that correspond the crosspoint cards, input cards, and output cards in Figure 6-5.

Fig. 6-5: Physical Signal Regions of the NV8576-Plus (Front View)

Expansion I/O Cards

Expansion output cards exchange signals between the two NV8576-Plus frames.

Expansion output cards (and their backplanes) are used in pairs, one card in frame 1 and another card of a *matching* type, in the same slot, in frame 2:



There are several expansion output card types:

- AES async (standard, coax or WECO)
- HD (standard, coax)
- 3Gig (standard, coax or fiber)
- Hybrid (i.e., embedder output or disembedder/embedder output)
- Hybrid MADI
- Standard filler
- Hybrid filler

An expansion output card in frame 1 must match the card type of the card to which it connects in frame 2. (The card in frame 1 must be in the same slot as the connected card in frame 2.) The following table lists the card types that can match:

Card Type	Matching Card Types
AES async	AES async; standard filler
HD	HD; standard filler
3Gig coax	3Gig coax; 3Gig fiber; standard filler
3Gig fiber	3Gig coax; 3Gig fiber; standard filler
Standard filler	AES async; HD; 3Gig coax; 3Gig fiber
Hybrid embedder	Hybrid embedder; hybrid disembedder/embedder; hybrid filler
Hybrid disembedder/embedder	Hybrid embedder; hybrid disembedder/embedder; hybrid filler
Hybrid MADI	Hybrid MADI; hybrid filler
Hybrid filler	Hybrid MADI; hybrid embedder; hybrid disembedder/embedder

See Chapter 2, Inputs and Outputs on page 21 for descriptions of the different I/O types.

Filler cards have no local outputs, although the backplanes they use do have connectors. What "filler" cards do is allow input signals to cross over to the other frame in slots that have no outputs.

For instructions on installing expansion output cards, see Installing I/O Cards on page 54. For instructions on installing expansion backplanes, see Installing I/O Cards on page 54.

Expansion output cards are available for both standard and hybrid. The following is a list of all expansion output cards and their corresponding backplanes:

Signal Type	Card Class	Rates	Signals	Backplane
AES async: asynchronous digital audio, unbalanced and balanced	Standard	Sample rates 32 to 192kHz (passed through)	9 AES pairs; 2 expansion	EM0789 (coax) EM0830 (WECO)
3Gig (coax): SD, HD, or 3Gig	Standard	Video rates from 19 Mb/s to 2.97 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 passed through	9 video; 2 expansion	EM0789 (coax)
3Gig (fiber optic): SD, HD, or 3Gig	Standard		9 video; 2 expansion	EM0698 (fiber optic)
3Gig (coax): SD, HD, or 3Gig	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s. Reclocking bypassed at other rates. Disembedded audio embedded into video stream	8 video; 128 embedded audio; 2 expansion	EM0789 (coax)
3Gig/TDM (coax): SD, HD, or 3Gig with MADI	Hybrid	Video rates from 19 Mb/s to 2.97 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 passed through Audio: 1 stream of 56 or 64 channels, 32 bits at 48 kHz, locked to reference.	8 video; 1 MADI stream; 2 expansion	EM0789
Filler	Either standard or hybrid	—	2 expansion connectors only	EM0789

Only coax backplanes (and cards) are used for hybrid I/O.

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

Expansion Output Backplanes

Expansion backplanes have 9 coax connectors, 9 LC connectors, or 9 WECO connections for *local* outputs and 2 28-pin connectors for *expansion* signals. (Expansion signals connect inputs from one frame to crosspoints in the other frame.)

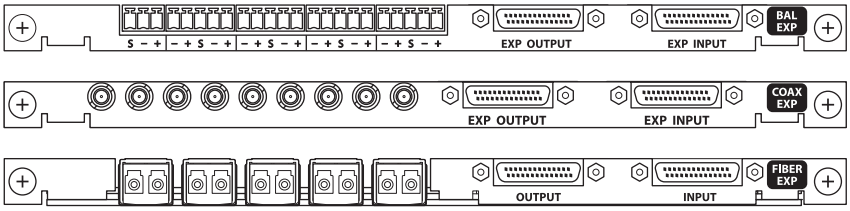


Fig. 6-6: Expansion Backplanes

Connecting the NV8576-Plus Frames

Besides the normal I/O connections, you must interconnect the two NV8576-Plus frames. The cabling for these interconnections includes the following:

- 28-pin "TDP" cables for video and audio signals.

  These are 4 meter cables that connect "expansion" output cards of one frame to expansion output cards of the other frame. See Making Expansion Connections, following.

- Either RJ-45 or BNC cross-connect cables for communication between the frames.

  An NV8576-Plus router with EM0666 control cards (i.e., *standard* router) the cross-connection uses RJ-45 cables with terminators.

  An NV8576-Plus router with EM0833 control cards (i.e., *hybrid* router) the cross-connection uses 75 Ω BNC cables ***without*** terminators.

  See Making Router Control System Connections on page 98.

- Monitor feeds.

  If the router uses monitor cards, monitor cards in the primary frame relay monitor information from the secondary frame to external monitoring equipment. Coax (DIN 1.0/2.3) cabling is required for the monitor connections. See Making NV8576-Plus Monitor Connections on page 99

Note that video and AES reference signals must be applied to each frame. (However, AES reference is optional.) See Making Reference Connections on page 58.

For information about I/O signal connections. refer to Chapter 2, Inputs and Outputs on page 21.

Making Expansion Connections

1 Facing the rear of frame, locate the two 28-pin expansion connectors on an expansion output backplane.

The two expansion connectors on each backplane are labeled **EXP INPUT** and **EXP OUTPUT**. Figure 6-7 shows the 3 types of backplanes:

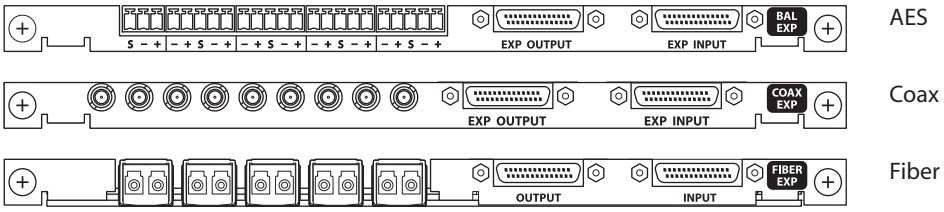


Fig. 6-7: Expansion Backplanes

2 Using a 4-meter WC0121 cable, connect the expansion input of the card in frame 1 to the expansion output of the card in the same slot of frame 2.

Then using another 4-meter WC0121 cable, connect the expansion output of the card in frame 1 to the expansion input of the card *in the same slot* of frame 2:.

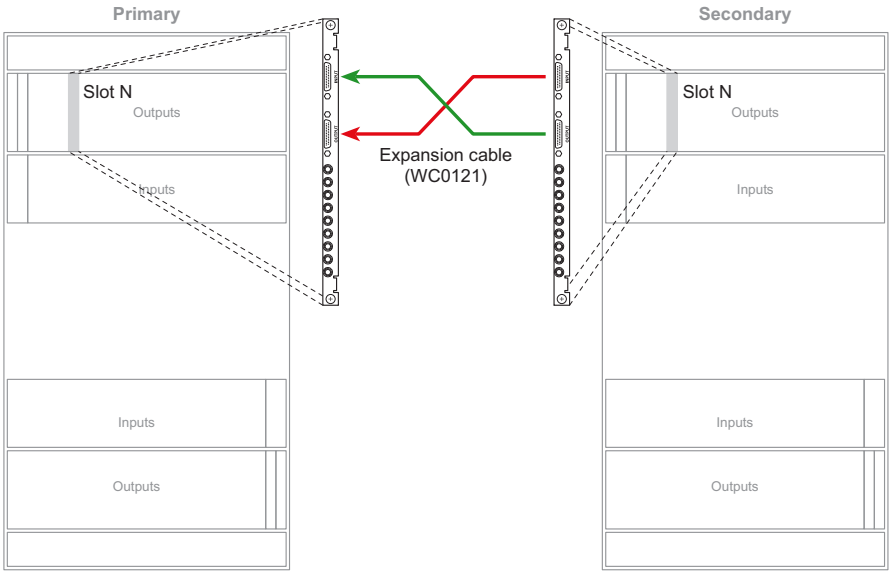


Fig. 6-8: Expansion Signal Connections

Make sure that the connectors are oriented properly. Otherwise, you can damage the connector pins.

In the upper bays of the router frame, the black side of the cable connector faces *right* and the silver side faces *left*.

In the lower bays, the black side of the connector faces *left* and the silver side faces *right*.

Keep in mind that the cards in the lower bays are installed "upside down," that is, rotated 180° with respect to the cards in the upper bays.

3 Repeat step 2 until all expansion connectors have been connected.

Making Router Control System Connections

An NV8576-Plus router with EM0666 control cards (i.e., *standard* router) the cross-connection uses RJ-45 cables with terminators.

An NV8576-Plus router with EM0833 control cards (i.e., *hybrid* router) the cross-connection uses BNC cables ***without*** terminators.

For Routers with EM0666 Control Cards

1 Face the rear of the router frames. Locate the **RTR EXP** connectors (RJ-45).

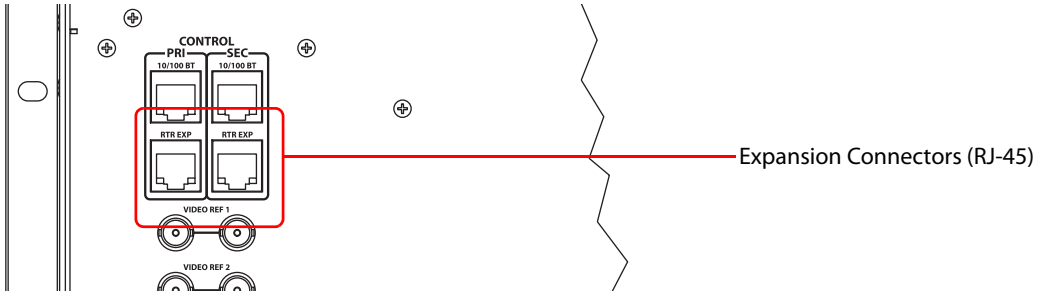


Fig. 6-9: RJ-45 Control Connections

Connect **RTR EXP** on one frame to **RTR EXP** on the other frame. Place terminators in the unused RJ-45 ports.

> Note
>
> Miranda provides the terminators (WC0084). They are small; be careful not to overlook them.

For Routers with EM0833 Control Cards

1 Face the rear of the router frames.

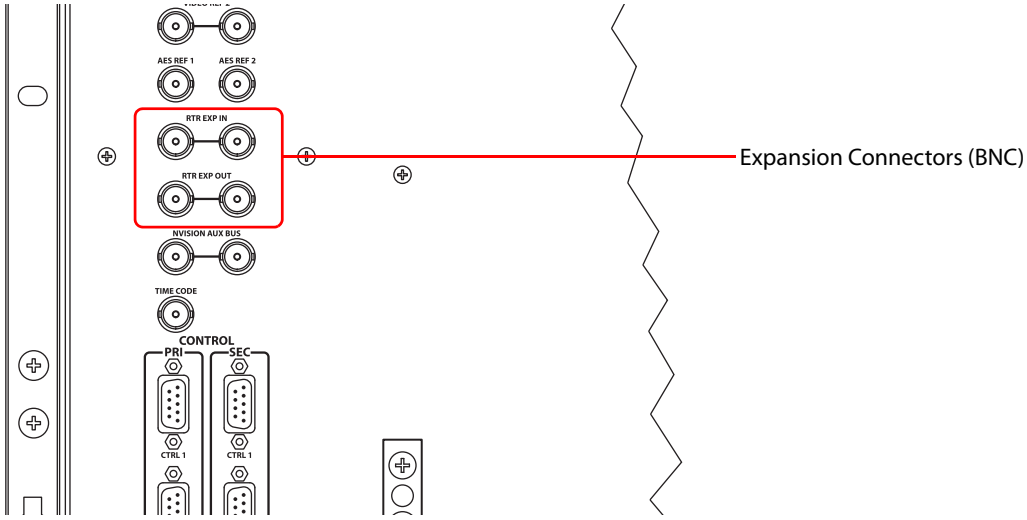


Fig. 6-10: BNC Control Connections

2 Using a 75Ω BNC cable, connect **RTR EXP IN** on frame 1 to **RTR EXP OUT** on frame 2.

3 Using a 75Ω BNC cable, connect **RTR EXP OUT** on frame 1 to **RTR EXP IN** on frame 2.

Because the cables are paired, you can use two cables for redundancy.

Making NV8576-Plus Monitor Connections

There are four monitor backplanes in each frame. Two are located in the upper region to the left of the output cards as you face the rear of the frame and two are located in the lower region to the right of the output cards.

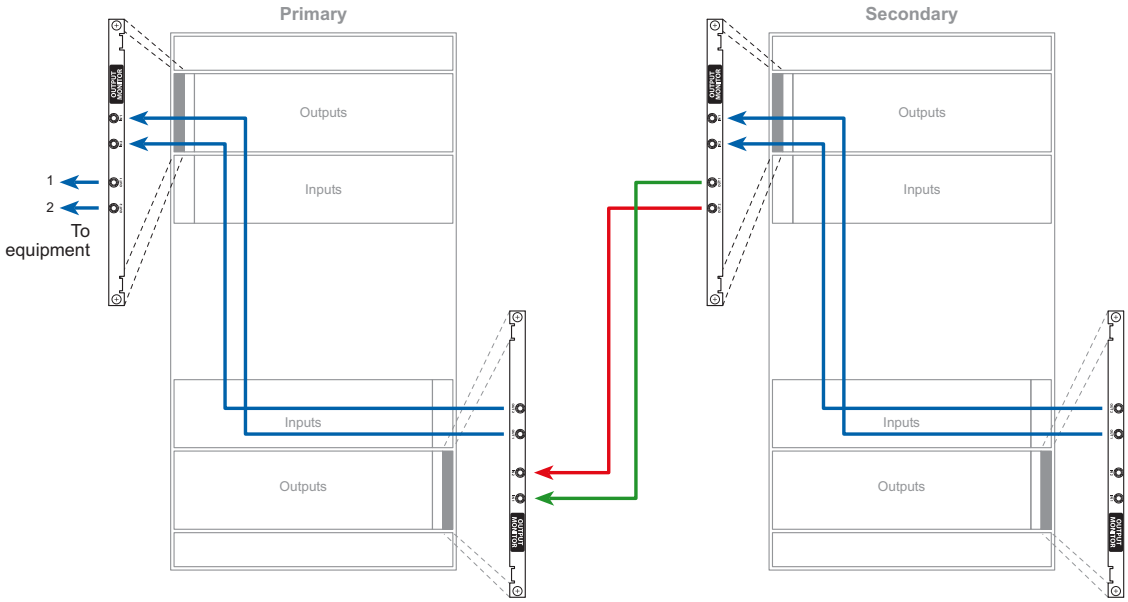


Fig. 6-11: NV8576-Plus monitor connections (Rear View)

(Refer also Figure 1-11 on page 15.)

The monitor backplanes toward the outside of the frame are output monitor backplanes; the backplanes toward the inside are input monitor backplanes.

For each output monitor connection, use an 1855A Belden cable (or equivalent) with coax (DIN 1.0/2.3) connectors, and make connections as shown in Figure 6-11:

1 For each frame,

   Connect **OUT 1** on the output monitor backplane in the *lower* region to **IN 1** of the output monitor backplane in the *upper* region.

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

2 Between the frames,

   Connect **OUT 1** of the *upper* output monitor backplane of frame 2 to **IN 1** of *lower* output monitor backplane of frame 1.

   Connect **OUT 2** of the *upper* output monitor backplane of frame 2 to **IN 2** of *lower* output monitor backplane of frame 1.

3 Connect **OUT 1** and **OUT 2** of the *upper* output monitor backplane to your monitoring equipment.

4 Repeat steps 1–3 for input monitor cards.

7 Alarms

The NV8500 series routers have system (i.e., router) alarm connections. The NV8300 power supply frame — used by the NV9280, NV8576, and NV8576-Plus — has power supply alarm connections.

These alarm signals can be delivered to external equipment that notifies technicians when an alarm condition occurs. Creation of an external alarm indicator is outside the scope of this manual, however basic instructions on wiring the alarm connection for external monitoring are provided.

The router sends alarm information to the router control system through its control card(s). The control card reads the status of an external power supply frame if it has one and monitors the router's power supply, fans, and reference connections. You can view both power supply status and router status using MRC. (See the *Miranda Router Configurator User's Guide*.)

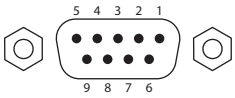
Topics

Power Supply Alarms

NV8300 Power Supply Alarms

The NV8300 frame has 2 power supply monitoring connectors and a power supply alarm connector. The monitor connectors are DB25s. One of these connects to an NV8280, NV8576, or NV8576-Plus router frame. The other DB25 connects to a DB25 on another NV8300 frame in cases where two NV8300s are required to power a router frame (as for the NV8576 and NV8576-Plus). The DB25 connections feed alarm status to the router which then feeds the status information to the router control system or to MRC.

The alarm connector that you can use for your own circuitry is a DE9 at the rear of the NV8300 frame. It provides alarm status for each of the 4 power supplies in the NV8300 frame. It is this connector you use to create a power supply alarm indicator.



1	PS1	5	PS3
2	PS1 COM	6	PS3 COM
3	PS2	7	PS4
4	PS2 COM	8	PS4 COM
		9	n.c.

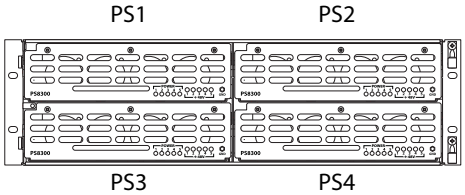


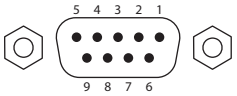
Fig. 7-1: NV8300 Power Supply Alarms Connector

As a reminder, the NV8300 power supply frame has 4 power supply slots, numbered as shown above, as viewed from the front of the frame. PS2 is redundant to PS1; PS4 is redundant to PS3.

Note that MRC can be configured so that when a PS8300 power supply module is removed from the NV8300 frame, MRC will report an alarm. The alarm connector itself reports no such alarm. (The configuration is made in MRC's 'Module Types' page.)

NV8140 and NV8144 Power Supply Alarms

The power supply panel on the rear of the NV8144 and the NV8140 routers has a DE9 connector that you can use to create a power supply alarm circuit.



1	PS1	5	n.c.
2	PS1 COM	6	n.c.
3	PS2	7	n.c.
4	PS2 COM	8	n.c.
		9	n.c.

An NV8140 or NV8144 has only one or two power supplies. Therefore pins 5–8 of the connector are unused.

Fig. 7-2: NV8144 and NV8140 Power Supply Alarms Connection

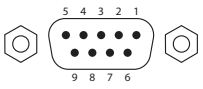
Note that MRC can be configured so that when a PS8300 power supply module is removed from the NV8300 frame, MRC will report an alarm. The alarm connector itself reports no such alarm. (The configuration is made in MRC's 'Module Types' page.)

- Do not confuse the power supply alarm connector with the system alarm connector located elsewhere on the rear of the router. See Making Alarm Connections on page 104 for more information.

External Power Supply Alarm Circuitry

When a power supply alarm occurs, the connection between an alarm pin and its matching COM (common) closes. When the alarm turns off, the connection opens again.

If you want a power supply alarm indicator, create a circuit similar to one of the circuits shown in Figure 7-3. Each pair of pins monitors an individual power supply. The NV8300 has 4 power supplies; the NV8140 and NV8144 have two.



For the NV8300				*For the NV8140 and NV8144*			
1	PS1	5	PS3	1	PS1	5	n.c.
2	PS1 COM	6	PS3 COM	2	PS1 COM	6	n.c.
3	PS2	7	PS4	3	PS2	7	n.c.
4	PS2 COM	8	PS4 COM	4	PS2 COM	8	n.c.
		9	n.c.			9	n.c.

Typical Circuit 1
Normally OFF, the LEDs turn ON to indicate failure

Typical Circuit 2
Customer-supplied relay (de-energized when alarm is ON)

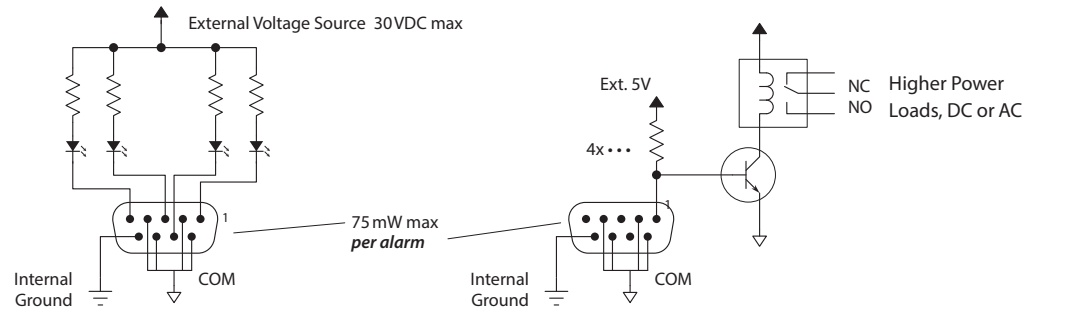


Fig. 7-3: PS Alarm Connections

Each of the alarm connections corresponds to a solid-state, optically isolated relay. The relay allows current to pass in your external circuit when the alarm is on. The relay can accept up to 30 VDC and tolerate up to 75 mW. Typical applications might use the following values for circuit 1 above:

Ext. Voltage	Resistor	Current	Power
5 V	470 Ω	6.3 mA	19.15 mW
12 V	1600 Ω	6.25 mA	62.5 mW

A current of about 6 mA is sufficient to illuminate LEDs brightly.

- Warning: do not reverse bias the alarm connections. They will not function and damage might occur.

Circuit 2, in Figure 7-3, controls electromechanical relays to drive higher loads, such as lamps or speakers, possibly using AC.

System Alarms

- System alarms, so called, are router alarms.

When an alarm occurs, the connection between an alarm pin and Alarm_COM closes. When the alarm turns off, the connection between Alarm_COM and the alarm pin opens again.

If you want a system alarm indicator, create a circuit similar to one of the circuits shown in Figure 7-4. Each pin (2–8) monitors a specific function and activates a specific alarm.

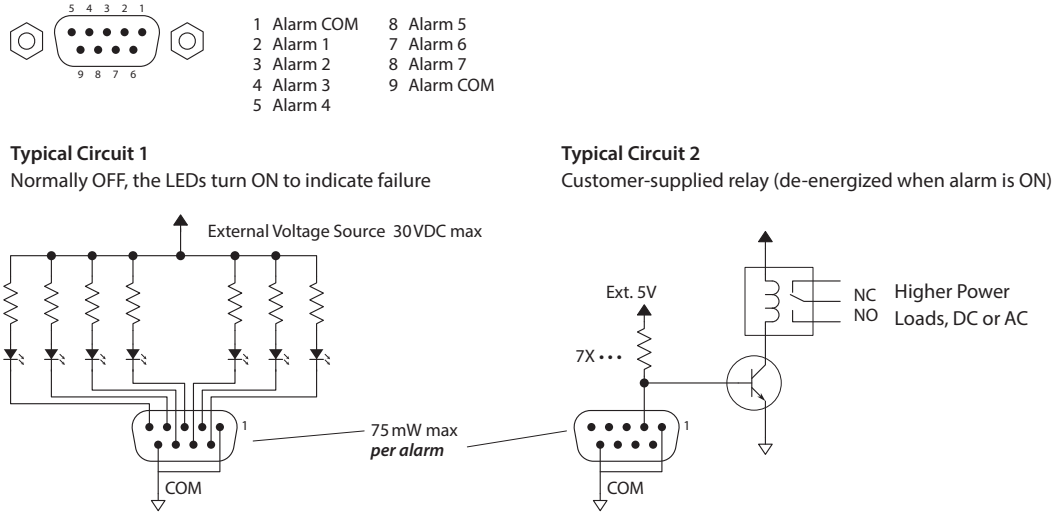


Fig. 7-4: Alarm Connections and On/Off Switches

Each of the 7 alarm connections corresponds to a solid-state, optically isolated relay. The relay allows current to pass in your external circuit when the alarm is on. The relay can accept up to 30 VDC and tolerate up to 75 mW. Typical applications might use the following values for circuit 1 above:

Ext. Voltage	Resistor	Current	Power
5 V	470 Ω	6.3 mA	19.15 mW
12 V	1600 Ω	6.25 mA	62.5 mW

A current of about 6 mA is sufficient to illuminate LEDs brightly.

▲ Warning: do not reverse bias the alarm connections. They will not function and damage might occur.

Circuit 2, in Figure 7-4, controls relays to drive higher loads, such as lamps or speakers, possibly using AC.

The following lists each DE9 pin and the associated *system* alarm. The pin number listed corresponds to the pin numbers in Figure 7-4:

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 Series.
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.”

On NV8140 and NV8144 routers, the power supply alarm connectors and the system alarm connectors look alike. Be careful to use the correct connector.

Making Alarm Connections

System Alarm Connections

System alarm signals connect from the router frame directly to your alarm indicators. System alarms are also sent by the control card to the router control system and display in MRC.

Making System Alarm Connections

1 At the rear of the router, locate the ‘ALARMS’ connector:

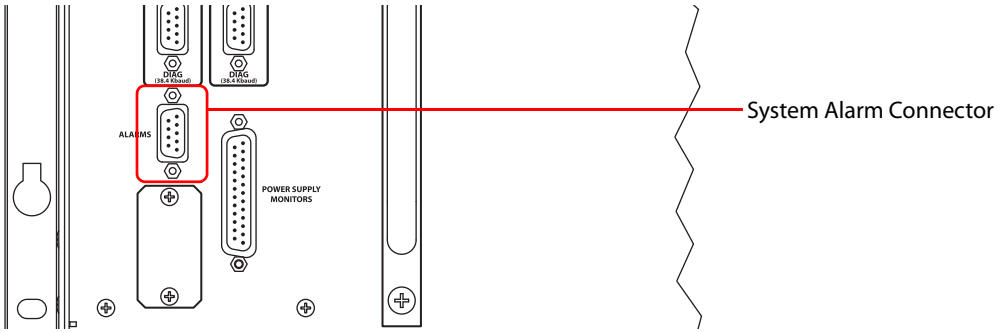
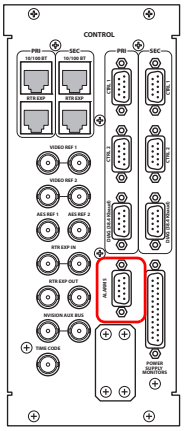


Fig. 7-5: System Alarm Connection on Router (Rear View)

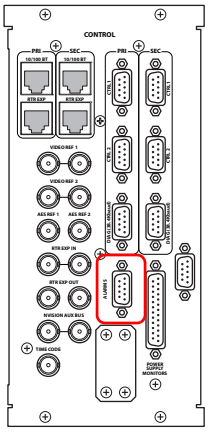
2 Using a DE9 connector and cable suitable for your equipment, connect your alarm indicators to the ‘ALARMS’ port of the router.

Location of the System Alarm Connector

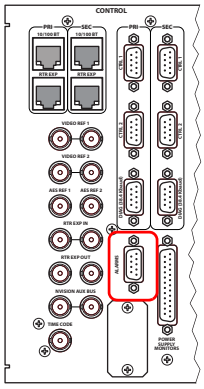
The system alarm connector is located among the various control and reference connectors at the rear of the router:



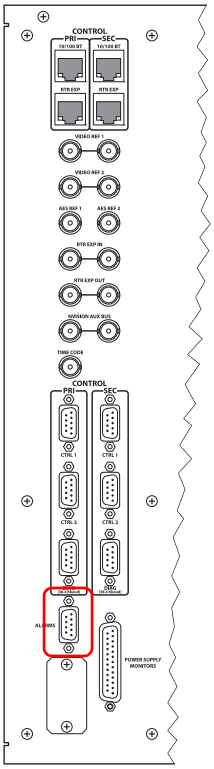
NV8144



NV8140



NV8280



NV8576, NV8576-Plus

Power Supply Monitor Connections

For the NV8280, NV8576, and NV8576-Plus, external power supply frames are required. Each power supply frame has two DB25 connectors labeled 'PS Frame 1 Monitor' and 'PS Frame 2 Monitor'.

Making Power Supply Frame Connections for the NV8280

The NV8280 requires one NV8300 frame.

1 At the rear of the NV8300 frame, locate the **PS Frame 1 Monitor** connector.

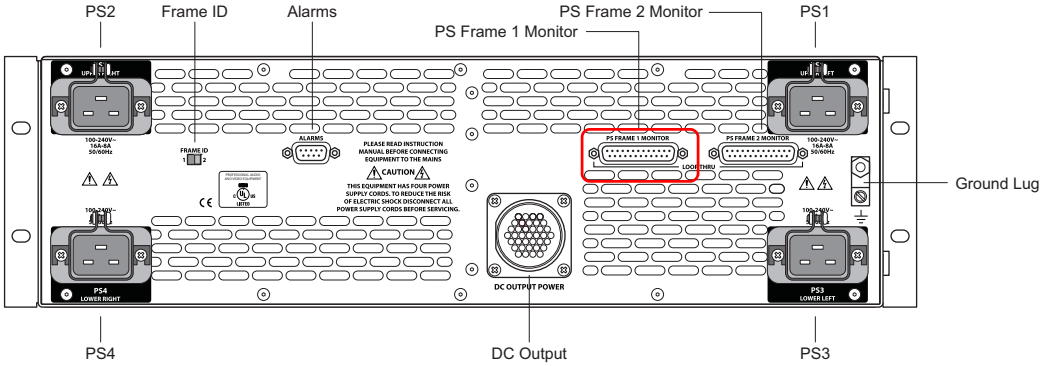


Fig. 7-6: NV8300 power supply frame (Rear View)

2 Using a WC0046-00 cable (having DB25 connectors), connect **PS Frame 1 Monitor** on the NV8300 to the P**ower Supply Monitor** connection at the rear of the NV8280.

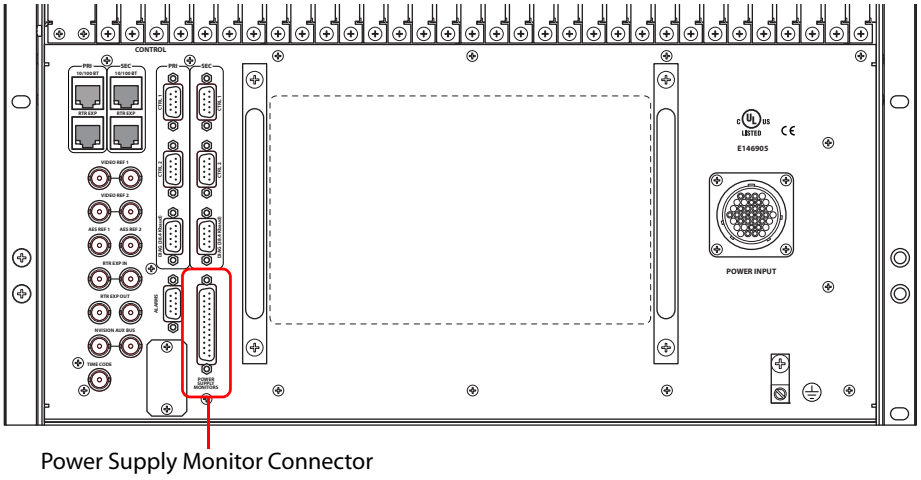


Fig. 7-7: NV8280 Power Supply Monitor and Power Input Connections (Rear View)

Making Power Supply Frame Connections for the NV8576 or NV8576-Plus

The NV8576 and NV8576-Plus require 2 NV8300 frames for each router frame.

1 At the rear of the one of the NV8300 frames, locate the **PS Frame 1 Monitor** connection.

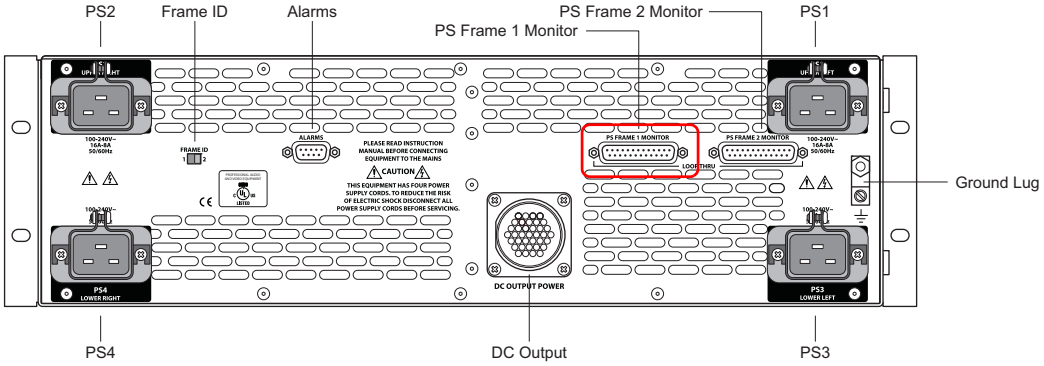


Fig. 7-8: NV8300 Power Supply Frame (Rear View)

2 Using a WC0046-00 cable (having DB25 connectors), connect **PS Frame 1 Monitor** on the NV8300 to the P**ower Supply Monitor** connection at the rear of the router frame.)

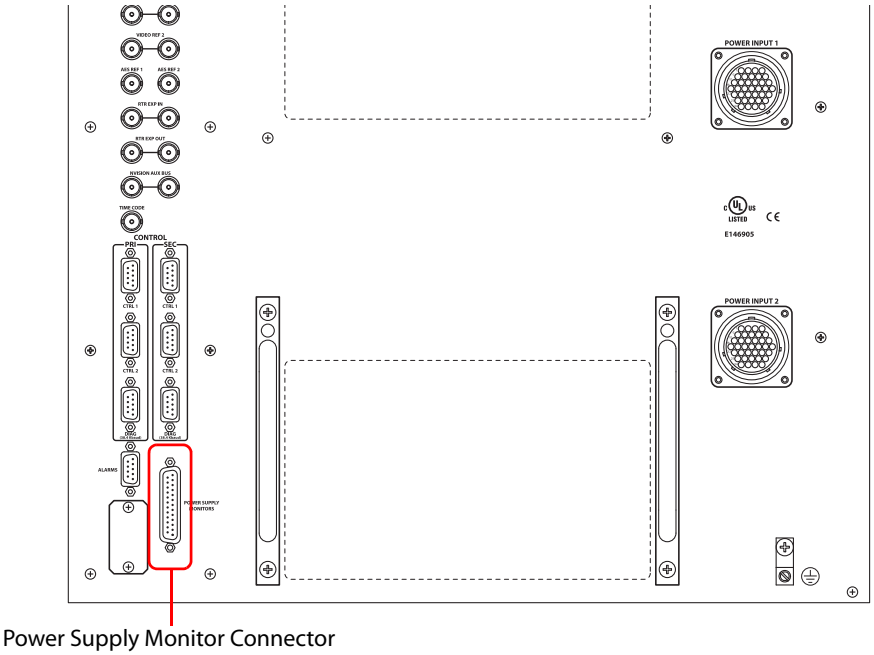


Fig. 7-9: NV8576 power supply monitor and power connections (Rear View)

3 Connect **PS Frame 1 Monitor** of the second NV8300 frame to **PS Frame 2 Monitor** of the first NV8300 frame, using a WC0046-00 cable.

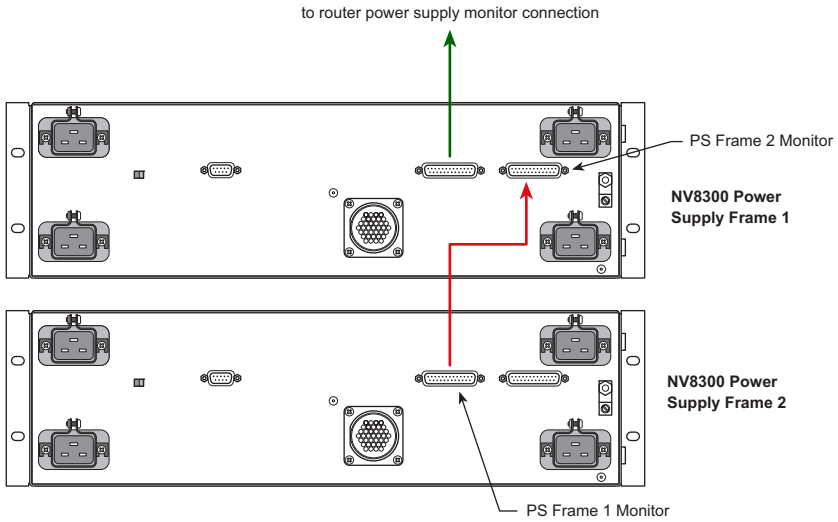


Fig. 7-10: Power Monitor Connections for Two NV8300 Frames (Rear View)

▲ Note also that the frame ID switches of the two power supply frames must be set differently.

Power Supply Alarm Connections

The NV8300 power supply frame has a DE9 connector for an external alarm indicator.

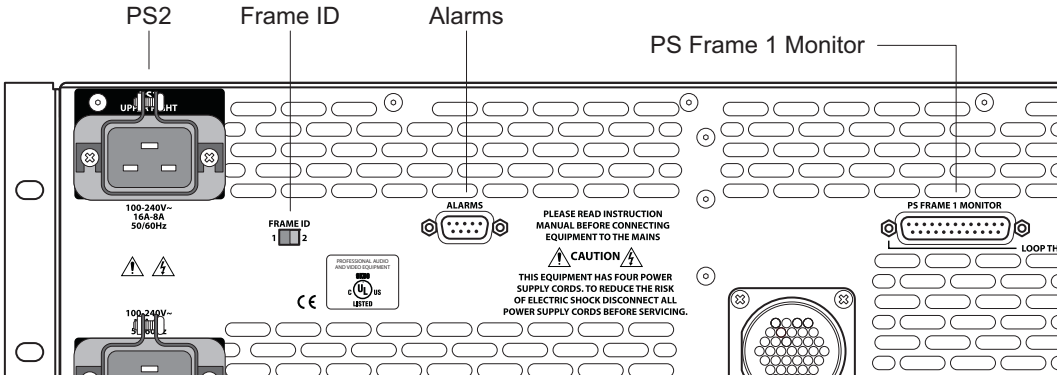
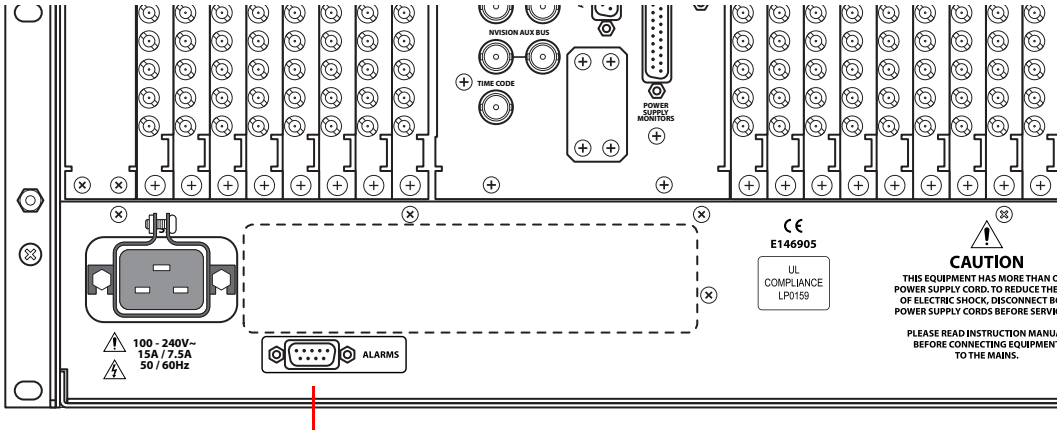


Fig. 7-11: NV8300 Power Supply Frame (Rear View)

The NV8140 and NV8144 routers, which do not use external power supply frames, also have a DE9 connector for an external alarm indicator:



Making a Power Supply Alarm Connection

1 At the rear of the router or the NV8300, whichever you have, locate the 'ALARMS' connector.

2 Using a DE9 connector and cable suitable for your equipment, connect your alarm indicators to the 'ALARMS' port.

8 Power

NV8500 series routers use power supply modules to power the router frames. Two power supply models exist: the PS8100 (850 Watts) and the PS8300 (1350 Watts). The PS8100 is used by the NV8144. The PS8300 is used by the NV8140, NV8280, NV8576, and NV8576-Plus. The PS8100 resides in a power supply bay of the NV8144. The PS8300 resides in a power supply bay of the NV8140. For the larger routers, the PS8300 resides in an external NV8300 power supply frame. The power supply frame holds up to 4 PS8300s.

Additional power supply modules can be installed as a backup, or secondary, source should the primary module fail. All routers are fully operational using only the primary or only the backup power supply module.

The router's control card monitors power supply status. Power status information is sent to the router control system and to the Miranda Router Configurator (MRC) in which alarms can be set up to notify technicians. (See Making Alarm Connections on page 104. Refer also to the *Miranda Router Configurator User's Guide*.)

For a list of power modules available and their part numbers, see Power Supply on page 189.

Topics

Power Requirements

Each router frame requires a different amount of power. Power requirements also depend, to a lesser degree, on the number of input and output cards installed. Each power supply module has been designed to meet the maximum power needs of a router frame.

The NV8144 uses the PS8100 module. A PS8100 can be installed directly in each of the frame's two power supply module bays. One is the primary supply and the is the secondary, or redundant, supply. The PS8100s use a 15A circuit and standard IEC 15 A AC power cords.

The NV8140 uses the PS8300 module. A PS8300 can be installed directly in each of the frame's two power supply module bays. One is the primary supply and the is the secondary, or redundant, supply. The NV8140 has two C19 power connectors and require 20A plant lines. The cable supplied in North America has a NEMA L5-20P connector at the other end. For customers outside North America, we ship these power cords with the NEMA end cut off.

The NV8280, NV8576, and NV8576-Plus use PS8300 power supplies, in an external NV8300 frame that holds up to four PS8300 power supply modules. Two are primary supplies and two are secondary (or redundant) supplies. The NV8280 requires 1 NV8300 power supply frame. The NV8576 requires 2 NV8300 power supply frames. The NV8576-Plus (two frames) requires 4 NV8300 power supply frames, 2 for each frame.

The NV8300 power supply frame requires a 20 A circuit for each power supply module. Each power supply module connects to power using the WC0157-00 cable that has a twist lock connector. Your facility might require some re-wiring to support multiple 20 A circuits.

The WC0157 cable is shipped without the twist-lock connector outside the U.S. and Canada.

Note: if you want to use 220V to power a PS8300 (in the U.S.), you must procure L6-20 line cords and discard the L5-20 line cords you received with the NV8300 frame.

The following table lists the power supply modules required for each type of router frame, for a fully loaded router frame:

Router	Type of I/O Cards Installed	Required Wattage	PS8100 Modules	PS8300 Modules	NV8300 Frames Required
NV8144	Coax	600	1 required, 1 redundant	—	—
	Fiber optic	820	1 required, 1 redundant	—	—
	Hybrid	820	1 required, 1 redundant	—	—
NV8140	Coax	700	—	1 required, 1 redundant	—
	Fiber optic	1485	—	1 required, 1 redundant	—
	Hybrid	1225	—	1 required, 1 redundant	—
NV8280	Coax	1,750	—	2 required, 2 redundant	1
	Fiber optic	2100	—	2 required, 2 redundant	1
	Hybrid	2700	—	2 required, 2 redundant	1
NV8576	Coax	3400	—	4 required, 4 redundant	2
	Fiber optic	4250	—	4 required, 4 redundant	2
	Hybrid	5400	—	4 required, 4 redundant	2
NV8576-Plus, stand-alone	Coax	3400	—	4 required, 4 redundant	2
	Fiber optic	4250	—	4 required, 4 redundant	2
	Hybrid	5400	—	4 required, 4 redundant	2

Router	Type of I/O Cards Installed	Required Wattage	PS8100 Modules	PS8300 Modules	NV8300 Frames Required
NV8576-Plus, expanded (two frames)	Coax	6,800	—	8 required, 8 redundant	4
	Fiber optic	8,500	—	8 required, 8 redundant	4
	Hybrid	10,800	—	8 required, 8 redundant	4

Overview of Power

The PS8100 and the PS8300 accept a wide range of AC input voltages and produce five +48 VDC outputs, called branches. Each power supply module has its own AC main cable. The power supply automatically senses the AC input voltage range (90–130 and 180–250 VAC) and adjusts to maintain a constant DC output. No "manual" voltage selection is required.

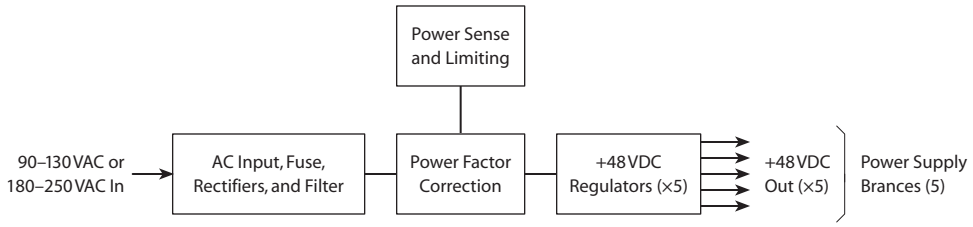


Fig. 8-1: Power Supply Architecture

The five regulated outputs are directed to various sections in the router where on-board regulators produce the DC voltages required by the local circuits. Each branch 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 165.)

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

(The PS8100, PS8300, and the NV8300 frame have no serviceable fuses.)

Power Supply Distribution

Each power supply module produces five +48 VDC branches. The branches are distributed to various modules of the router frame: input, output, control, monitor, and crosspoint cards.

The NV8140 and the NV8144 have one primary power supply module and one redundant power supply module. One is active and the other is standby. The 5 branches distribute power to all input, output, control, monitor and crosspoint modules.

The NV8280, NV8576, and NV8576-Plus frames require more than one PS8300 power supply module. Therefore, each power supply module supplies power to only a section of the router frame. (If power from a PS8300 is interrupted, only that section of the router is affected. You can determine which power supply failed (or failed over to the standby supply) by seeing which cards are not receiving power.

NV8144

The NV8144 requires one internal PS8100 power supply. (It might have a redundant power supply as well, but only one power supply is in use at a time.) Figure 8-2 shows the power supply branches for each part of the NV8144, as viewed from the front.

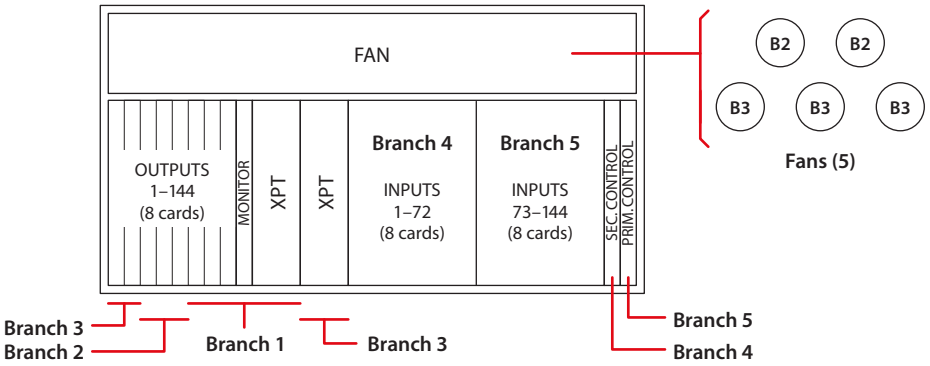


Fig. 8-2: NV8144 Power Supply Branches (Front View)

NV8140

The NV8140 requires one internal PS8300 power supply. (It might have a redundant power supply as well, but only one power supply is in use at a time.) Figure 8-3 shows the power supply branches for each part of the NV8140, as viewed from the front.

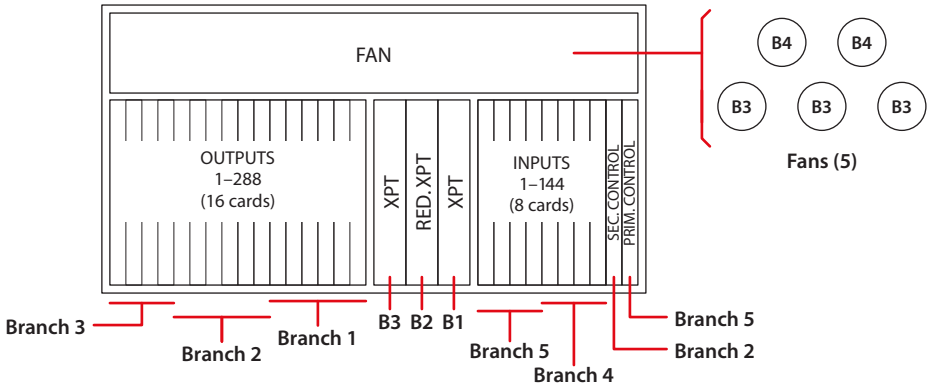


Fig. 8-3: NV8140 Power Supply Branches (Front View)

NV8280

The NV8280 requires one NV8300 power supply frame and two primary PS8300 power supply modules (and two additional modules for redundancy). The primary power supply modules are labeled PS 1 and PS 3; the redundant power supply modules are PS 2 and PS 4.

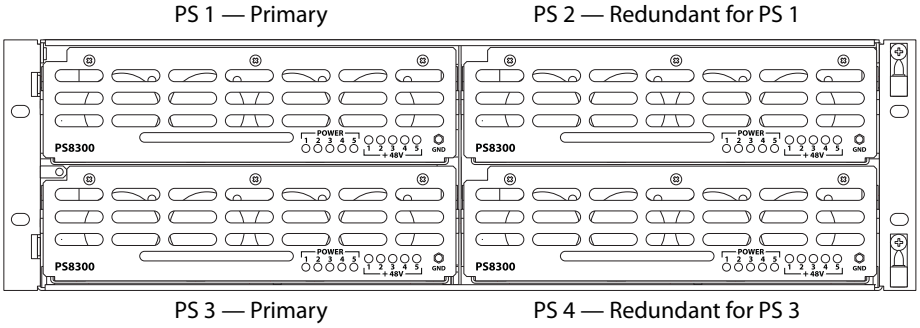


Fig. 8-4: Power supply module locations in a NV8300

Figure 8-5 shows the power supply branches for each part of the NV8280, as viewed from the front.

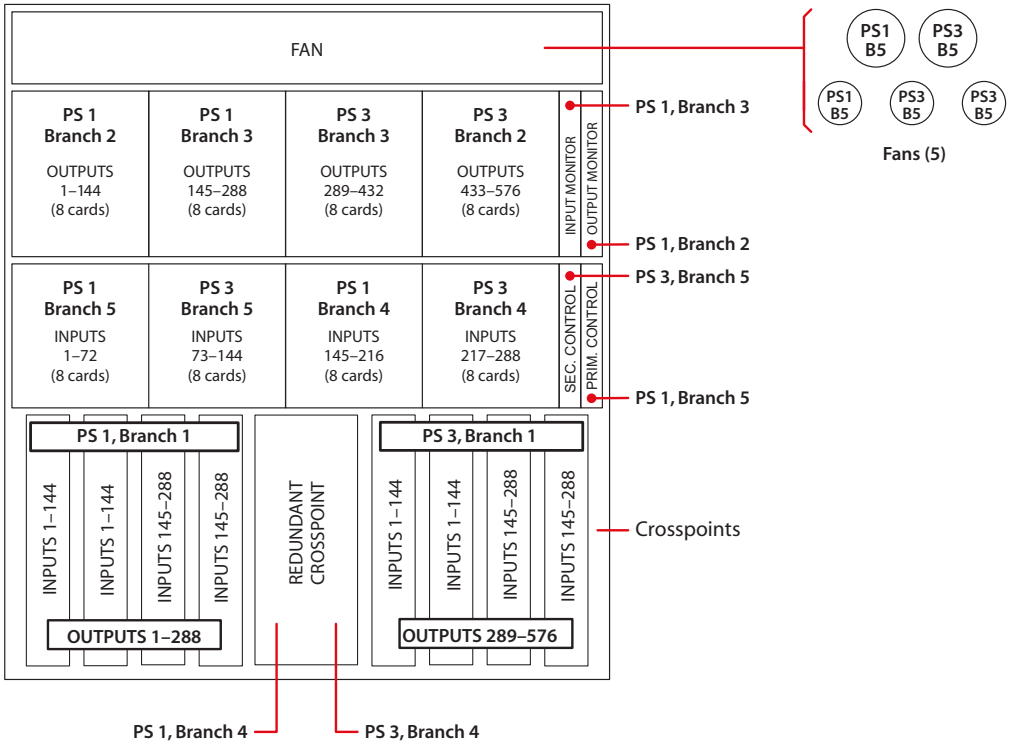


Fig. 8-5: NV8280 Power Supply Branches (Front View)

NV8576 or NV8576-Plus

The NV8576 requires 2 NV8300 power supply frames and 4 primary PS8300 power supply modules (and 4 optional modules for redundancy).

The NV8576-Plus, having two frames, requires 4 NV8300 power supply frames and 8 primary PS8300 power supply modules (and 8 optional modules for redundancy). Two NV8300s apply to frame 1 of the NV8576-Plus and two NV8300s apply to frame 2 of the NV8576-Plus.

The primary power supply modules are numbered PS 1, PS 3, PS 5, and PS 7, and the secondary power supply modules are numbered PS 2, PS4, PS 6, and PS 8, Figure 8-6 shows the modules as viewed from the front of the NV8300 frame.

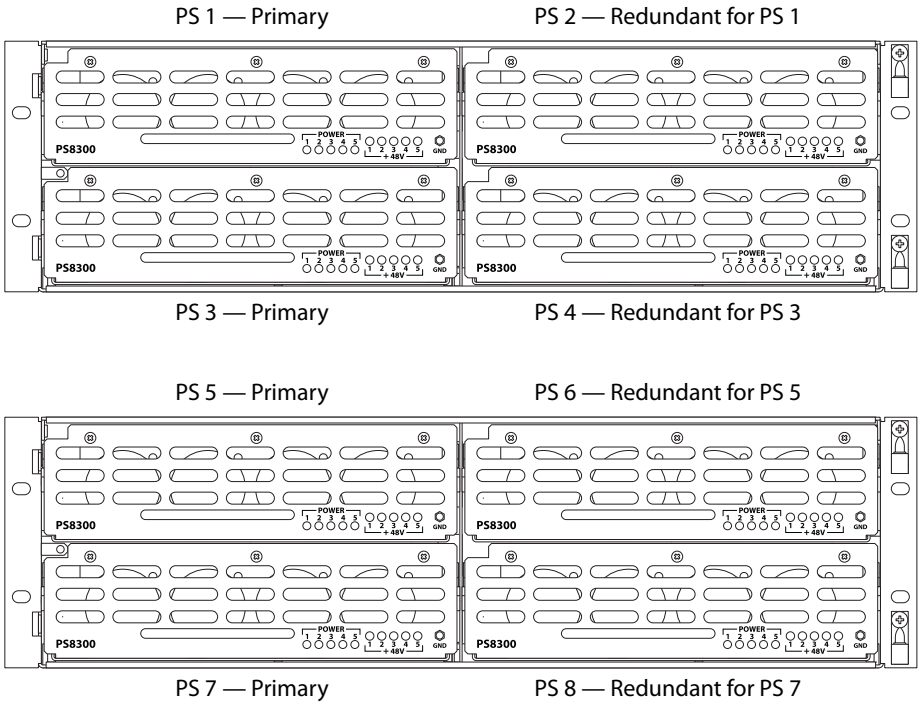


Fig. 8-6: NV8300 Power Supply Frames Required for NV8576 and for the NV8576-Plus

Figure 8-7 shows the power supply branches for each part of the NV8756 frame or NV8576-Plus frame, as viewed from the front.

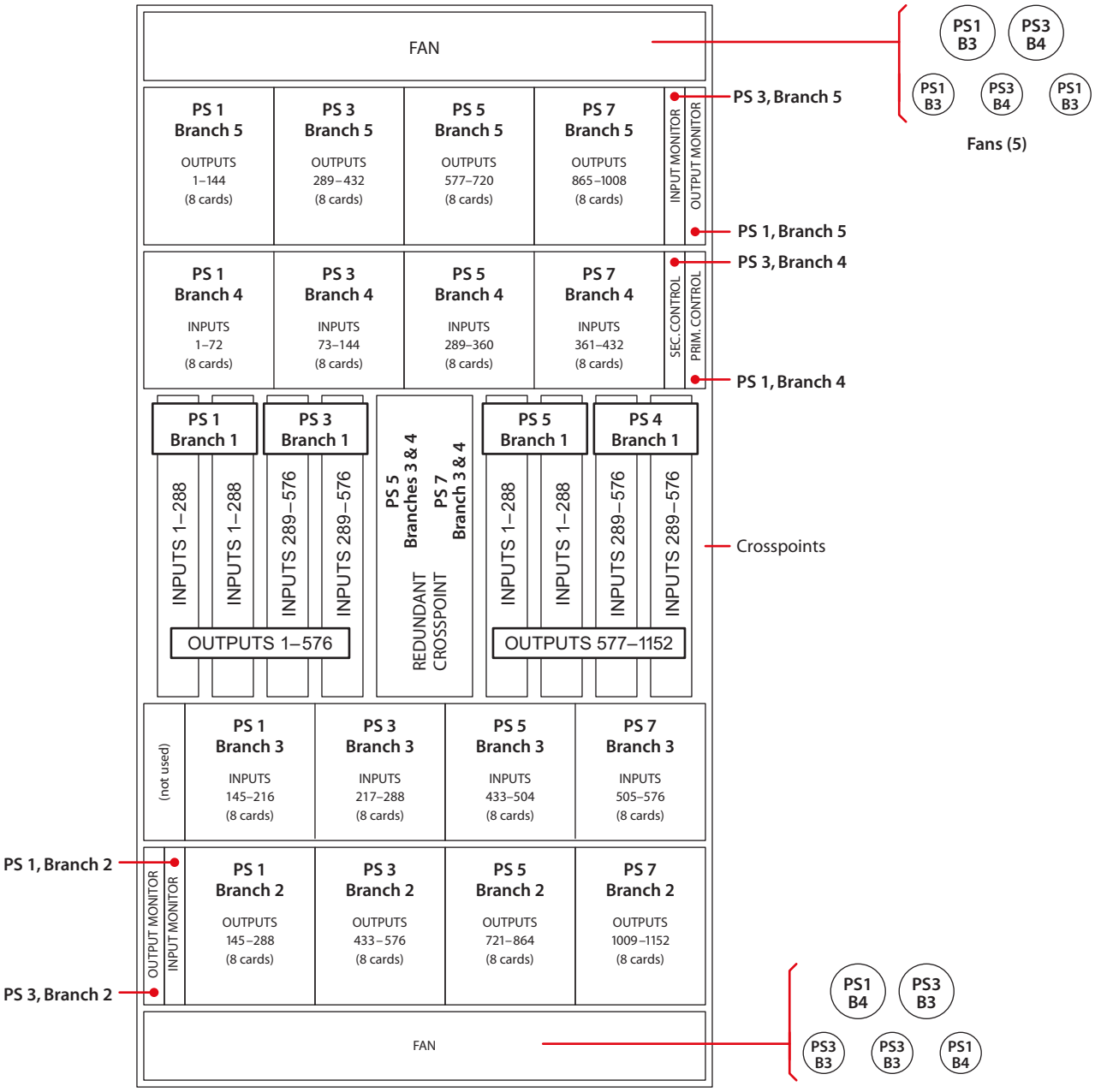


Fig. 8-7: NV8576 Power Supply Branches (Front View)

Connecting to Power

Connecting an NV8144 router frame to power is fairly simple. The router frame is connected to a 15A AC power source sufficient to power the PS8100 modules installed in the frame.

Connecting an NV8140 frame to power is nearly as simple. The NV8140 frame has two C19 power connectors and requires connection 20A plant lines. The cable supplied in North America has a NEMA L5-20P connector at the other end. For customers outside North America, we ship these power cords with the NEMA end cut off.

For the NV8280, NV8576, and NV8576-Plus that require an external NV8300 power supply frame, additional power connections and precautions are required. In addition, power supply monitoring and alarm connections can be made.

The NV8300 power supply frame has two DB25 connectors located at the rear. The connector labeled **Power Supply Monitor** carries alarm and temperature signals to the router. The router, through its control card, sends this information to the router control system.

The other connector, labeled **Alarms**, presents isolated alarm signals that can be connected to an external alarm indicator. See Alarms on page 101.

Recommended Protections

The following recommendations are not necessary for connecting a router to a power source, but are strongly encouraged:

- Connect to separate branch circuits.

  For added protection in a main power failure, connect the main and redundant power source connections to the NV8300 power supply frame be connected to different branch circuits.

- Label the line-side power connection (near your facility's power outlets).

  Accidental disconnection of router power at the outlets can cause a disruption in your on-air signals.

  Normally to remove power from an NV8140 or NV8144, you pull its power cords.

  Normally to remove power from an NV8280, NV8576, or NV8576-Plus, you pull the PS8300s out of the NV8300 power supply frame, one by one.

  Note: For the NV8576-Plus, there are 8 or 16 PS8300s to pull out. This takes a significant amount of time.

- Connect the ground lug to earth ground.

  Each router has a ground lug on the back of the frame. You should 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.

Wiring

If you choose to make your own power cables, use the following wiring methods:

- For the NV8144 (110 VAC, 15A)

- For the NV8140, NV8280, NV8576, NV8576-Plus (110 VAC, 20A or 220 VAC, 10A)

For customers outside North America, we ship these power cords with the NEMA end cut off.

Power Connection Requirements

IMPORTANT

Remove PS8300 power supply modules from NV8300 frames before making power connections.

Re-insert PS8300 power supply modules only ***after*** making all power connections of the router to the NV8300(s) and of the NV8300(s) to AC power, and preferably after making all I/O and control connections.

Inserting PS8300s in the power supply frames is the way you power-up a router (other than the NV8140 or NV8144). Insert the PS8300s one-by-one, with an interval of at least a few seconds between each one.

Making Power Connections to the NV8144

1 Facing the rear of the router, connect power cord WC0109 from an AC power source to **Power Input 1**:

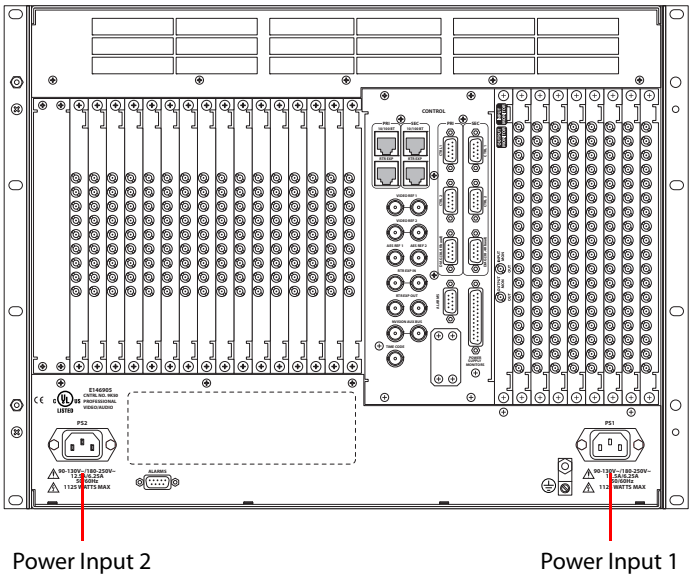


Fig. 8-8: NV8144 (Rear View)

2 Repeat for **Power Input 2**, for the secondary supply.

3 At the front of the router, insert a PS8100 in bay 1. This is the slot for the required, primary power supply module.

4 Install an optional redundant power supply module in slot 2:

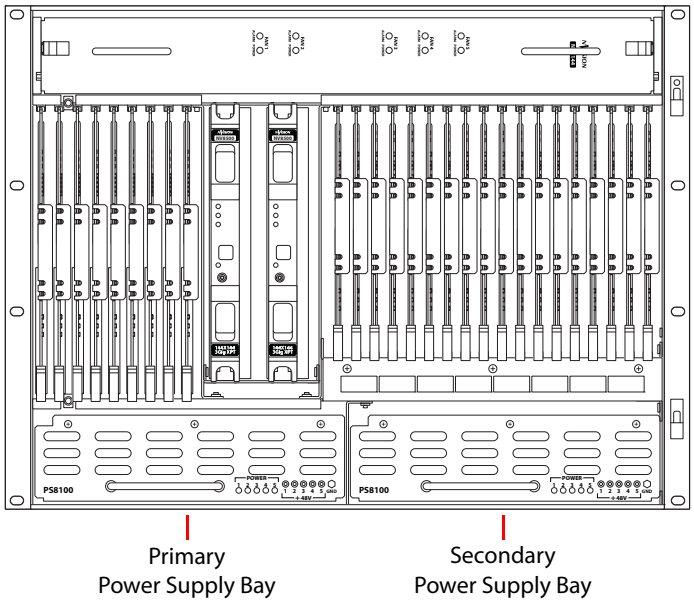


Fig. 8-9: NV8144 (Front View)

5 Connect the router's ground lug to earth ground using a copper wire (14–6 AWG). The ground lug is located in the lower right corner at the rear of the frame.

Making Power Connections to the NV8140

1 Facing the rear of the router, connect power cord WC0157 from a 20A AC power source to **Power Input 1**:

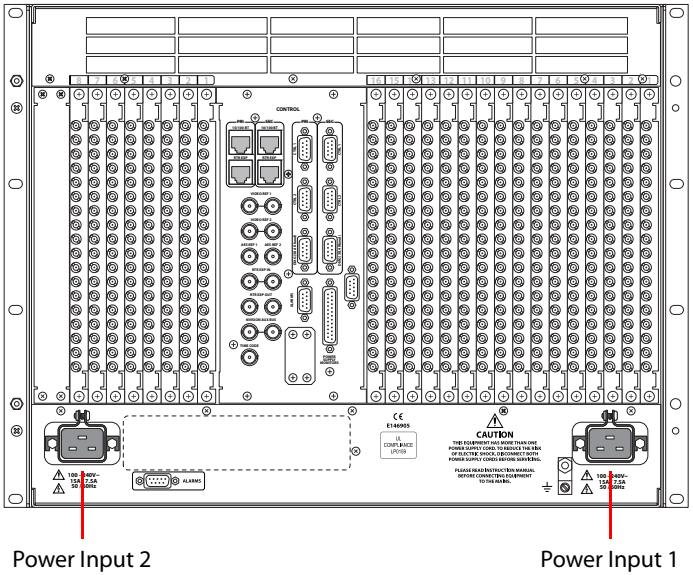


Fig. 8-10: NV8140 (Rear View)

2 Repeat for **Power Input 2**, for the secondary supply.

3 At the front of the router, insert a PS8300 in bay 1. This is the slot for the required, primary power supply module.

4 Install an optional redundant PS8300 power supply module in slot 2:

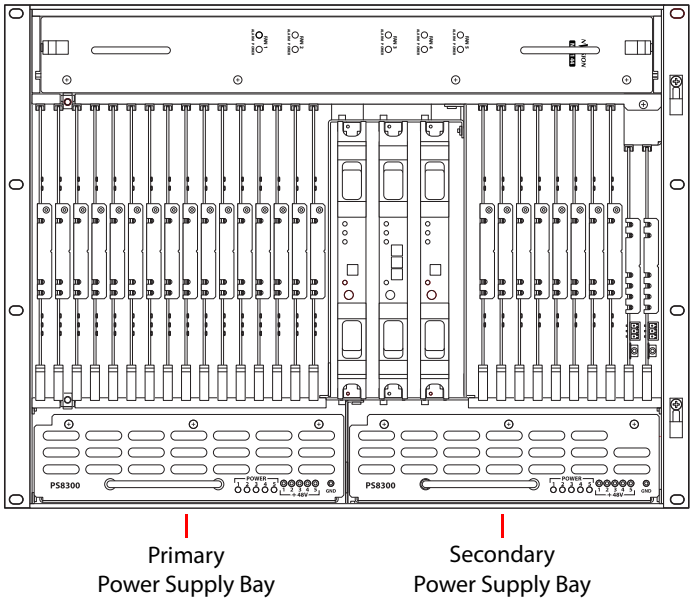


Fig. 8-11: NV8144 (Front View)

5 Connect the router's ground lug to earth ground using a copper wire (14–6 AWG). The ground lug is located in the lower right corner at the rear of the frame.

Making Power Connections to the NV8280

1 Facing the rear of the NV8300 power supply frame, connect one end of the WC0154-00 power cable to the large **DC Output** connector, shown here:

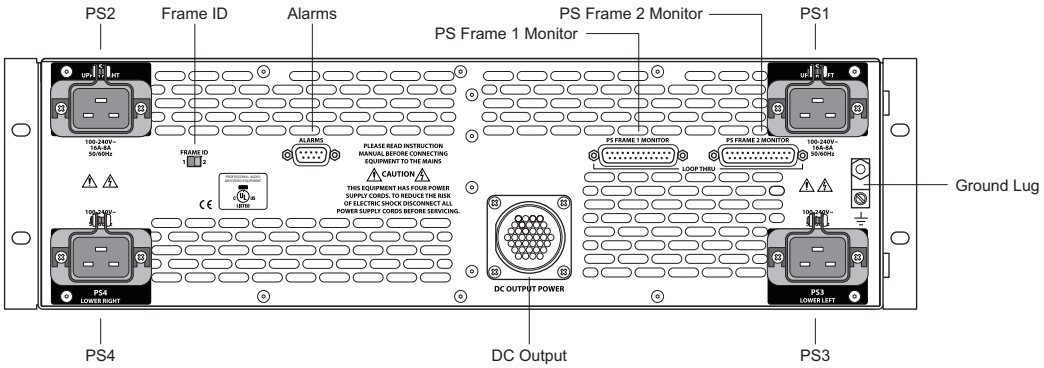


Fig. 8-12: NV8300 Power Supply Frame (Rear View)

2 Facing the rear of the NV8280, connect the other end of the WC0154-00 power cable to the **Power Input** connection:

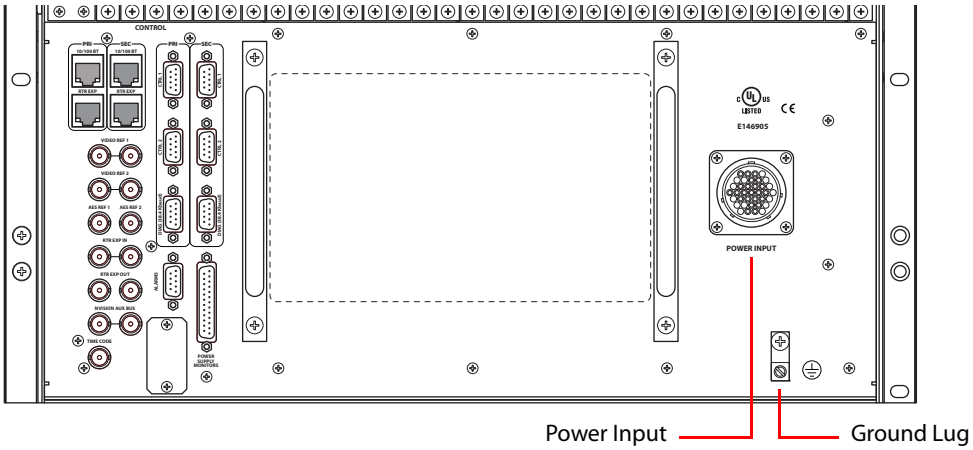


Fig. 8-13: NV8280 Power Supply Monitor and Power Connections (Rear View)

3 Still facing the rear of the NV8280, connect the 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.

4 Facing the rear of the NV8300 power supply frame, use a WC0157-00 power cable to connect **PS1** to an 20 A AC power source. In the U.S., these power cables have a twist-lock connector, In other countries, the cable lacks a power connector and you must fabricate your own.

5 Repeat step 4 for **PS3** and optionally for **PS2** and **PS4**, that is for each remaining PS8300 power supply module to be installed.

6 ***After all power connections have been made,*** and only when you are ready to power-up the router, face the front of the NV8300 power supply frame and insert a PS8300 in power mod-

ule both slot 1 and slot 3. These slots are for the required, primary power supply modules. If you are installing optional redundant PS8300s, install a module in both slot 2 and in slot 4:

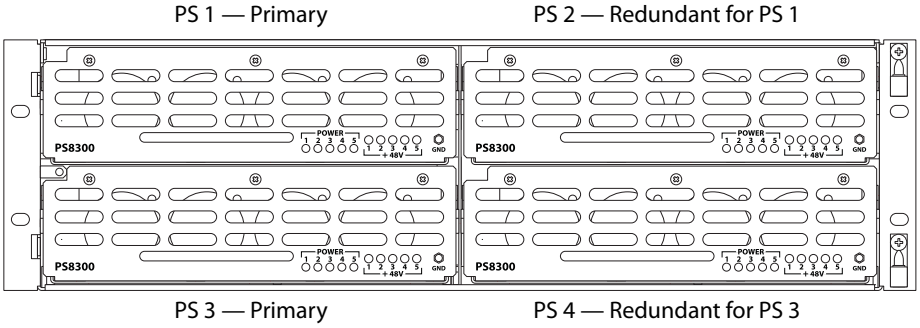


Fig. 8-14: Power Supply Module Locations in an NV8300

Making Power Connections to the NV8576 or NV8576-Plus

Note: for the NV8576-Plus, you will execute this procedure for each frame.

1 Select one of the NV8300 power supply frames.

2 Facing the rear of the NV8300, connect one end of a WC0154-00 power cable to the **DC Output** connector. (See Figure 8-12 on page 122.)

3 Facing the rear of the router frame, connect the other end of the WC0154-00 power cable to **Power Input 1**:

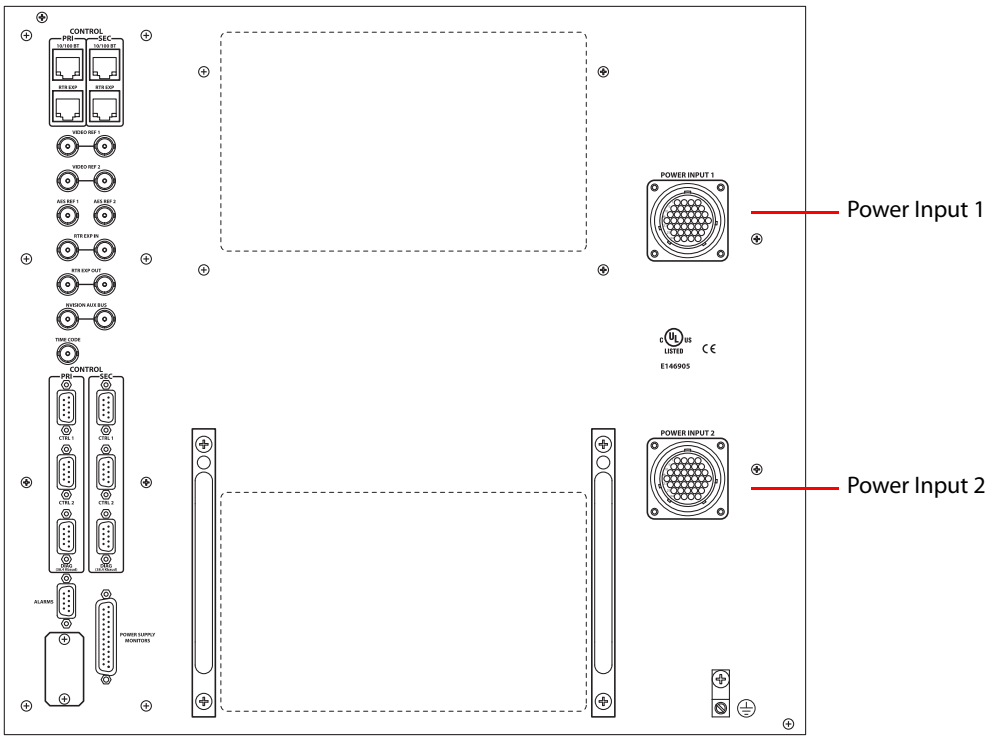


Fig. 8-15: NV8576 Power Supply Monitor and Power Connections

4 Facing the rear of the NV8300 power supply frame, use a WC0157-00 power cable to connect **PS1** to an 20 A AC power source. In the U.S., these power cables have a twist-lock connector, In other countries, the cable lacks a power connector and you must fabricate your own.

5 Repeat step 4 for each PS8300 power supply module to be installed, at **PS3**, and optionally at **PS2** and **PS4** for redundant power supplies.

6 Set the Frame ID switch on the NV8300 power supply frame to **1**. See Figure 8-12.

7 Select the second NV8300 power supply frame.

8 Facing the rear of the NV8300, connect one end of a WC0154-00 power cable to the **DC Output** connector. (See Figure 8-12 on page 122.)

9 Facing the rear of the router frame, connect the other end of the WC0154-00 power cable to **Power Input 2**. (See Figure 8-15.)

10 Still facing the rear of the NV8280, connect the 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 Facing the rear of the second NV8300 power supply frame, use a WC0157-00 power cable to connect **PS1** to an 20 A AC power source.

12 Repeat step 11 for each PS8300 power supply module to be installed, at **PS3**, and optionally at **PS2** and **PS4** for redundant power supplies.

13 Set the Frame ID switch on the NV8300 power supply frame to **2**. See Figure 8-12.

14 ***After all power connections have been made,*** and only when you are ready to power-up the router, face the front of each the NV8300 power supply frame and insert a PS8300 in power module slots 1, 3, 5, and 7. These slots are for the required, primary power supply modules. If you are installing optional redundant PS8300s, install a module in slots 2, 4, 6, and 8:

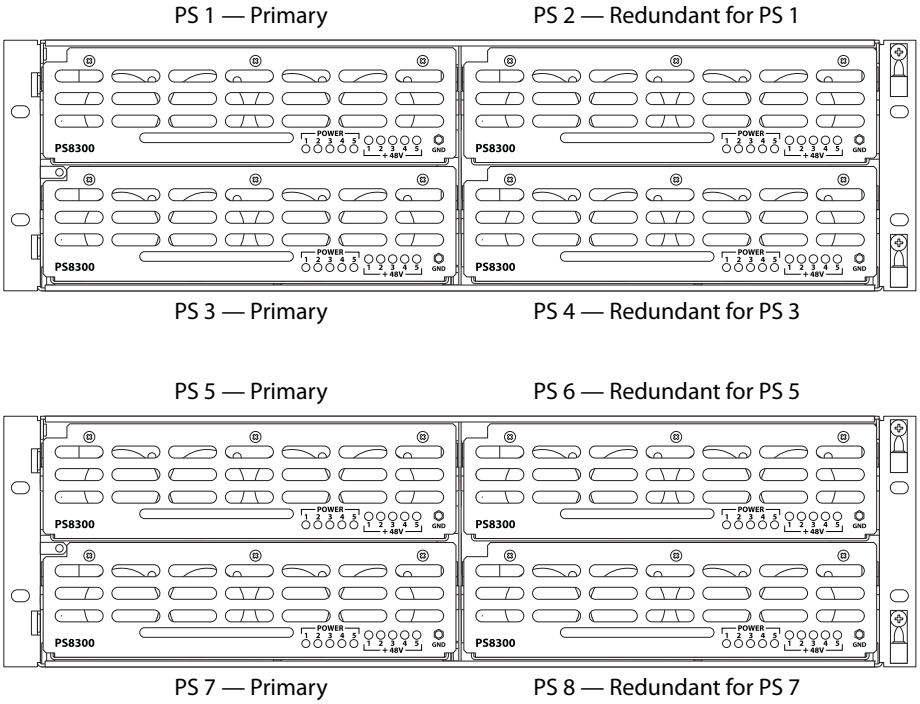


Fig. 8-16: Power Supply Module Locations for an NV8576 or NV8576-Plus Frame

Validating Your Installation

When your installation is complete, perform the following checks to make sure the router and power supplies are operating properly:

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:

- Verify that the PS8100 or PS8300 power supply module is fully seated in its slot.
- Test for +48 volts at each of the 5 test points at the front of the power supply module.

9 Configuration

There are 4 tools that are used for configuring NV8500 Series routers:

- MRC (Miranda Router Configurator).

  This software configures the I/O cards, control cards, monitor cards, and crosspoint cards of the router and specifies most details of its behavior.

  MRC is also used to upload firmware to the NV8500 Series routers.

- NV9000-SE Utilities.

  NV9000-SE Utilities configures an NV9000 router control system and, among other things, specifies the signals that are routed to and from the routers in the system, including the NV8500 Series routers.

- iControl-Solo

  iControl-Solo is used, specifically, to configure the various frame sync functions of frame sync input cards of the NV8500 Series routers.

- Browser application

  Each frame sync card has a built-in browser application. This application can occasionally be used to upload new frame sync software to your frame sync cards.

MRC

Use MRC (the Miranda Router Configurator) to configure NV8500 series routers. MRC communicates with the router control card through an Ethernet connection. MRC usually resides on the same network as the router control system.

MRC is a software application used to set up and modify configuration settings, and perform diagnostics, for NV8500 series routers. MRC runs on a PC and communicates with the router through the router's control cards using Ethernet connections.

MRC configures the router by applying settings to the router control card. Configuration settings vary depending upon the router's matrix switching type, the protocol in use, and the level of complexity of the router partitioning. MRC can be used to test a router's crosspoints (i.e., perform takes) and examine I/O cards.)

The router control card facilitates communication between a router control system and the router hardware. NVISION Ethernet protocol is used to send commands from the router control system to the control card. NVISION Ethernet protocol is always available through the router's Ethernet connection. NVISION serial protocol is always available through the router's serial **CTRL 2** port. Other protocols can be used on the serial **CTRL 1** port only. Ports labeled **CTRL 1** and **CTRL 2** correspond to the primary and the secondary control card slots on the router frame. The control card allows only one third-party protocol to be loaded at any one time.

For information about configuring an NV8500 Series router, see the *Miranda Router Configurator User's Guide*.

NV9000-SE Utilities

Use NV9000-SE Utilities to configure the inputs and outputs (of the NV9000 router control system) that are connected to, and used by, the NV8500 family routers.

iControl-Solo

iContol-Solo is used to configure the various frame sync functions of frame sync input cards of the NV8500 Series routers.

These are the functions available, in the frame sync card, for each video channel:

1 You can configure 16×16 audio shuffles.

2 You can change gain and offset in either the YCrCB or RGB space. You can also change the hue in the YCrCb space.

3 You can set audio gain and inversion (and muting) for each audio channel.

4 You can set the video delay (up to 3+ frames).

5 You can adjust audio delay (up to 2 sec).

6 Each channel is "Dolby E aware." This means that the card performs adds and drops during the guard band. It does not guarantee that the header packet is located in the correct line.

The video channels of the frame sync card are tied to the router frame's REF 1 and ignore REF 2.

Browser Application

Refer to Chapter 10, Frame Sync Cards, on page 129 for more information about the browser application.

10 Frame Sync Cards

Chapter 10 describes frame sync input cards and briefly describes iControl-Solo, the configuration program used to configure the cards' frame sync functions, and the card's browser application.

- To configure the NV8500 frame sync functions, iControl-Solo v4.44 or later is required. This is a free software application that can be downloaded from the Grass Valley Technical Support Portal at http://www.miranda.com/support.

Topics

Summary

Frame sync cards are essentially hybrid disembedder cards with the addition of frame sync functions. The frame sync functions are configurable. Each of the 8 video inputs on the card has independently configurable functions. The card itself also has configurable functions.

Each frame sync card has an Ethernet port through which you can configure the card. You can designate the IP address of the port using either the 'Ethernet Settings' page of MRC or the browser application built into the frame sync card. After you have specified the port's IP address, you can configure the card and its 8 video channels using iControl-Solo. (The port's IP address is not related in any way to the IP addresses of the router's control cards.)

Because the frame sync card is a disembedder card, it has 8 video ports. There are 9 video connectors on its backplane module; the ninth connector is unused.

The card's frame sync functions are a subset of those of a Densité frame sync card. Therefore, iControl-Solo classifies the frame sync card as a Densité frame sync card.

Frame Sync Functions

These are the functions available in the frame sync card, for each video channel:

1. You can configure 16×16 audio shuffles.
2. You can change gain and offset in the YCrCb space and hue (in degrees).
3. You can set audio gain and inversion (and muting) for each audio channel.
4. You can set the video delay (up to 3+ frames).
5. You can adjust audio delay (up to 2 sec).
6. Each channel is "Dolby E aware." This means that the card performs adds and drops during the guard band. It does not guarantee that the header packet is located in the correct line.

The video channels of the frame sync card are tied to the router frame's REF 1. They ignore REF 2.

Physical Connection

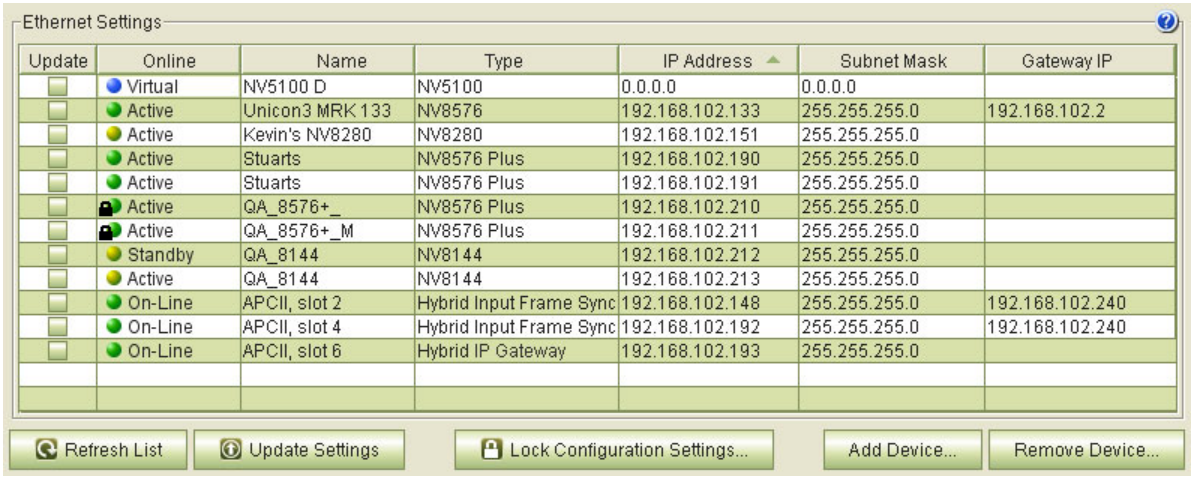
The frame sync input card, like all input cards, resides in an input bay of an NV8144, NV8280, NV8576, or NV8576-Plus frame, with its matching backplane module. There is no frame sync card available for an NV8140.

The frame sync card has an Ethernet port at its backplane. It is through an Ethernet connection on this port that you can configure the card's frame sync functions using iControl-Solo. It is also through this port that you can use the card's browser application.

When you place a frame sync card, with its backplane module, in a slot in a router frame, the card initially acquires a default IP address that is based on the slot number: the lower octet of the IP address is the slot number (in the range 1 to 64). The default subnet is 192.168.3.xxx.

- The two frames of an expanded NV8576-Plus have identical slot numbering. Therefore, using the defaults for IP address will probably result in duplicate IP addresses on the network you use to configure the cards. You must assign specific IP addresses to such cards.

You can change the IP address of a frame sync card in the 'Ethernet Settings' page of MRC:



The IP address of the card is the IP address associated with the RJ-45 configuration port of the card.

To assign the IP address, locate any devices of type 'Hybrid Input Frame Sync' and change their IP addresses as required. Also change the gateway IP address if necessary. The subnet mask should probably remain 255.255.255.0, but you can also change that if necessary.

After you change the IP address of frame sync card, it will never be assigned the default address again. The IP address assigned to the frame sync card is actually stored in the card's backplane module. If you move the backplane module, the assigned IP address moves with it. The frame sync cards themselves are interchangeable.

- It is easy to forget the IP address of a frame sync card. There is no simple way to determine the IP address of a particular frame sync card, particularly if your router has many of them.

  If you do forget, open MRC's 'Ethernet Settings' page and review the IP addresses of your frame sync cards. Also open MRC's 'Module Status' or 'Module Types' page. Each of these pages tells you in which slots your frame sync cards are located, but does not tell you their IP address. The 'Ethernet Settings' page tells you the IP address but does not tell you in which slot the card (or really its backplane module) is located.

Perhaps the best way to remember a frame sync card's IP address is to label its backplane module with the IP address.

You can upgrade the firmware in a frame sync card the same way you upgrade any other I/O card. Refer to the *MRC User's Guide* for information.

Cabling

After you place frame sync cards in your router frame and assign their IP addresses, connect the Ethernet ports of the frame sync cards to an Ethernet switch using Ethernet cable. The configuration PC on which you use either iControl-Solo or the browser application must be able to access the subnet used by the frame sync cards your are configuring.

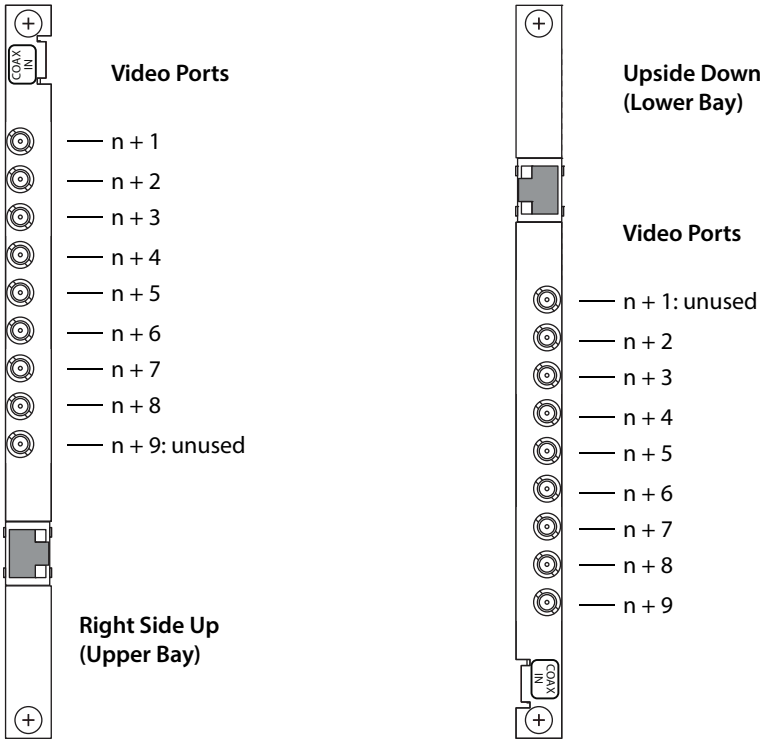
It is not necessary for all frame sync cards to be on the same subnet.

It is not necessary for frame sync cards to be connected unless you are configuring them.

There is no relationship between the network(s) used by the frame sync cards and the network used by the router's control cards.

Port Numbering

Backplanes and cards are installed "upside down" in the lower bays of NV8576 frames. In the upper bays and in the other NV8500 routers, backplanes and cards are installed right side up. This drawing shows the port ordering for a frame sync input backplane:



The value of n = (S – 1) × 9, where S is the logical slot number (and not the labeled slot number). See Slot Order for Port Numbering on page 35.

For example, in logical slot 17, the first in the lower bay of an NV8576 frame. ports range from 145 to 154, with port 145 being unused.

Please refer to the NV8500 port enumeration drawings available from Grass Valley for complete detail.

Configuration in iControl-Solo

This is a brief introduction to iControl-Solo as it applies to the configuration of NV8500 frame sync input cards. Please refer to the *iControl-Solo User's Guide* and to the *FRS-1801 User's Guide* for complete detail.

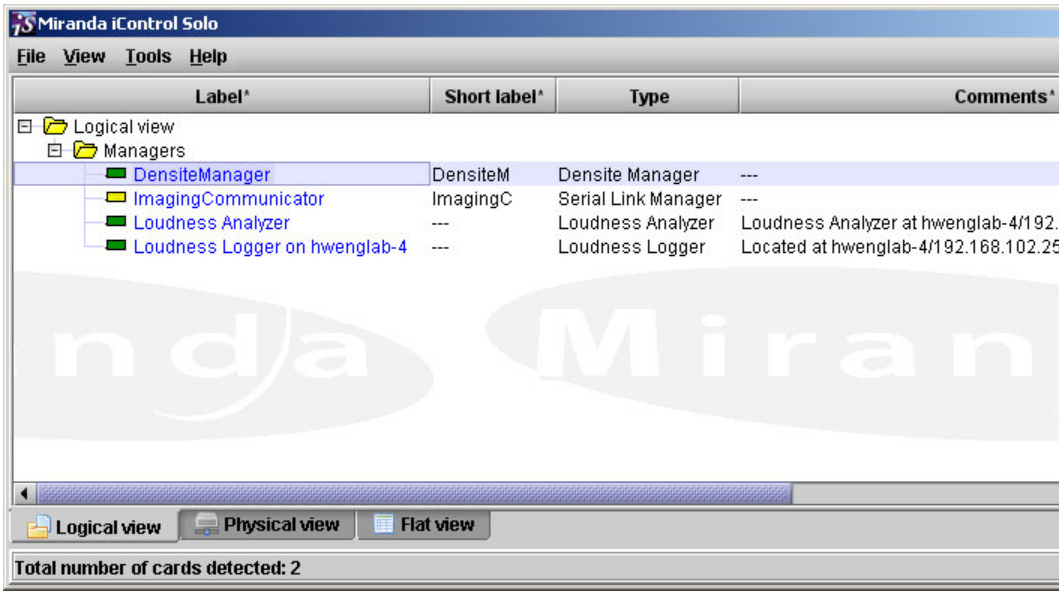
▲ During configuration, the frame sync card behave as if it were an FRS-1801 Densité card.

There are two components to frame sync configuration:

- Configuration of the card.
- Configuration of the card's video channels.

Initial Window

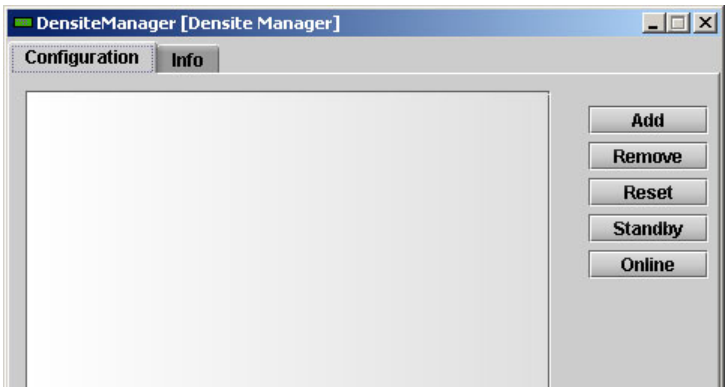
When you launch iControl-Solo, it first displays a splash panel and then presents an initial window in which you can select devices to configure. The window might at first be devoid of configurable devices, as show here:



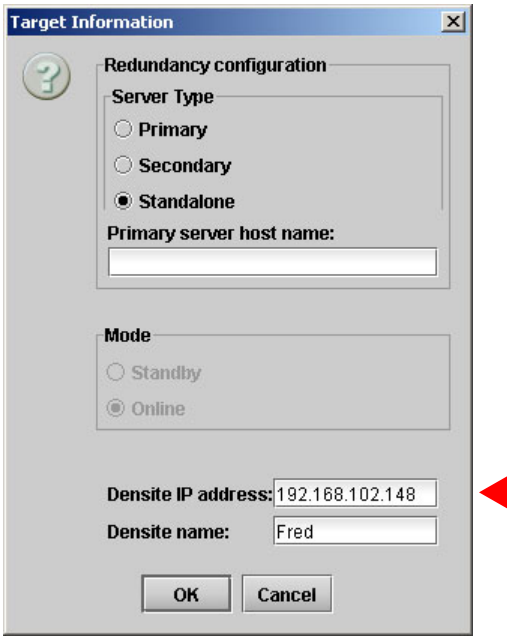
Adding Frame Sync Cards to the Window

To add a frame sync card to the list of devices (possibly empty) in the window, follow these steps:

1 Double-click the row labeled 'Densité Manager'. A dialog appears:



2 Click 'Add'. A 'Target Information' dialog appears:



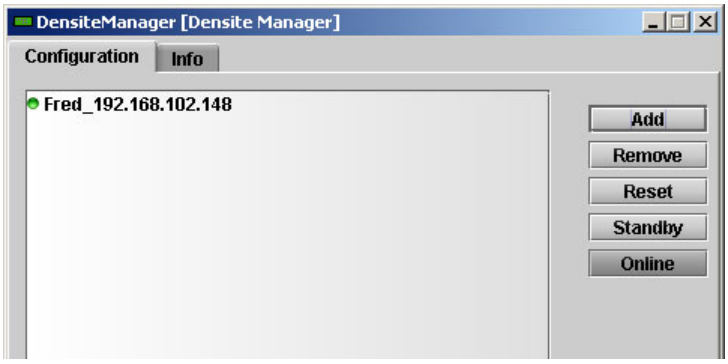
Enter the IP address of the frame sync card in the 'Densité IP address' field. Also assign a name to the card.

The IP address is either the default (192.168.3.‹*soliton*›) or the one that you assign in MRC's 'Ethernet Settings' page. (You can also reassign the IP address in the card's browser application, although you need to know the card's present IP address to do that.)

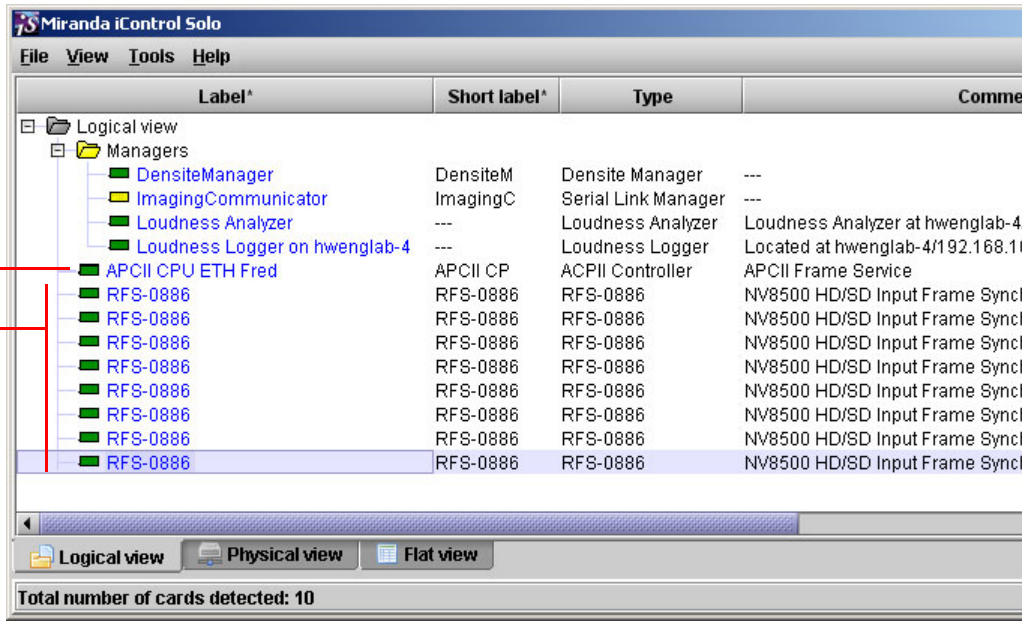
You must also have connected the frame sync card, through its Ethernet port, to an Ethernet LAN on which your computer can communicate.

▲ The two frames of an expanded NV8576-Plus have identical slot numbering. Using the defaults for IP address will probably result in duplicate IP addresses on the network you use to configure the cards. You must assign specific IP addresses to such cards.

3 Click ‘OK’. The software returns to the Densité Manager and displays the name and IP address of the card you just added:



4 Dismiss the Densité Manager to return to the iControl-Solo main window. The newly added card and its eight video ports appear in the list of configurable devices:



The card is identifiable as an “APCII” card and the name you assigned to it is displayed.

The eight video ports are identified by “RFS-0866” and are distinguished by the two right-hand columns of the window. The ports appear in order, 1–8. (You might have to scroll the window to see these columns.)

- It might help you to distinguish the different ports more readily if you drag the column headers to move the ‘Frame’ and ‘Slot’ columns to a more suitable position in the window. As an alternative to that, you can also right-click the ‘Short label’ field of RFS entries and choose ‘Rename’ from the context menu to give the RFS entries unique identifiers.
- The terminology of iControl-Solo does not apply well to frame sync cards. For frame sync cards, the term “frame” means “card” and cards are identified by the name you gave them. The term “slot” means video port and the “slots” are identified by the numbers 1–8.
- “RFS” stands for “router frame sync” and the term 0886 stems from the fact that the frame sync card’s part number is EM0886-*xx*. “APC” means “advanced processing card.”

After you have identified the APCII card (and its video ports), you can double-click the 'APCII' entry to edit the card's functions and you can double-click any 'RFS-0886' entry to edit that video port's frame sync functions.

The icons for the entries are color-coded: green means healthy, read means an alarm condition exists. Refer to the *iControl-Solo User's Guide* for information about these and other colors.

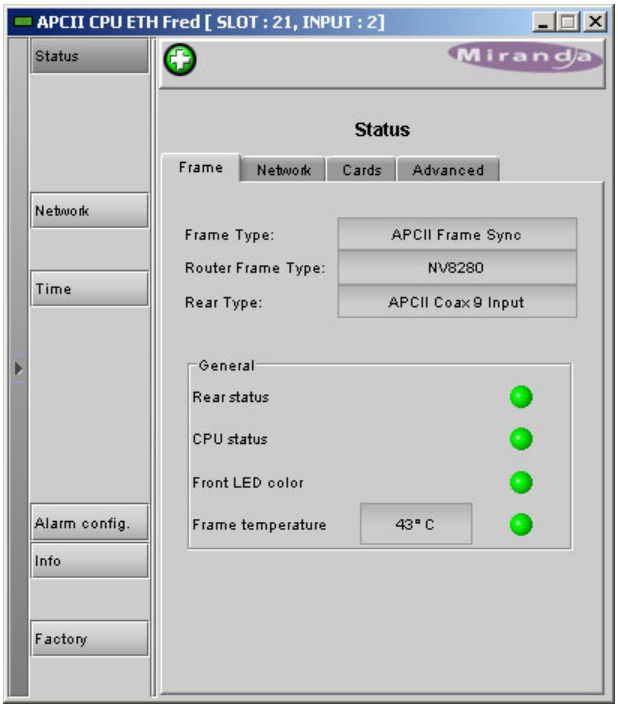
Configuration of the APCII

The windows available when you edit an APCII are appropriate for diagnostics and maintenance, but have no direct bearing on the operation of an NV8500 router or even of the frame sync card itself.

We do not address this subject in any detail.

▲ Again, please refer to the *iControl-Solo User's Guide* if you are interested in this subject.

The APCII configuration window has a navigation pane at the left and a work area in which to enter configuration values at the right:



The navigation pane has 6 buttons:

Status	Network	Time
Alarm Config	Info	Factory

Click a button to access the corresponding configuration page.

The APCII window also has a green "health" icon. Hover your cursor over the icon to view a brief health message:

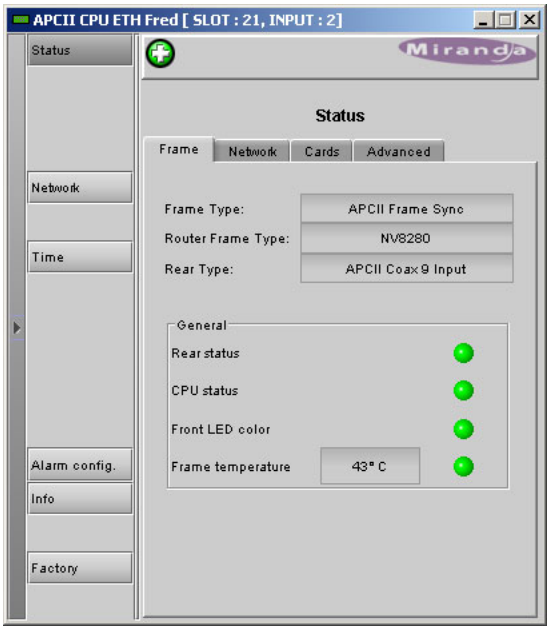
Status Page

The status page has four tabs:

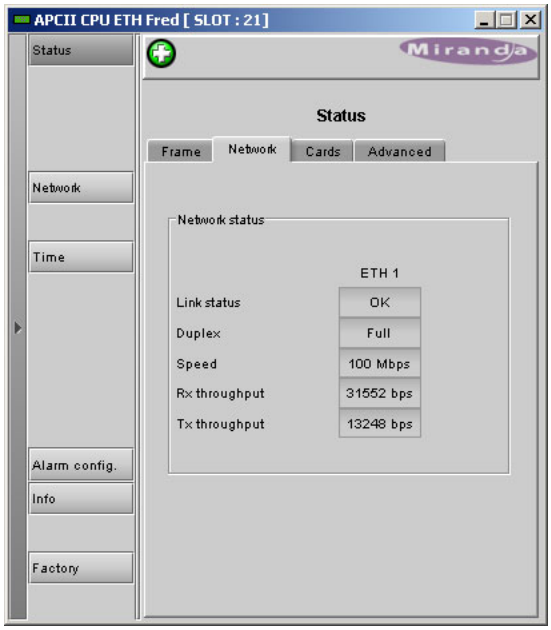
Frame Network Cards Advanced

Following are views of these tabs, without further discussion.

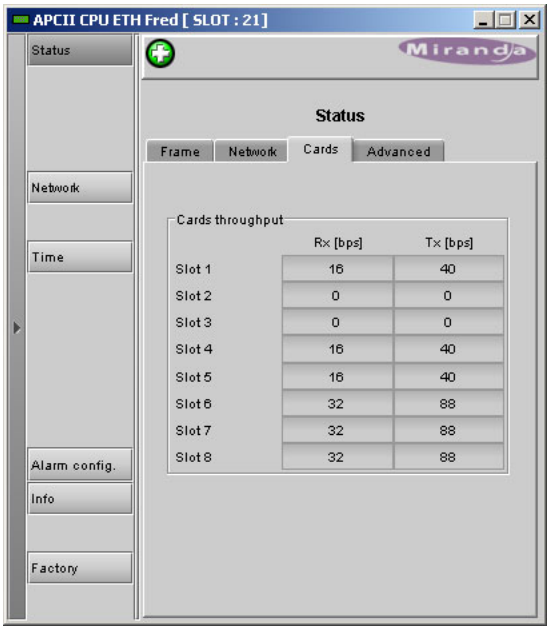
(A) Frame



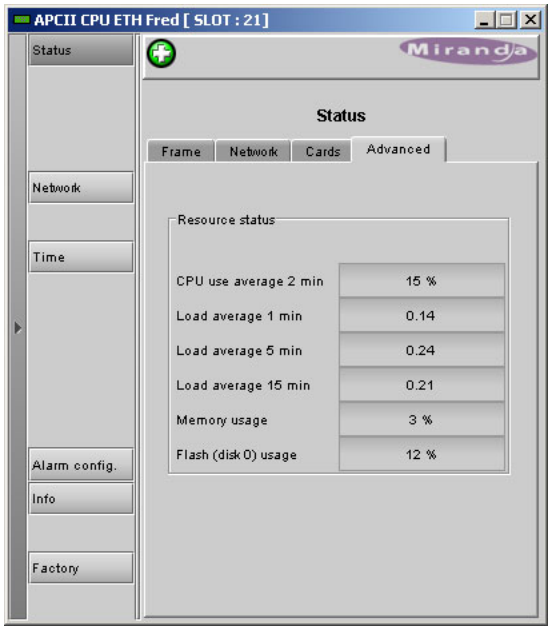
(B) Network



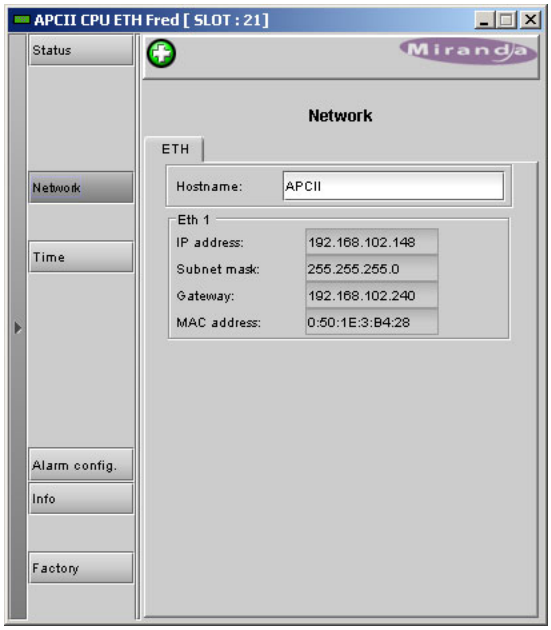
(C) Cards



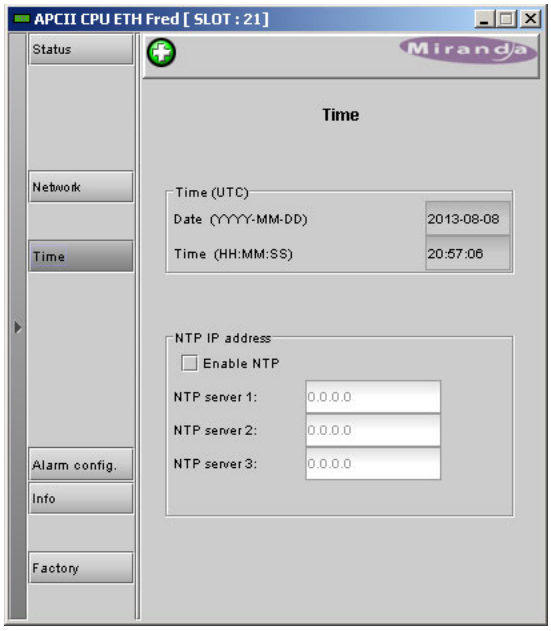
(D) Advanced



Network Page

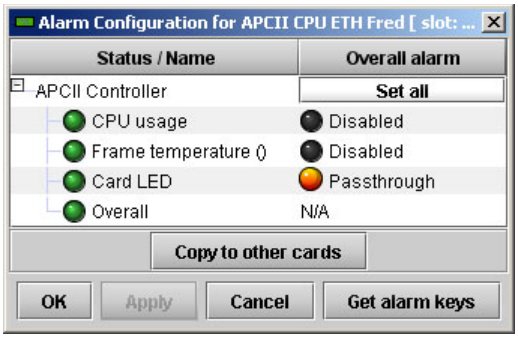


Time Page



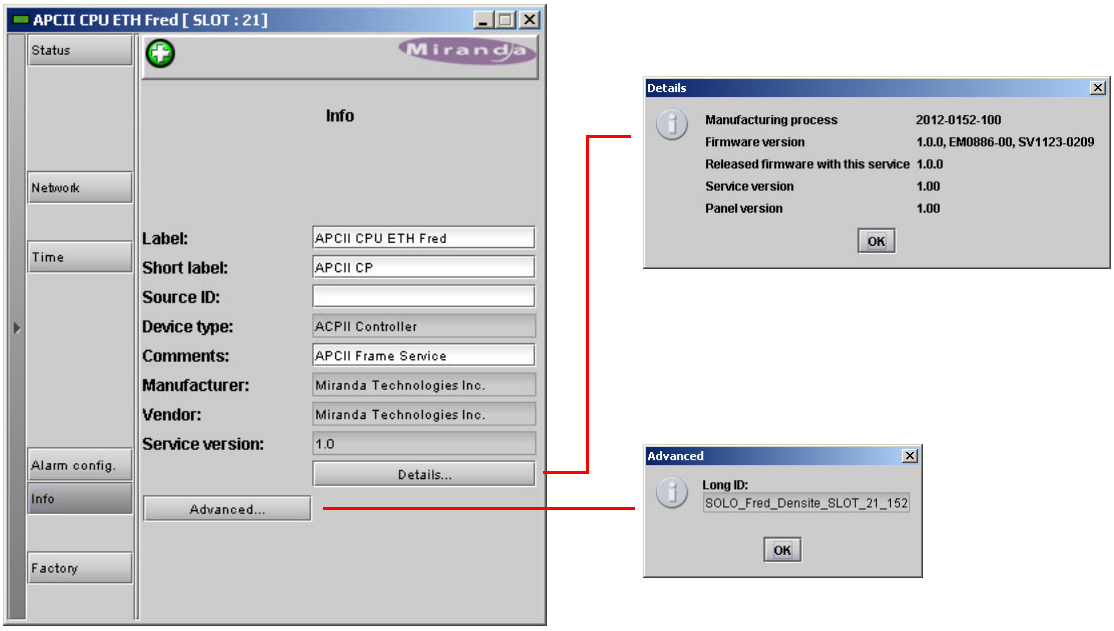
Alarm Config Page

The 'Alarm Configuration' page lets you enable or disable certain alarms;



Info Page

The 'Info' page presents information about the frame sync card:

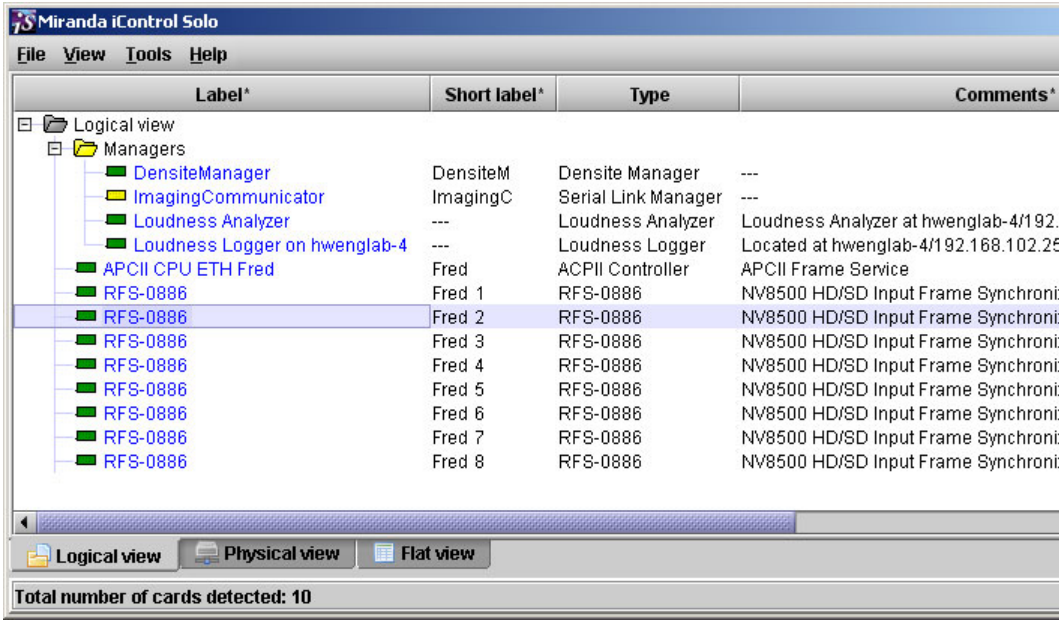


Factory

Configuration of an "RFS" Video Port

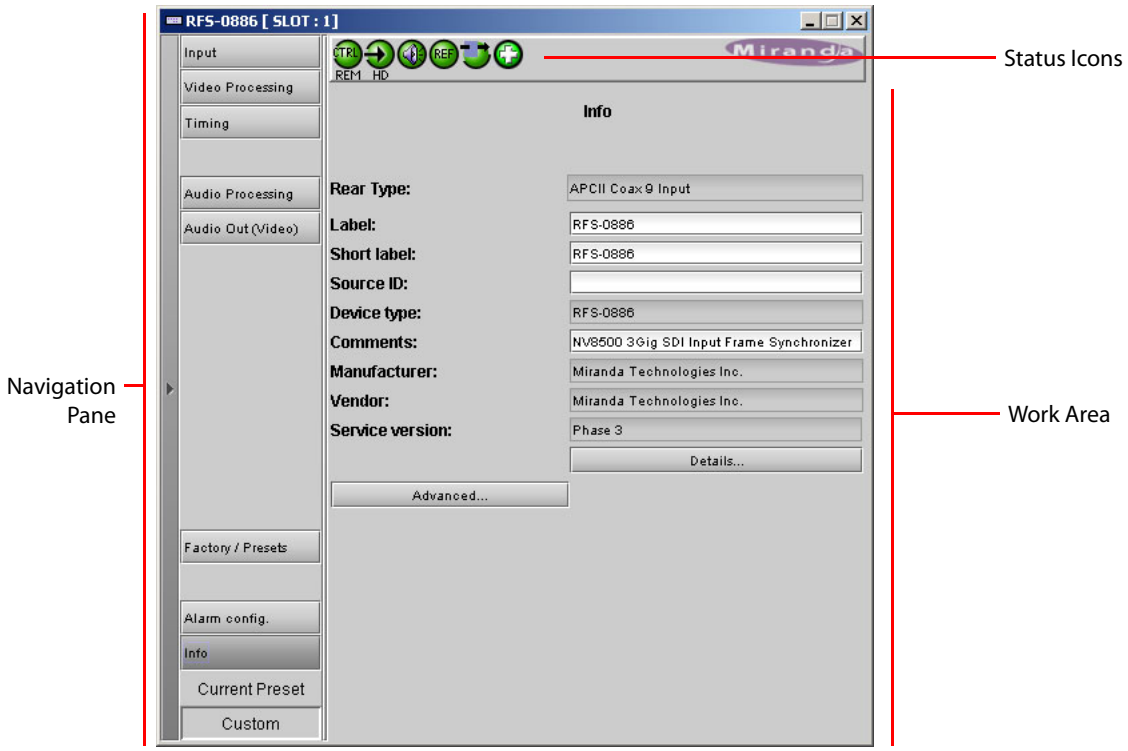
Each frame sync card has 8 video channels. Frame sync functions can be configured for each of them. Each channel appears as an entry in iControl-Solo's list of devices. They are all called RFS-0886 in the iControl-Solo terminology.

To edit a port configuration, choose an "RFS" entry from the main iControl-Solo window:



▲ You must have chosen 'Logical View' at the bottom of the window to see the list.

When you select an “RFS” port, a configuration window appears:



Choose a configuration option from the navigation pane at the left. There are buttons for 8 configuration pages:

Input	Video Processing	Timing	Audio Processing
Audio Output	Factory Presets	Alarm Config	Info

Status Icons

There are 6 status icons at the top of the RFS window. These are not named. Normally green, they might appear red or in some other color if alarm conditions or problems exist. When you hover your cursor over them, they provide status, as follows, in order from left to right:

(A)

(B)

(C)

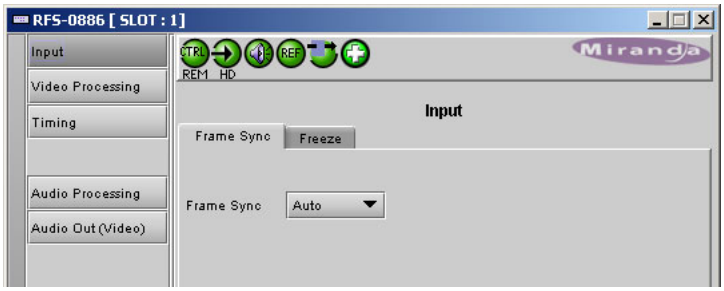
(D)

(E)

(F)

Input Page

The 'Input' page has two tabs in the work area: 'Frame Sync' and 'Freeze'. This is the 'Frame sync' tab:



The 'Frame Sync' tab has a drop-down menu that lets you choose one of two frame sync options:

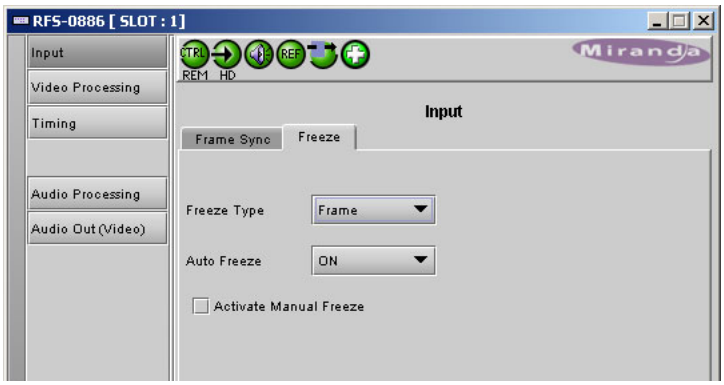
- Off — video (and its audio) bypasses frame sync processing. (Such a video channel is like any normal disembedder channel.)
- Auto — there are several cases:

  If the video frame rate is the same as the reference rate, the video undergoes frame sync and is aligned to the reference signal.

  If the video signal is removed, the frame sync processor performs a freeze frame (according to the specifications in the 'Freeze' tab (described next).

  If the video signal is not at the reference rate, the video bypasses frame sync processing (as if frame sync were off).

This is the 'Freeze' tab:



The 'Freeze' tab has two drop-down menus. The first lets you specify the freeze-frame type:

- Black — when the video freezes, it shows black.
- Frame — when the video freezes, it shows the last frame.

The second drop-down menu lets you turn automatic freeze on or off.

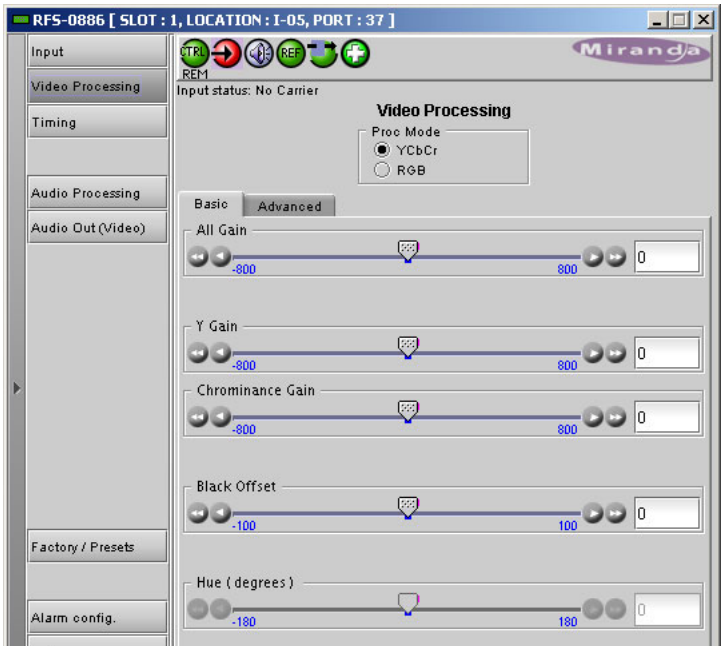
Check the 'Activate Manual Freeze' to perform a manual freeze-frame. Doing so should result in an immediate freeze of that video channel according to the type of freeze you specified: black or last frame.

Video Processing

The video processing page configures video in either the YCrCb space or RGB space. You can select either space using the radio buttons at the top of the page.

YCrCb Space

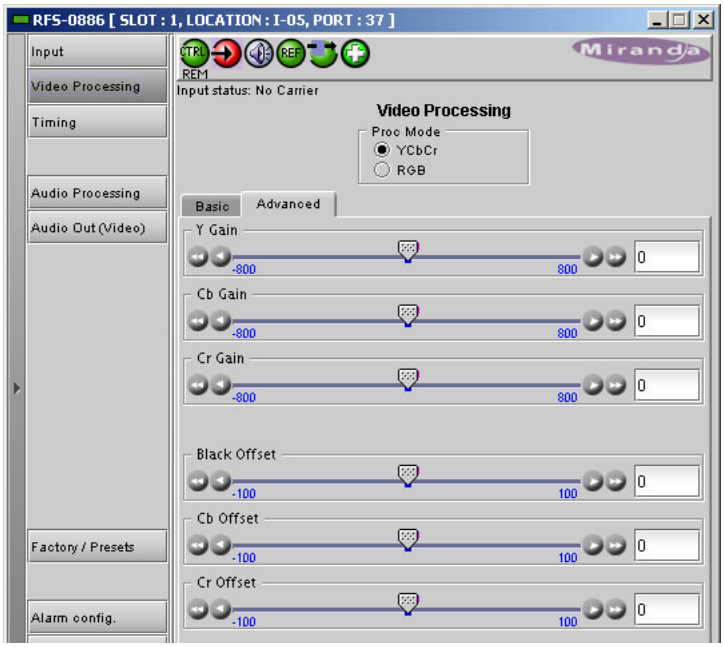
You can set gain and offset values in the YCrCb space. There are two tabs, 'Basic' and 'Advanced'. This is the basic tab:



The double arrows move the gain values in increments of 25 units. The double arrows move the offset value in increments of 20 units. The single arrows, in all cases, move the adjustment value in increments of 1 unit. You can also slide the indicators manually for gross adjustment.

The hue controls are disabled.

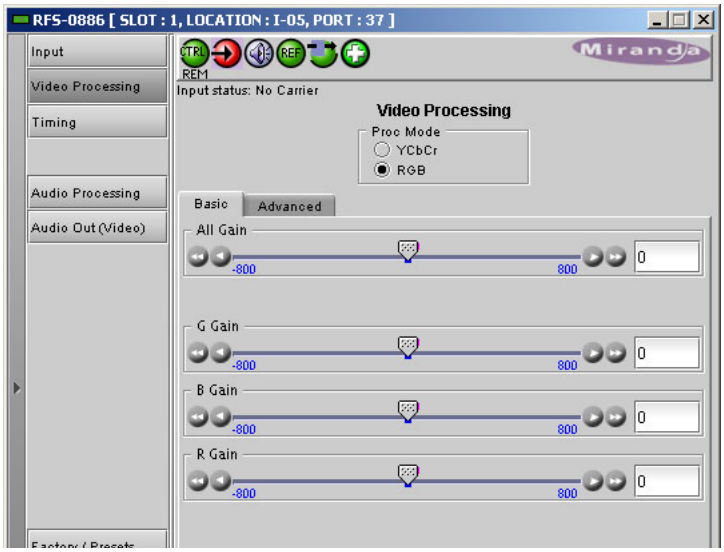
This is the 'Advanced' tab:



The double arrows move the gain values in increments of 25 units. The double arrows move the offset value in increments of 20 units. The single arrows, in all cases, move the adjustment value in increments of 1 unit. You can also slide the indicators manually for gross adjustment.

RGB Space

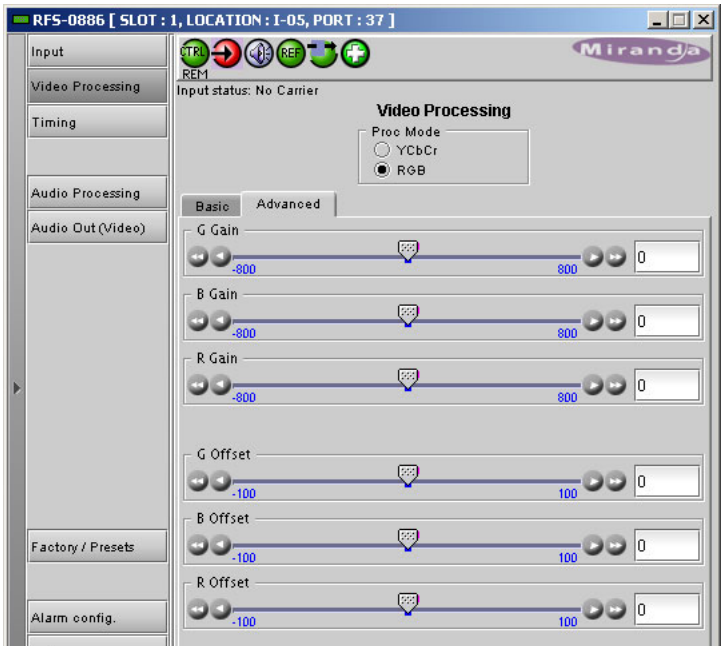
You can set gain and offset values in the RGB space. There are two tabs, 'Basic' and 'Advanced'. This is the basic tab:



The double arrows move the gain values in increments of 25 units. The single arrows, in all cases, move the adjustment value in increments of 1 unit. You can also slide the indicators manually for gross adjustment.

Note that changing any of the RGB values also changes the overall gain.

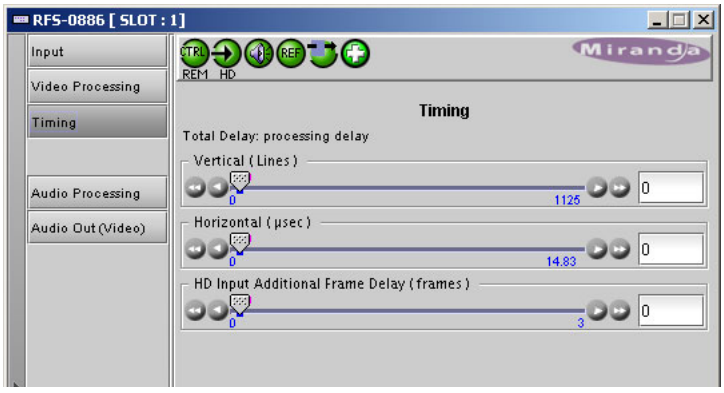
This is the 'Advanced' tab:



The double arrows move the gain values in increments of 25 units. The double arrows move the offset value in increments of 20 units. The single arrows, in all cases, move the adjustment value in increments of 1 unit. You can also slide the indicators manually for gross adjustment.

Timing

The timing page adjusts the total delay of the video signal:



There are 3 sliders. These control, respectively, the vertical offset (in lines), the horizontal offset (in µsec) and frame delay (in number of frames).

The double arrows move the vertical offset value (and the indicator) in increments of 2 lines. The double arrows move the horizontal offset value in increments of 0.0333 µs, rounded off to the

nearest 0.01 µs. The double arrows move the frame delay value in increments of 3 frames (which is the full extent of the slider).

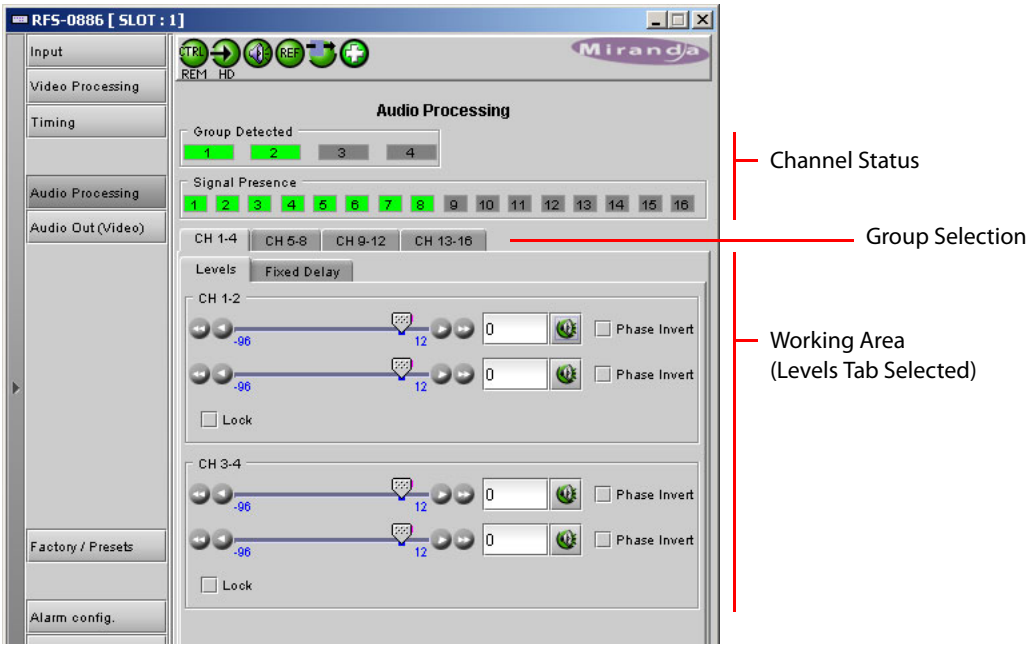
The single arrows move the horizontal offset in increments of 0.00666 µs, rounded off to the nearest 0.01 µs. (Three clicks of a single arrow result in a change of 0.02 µs.)

The single arrows, for the other two scales, move the adjustment value in increments of 1 unit. You can also slide the indicators manually for gross adjustment.

Audio Processing

The audio processing page has several sections. The working area has two sets of tabs. The first set of tabs lets you choose an audio group: 1–4, 5–8, 9–12, or 13–16.

Within each group there are two sub-tabs: 'Levels' and 'Fixed Delay'. This illustration shows the 'Levels' tab (for group 1):



Channel Status

A channel button in this section turns green if (embedded) audio is present on the channel and remains grey if it is not.

A group button in this section turns green if (embedded) audio is present in the group and remains grey if it is not.

Group Selection

Choose one of the tabs here to select an audio group. (The level controls and delay controls in the working area apply to the group you select.)

Levels

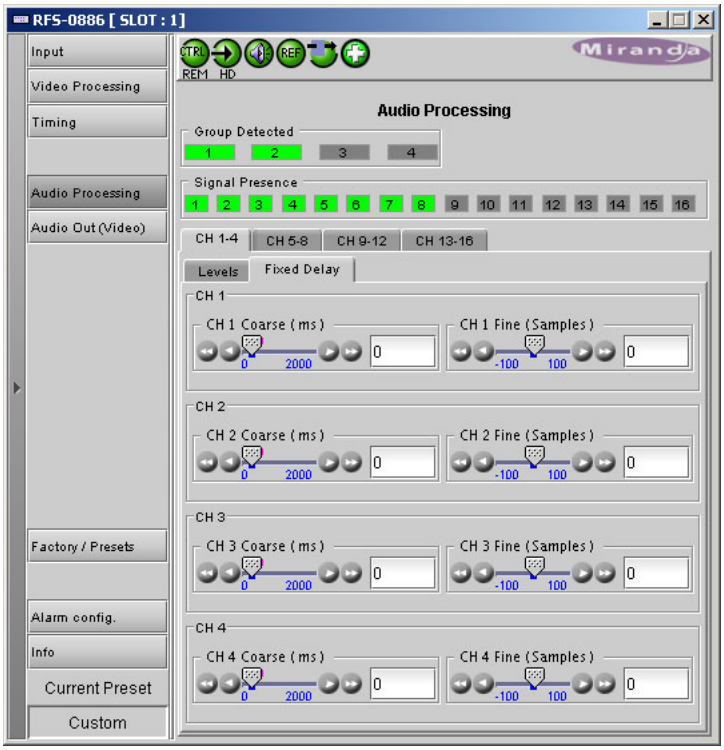
The levels tab (as shown above) provides gain sliders (from –90 to +12 dB), inversion check boxes, and muting icons for each channel in the selected group.

The levels tab provides a 'lock' check box for each pair of channels. A lock causes the two scales of the channel pair to move identically, simultaneously. If one scale moves +10 dB, the other does also, subject to the limits of the scale. The "lock" has no effect on muting or inversion.

The double arrows move the gain values in increments of 5 dB. The single arrows, in all cases, move the adjustment value in increments of 0.5 dB. You can also slide the indicators manually for gross adjustment

Fixed Delay

The 'Fixed Delay' tab of the audio processing page lets you specify the audio delay for each of the channels in the selected group:



There is a coarse adjustment slider (in ms) and a fine adjustment slider (in samples).

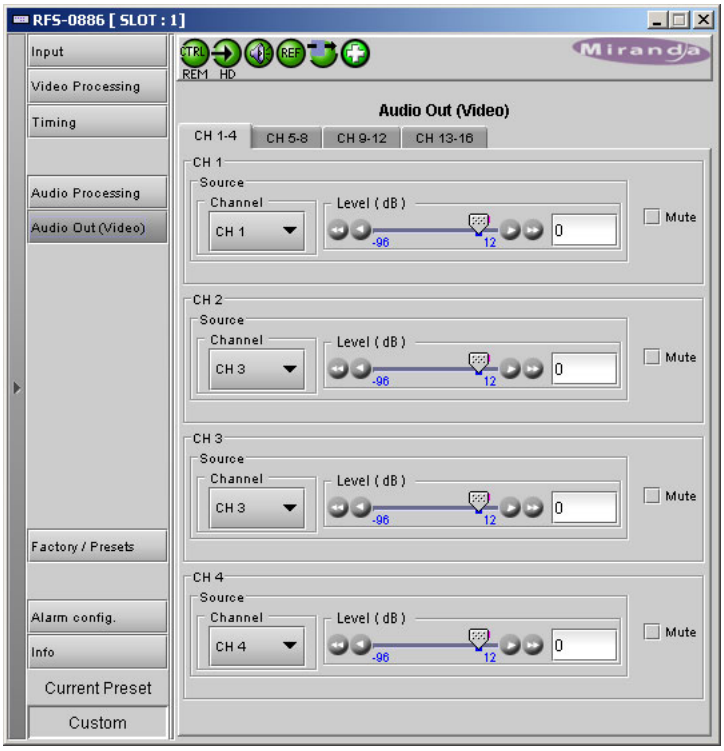
For coarse adjustment, the double arrows move the adjustment value (and the indicator) in increments of 200 ms. The single arrows move the adjustment value in increments of 1.

For fine adjustment, the double arrows move the adjustment value (and the indicator) in increments of 30 samples. The single arrows move the adjustment value in increments of 1.

You can also slide the indicators manually for gross adjustment.

Audio Output

The audio output page allows you (1) to set the level (or gain, in dB) for selected output channels, (2) to mute selected output channels, and (3) to shuffle the channels. The page has 4 tabs, one for each group. This page shows group 1:



The controls available apply to the selected group.

Keep in mind that the frame sync card is an *input* card. The "audio output" of the video port (that you are configuring) is what the video port delivers to the router's audio switching matrix.

The double arrows move the adjustment value (and the indicator) in increments of 5 dB. The single arrows move the adjustment value in increments of 0.5 dB. You can also slide the indicators manually for gross adjustment.

The coarse and fine adjustments combine (add) subject to clipping at either end of the scale. For instance, if the coarse delay is 100 ms and the fine delay is -100 samples, the actual delay is 100 ms – 100 samples. (There are nominally 48 samples per millisecond.)

▲ The maximum coarse delay is slightly less than 2000 ms.

Factory / Presets

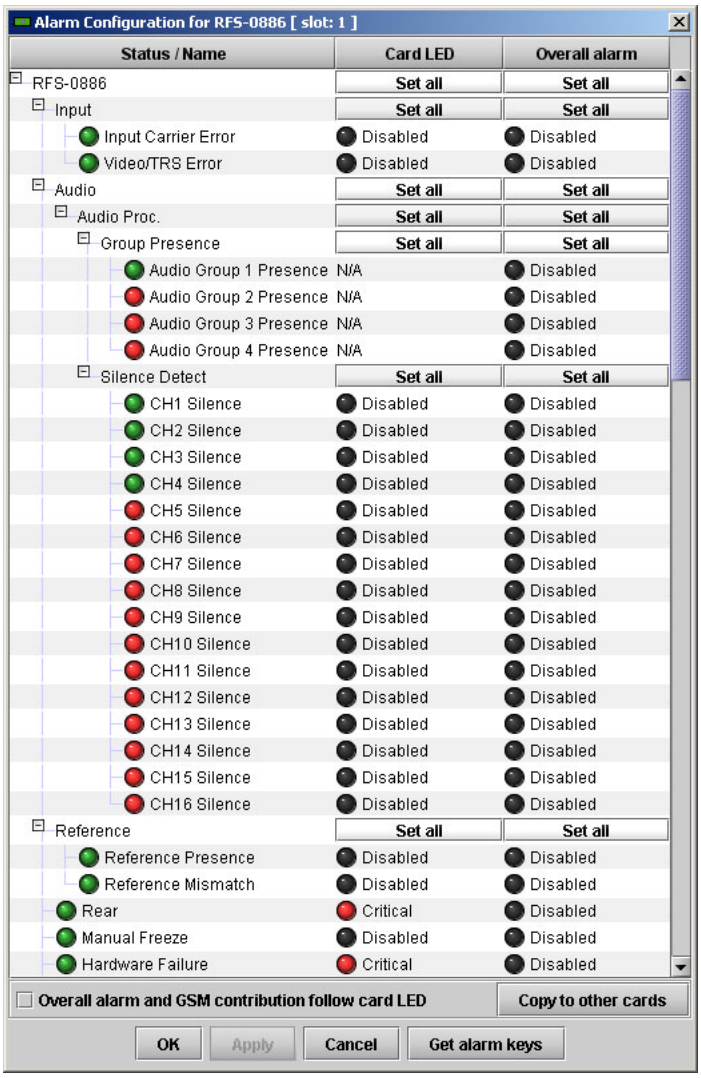
The 'Factory / Presets' page lets you load or save configuration parameters:

You can save the configuration you have just made as a "preset" and load it later either for this video port or for another.

For details, read the *iControl-Solo User's Guide*.

Alarm Configuration

The 'Alarm Config' page lets you enable or disable alarm conditions. Shown here are the first few of the many alarm conditions you can enable or disable:



For details, read the *iControl-Solo User's Guide*.

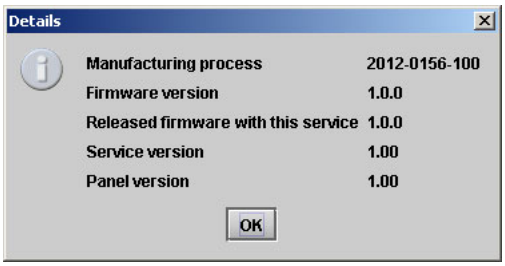
Information

The 'Info' page presents a set of facts about the frame sync card:

If you click the 'Advanced . . .' button, the software displays a "long ID":

The long ID is not material to any of the operations of the frame sync card.

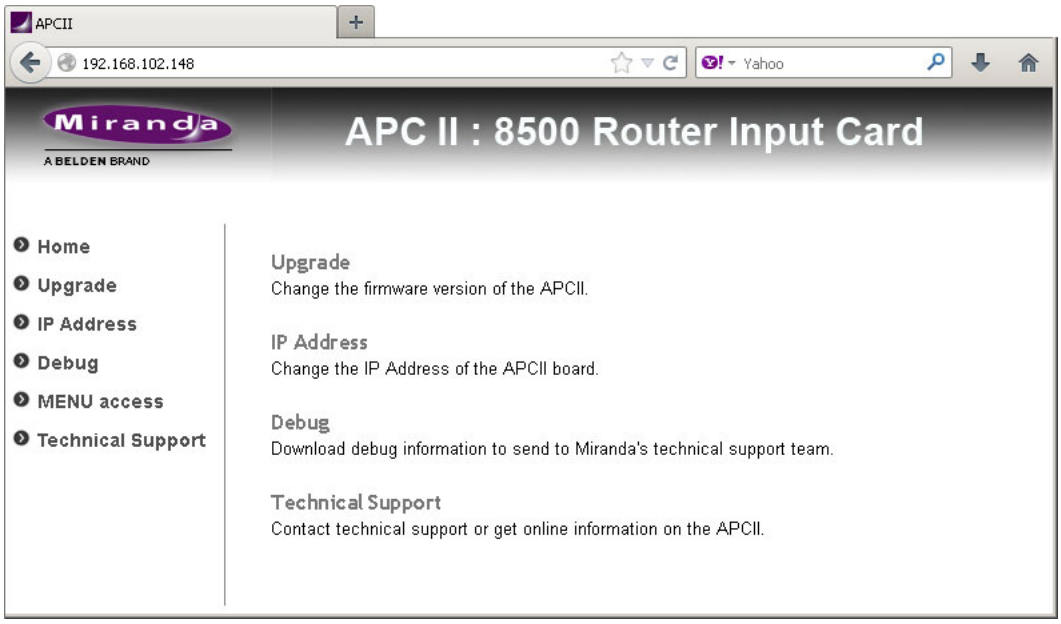
If you click the 'Details . . .' button, further details appear:



Browser Application

Every frame sync card has a simple built-in browser application. If you enter the frame sync card's IP address in your browser's URL field, the application appears, as long as your PC has an Ethernet connection to the card.

At the start, the application displays its main page or home page:



This page presents a brief summary of what you can do with the application.

At present, the application lets you perform these tasks:

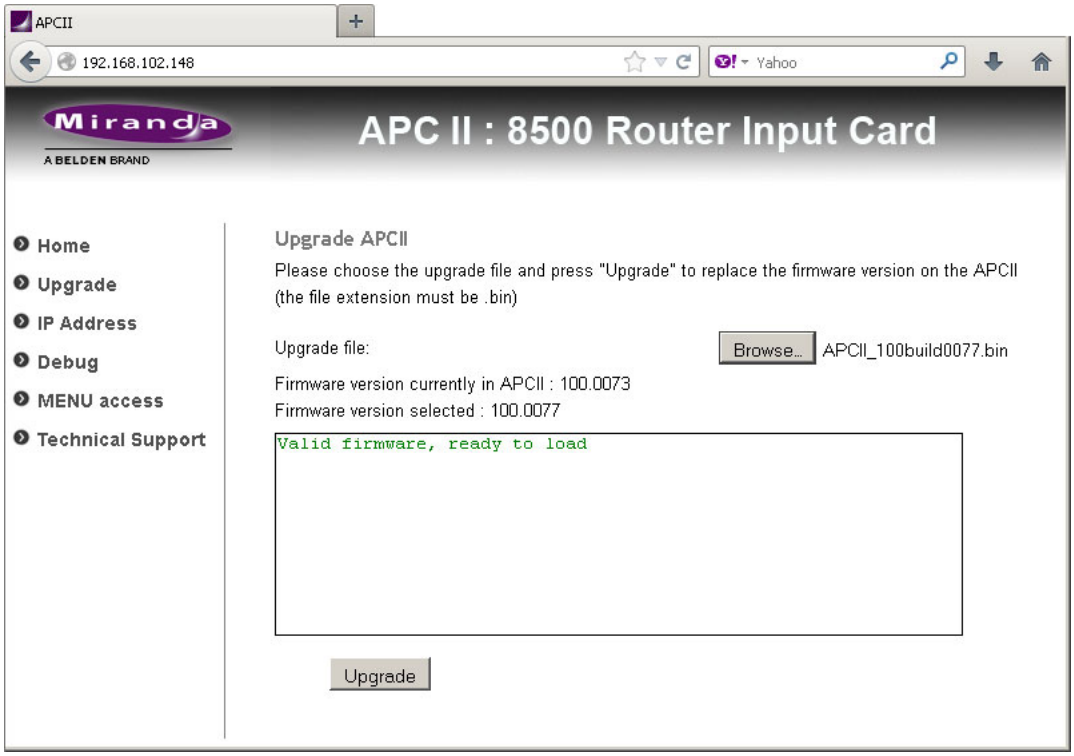
- Upgrade the frame sync software.
- Change the card's IP address.
- Review Grass Valley's technical support contact information.

At the left side is a navigation pane. Clicking an entry in the navigation pane causes its corresponding page to be displayed.

The 'Menu Access' page is not available yet. The 'Debug' page is for technical support.

Upgrade

Click 'Upgrade' in the navigation pane to update the card's frame sync software. The 'Upgrade' page appears:



To update the frame sync software:

1 Click the 'Browse' button. In the dialog that appears, navigate to select a .bin file for the card.

If you choose a valid .bin file, the message area tells you so, as shown above. If you choose file that has older software, the message informs you:

```
The selected version is anterior to the current version
```

Nevertheless, you will be able to upload the software.

If the file you choose is not an appropriate .bin file, the message will be 'Version cannot be retrieved':

Firmware version currently in APCII : 100.0073
Firmware version selected : Version cannot be retrieved

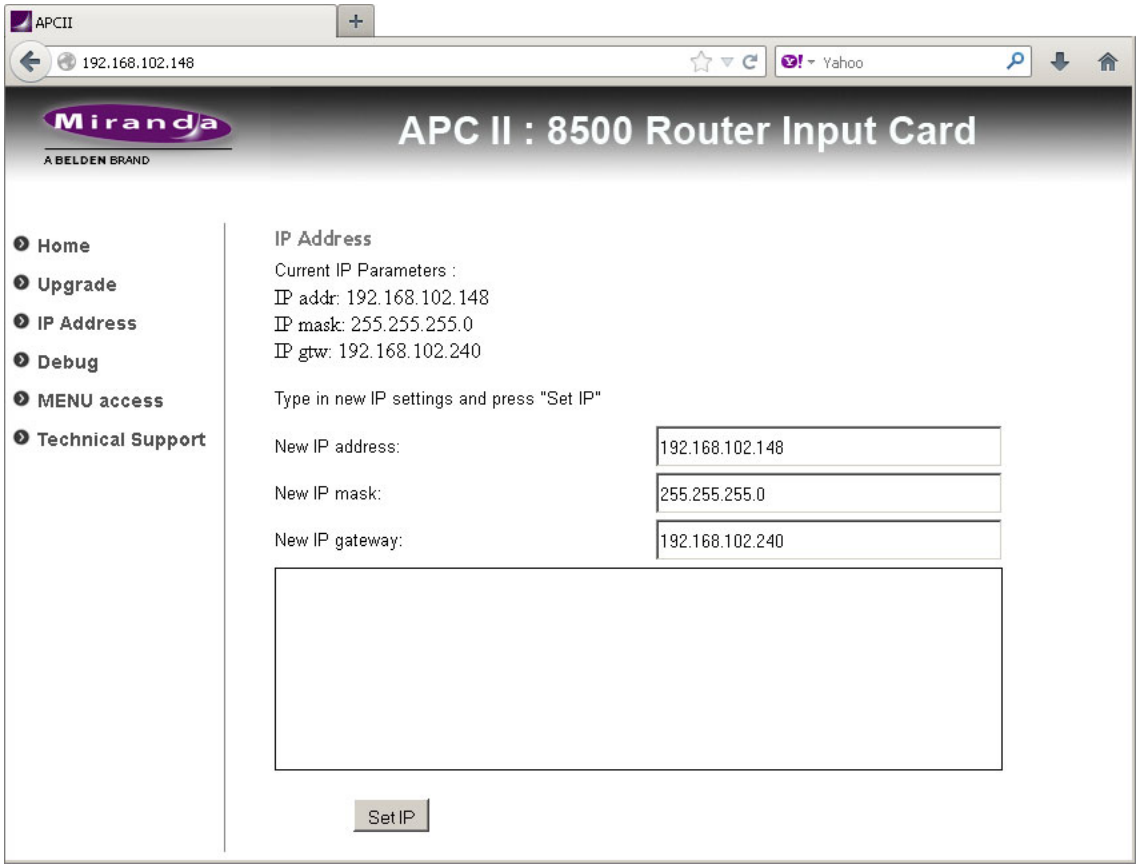
2 When you have chosen a valid file, click the 'Upgrade' button.

The upgrade (or downgrade if that is the case) proceeds automatically to completion.

The upgrade takes about a minute. During that time, the application presents a series of progress messages. When the upgrade is complete, the application gives you a "successful completion" message and returns to its normal state.

IP Address

Click 'IP Address' in the navigation pane to change the card's IP address and its related values. The 'IP Address' page appears:



(The field labeled 'New IP Mask' is the network's subnet mask.)

Note of Caution

When you first place a frame sync card, with its backplane module, in a slot in a router frame, the card initially acquires a default IP address that is based on the slot number: the lower octet of the IP address is the slot number (in the range 1 to 64). The default subnet is 192.168.3.xxx.

After you change the IP address of frame sync card, it will never be assigned the default address again. The IP address assigned to the frame sync card is actually stored in the card's backplane module. If you move the backplane module, the assigned IP address moves with it. The frame sync cards themselves are interchangeable.

- The two frames of an expanded NV8576-Plus have identical slot numbering. Therefore, using the defaults for IP address will probably result in duplicate IP addresses on the network you use to configure the cards. You must assign specific IP addresses to such cards.
- It is easy to forget the IP address of a frame sync card. There is no simple way to determine the IP address of a particular frame sync card, particularly if your router has many of them. Further, there is no way to access the card through your browser.

  If you do forget, open MRC's 'Ethernet Settings' page and review the IP addresses of your frame sync cards. Also open MRC's 'Module Status' or 'Module Types' page. Each of these

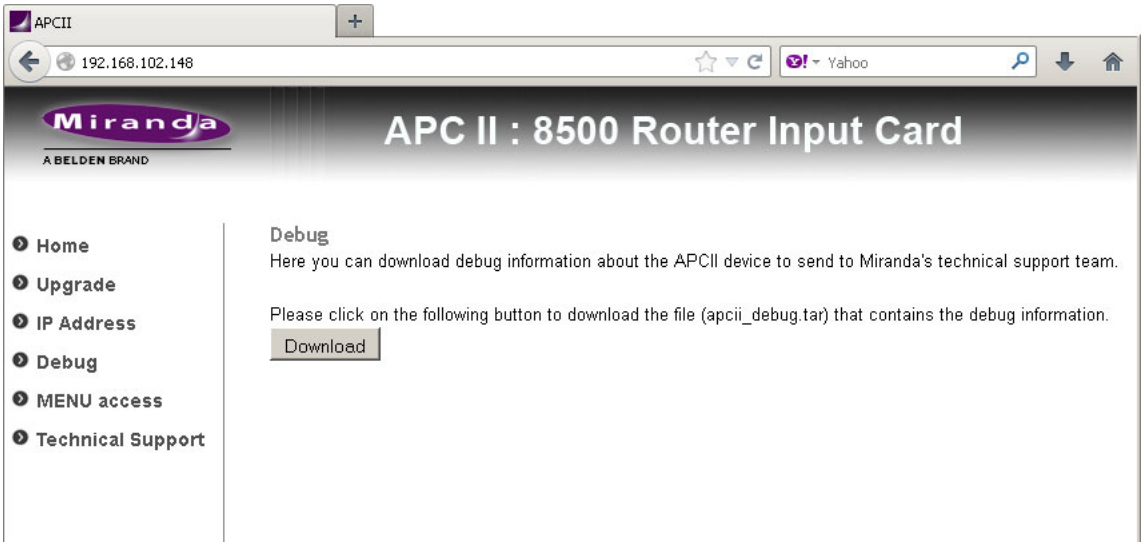
pages tells you in which slots your frame sync cards are located, but does not tell you their IP address. The 'Ethernet Settings' page tells you the IP address but does not tell you in which slot the card (or really its backplane module) is located.

Perhaps the best way to remember a frame sync card's IP address is to label its backplane module with the IP address.

- You can also change the IP address of a frame sync card in the 'Ethernet Settings' page of MRC.

Debug

Click 'Debug in the navigation pane to generate a .tar file containing debug information that you can send to Grass Valley technical support. The 'Debug' page appears:



Click the 'Download' button to generate the .tar file.

Different browsers download files to different locations. Locate the .tar file in the location appropriate for your browser.

Firefox, for example, saves the file in `C:\Users\<username>\Downloads\`. The file is named `apcii_debug.tar`. If the file exists, Firefox appends a qualifier to the name: `(1)`, `(2)`, or similar.

Video Formats

The frame sync input card supports many video formats, subject to the video reference applied, through the router, to the card. If the router's video reference is not suitable, the incoming video signal is passed through to the router's crosspoint and the frame sync functions are bypassed. Blank fields in the table that follows indicate formats for which bypass occurs.

Light green fields with check marks (✓) in the table represent signals that properly frame-sync to the given reference. Yellow fields with diamonds (♦) in the table represent signals that properly frame-sync to reference, but because they are different frame rates, downstream equipment may have "issues." SMPTE352 packets are passed through and not updated to reflect change in frame rate.

This is the table. Notes follow.

		Reference													
		50 Hz				59.94 Hz				60 Hz			24 Hz	23.98 Hz	None
		Bi-Level	Tri-Level			Bi-Level	Tri-Level			Tri-Level			TriLevel	TriLevel	
Video Format		625i 50	1080i 50	720p 50	1080p 50	525i 59.94	1080i 59.94	720p 59.94	1080p 59.94	1080i 60	720p 60	1080p 60	1080p 24	1080p 23.98	—
50 Hz															
SD	PAL	✓	✓	✓	✓										
HD	1080i50	✓	✓	✓	✓										
	1080p25	✓	✓	✓	✓										
	1080sf25	✓	✓	✓	✓										
	720p50	✓	✓	✓	✓										
	720p25	✓	✓	✓	✓										
3GA	1080p50	✓	✓	✓	✓										
3GB	1080p50	✓	✓	✓	✓										
3GB-DS*	1080p25	✓	✓	✓	✓										
	1080i50	✓	✓	✓	✓										
	1080sf25	✓	✓	✓	✓										
	720p50	✓	✓	✓	✓										
	720p25	✓	✓	✓	✓										
59.94 Hz															
SD	NTSC					✓	✓	✓	✓	◆	◆	◆			
HD	1080i59.94					✓	✓	✓	✓	◆	◆	◆			
	1080p29.97					✓	✓	✓	✓	◆	◆	◆			
	1080sf29.97					✓	✓	✓	✓	◆	◆	◆			
	720p59.94					✓	✓	✓	✓	◆	◆	◆			
	720p29.97					✓	✓	✓	✓	◆	◆	◆			
3GA	1080p59.94					✓	✓	✓	✓	◆	◆	◆			
3GB	1080p59.94					✓	✓	✓	✓	◆	◆	◆			
3GB-DS	1080p29.97					✓	✓	✓	✓	◆	◆	◆			
	1080i59.94					✓	✓	✓	✓	◆	◆	◆			
	1080sf29.97					✓	✓	✓	✓	◆	◆	◆			
	720p59.94					✓	✓	✓	✓	◆	◆	◆			
	720p29.97					✓	✓	✓	✓	◆	◆	◆			
60 Hz															
HD	1080i60					◆	◆	◆	◆	✓	✓	✓			
	1080p30					◆	◆	◆	◆	✓	✓	✓			
	1080sf30					◆	◆	◆	◆	✓	✓	✓			
	720p60					◆	◆	◆	◆	✓	✓	✓			
	720p30					◆	◆	◆	◆	✓	✓	✓			
3GA	1080p60					◆	◆	◆	◆	✓	✓	✓			
3GB	1080p60					◆	◆	◆	◆	✓	✓	✓			
3GB-DS	1080p30					◆	◆	◆	◆	✓	✓	✓			
	1080i60					◆	◆	◆	◆	✓	✓	✓			
	1080sf30					◆	◆	◆	◆	✓	✓	✓			
	720p60					◆	◆	◆	◆	✓	✓	✓			
	720p30					◆	◆	◆	◆	✓	✓	✓			
24 Hz															
HD	1080p24												✓	◆	
	1080sf24												✓	◆	
	720p24												✓	◆	
3GB-DS	1080p24												✓	◆	
	1080sf24												✓	◆	
	720p24												✓	◆	
23.98 Hz															
HD	1080p23.98												◆	✓	
	1080sf23.98												◆	✓	
	720p23.98												◆	✓	
3GB-DS	1080p23.98												◆	✓	
	1080sf23.98												◆	✓	
	720p23.98												◆	✓	

Notes:

1 In iControl, 1080sf formats report as 1080i. This is acceptable because the transport really is 1080i, although the format is “sf.”

2 DS means dual stream.

11 M3 Cards

Chapter 11 describes M3 output cards and backplane modules and briefly describes the backplane's M3 connector.

Topics

Summary

The M3 output card is functionally equivalent to the standard output card but is designed to operate with M3 backplane modules. The M3 backplane module has a 16-terminal M3 connector and two coax (DIN1.0/2.3) connectors — for 18 video connections.

The M3 connector is presently used to make connections from NV8500 routers to Kaleido multiviewers that have M3 connectors.

M3 Backplane Module

The M3 backplane module has one M3 connector and two coax connectors. The M3 connector supports 16 of the video channels of the M3 card and the two coax connectors support the other 2 channels.

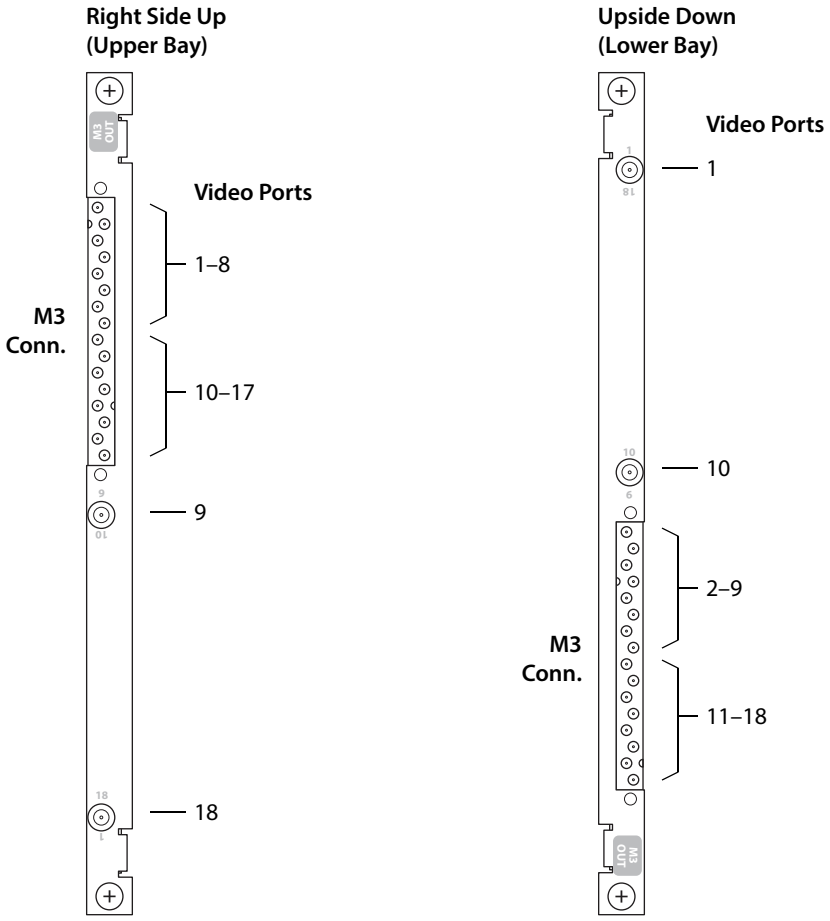
When the backplane is installed in the lower output bays of an NV8576 frame, it is upside down and its port ordering differs from when the backplane is installed in the upper bays (right side up) of an NV8576 frame.

When the M3 backplane module is installed in an NV8140, NV8144, or an NV8280, it is considered right side up.

- The M3 output card does not operate when it couple with a standard coax backplane module.
- Any embedder, TDM, or standard output card can use an M3 backplane module.

Port Ordering

This drawing shows the port ordering for an M3 backplane:

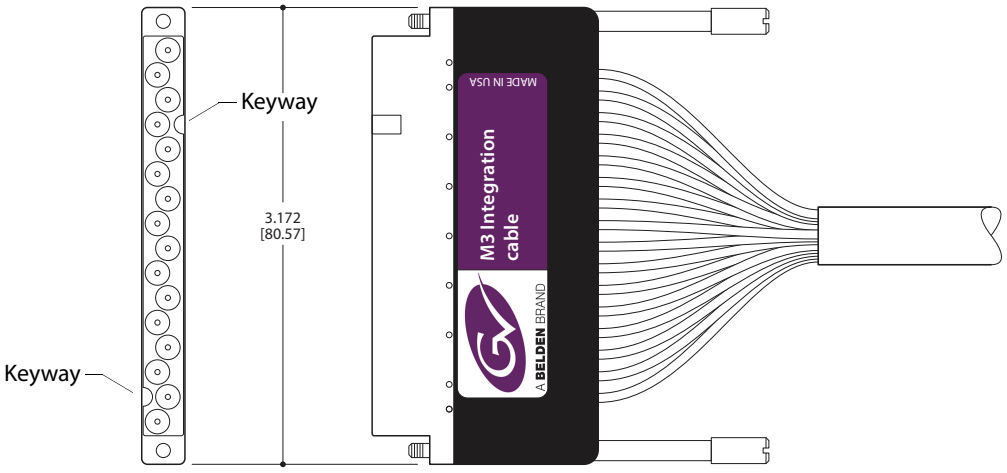


M3 Cable and Connectors

There are 2 M3 cables available in different lengths. The order code indicates the length. For instance, -5M means 5 meters.

- M3GIC-1M
- M3GIC-5M

The M3 cable has identical connectors on each end. This is a drawing of the cable connector:



The connectors are keyed so that you cannot connect the cables in the wrong orientation.

12 IOXM Extended Status

Chapter 12 provides tables that represent the data that can appear in the 'Individual Module Status' section of MRC's 'Module Status' page.

Module Types

Not all modules provide extended status. These are the modules that do:

Inputs

EM0687	AES async, 9-input
EM0783	Standard, 3Gig, 9 -input, coax
EM0783	Standard, 3Gig, 9 -input, coax, for NV8144
EM0783	Standard, HD, 9-input, coax
EM0814	Hybrid disembedder, 3Gig, 8-input, coax
EM0814	Hybrid 3Gig, 8 Video, 1 MADI, coax
EM0902	Standard, 3Gig, 9 -input, coax
EM0902	Standard, 3Gig, 9 -input, coax, for NV8144
EM0902	Standard, HD, 9-input, coax
EM0903	Hybrid disembedder, 3Gig, 8-input, coax
EM0903	Hybrid 3Gig, 8 Video, 1 MADI, coax

Outputs

EM0688	AES async, 18-output
EM0785	Standard, 3Gig, 18 -output, coax
EM0815	Hybrid embedder, 3Gig, 16-output, coax

Crosspoints

EM0662	Standard 288×288 crosspoint, 3Gig
EM0676	Standard 288×288 redundant crosspoint, 3Gig
EM0799	Standard 144×144 crosspoint, 3Gig
EM0819	Hybrid 144×144 crosspoint, 3Gig
EM0894	Standard 144×144 crosspoint, 3Gig
EM0895	Standard 144×144 redundant crosspoint, 3Gig, for NV8140
EM0896	Standard 288×288 crosspoint, 3Gig

Extended status data are not available for any other modules. MRC reports "N/A."

Video Formats

These are the (identifiers for the) video formats accepted by the NV8500 routers:

720p60, 720p59.94, 720p30, 720p29.97, 720p25, 720p24, 720p23.98, 720p50
1080i60, 1080i59.94, 1080i50, 1080i48
1080p25, 1080p30, 1080p29.97, 1080p60, 1080p59.94, 1080p50, 1080p24, 1080p23.98
525i59.94 (NTSC), 625i50 (PAL)

If MRC does not recognize the video format, it reports "unknown."

IOXM Extended Status Reporting

Following are the data reported for various module types:

Standard Input

Path Light (whether the module's path light is on).

Rear (whether the backplane module in the slot is present and appropriate for the module).

Temperature (8-bit value in degrees centigrade).

Input carrier detect (a 9-bit string of 1s and 0s, one bit for each input, indicating whether a signal is present at the input).

Standard Output

Path Light

Rear

Temperature

Output Reclocker (an 18-bit string of 1s and 0s, one bit for each output).

The 'Output Reclocker' bits mean "output's reclocker flag is set AND a video signal is present."

Hybrid Output

Path Light

Rear

Temperature

Output Reclocker (an 18-bit string of 1s and 0s, one bit for each output).

The 'Output Reclocker' bits mean "output's reclocker flag is set AND a video signal is present." Outputs 9 and 18 are of course reported as 0 because they are not actual outputs.

Video rate and format for each output.

Hybrid Input

Path Light

Rear

Temperature

Input carrier detect (18 bits for NV8140 input cards, 9 bits for input cards of other NV8500 routers).

Video rate and format (18 values for NV8140 input cards, 9 values for input cards of other NV8500 routers).

MADI Input

Path Light

Rear

Temperature

Input carrier detect (18 bits for NV8140 input cards, 9 bits for input cards of other NV8500 routers).

Video rate and format (18 values for NV8140 input cards, 9 values for input cards of other NV8500 routers).

MADI input valid (2 bits, 1s or 0s, for connector 9 and, for NV8140s, connector 18).

AES Input

Path Light.

Rear.

Temperature.

AES Output

Path Light.

Rear.

Temperature.

Standard Crosspoint

Path Light.

Active/Inactive (Whether the crosspoint is active is reported by the card, but not reported in MRC.)

Temperature (five 8-bit values because the module has 5 temperature sensors).

Standard Crosspoint

Path Light.

Active/Inactive (Whether the crosspoint is active is reported by the card, but not reported in MRC.)

Temperature (two 8-bit values because the module has 2 temperature sensors).

Std Redundant XPT

Path Light.

Active/Inactive (Whether the redundant crosspoint is active is reported by the card, but not reported in MRC.)

Temperature (two 8-bit values because the module has 2 temperature sensors).

Hybrid Crosspoint (144×144)

Path Light.

Active/Inactive (Whether the crosspoint is active is reported by the card, but not reported in MRC.)

Temperature (two 8-bit values).

TDM link in use (a 16-bit string of 1s and 0s, one bit for each input card associated with the crosspoint card).

13 Maintenance

Routers in the *NV8500 Series* 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. 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.

Topics

Fuse Replacement

There are no user-serviceable fuses.

Indicator LEDs

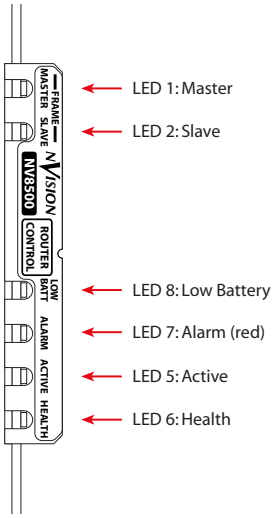
Indicator LEDs indicate whether DC power is present and if a card is operating normally. LEDs are visible when the router front door is closed. In the following sections, LEDs are listed in the order they appear on the cards, from top to bottom.

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.

Control Cards

You can observe the LEDs on the control cards to determine whether the cards are operating properly. This illustration shows the LEDs of hybrid control card as an example:



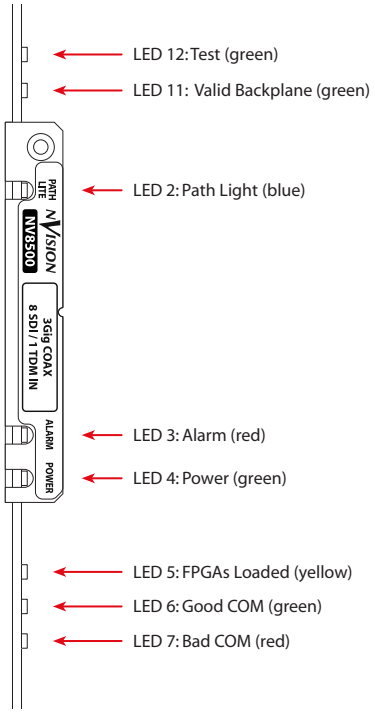
These are the LEDS at the front of a control card, from top to bottom:

LED No.	LED Name	LED Color	Function
1	Master	Green	ON for both control cards in the master, or primary, frame of an NV8576-Plus router. OFF in the "slave" or secondary frame. Which is the master frame is configured in MRC.
2	Slave	Yellow	ON for both control cards in the "slave," or secondary, frame of an NV8576-Plus router. OFF in the master, or primary frame. Which is the master frame is configured in MRC.
8	Low Battery	Red	OFF, normally. ON when the battery needs replacement. See Battery Replacement on page 170.
7	Alarm	Red	OFF, normally. ON when there is a problem or fault. Check the external reference signals. If that does not resolve the problem, refer to the system status window in MRC for additional information. If you cannot resolve the problem, call Grass Valley Technical Support.
5	Active	Yellow	ON when the card is the active control card in the frame. OFF when the card is stand-by.
6	Health	Green	ON, normally. Indicates the card has power and is operating normally.

LEDs 8, 7, 5 and 6 are visible through the door for both control cards.

Input Cards and Output Cards

You can observe the LEDs on the input and output cards to determine whether the cards are operating properly. This illustration shows the LEDs of a 3Gig/TDM (MADI) input card as an example:

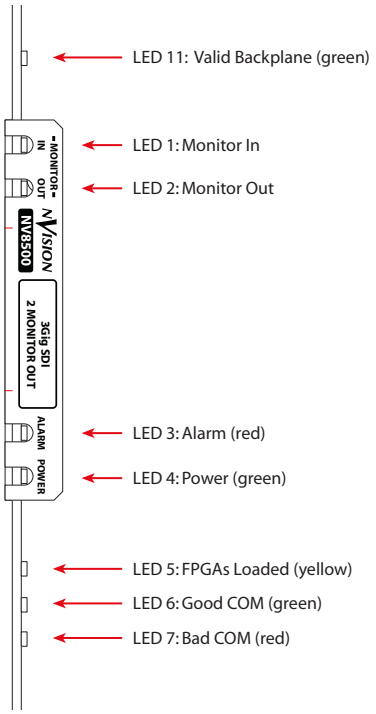


These are the LEDS at the front of an input or output card, from top to bottom:

LED No.	LED Name	LED Color	Function
12	Test	Green	ON normally. In TDM test mode with DIP switch position 8 in the ON position, LED 12 will blink at a rate of approximately 1Hz
11	Valid Backplane	Green	ON if the card is mated to a correct backplane
2	'Path Lite'	Blue	OFF normally. On if errors were detected in either stream under test mode, reset by pressing the PathLite switch. *Reserved for Grass Valley personnel.*
3	Alarm	Red	OFF normally. ON if there is a power supply failure
4	Power	Green	ON if all power supplies are working properly
5	FPGAs Loaded	Yellow	ON if all FPGAs have successfully loaded. OFF otherwise
6	COM Good	Green	ON if communication with the control card is good. OFF otherwise
7	COM Bad	Red	ON if errors are received in the control stream from the control card. Will Blink in test mode

Monitor Cards

You can observe the LEDs on the monitor cards to determine whether the cards are operating properly. This illustration shows the LEDs of monitor card:



These are the LEDS at the front of a monitor card, from top to bottom:

LED No.	LED Name	LED Color	Function
11	Valid Backplane	Green	ON if the card is mated to a correct backplane
1	Monitor In	Green	The card is an input monitor. (It is in the input card slot.)
2	Monitor Out	Green	The card is an output monitor. (It is in the output card slot.)
3	Alarm	Red	OFF normally. ON if there is a power supply failure
4	Power	Green	ON if all power supplies are working properly
5	FPGAs Loaded	Yellow	ON if all FPGAs have successfully loaded. OFF otherwise
6	COM Good	Green	ON if communication with the control card is good. OFF otherwise
7	COM Bad	Red	ON if errors are received in the control stream from the control card. Will Blink in test mode

Crosspoint Cards

You can observe the LEDs on the crosspoint cards to determine whether the cards are operating properly. The LEDs indicate the following:

LED Name	LED Color	Function
Alarm	Red	OFF, normally. ON when there is a problem. Replace the faulty card or call Grass Valley Technical Support.
Active	Yellow	ON, normally. The card has power and is operating normally. If the LED is off, it might have been made inactive through the redundant crosspoint controls.
Health	Green	ON, normally. The software has loaded and the card is operating normally.

Fans

There are five pairs of LEDs at the front of each fan tray, one pair for each fan in the tray. There is an Alarm LED and a Power LED in each pair.

Normally, the power LED should be ON and the Alarm LED should be off. The Alarm LED will come on if there is a fan failure.

With the router door closed, you cannot see these LEDs. Fan failure (or module over-temperature) is reported as 'Alarm 6' on the router's system alarm connector. See System Alarms on page 103.

Air Flow

NV8500 series routers draw cooling air from the front of the router, through the door, and exhausts heated air through the rear of the frame. The door must be 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/or bottom of the router frame. Fan trays can be removed for inspection or cleaning by 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 fan tray. Also check the openings at the back of the frame where air enters and exits to be sure dust and lint have not accumulated.

Fan trays can be removed briefly for inspection or cleaning with the router powered on.

Intake Filter Screen Cleaning

NV8500 series routers have an air filter mounted in the door. The filter enclosure is 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' indicator (LED 8) on the control card is lit, the battery located on the front edge of the control card must be replaced. 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 Grass Valley for replacement battery information.

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.

When you insert the new battery, be careful to observe the correct polarity. The "+" side of the battery must be farther away from the circuit board.

Note: The battery is a 3V Panasonic CR2330 coin type battery or its equivalent.

Troubleshooting

Many system problems 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 About the NV8500 Series Routers 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 Grass Valley Technical Support.

If 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 Grass Valley.

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.

Symptom	Possible Causes and Solutions
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.
Intermittent or missing signals on all outputs.	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. **NOTE:** Video can pass through with no control cards installed, but the audio might be missing.

Obtaining Service

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

1. Call Grass Valley Customer Support at the telephone number given under Contact Us on page 201. Our Customer Service Personnel will help you resolve any service issues.
2. If you need an exchange or repair, Grass Valley will assign you a Return Material Authorization (RMA) number. **Do not return equipment without first receiving an RMA number.** Grass Valley uses the RMA to track receipt of the equipment and to record repair or replacement information.
3. For out-of-warranty equipment, the Grass Valley Technical Support engineer estimates the cost of repair when you call and requests a purchase order payable to Grass Valley.
4. If a 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 this manual under Contact Us on page 201, and ship the equipment to Grass Valley at your company's expense.
6. When repair or replacement of in-warranty equipment is complete, Grass Valley return ships the items at its own expense. For out-of-warranty equipment, Grass Valley charges a shipping and handling fee. The standard shipping method is second day.
7. For out-of-warranty service, Grass Valley will send your company an invoice following the repair or replacement.

A Specifications

This appendix provides technical specifications for the NV8500 series hybrid routers, the NV8300 power supply, and the MADI interfaces.

Power Specifications (PS8100)

The NV8144 uses the PS8100 power supply module. For the NV8144, power supply modules are installed in the router frame.

The following are power specifications for the PS8100:

Type	Parameters
AC Input	90–130/180–250 VAC, 50/60 Hz, Auto-ranging. 15 Amp at 110 VAC;7.5 Amp at 220 VAC.
AC Fuses	No user serviceable fuses
AC Connectors	2, IEC 320-C13 (one for each PS8100 module installed)
AC Power	PS8100, 850 Watts, one IEC 320-C13 (female), one NEMA 5-15p (male)
AC Power Usage	850 Watts nominal (144 × 144), power factor corrected Power draws for fully loaded frame: Coax 600 Watts Fiber optic 820 Watts Hybrid 820 Watts
Modules and Module Slots	Required minimum number of PS8100 modules: 1 primary (1 optional redundant)
Power Supply Alarm Connection	DE9; reads status from each PS8100
Power Supply Monitor Connection	DB25, loop-through possible
Cabling	WC0109-00 — cable from NV8144 to power source
Environmental	Operating temperature: 0 to 40° C Relative humidity: 0 to 90%, non-condensing
Regulatory Compliance	UL listed and CE compliant

Power Specifications (NV8300, PS8300)

The NV8280, NV8576, and NV8576-Plus use the NV8300 power supply frame, which houses PS8300 power supply modules. The NV8140 uses PS8300s internally.

The following are power specifications for the NV8300 and the PS8300:

Type	Parameters
AC input	90-130/180-250 VAC, 50/60 Hz, Auto-ranging. 20 Amp at 110 VAC; 10 Amp at 220 VAC
AC fuses	No user serviceable fuses
AC connectors	4, IEC 320-C19 (one for each PS8300 module installed)
AC power	PS8300, 1,350 Watts, one IEC 320-C19 (female), one NEMA L5-20p (male)
AC power usage	**NV8140:** Power draw for fully loaded frame: Coax, 700 Watts, power factor corrected Fiber optic, 1485 Watts, power factor corrected Hybrid, 1485 Watts, power factor corrected **NV8280:** Power draw for fully loaded frame: Coax, 1750 Watts nominal, power factor corrected Fiber optic, 2100 Watts nominal, power factor corrected Hybrid, 2700 Watts nominal, power factor corrected **NV8576, NV8576-Plus (stand-alone):** Power draw for fully loaded frame: Coax, 3400 Watts nominal, power factor corrected Fiber optic, 4250 Watts nominal, power factor corrected Hybrid, 5400 Watts nominal, power factor corrected. (The NV8576 requires two NV8300 frames.) **NV8576-Plus (expanded):** Power draw for each fully loaded frame: Coax, 3400 Watts nominal, power factor corrected Fiber optic, 4250 Watts nominal, power factor corrected Hybrid, 5400 Watts nominal, power factor corrected (Each frame requires two NV8300 frames.)
Modules and module slots	**NV8140:** Required minimum number of PS8300 modules: 1 primary (1 optional redundant) mounted internally (no NV8300 required) **NV8280:** Required minimum number of PS8300 modules: 2 primary (2 optional redundant) **NV8576, NV8576-Plus (stand-alone):** Required minimum number of PS8300s in each NV8300: 4 primary (4 optional redundant) **NV8576-Plus (expanded):** Required minimum number of PS8300s in each NV8300: 4 primary (4 optional redundant)
Dimensions	3 RU high (5.22 inches, 132.6 mm) 19.0" (482.6 mm) wide 15.85" (402.6 mm) deep
Weight	NV8300: 19.2 lbs (8.71 kg) empty; 44.6 lbs (20.23 kg) fully loaded

Type	Parameters
DC power	AC Cable: WC00157-00; DC Cable: WC0154-00
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, 9.84 feet (3.0 meters) WC0157-00: Cable from NV8300 to power source, 20 Amp, 8.0 feet (2.44 meters)
Environmental	Operating temperature: 0–40 °C Relative humidity: 0–90%, non-condensing
Regulatory compliance	UL listed and CE compliant

Mechanical Specifications

The following are mechanical specifications for the NV8500 Series routers:

Type	Parameters
Dimensions	**NV8144, NV8140:** 8 RU (13.97 inches, 354.8 mm) high 19.0 inches (483 mm) wide 17.2 inches (436.88 mm) deep **NV8280:** 16 RU (27.97 inches, 710.4 mm) high 19.0 inches (483 mm) wide 17.2 inches (436.88 mm) deep **NV8576, NV8576-Plus (stand-alone):** 32 RU (55.97 inches, 1421.6 mm) high 19.0 inches (483 mm) wide 17.2 inches (436.88 mm) deep **NV8576-Plus (expanded):** Comprises 2 NV8576-Plus frames: each 32 RU (55.97 inches, 1421.6 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 **NV8140:** 51.4 lbs (23.3 kg) empty; 97.0 lbs (43.99 kg) fully loaded **NV8280:** 108.4 lbs (49.17 kg) empty; 149.00 lbs (67.58 kg) fully loaded **NV8576, NV8576-Plus (stand-alone):** 169.86 lbs (77.05 kg) empty; 308.80 lbs (140.07 kg) fully loaded **NV8576-Plus (expanded)** Comprises 2 NV8576-Plus frames, each 169.86 lbs (77.05 kg) empty; 308.80 lbs (140.07 kg) fully loaded
Mounting	EIA 310-C, 19.0 inches (483 mm)

Type	Parameters	
Grounding terminal	Copper, accepts 14-6 AWG	
Modules and module slots	**NV8144:** 16 Input cards, 9 connectors each 8 Output cards, 18 connectors each 2 Crosspoint cards (1 primary, 1 optional redundant) 2 Control cards (1 primary, 1 optional secondary) 1 Monitor card 1 Fan module 2 PS8100 power supply modules (1 required, 1 optional redundant) **NV8140:** 8 Input cards, 18 connectors each 16 Output cards, 18 connectors each 3 Crosspoint cards (2 primary, 1 optional redundant) 2 Control cards (1 primary, 1 optional secondary) 1 Fan module 2 PS8300 power supply modules (1 required, 1 optional redundant) **NV8280:** 32 Input cards, 9 connectors each 32 Output cards, 18 connectors each 9 Crosspoint cards (8 primary, 1 optional redundant) 2 Control cards (1 primary, 1 optional secondary) 2 Monitor cards 1 Fan module **NV8576, NV8576-Plus (stand-alone):** 64 Input cards, 9 connectors each 64 Output cards, 18 connectors each 8 crosspoint cards and 1 optional redundant crosspoint 2 control cards (1 primary and 1 optional secondary) 4 monitor cards 2 fan modules **NV8576-Plus (expanded, twice the number of the stand-alone router):** 128 input cards, 9 connectors each 128 output cards, 9 connectors each plus 2 high density interconnects for expansion 16 crosspoint cards (8 primary and 1 optional redundant crosspoint for each frame), 4 control cards (1 primary and 1 optional secondary, for each frame) 8 monitor cards 4 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

Type	Parameters	
Ethernet	Type	10/100 Base T
	Standard	IEEE 802.3
	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 Ω
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 Ω
	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	Standard routers (with EM0666 control cards)	RJ-45
	Hybrid routers (with EM0833 control cards)	BNC, 75 Ω
Power Supply Monitor	Connector	DB25

Environmental Specifications

These are the routers' environmental specifications;

Type	Parameters
Operating temperature	0 to 40° C
Relative humidity	0 to 90%, non-condensing

Audio Specifications

These are the routers' audio specifications:

Type	Parameters	
Audio Reference Input	Type	Serial digital audio
	Standard	AES3id
	Sample Rate	48 kHz
	Connector	2, BNC (redundant)
	Impedance	75 Ω
	Input Level	0.5 V pp to 2.0 V pp
AES3 Inputs/Outputs	Type	Balanced digital audio
	Standard	AES3
	Sample Rate	Asynchronous, 32 to 192 kHz
	Connector	WECO
	Impedance	110 Ω
	Input Level	200 mV to 10 V pp
	Output Level	2 V pp
AES3id Inputs/Outputs (same for Dolby E)	Type	Unbalanced digital audio
	Standard	AES3id
	Sample Rate	Asynchronous, 32 to 192 kHz
	Connector	DIN 1.0/2.3
	Impedance	75 Ω
	Input Level	100 mV to 1.2 V pp
	Output Level	1 V ± 10%
AES10 (hybrid MADI) Inputs/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 Ω
	Input Level	150 mV to 600 mV
	Output Level	600 mV
	Cable length, EM0814 input card, equalization *off*.	100 m, Belden 1694A
	Cable length, EM0814 input card, equalization *on*.	300 m, Belden 1694A
	Cable length, EM0898 input card (NV8140)	400 m, Belden 1694A
	Cable length, EM0903 input card (other frames)	400 m, Belden 1694A

Video Specifications

These are the routers' video specifications:

Type	Parameters	
Video reference input	Type	Analog video reference
	Standard	PAL, NTSC or Tri-Level Sync
	Connector	Loop-through, BNC
	Impedance	75 Ω or Hi-Z (>20,000 Ω), not selectable
	Input Level	0.5 V pp to 2.0 V pp
	Input Return Loss	> 30 dB to 5 MHz
HD (SD and HD) inputs and outputs, (standard Only)	Type	High definition serial digital video
	Standard	SMPTE 259M, 272M, 292M and 299M
	Data Rates	Outputs: automatic re-clocking at 270 Mb/s and 1.483, 1.485 Gb/s or automatic bypass with pass-through from 19 Mb/s to 1.5 Gb/s
	Connector	DIN 1.0/2.3
	Impedance	75 Ω
	Cable Equalization	150 m Belden 1694A, 85 m Belden 1855A, or equivalent cable, at 1.5 Gb/s 350 m Belden 1694A, 200 m Belden 1855A, or equivalent cable, at 270 Mb/s
	Router Path	Non-inverting
	Input and Output Return Loss	> 15 dB, 5 MHz to 1.5 GHz
	Output Level	800 mV pp ± 10%
	Output Rise/Fall Time	≤ 270 ps
	Output Overshoot	≤ 10% of amplitude max
	Output Alignment Jitter	≤ 0.2 UI pp from 100 kHz to 150 MHz
	Output Timing Jitter	≤ 1.0 UI pp from 10 Hz to 100 kHz

Type	Parameters	
3Gig (and HD and SD) inputs and outputs, standard and hybrid, coax	Type	Standard; coax. High definition serial digital video; embedded audio is passed through. Hybrid; coax. High definition serial digital video; embedded audio can be de-embedded and re-embedded.
	Standard	Standard: SMPTE 259M, 272M, 291M, 292M, 299M, 424M Hybrid: SMPTE 259M, 272M, 274M, 292M, 296M, 299M, 424M Also 23.976, 24 and 25 fps, including PsF formats.
	Data Rates	Outputs: Auto re-clocking at 270 Mb/s and 1.483, 1.485, 2.967, 2.970 Gb/s or automatic bypass with pass-through from19 Mb/s to 3.0 Gb/s
	Connector	DIN 1.0/2.3
	Impedance	75 Ω
	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

Type	Parameters	
3Gig (and 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 automatic bypass with pass-through from 19 Mb/s to 3.0 Gb/s Frames per second: 23.976, 24 and 25 fps, including PsF formats.
	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	**Note:** fiber spec can vary depending on type: 1310 nm: –5 to 0 dBm (–2 dBm typical) CWDM: –6 to –3 dBm High-power CWDM: 0 to +4 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)

B Part Numbers

This appendix provides a list of parts provided by Grass Valley for the *NV8500 Series* of routers, the NV8300 power supply frame, and PS8300 power supply modules. Unless otherwise noted, part numbers apply to all routers in the *NV8500 Series*.

Frames

The following is a list of frame part numbers for each router frame and each power supply frame:

Part Number	Description
FR0045-03	NV8144 frame
FR0125-00	NV8140 frame
FR0044-03	NV8280 frame
FR0043-08	NV8576 frame
FR0073-06	NV8576-Plus frame
FR0034-01	NV8000 frame[a]
FR0111-00	NV8300 frame

a. Used in some existing systems

Input Cards and Backplanes

The following is a list of all input cards and the corresponding backplanes:

Card and Signal Type	Part Number	Card Class	Rates	Signals	Back-plane
AES async (coax): asynchronous digital audio, unbalanced	8500-AES-ASYNC-IN	Standard	Sample rates 32 to 96 kHz (passed through)	9, stereo	EM0791 (coax)
AES async (WECO): asynchronous digital audio, balanced	8500-AES-ASYNC-IN	Standard	Sample rates 32 to 96 kHz (passed through)	9, stereo	EM0828 (WECO)
HD (coax): SD or HD	8500-HD-IN-COAX	Standard	150m Belden 1694A, 85m Belden 1855A, or equivalent cable, at 1.5 Gb/s	9, video	EM0791 (coax)

Card and Signal Type	Part Number	Card Class	Rates	Signals	Back-plane
3Gig (coax): SD, HD, or 3Gig	8500-3GIG-IN-COAX	Standard	Video rates from 19 Mb/s to 2.97 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A 3.0 Gb/s 100 m Belden 1694A, 45 m Belden 1855A	9, video	EM0791 (coax)
(for NV8140) 3Gig (coax): SD, HD, or 3Gig	8140-3GIG-IN-COAX	Standard	Video rates from 19 Mb/s to 2.97 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A 3.0 Gb/s 100 m Belden 1694A, 45 m Belden 1855A	18, video	EM0888 (coax)
(for NV8140) HD (coax): SD or HD	8140-HD-IN-COAX	Standard	Video rates from 19 Mb/s to 1.5 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A	18, video	EM0888 (coax)
3Gig (fiber optic): SD, HD, or 3Gig	8500-3GIG-IN-FIBER	Standard	(Note: cable equalizers are not present on input cards managing fiber optic signals.)	9, video	EM0696 (fiber optic)
(for NV8140) 3Gig (fiber optic): SD, HD, or 3Gig	8140-3GIG-IN-FIBER	Standard	(Note: cable equalizers are not present on input cards managing fiber optic signals.)	18, video	EM0901 (fiber optic)

Card and Signal Type	Part Number	Card Class	Rates	Signals	Back-plane
Hybrid 3Gig disembedder (coax): SD, HD and 3Gig	8500H-IP-3G-DEM-CX	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A 3.0 Gb/s 100 m Belden 1694A, 45 m Belden 1855A	8, video; 128, audio	EM0791 (coax)
Frame sync input (coax): SD, HD and 3Gig	8500H-IP-3G-FS-CX	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A 3.0 Gb/s 100 m Belden 1694A, 45 m Belden 1855A	8, video; 128, audio; Ethernet (for configuration)	EM0907 (coax + RJ-45)
(for NV8140) Hybrid 3Gig disembedder (coax): SD, HD and 3Gig	8140H-IP-3G-DEM-CX	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A 3.0 Gb/s 100 m Belden 1694A, 45 m Belden 1855A	16, video; 256, audio	EM0791 (coax)

Card and Signal Type	Part Number	Card Class	Rates	Signals	Back-plane
3Gig/TDM (coax): SD, HD, or 3Gig for video, plus MADI synchronous digital audio, unbalanced	8500H-IP-3G-TDM-CX	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A 3.0 Gb/s 100 m Belden 1694A, 45 m Belden 1855A Audio: 1 stream of 64 channels, 24 bits, at 48 kHz, locked to reference	8, video; 1 MADI stream	EM0791 (coax)
(for NV8140) 3Gig/TDM (coax): SD, HD, or 3Gig for video, plus MADI synchronous digital audio, unbalanced	8140H-IP-3G-TDM-CX	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. (for cables listed, or equivalent cables) 270 Mb/s, 400 m Belden 1694A, 250 m Belden 1855A 1.5 Gb/s 150 m Belden 1694A, 100 m Belden 1855A 3.0 Gb/s 100 m Belden 1694A, 45 m Belden 1855A Audio: 1 stream of 64 channels, 24 bits, at 48 kHz, locked to reference	16, video; 2 MADI streams	EM0791 (coax)

Output Cards and Backplanes

The following is a list of all output cards and the corresponding backplanes:

Card and Signal Type	Part Number	Card Class	Rates	Signals	Back-plane
AES async (coax): asynchronous digital audio, unbalanced	8500-AES-ASYNC-OUT	Standard	Sample rates 32 to 96 kHz (passed through)	18, stereo	EM0793 (coax)
					EM0829 (WECO)
AES async: asynchronous digital audio, unbalanced and balanced, expansion	8500-AES-ASYNC-OUT-EXP	Standard Expansion	Sample rates 32 to 96 kHz (passed through)	9, stereo; 2 expansion	EM0789 (coax) EM0830 (WECO)
HD (coax): SD or HD	8500-HD-OUT-COAX	Standard	Auto reclocking at 270 Mb/s, 1.483 Gb/s, or 1.485 Gb/s. Reclocker bypass, with pass-through, at other rates from 19 Mb/s to 1.5 Gb/s	18, video	EM0793 (coax)
3Gig (coax): SD, HD, or 3Gig	8500-3GIG-OUT-COAX	Standard	Video rates from 19 Mb/s to 2.97 Gb/s. Selectable reclocking (can be enabled or disabled) at 270 Mb/s or 1.483, 1.485, 2.966, or 2.97 Gb/s. Reclocking bypassed at other rates.	18, video	EM0793 (coax)
3Gig (fiber optic): SD, HD, or 3Gig	8500-3GIG-OUT-FIBER	Standard		18, video	EM0694 (fiber optic)
3Gig (M3, coax): SD, HD, or 3Gig	8500-3GIG-OUT-M3	Standard		18, video	EM0939 (M3, coax)
3Gig (coax): SD, HD, or 3Gig, expansion	8500-3GIG-OUT-COAX -EXP	Standard, Expansion		9, video; 2 expansion	EM0789 (coax)
3Gig (fiber optic): SD, HD, or 3Gig, expansion	8500-3GIG-OUT-FIBER-EXP	Standard, Expansion		9, video; 2 expansion	EM0698 (fiber optic)
Hybrid 3Gig (coax): SD, HD, or 3Gig	8500H-OP-3G-EMB-CX	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s.	16, video 256, audio	EM0793 (coax)
Hybrid 3Gig (coax): SD, HD, or 3Gig, expansion	8500H-OPX-3G-EMB-CX	Hybrid, Expansion		8, video; 128, audio; 2 expansion	EM0789 (coax)
Hybrid 3Gig (coax): SD, HD, or 3Gig	8500H-OP-3G-DEM/EMB-CX	Hybrid	"Disembedder/embedder" or "DEM/EMB" cards. Video rates from 19 Mb/s to 2.97 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.970 Gb/s.	16, video 256, audio	EM0793 (coax)
Hybrid 3Gig (coax): SD, HD, or 3Gig, expansion	8500H-OPX-3G-DEM/EMB-CX	Hybrid, Expansion		8, video; 128, audio; 2 expansion	EM0789 (coax)

Card and Signal Type	Part Number	Card Class	Rates	Signals	Back-plane
Hybrid 3Gig/TDM (coax): SD, HD, 3Gig, for video plus MADI	8500H-OP-3G-TDM-CX	Hybrid	Video rates from 19 Mb/s to 2.97 Gb/s. Automatic reclocking at 270 Mb/s and 1.483, 1.485, 2.966, 2.97 Gb/s. Embedded audio passed through; reclocking bypassed at other rates. Audio: 1 stream of 64 channels, 24 bits at 48 kHz, locked to reference.	16 video; 2 MADI streams	EM0793
Hybrid 3Gig/TDM (coax): SD, HD, 3Gig, for video plus MADI; expansion	8500H-OPX-3G-TDM-CX	Hybrid, Expansion		8 video; 1 MADI stream; 2 expansion	EM0789
Filler	8500-OUT-FILLER-EXP	Standard, Expansion	–n/a–	–n/a–	EM0789
Hybrid filler	—	Hybrid, Expansion			

Crosspoint Cards

The following lists the crosspoint cards available:

Catalog Number	Card Class	Router
144-3GIG-XPT (EM0894)	Standard	NV8140, NV8144 and NV8280. Also used for the redundant crosspoint in the NV8144
144-3GIG-XPT (EM0799)	Standard	**Obsolete.** NV8144 and NV8280. Also used for the redundant crosspoint in NV8144
144-3GIG-XPT-RED	Standard	Standard redundant crosspoint for the NV8140
8500H-XPT-144 (EM0899)	Hybrid	NV8140, NV8144 and NV8280. Also used for the redundant crosspoint in the NV8144
8500H-XPT-144 (EM0819)	Hybrid	**Obsolete.** NV8144 and NV8280. Also used for the redundant crosspoint in the NV8144
8500H-RXPT-140	Hybrid	Hybrid redundant crosspoint for the NV8140
8500H-RXPT-144	Hybrid	Hybrid redundant crosspoint for the NV8280
288-3GIG-XPT	Standard	NV8576 and NV8576-Plus
288-3GIG-XPT-RED	Standard	Standard redundant crosspoint for the NV8576 and NV8576-Plus
8500H-XPT-288	Hybrid	NV8576 and NV8576-Plus
8500H-RXPT-288	Hybrid	Hybrid redundant crosspoint for the NV8576 and NV8576-Plus

Control Cards

The following is a list of control cards for standard and hybrid systems:

Part Number	Card Class	Description
8500-NV	Standard	NV8576, NV8280, and NV8144 (EM0666)
8500H-NV	Standard and hybrid	NV8576, NV8280, and NV8144 (EM0833)

Monitor Cards

The following is a list of monitor cards and corresponding backplanes:

Part Number	Card Class	Description	Backplane
8500-MNTR	Standard and hybrid	3Gig monitor for the NV8280, NV8576, and NV8576-Plus	Input EM0715 Output EM0714
8500-MNTR	Standard and hybrid	3Gig monitor for NV8144	EM0846

Power Supply

The following is a list of power supply modules and cables necessary for making power connections:

Part Number	Description
PS8100	Power supply module (850 Watts)
PS8300	Power supply module (1,350 Watts)
WC0046-00	Power supply monitor cable
WC0123-10	DC power supply cable
WC0154-00	Power supply cable from NV8300 to router
WC0109-00	Cable from NV8144 to power source
WC0157-00	AC cable from NV8300 to power source, 20 amp, twist lock connector

Frame Expansion

The following are the cable and the terminator used when making expansion signal connections for an NV8576-Plus:

Part Number	Description
WC0121	Expansion cable, 4 meters, appx. 13 feet. These come as a set of 128 cables.
WC0084	Two of these RJ-45 terminators are required if you are cross-connecting an NV8576-Plus that uses EM0666 control cards (i.e., a standard router). If you are cross-connecting a hybrid router, one that has EM0833 control cards, you will use BNC coax cable and no termination is required.

Glossary

3Gig A term adopted by Grass Valley to refer to video rates of 2.966 Gb/s and 2.970 Gb/s. For NVISION series routers, a 3Gig signal also accepts HD and SD rates. It reclocks at 270 Mb/s, 1.483 Gb/s, 1.485 Gb/s, 2.996 Gb/s, and 2.970 Gb/s. Reclocking is bypassed at other rates.

AC Alternating Current.

AES Audio Engineering Society, also known as AES/EBU. In Grass Valley documents, the name refers to a digital audio standard officially known as AES3. It was developed by the Audio Engineering Society (AES) and the European Broadcasting Union (EBU).

Async Asynchronous. A signal that is not locked to a clock. Switching between asynchronous signals has unpredictable results.

Balanced A balanced signal is a circuit having two sides (conductors) carrying voltages that are symmetrical around a common reference point, typically ground. See Unbalanced, following.

CE Conformité Européenne. European health and safety organization and its 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. The originator of standards such as RS-232 and RS-485.

ESD Electrostatic discharge.

HD High Definition (i.e., HD-SDI). Digital video signal rates of 1.483 and 1.485 Gb/s. Governed by SMPTE 259M.

iControl-Solo Software with which, among other functions, to configure the frame sync functions of frame sync input cards. iControl-Solo is also used to control and monitor frame sync functions during operation.

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. In Grass Valley systems, this is an Ethernet network or subnetwork.

LC A small form factor connector for fiber-optic signals.

LED Light Emitting Diode.

MADI Multichannel Audio Digital Interface. A 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 NV8500 series routers.
NV9000-SE Utilities	An application that configures NV9000 series router control systems. This is the software with which to specify the inputs and outputs to the router and their characteristics.
PCM	Pulse Code Modulation. A digital representation of sampled analog signals.
RU	Rack Unit. A standard measure or size for frames (1.75 inches).
SD	Standard Definition (i.e., SD-SDI). Digital video signal rates of 143, 177, 270, 360 and 540 Mb/s. Governed by SMPTE 259M and SMPTE 344M.
SMPTE	Society of Motion Picture and Television Engineers, www.smpte.org. An international association, based in the United States, of engineers in the motion imaging industries.
TDM	Time Domain Multiplexing (TDM). TDM allows multiple signals to exist on a single cable by placing the incoming signals alternately in a continuous stream. This allows the multiple signals to use a significantly fewer number of connectors. For the NV8500 routers, crosspoint cards can store and switch AES3 synchronous channels separately for mono switching.
UL	Underwriters Laboratory. An organization that develops standards and test procedures for materials, components, assemblies, tools, equipment and procedures, chiefly dealing with product safety and utility.
Unbalanced	Generally, a circuit that has one side grounded. An unbalanced signal is often called single-ended. See Balanced.
V	Volts.
VAC	Volts, Alternating Current.
VDC	Volts, Direct Current.
WECO	Connector for AES asynchronous balanced signals. WECO output connectors have 3 or 5 pins. Those having 5 pins support two AES signals, where each connector has 2 "–" pins and 2 "+" pins that share a middle ground pin. The spacing on the pins is 3.5 mm. WECO connectors have two parts for quick-release connections. One part is for the cable end and the other part is installed in the hardware (e.g., the router's backplane modules).

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