NVISION 8500 HYBRID

Digital video/audio routers with audio processing (3Gbps/HD/SD/ASI/AES/MADI)

NVISION 8500 Hybrid routers combine exceptional resilience with cost, space and power efficiency, due to the integrated audio processing. Ideal for production and playout applications, they also offer simplified cable management, using high density cabling, direct fiber connectivity, and audio concentrators. The NVISION 8500 Hybrid router range includes four frame sizes, with matrices from 144 x 144 to 1152 x 1152.

KEY FEATURES AND BENEFITS

Space, power and cost saving with integrated audio processing

» Integrated 16 channel audio de-embedding, shuffling, re-embedding and breakaway saves space, power, weight and costs

» For optimal cost efficiency, audio processing can be performed across all video inputs, using just a small portion of matrix equipped with audio processing modules using Dynamic Hybrid Pathfinding.

» Dynamic Hybrid Pathfinding automatically routes signals via the audio processing modules whenever required, under manual or automated control

Eliminating audio to video delay problems

» By eliminating the requirement for external audio de-embedders and embedders, the router prevents audio to video latency problems, which can be an issue in live production environments when feeding signals to an audio console

Simplified cable management with direct fiber connectivity

» Unique, clean design provides unparalleled signal integrity and allows longer coaxial cable runs

» High density coaxial connectors streamline cabling and lower weight

» Direct fiber connectivity using SFP modules for 1310 nm and CDWM wavelengths

» Audio concentrators minimize cabling, associated labor, and weight

Ultra resilient design

» Patented N-on-1 crosspoint redundancy

» Front loading with hot-swappable power supplies, input, output, controller and crosspoint modules, and speed controlled fans

» Small failure block: input block is 9, output block is 18

» Redundant power supplies, crosspoints, and control cards

Scalable for the very largest systems

» Four frames sizes provide matrices from 144 x 144 to 1152 x 1152

» Rectangular matrices (twice as many outputs as inputs) are ideally suited to feeding multi-viewer systems

Highly flexible control

» Integrates tightly with advanced NVISION 9000/915 controllers and wide range of control panels for easier signal management, even in the most complex facilities

Rich facility integration

» Exceptional integration across a facility, including with multi-views, signal processors, master control switchers, tally management systems, and production switchers

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<th>Traditional video / audio routers with embedders / de-embedders</th>
<th>NVISION 8500 HYBRID digital video / audio router with integrated audio processing</th>
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<td>Rack space</td>
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<td>Video router 576 x 576 - 38RU</td>
<td>38RU</td>
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<td>Audio router 512 x 512 - 19RU</td>
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<tr>
<td>100 x embedders and 100 x de-embedders</td>
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<td>Totals</td>
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<td>Savings</td>
<td>60 %</td>
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Typical space, power and weight savings with integrated audio processing
Four frames sizes: 144 x 144 to 1152 x 1152

**NVISION 8144**
- Up to 144 x 144
- 8RU

**NVISION 8280**
- Up to 288 x 576
- 16RU (plus 3RU PSU)

**NVISION 8576**
- Up to 576 x 1152
- 32RU (plus two 3RU PSUs)

**NVISION 8576-Plus**
- Up to 1152 x 1152
- 2 frames of 32RU (plus four 3RU PSUs)
Traditionally, production and broadcast facilities have used dedicated digital video and audio routers plus external de-embedders/embedders for signal management. This equipment has provided the ability to overcome typical signal problems like audio channel mismatching. However, this approach has now been superseded by the NVISION 8500 Hybrid router, which integrates digital video/audio routing and 16 channel de-embedding/shuffling/embedding and break-away. This functional integration saves costs, as well as space, weight and power (see table page 354). It also eliminates audio to video latency problems due to external de-embedders/embedders, while also streamlining the workflow, and minimizing cabling.

**Traditional broadcast infrastructure**

**Digital video router**

Video with embedded audio

**External de-embedders/embedders**

**Digital audio router**

Discrete audio

MADI (64 ch/wire)

Discrete audio

MADI (64 ch/wire)

Traditional broadcast infrastructure: multiple racks with digital video router and de-embedders/embedders to connect to an associated digital audio router
The NVISION 8500 Hybrid router performs audio processing using Hybrid input, crosspoint and output modules, which fit inside a single frame alongside regular (non-audio processing) modules. By using Dynamic Hybrid Pathfinding, the router can perform audio processing across all its video inputs, with just a small portion of its matrix equipped with input, crosspoint and output cards capable of audio processing.

The Dynamic Hybrid Pathfinding process automatically routes signals via the audio processing modules whenever required, under manual or automated control. This architecture promotes optimal cost-efficiency by reducing the requirement for more expensive Hybrid modules, without impacting overall functionality.

Streamlined broadcast infrastructure: single rack with NVISION 8500 HYBRID router with integrated digital video/audio routing and de-embedding/embedding.
**NVISION 8500: typical audio processing applications**

**Feeding audio console with signals from production switcher**

The NVISION 8500 Hybrid router is ideally suited for connecting a production switcher and audio console in a control room. The router’s integrated audio processing eliminates the need for external de-embedders/embedders for feeding MADI to/from the audio console, and this eliminates audio to video latency problems.

**Swapping audio between MADI and embedded sources**

MADI audio tracks, such as a voice-over from an audio console, can be easily embedded into SDI video.
Switching embedded audio between two signals

The integrated de-embedding, shuffling, and embedding simplifies the task of switching audio tracks between embedded video signals.

Swapping embedded audio tracks

Integrated audio processing simplifies the task of embedded audio track shuffling, and this is performed using traditional router commands.
**NVISION 8500: ultimate resilience with redundant crosspoints**

The NVISION 8500 Hybrid router offers patented N-on-1 crosspoint redundancy to provide a zero downtime capability, with a back-up system for the largest possible impact block in the router. A redundant crosspoint array continuously shadows the main array and, in the event of a failure, a single action repairs the situation by “gang switching” all outputs to the good, redundant crosspoint card during the next vertical interval. Router maintenance can then be performed without impacting the facility’s operations. This maintenance process is outlined below:

### 1: Normal operations

During normal operations, a redundant crosspoint array continuously shadows the main crosspoint array.

![NVISION 8500 diagram](image)

### 2: Crosspoint array failure

A single crosspoint failure develops in the main crosspoint array.

![NVISION 8500 diagram](image)
3: Switching to redundant array

A single action instantly repairs the situation by “gang switching” all outputs to the good, redundant crosspoint card during the next vertical interval.

4: Returning to normal operations

Router maintenance can then be performed to repair the faulty array, without impacting the facility’s operations.
The NVISION 8500 Hybrid routers offer highly streamlined cabling using either coaxial or fiber. The unique, clean design of the router provides unparalleled signal integrity and allows longer coaxial cable runs, using high density cable connectors which save space and lower weight. Advanced direct fiber connectivity is also available, using SFP modules for 1310 nm or CDWM wavelengths.

The use of high density cable connectors on large routers provides densities two to three times that of conventional BNCs, and lets you fully exploit cost-effective coaxial cable for shorter runs, along with major rack-space savings. The smaller DIN 1.0/2.3 connectors are less stressed than traditional BNCs, and they don’t require a tight bend radius, this contributes to a better RF launch profile, and a better return loss.

Direct fiber connectivity is available using removable fiber SFP modules (single mode, Dual LC connectors at 1310 nm), which simplify configuration and maintenance. For more advanced fiber requirements using CWDM, there is a rack mounting tray that holds 4 CWDM muxes/demuxes. With this configuration, 72 3Gbps/HD/SD signals are transmitted by four fibers.

**NVISION 8500: streamlined cabling using coaxial and fiber**

**NVISION 8500**

- **SDI**
- **AES**
- **MADI**

16/18 SDIs on 1 fiber

**NVISION CWDM muxes/demuxes**

**NVISION CWDM muxes/demuxes**

**NVISION CWDM muxes/demuxes**

**CWDM is ideal for router-to-router and router-to-interface frame interconnects**

(Fiber is only available for standard SDI inputs and outputs)
**NVISION 8500: AES / MADI audio concentrators**

To further streamline cabling, the NVISION 8500 Hybrid routers can be used with NVISION 8900 audio concentrators. These devices convert AES to MADI, and MADI to AES, and this can radically reduce the number of audio cables needed in broadcast infrastructures. This reduces installation costs, simplifies troubleshooting, and reduces weight in a mobile environment.

![NVISION 8500 AES (balanced) to MADI converter](image1)

![NVISION 8500 MADI to AES (balanced) converter](image2)

![NVISION 8900 AES (unbalanced) to MADI converter](image3)

![NVISION 8900 MADI to AES (unbalanced) converter](image4)

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**Audio cabling can be streamlined using NVISION 8900 audio concentrators**

![Diagram](image5)

- **Incoming audio lines area**
- **Studio floor boxes**
- **Announce booths**
- **Audio console Studio A**
- **Audio console Studio B**

300m maximum distance

MADI (64 channels)
NVISION 8144 frame (144 x 144 in 8RU)

NVISION 8144 front view

NVISION 8144 rear view
NVISION 8144 typical configurations

144 x 144 3Gbps standard coax

64 x 64 de-embed/embed
2 x 2 MADI
128 x 128 sync AES (MADI + NV8900)
18 x 18 3Gbps fiber (CWDM)

64 x 64 3Gbps de-embed/embed
256 x 256 sync AES (MADI + NV8900)

108 x 108 3Gbps standard coax
36 x 36 3Gbps fiber (1310 nm)
NVISION 8280 frame (288 x 576 in 16RU)
NVISION 8280 typical configurations

288 x 576 3Gbps standard coax

216 x 432 3Gbps standard coax
64 x 128 3Gbps de-embed/embed

128 x 256 3Gbps de-embed/embed
36 x 72 3Gbps fiber (1310 nm)
4 x 8 MADI
256 x 512 sync AES (MADI + NV8900)

72 x 216 3Gbps standard coax
32 x 128 3Gbps de-embed/embed
54 x 32 3Gbps fiber (1310 nm)
36 x 108 3Gbps fiber (CWDM)
4 x 4 MADI
192 x 128 sync AES (MADI + NV8900)
NVISION 8576 frame (576 x 1152 in 32RU)
### NVISION 8576 typical configurations

**3Gbps standard coax**

**3Gbps de-embed (in) or embed (out)**

**3Gbps fiber (1310 nm)**

**3Gbps fiber (CWDM)**

**MADI**

**3Gbps standard coax**

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<tr>
<th>Configuration</th>
<th>Description</th>
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<td>576 x 1152</td>
<td>3Gbps standard coax</td>
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<tr>
<td>288 x 864</td>
<td>3Gbps standard coax&lt;br&gt;144 x 144 3Gbps fiber (1310 nm)&lt;br&gt;144 x 144 3Gbps S (CWDM)</td>
</tr>
<tr>
<td>144 x 288</td>
<td>3Gbps standard coax&lt;br&gt;108 x 108 3Gbps fiber (CWDM)&lt;br&gt;128 x 512 3Gbps de-embed/embed&lt;br&gt;4 x 4 MADI&lt;br&gt;512 x 512 sync AES (MADI + NV8900)</td>
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</table>
NVISION 8576 Plus frame (1152 x 1152 in 64RU)
NVISION 8576 Plus typical configurations

- 3Gbps standard coax
- 3Gbps fiber (1310 nm)
- MADI
- 3Gbps de-embed (in) or 3Gbps embed (out)
- 3Gbps fiber (CWDM)
- 3Gbps standard coax

640 x 896 3Gbps de-embed//embed
8 x 4 MADI
1280 x 384 MADI + NV8900
NVISION 8500 HYBRID TECHNICAL SPECIFICATIONS

ELECTRICAL

**PS8100 (FR8144 only)**

- **AC input:** 90-130/180-250 VAC, 50/60 Hz, Auto-ranging, 15 Amp
- **AC fuses:** No user serviceable fuses
- **AC connectors:** Female - IEC 320-C13 (one for each PS8100 module installed), Male – NEMA 5-15p
- **AC power:** PS8100, 850 Watts, one IEC 320-C13
- **AC power usage:** Power based on PS8100 modules.

**NV8144:**

- 850 Watts nominal (144 x 144), power factor corrected

**NV8300 and PS8300 (FR8280, FR8567, and FR8576-Plus)**

- **AC input:** 90-130/180-250 VAC, 50/60 Hz, Auto-ranging, 20 Amp
- **AC fuses:** No user serviceable fuses
- **AC connectors:** Female - IEC 320-C19 (one for each PS8300 module installed), Male - NEMA L5-20P Locking (one for each PS8300 module installed)
- **AC power:** PS8300, 1,350 Watts, one IEC 320-C19
- **AC power usage**
  - **NV8280:** Fiber optic: 2,100 Watts nominal (fully loaded), power factor corrected
  - Hybrid: 2,700 Watts nominal (fully loaded), power factor corrected

**NV8576, NV8576-Plus:**

- **Fiber optic:** 4,250 Watts nominal
- **Hybrid:** 5,400 Watts nominal (fully loaded, single frame), power factor corrected (each frame requires two NV8300 frames)

DIAGNOSTIC

- **Type:** Serial port
- **Standard:** SMPTE 207M, EIA-422/EIA-232, configurable
- **Connector:** 2, DE-9

SERIAL CONTROL

- **Type:** Serial port (2 per control card)
- **Standard:** SMPTE 207M, EIA-422
- **Connector:** 4, DE-9

ETHERNET

- **Type:** 10/100 Base T
- **Standard:** IEEE 802.3
- **Protocol:** NVISION Ethernet protocol
- **Connector:** 2, RJ-45

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 ohm
- **Signal details:** See related section of this specification for details for each monitored signal type, I/O levels and return loss (FR8576-Plus only)

EXPANSION I/O

- **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 signal type, I/O levels and return loss (FR8576-Plus only)

CONTROL EXPANSION

- **Type:** 10Base2 port
- **Connector:** 2, BNC, loop-thru
- **Impedance:** 50 ohm

POWER SUPPLY MONITOR (except FR8144)

- **Connector:** DB-25

ENVIRONMENTAL SPECIFICATIONS

- **Operating temperature:** 0 to 40 ºC
- **Relative humidity:** 0 to 90 %, non condensing

VIDEO REFERENCE INPUT

- **Type:** Analog video reference
- **Standard:** PAL, NTSC, or tri-level sync
- **Connector:** Loop-thru, BNC
- **Impedance:** 75 ohm or Hi-Z (>20,000 ohm), not selectable
- **Input level:** 0.5 Vp-p to 2.0 Vp-p
- **Input return loss:** >30 dB to 5 MHz
- **Output timing jitter:** <0.2 Ulpp from 10 Hz to 1.0 kHz

INPUTS/OUTPUTS (HD/SD)

- **Type:** High definition serial digital video
- **Standard:** SMPTE 295M and 242M
- **Data rates for auto re-clocking:** 270 Mbps and 1,483, 1,485 Gbps or auto bypass with pass-through from 19 Mbps to 3.0 Gbps
- **Connector:** DIN 1.0/2.3
- **Impedance:** 75 ohm
- **Cable equalization for cables listed or equivalent cable:**
  - 400 m Belden 1694A at 270 Mbps
  - 150 m Belden 1694A at 1,485 Gbps
  - 150 m Belden 1694A at 2,970 Gbps
  - 100 m Belden 1694A at 3,0 Gbps
- **Router path:** Non-inverting
- **Input and output return loss:** >15 dB, 5 MHz to 1.5 GHz
- **Output level:** 800 mVp ±10 %
- **Output rise/fall time:** ≤270 ps
- **Output overshoot:** ≤10 % of amplitude max
- **Output alignment jitter:** ≤0.2 Ulpp from 100 kHz to 150 MHz
- **Output timing jitter:** ≤1.0 Ulpp from 10 Hz to 100 kHz

INPUTS/OUTPUTS (3Gbps/HD/SD)

- **Type:** High definition serial digital video
- **Standard:** SMPTE 295M, 344M, 292M and 342M
- **Data rates for auto re-clocking:** 270 Mbps and 1,483, 1,485, 2,966, 2,970 Gbps or auto bypass with pass-through from 19 Mbps to 3.0 Gbps
- **Connector:** DIN 1.0/2.3
- **Impedance:** 75 ohm
- **Cable equalization for cables listed or equivalent cable:**
  - 400 m Belden 1694A, 250 m Belden 1855A at 270 Mbps
  - 150 m Belden 1694A, 100 m Belden 1855A at 1,485 Gbps
  - 45 m Belden 1855A at 3,0 Gbps
- **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 rise/fall time:** ≤135 ps
- **Output overshoot:** ≤10 % of amplitude max
- **Output alignment jitter:** ≤0.3 Ulpp from 100 kHz to 300 MHz
- **Output timing jitter:** ≤2.0 Ulpp from 10 Hz to 100 kHz
### NVISION 8500 HYBRID ORDERING INFORMATION

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<tr>
<td>FR8576-Plus</td>
<td>576 x 576 in a single 32RU frame expandable to 1152 x 1152 in two frames</td>
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<td>FR8280</td>
<td>288 x 576 in a single 16RU frame</td>
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<td>FR8144</td>
<td>144 x 144 in single 8RU frame</td>
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<td>NV8300</td>
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<td>8500 9 in 3 Gig Coax Input</td>
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<td>8500-3GIG-IN-FIBER</td>
<td>8500 9 in 3 Gig Fiber Input</td>
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<td>8500-HD-IN-COAX</td>
<td>8500 9 in HD Coax Input</td>
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<td>8144-3GIG-IN-COAX</td>
<td>8144 9 in 3 Gig Coax Input (8144 frame only)</td>
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<td>8500 9 out 3 Gig Coax Output + Expansion</td>
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<td>8500-3GIG-OUT-FIBER</td>
<td>8500 18 out 3 Gig Fiber Output</td>
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<td>8500 9 out 3 Gig Fiber Output + Expansion</td>
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<td>8500-HD-OUT-COAX</td>
<td>8500 18 out HD Coax Output</td>
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<td>8144 18 out 3 Gig Coax Output (8144 frame only)</td>
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<td>8500 Series 144 x 144 3GIG XPT</td>
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<td>288-3GIG-XPT</td>
<td>8500 Series 288 x 288 3GIG XPT</td>
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<tr>
<td>144-3GIG-XPT-RED</td>
<td>8500 Series 144 x 144 3GIG redundant XPT</td>
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<tr>
<td>288-3GIG-XPT-RED</td>
<td>8500 Series 288 x 288 3GIG redundant XPT</td>
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<td>8500 8 in 3Gig/de-emb coax</td>
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<td>8500 8 in 3Gig 1 in MADI coax</td>
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<td>8500H-OPX-3G-EMB-CX</td>
<td>8500 8 out w/exp 3Gig/embed coax</td>
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<td>8500H-OP-3G-TDM-CX</td>
<td>8500 16 out 3Gig 2out MADI coax</td>
</tr>
<tr>
<td>8500H-OPX-3G-TDM-CX</td>
<td>8500 8 out 3Gig 1out MADI w/exp coax</td>
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<td>8576 3Gig/hybrid XPT</td>
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<tr>
<td>8500H-RXPT-288</td>
<td>8576 3Gig/hybrid redundant XPT</td>
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<td>8500H-XPT-144</td>
<td>8280/8144 3Gig/hybrid XPT</td>
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<tr>
<td>8500H-RXPT-144</td>
<td>8280 3Gig/hybrid redundant XPT</td>
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<td>8500 2in Optical SFP Module, Single mode, 1310 nm, Dual LC</td>
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<td>IO8500-3GIG-OUT-SFP</td>
<td>8500 2out Optical SFP Module, Single mode, 1310 nm, Dual LC</td>
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<td>8500 2in Optical SFP Module, Single mode, 1260-1620 nm, Dual LC</td>
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<td>IO8500-CWDM-OUT-SFP-27/29</td>
<td>8500 2out Optical SFP Module, Single mode, 1271/1291 nm, Dual LC</td>
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<td>IO8500-CWDM-OUT-SFP-31/33</td>
<td>8500 2out Optical SFP Module, Single mode, 1311/1331 nm, Dual LC</td>
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<td>IO8500-CWDM-OUT-SFP-35/37</td>
<td>8500 2out Optical SFP Module, Single mode, 1351/1371 nm, Dual LC</td>
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<td>8500 2out Optical SFP Module, Single mode, 1391/1411 nm, Dual LC</td>
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<td>8500 2out Optical SFP Module, Single mode, 1431/1451 nm, Dual LC</td>
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<td>8500 2out Optical SFP Module, Single mode, 1471/1491 nm, Dual LC</td>
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<td>IO8500-CWDM-OUT-SFP-51/53</td>
<td>8500 2out Optical SFP Module, Single mode, 1511/1531 nm, Dual LC</td>
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<td>IO8500-CWDM-OUT-SFP-55/57</td>
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<tr>
<th>NVISION 8900 AES / MADI audio concentrators</th>
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<tr>
<td>8900-SA-TDM-BAL</td>
<td>8900 32IN AES (110) TO MADI 1U</td>
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<td>8900-SA-TDM-CX</td>
<td>8900 32IN AES (75) TO MADI 1RU</td>
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<th>Power supply</th>
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<td>CRPS1</td>
<td>Redundant power supply for NV890</td>
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