

COUGAR AUDIO ROUTING SWITCHER

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About This Manual

This manual provides detailed instructions for the installation, operation, and maintenance of the PESA Cougar Audio Routing Switcher.

Warnings, Cautions, and Notes



Warning statements identify conditions or practices that can result in personal injury or loss of life.



Caution statements identify conditions or practices that can result in damage to equipment.



Notes contain information important to the correct installation, operation, or maintenance of the equipment.

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Chapter 1 – Introduction

1.1 Overview

The PESA Cougar Audio Routing Switcher offers a reliable low cost answer to your audio routing needs while providing a 2 levels of audio switching utilizing a 32X32 matrix within a single frame. The Cougar Audio Routing Switcher is housed in a 3RU frame providing a small profile for space efficient installations. The Cougar Frame can also be equipped with redundant power supplies for maximum reliability and fail safe operation.

The Cougar Audio Routing Switcher is designed with small to mid-range size routing matrix applications in mind. This cost efficient router is expandable to 64X64 size matrix. The Cougar Frame uses plug-in circuit cards for ease of maintenance and component replacement. The Cougar Audio Routing Switcher can be serviced hot, allowing circuit card changes without powering down the matrix.

The Cougar Audio Matrix Card features easily visible LED indicators for quick view of critical voltage and circuit conditions. The Cougar Frame comes equipped with a control port and external alarm connectors for audible monitoring the operation of the internal power and controller circuits.

The Cougar Audio Matrix Card provides electronically balanced inputs and outputs for improved slew rate and lower distortion over comparable transformer coupled circuits. The Cougar Audio Matrix Card features short circuit protection; which protects the matrix card by automatically protecting and recovering if a sustained short circuit to a signal or chassis ground occurs.

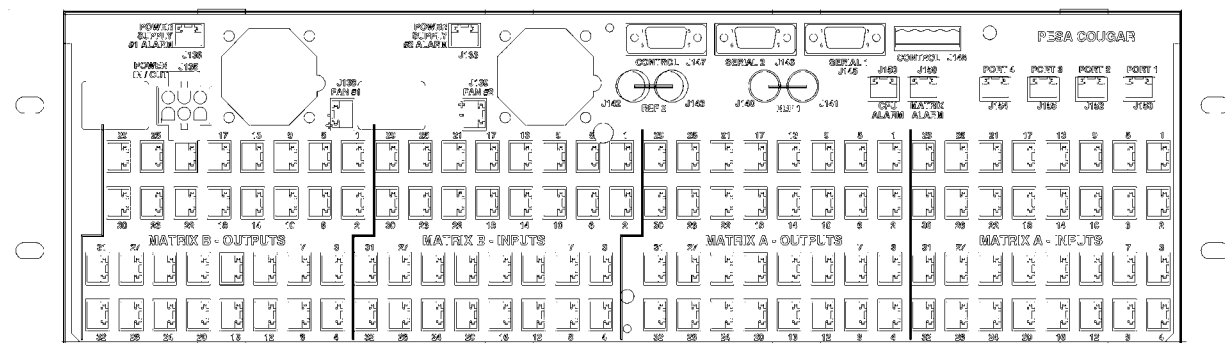


Figure 1. Cougar Audio Rear View

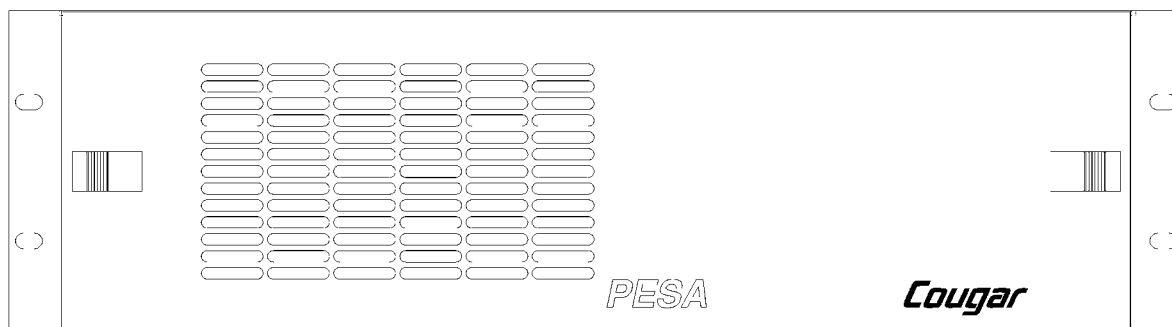


Figure 2. Cougar Audio Front View

1.2 Specifications

INPUT CHARACTERISTICS

Level	+28dBm Max
Impedance	>60K Ohms
Type	Electrically Balanced
Coupling	Direct (DC)
Common Mode Rejection Ratio	-80dB (50Hz to 60Hz)
Connector Type	3-Pin, 2-Part, Detachable Plug

OUTPUT CHARACTERISTICS

Level	+28dBm into 600 Ohms
Level Variation Between Inputs	±0.1dB
Impedance	<67 Ohms
Type	Electrically Balanced
Number	Single
Coupling.....	Direct (DC)
DC on Outputs	±20mV
Minimum Load @ 28dBm.....	600 Ohms
Connector Type.....	3-Pin, 2-Part, Detachable Plug

GAIN CHARACTERISTICS

Gain.....	Adjustable to $\pm 0.1\text{dB}$
Gain Stability	$\pm 0.05\text{dB}$
Adjustment Range.....	Approximately $\pm 1\text{dB}$

FREQUENCY CHARACTERISTICS

Sine Wave Response.....<±0.1dB, 20Hz to 20KHz
-3dB to 200KHz

Square Wave Response
(Overshoot and Ringing).....<±5%, 3KHz 100µS Rise Time (20V P-P)

DISTORTION CHARACTERISTICS

Total Harmonic Distortion (THD).....	<0.10% @ 28dBm, 20Hz to 20KHz
Intermodulation Distortion (IMD).....	<0.02% @ 28dBm, 20Hz to 20KHz

CROSSTALK

20Hz to 20KHz <-92dB (All Inputs and Outputs Hostile)

HUM AND NOISE

(Unity Dynamic Range +28dBm)

Wideband 10Hz to 300KHz.....	<-80dBm	-108dBm
80KHz Low Pass Filter.....	<-88dBm	-116dBm
30KHz Low Pass Filter.....	<-92dBm	-120dBm
15KHz Low Pass Filter.....	<-94dBm	-122dBm
"A" Weighted.....	<-96dBm	-124dBm

SWITCHING CHARACTERISTICS

DC Offset	<10mV, Peak
Switching Transients (30KHz Low Pass)	<20mV, Peak

Chapter 2 – Operation

This section details the Cougar Audio Routing Switcher installation procedures. The following topics are discussed:

- Receipt Inspection
- Unpacking
- Location
- Mounting
- Cabling
- Level Code (Strobe) Selection
- Input/Output Coding Selection
- PS70V Setting Line Voltage
- PS70V Power Supply Installation
- 32X32 Audio Matrix Card Installation
- Rear Panel Connectors
- System Connections

2.1 General

If specified when ordered, the Cougar Audio Routing Switcher will be configured for the intended system at the factory. Before attempting to install any frame, matrix card, controller card, or power supply; this section should be read carefully.



The Cougar Audio Routing Switcher contains static sensitive devices. Care should be used when it is necessary to handle the internal circuit cards. It is recommended that a ground wrist strap and grounding mat be used before attempting any equipment installations.

2.2 Receipt Inspection

The Cougar Audio Routing Switcher was tested and inspected prior to leaving the factory. Upon receipt, inspect the equipment for shipping damage. If any damage is found, contact the carrier immediately and save all packing material.

2.3 Unpacking

The Cougar Audio Matrix Switcher is comprised of a frame, backplane, a 32X32 Audio Matrix Card, and up to two PS70V Power Supplies. Prior to discarding packing material compare the parts received against the packing list. Carefully inspect the layers of packing material for any components which may have been overlooked during the initial unpacking.

2.4 Location

The Cougar Audio Routing Switcher may be located anywhere power is available. However, units should be mounted as close as possible to their associated equipment to minimize cable runs. Forced air cooling is provided by a small fans located at the back of the unit. Care should be taken not to block airflow around these fans. Installation should be in an area where the ambient temperature does not exceed 40°C (104°F) inside the equipment rack.

2.5 Mounting

The Cougar Audio Routing Switcher is rack mountable in a standard 19" equipment rack. Sufficient space must be provided behind the equipment racks to allow for the control cables and power cable. All mounting holes should be utilized and mounting hardware tightened securely. As with all equipment installed in a rack, the bottom screw on each side should be installed before proceeding with the remainder of the screws. Then all screws should be securely tightened. Support the Cougar Switcher's bottom while installing it in the rack. Figure 3 illustrates chassis installation in the equipment rack.



Remove the power supply retaining screws before installing the Cougar Audio Routing Switcher in an equipment rack.

To install a Cougar Audio Routing Switcher in an equipment rack follow these steps:

1. Align the frame with the slotted opening in the rack.
2. Install the bottom screws first.
3. Install the two top screws
4. Tighten all four screws securely.

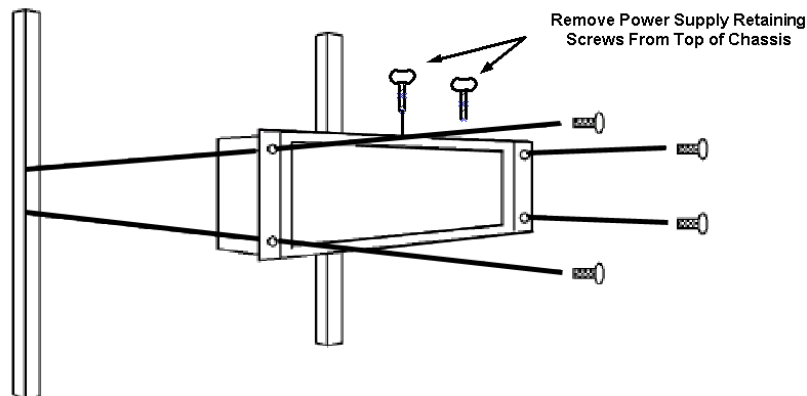


Figure 3. Chassis Installation

2.6 Cabling

Considerable weight will be added to the rear panel of the Cougar Audio Routing Switcher by the audio, control, and power cables. Therefore, all cables should be strained relieved and secured to racks or other supporting structures. Failure to provide adequate cable support can result in cables separating from connectors. If cable runs are to be stored under an elevated floor, they should be tied to the racks as a guide. If cables are run along the floor, do not allow them to lay in the work area behind the racks. Stepping or tripping on the cables may result in connections being pulled free or wire breakage inside the insulation. The Cougar Audio Routing Switcher should be installed in the equipment rack prior to attaching cables.

Use the following rules when cabling the Cougar Audio Routing Switcher:

1. Lay all cables in their intended positions, separating control, audio, and power cables wherever possible.
2. Provide proper support for each cable during the cabling process. The use of tie-wraps is recommended as shown in Figure 4.

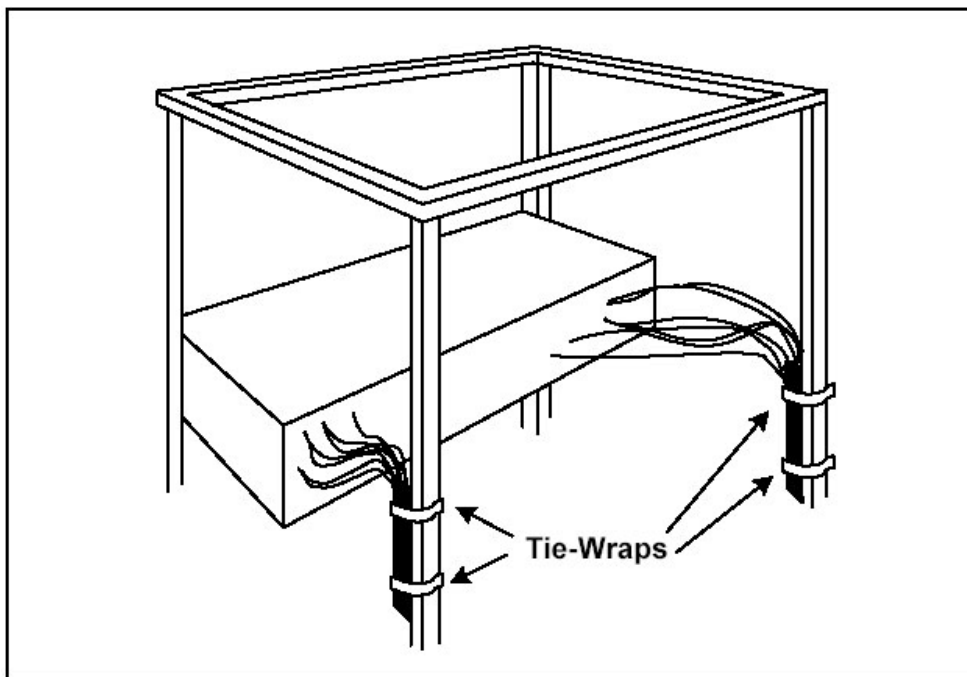


Figure 4. Cables Attached to Supports

2.7 Level Code (Strobe) Selection

The level (strobe) select switches, S1 (matrix A) and S4 (matrix B) are located on the inside of the Cougar Audio Routing Switcher on lower left-hand side of the backplane. Switch numbers are 1 through 8 right to left. Switches 1-6 select level codes 0 through 63. **Switches 7 and 8 are not used – their position is unimportant.** See Figure 5 for an example of setting the level code switches and Figure 6 for the switch locations.

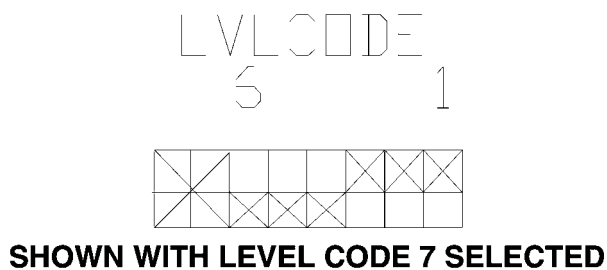


Figure 5. Level Code (Strobe) Selection

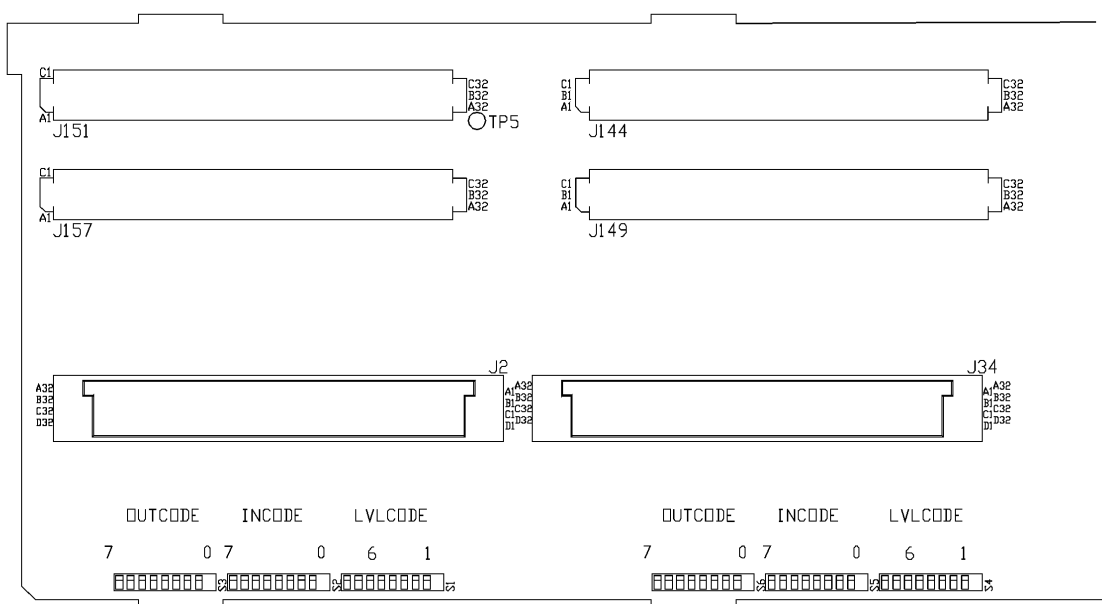


Figure 6. Coding Switch Locations

Physical 0 (Logical 1) = OFF (UP)
Physical 1 (Logical 0) = ON (DOWN)



The following are logical selections.

SWITCH POSITIONS	6	5	4	3	2	1		
STROBE LEVEL	0		0	0	0	0	0	0
STROBE LEVEL 1	0	0	0	0	0	1		
STROBE LEVEL 2	0	0	0	0	1	0		
STROBE LEVEL 3	0	0	0	0	1	1		
STROBE LEVEL 4	0	0	0	1	0	0		
STROBE LEVEL 5	0	0	0	1	0	1		
STROBE LEVEL 6	0	0	0	1	1	0		
STROBE LEVEL 7	0	0	0	1	1	1		
UP TO....								
STROBE LEVEL 62	1	1	1	1	1	0		

2.8 Output/Input Code Selection

Input and output coding switches are located on the inside of the Cougar Audio Routing Switcher on the lower left corner of the backplane. The input and output switch numbers run 0 to 7, right to left. Switches S2 and S3 (matrix A and matrix B outcode switches respectively) select output codes 0-255 and switches S3 and S6 (matrix A and matrix B incode switches respectively) select input codes 0-255. See Figure 7 for an example of output code selection and Figure 8 for an example of input code selection.

2.8.1 Output Code

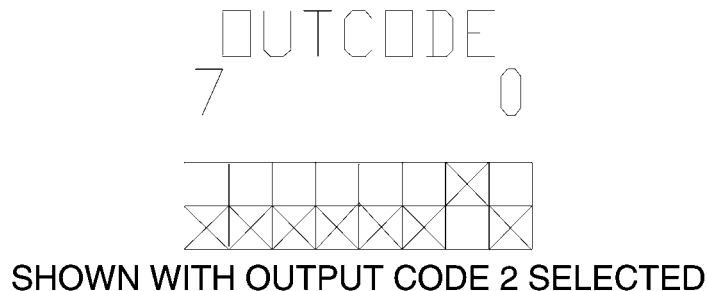


Figure 7. Output Code Selection

Physical 0 (Logical 1) = OFF (UP)
Physical 1 (Logical 0) = ON (DOWN)



The following are logical selections.

SWITCH POSITION	7	6	5	4	3	2	1	0	OUTPUTS
OUTPUT CODE 0	0	0	0	0	0	0	0	0	0-32
OUTPUT CODE 1	0	0	0	0	0	0	0	1	33-64
OUTPUT CODE 2	0	0	0	0	0	0	1	0	65-96
OUTPUT CODE 3	0	0	0	0	0	0	1	1	97-128
OUTPUT CODE 4	0	0	0	0	0	1	0	0	129-160
OUTPUT CODE 5	0	0	0	0	0	1	0	1	161-192
OUTPUT CODE 6	0	0	0	0	0	1	1	0	193-224
OUTPUT CODE 7	0	0	0	0	0	1	1	1	225-256
UP TO....									
OUTPUT CODE 255	1	1	1	1	1	1	1	1	8161-8192

2.8.2 Input Code

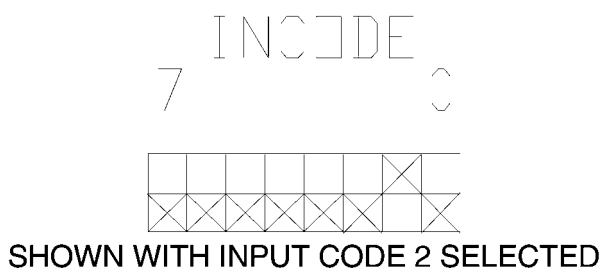


Figure 8. Input Code Selection

Physical 0 (Logical 1) = OFF (UP)
 Physical 1 (Logical 0) = ON (DOWN)



The following are logical selections.

SWITCH POSITION	7	6	5	4	3	2	1	0	INPUTS
INPUT CODE 0	0	0	0	0	0	0	0	0	0-32
INPUT CODE 1	0	0	0	0	0	0	0	1	33-64
INPUT CODE 2	0	0	0	0	0	0	1	0	65-96
INPUT CODE 3	0	0	0	0	0	0	1	1	97-128
INPUT CODE 4	0	0	0	0	0	1	0	0	129-160
INPUT CODE 5	0	0	0	0	0	1	0	1	161-192
INPUT CODE 6	0	0	0	0	0	1	1	0	193-224
INPUT CODE 7	0	0	0	0	0	1	1	1	225-256
UP TO....									
INPUT CODE 255	1	1	1	1	1	1	1	1	8161-8192

2.9 PS70V Setting Line Voltage

The PS70V Power Supply has an AC Line Select Switch that allows you to select the required line voltage range. This switch is accessed by removing the plug-in power supply from the switcher, if the power supply is already installed. Be sure to disconnect the AC power cord before removing the power supply from the switcher. A separate jumper, located under the plastic safety cover surrounding the switch is used to add 15 volts to each switch setting. Using only the switch, nominal ($\pm 10\%$) voltages available are 100, 120, 140, 200, 220, and 240. If the jumper is also moved, these voltages become 115, 135, 155, 215, 235, and 255.



Be sure the AC Line Select Switch and jumper are set to the correct positions before powering up the audio routing switcher.

Access is provided to the jumper by removing the two screws that secure the cover. These screws also secure the PC board to the mounting tray. Be sure to replace both screws. Tighten securely but avoid cracking the plastic cover.

2.10 PS70V Power Supply Installation

The PS70V Power Supply(s) are installed in the upper right-hand portion of the Cougar Audio Routing Switcher. The Cougar Audio Routing Switcher is designed for the installation of up to two PS70V Power Supplies. If only one PS70V Power Supply is to be installed in the Cougar Audio Routing Switcher, install it in the left-hand position.

To install the PS70V Power Supply or to install the PS70V Power Supplies in the Cougar Audio Routing Switcher take the following steps:

1. Align the primary power supply with the left-hand set of circuit card guides in the upper right-hand side of the Cougar Audio Routing Switcher.
2. Carefully push the power supply into the switcher until the power supply connector makes initial contact with backplane power connector. At this point, firmly but carefully continue pushing the power supply into the switcher while making sure the connectors are properly aligned. Continue pushing the power supply until it is in place and the connectors are firmly mated.
3. Align the secondary (redundant) power supply with the right-hand set of circuit card guides in the upper right-hand side of the Cougar Audio Routing Switcher.
4. Repeat step two.
5. If the Cougar Audio Routing Switcher is being shipped, install the two power supply retainer screws through the top of the Cougar Audio Routing Switcher.

2.11 32X32 Audio Matrix Card Installation

The 32X32 Audio Matrix Card is installed in the lower portion of the Cougar Audio Routing Switcher. To install the matrix board in the Cougar Audio Routing Switcher take the following steps:

1. Align the matrix card shield plate with the set of circuit card guides in the lower portion of the Cougar Audio Routing Switcher.
2. Carefully push the matrix board into the switcher until the circuit card connectors make initial contact with backplane connectors. At this point, firmly but carefully continue pushing the matrix card into the switcher while making sure the connectors are properly aligned and that no connector pins are being bent. Continue pushing the card until it is in place and the connectors are firmly mated.

2.12 Rear Panel Connectors

The manual subsections discuss the various system connectors found on the rear backplane (rear panel) of the Cougar Audio Routing Switcher.

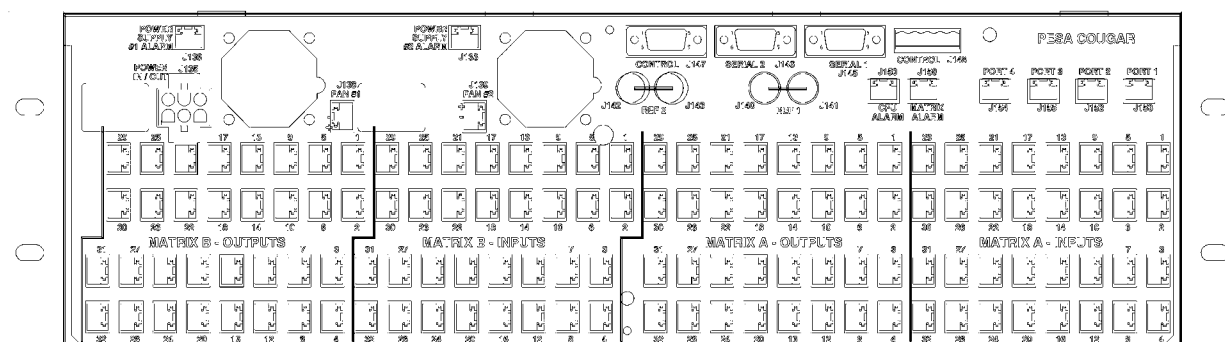


Figure 9. Cougar Audio Rear Panel

2.12.1 RCP Panel Connectors (J152-J155)

Not used.

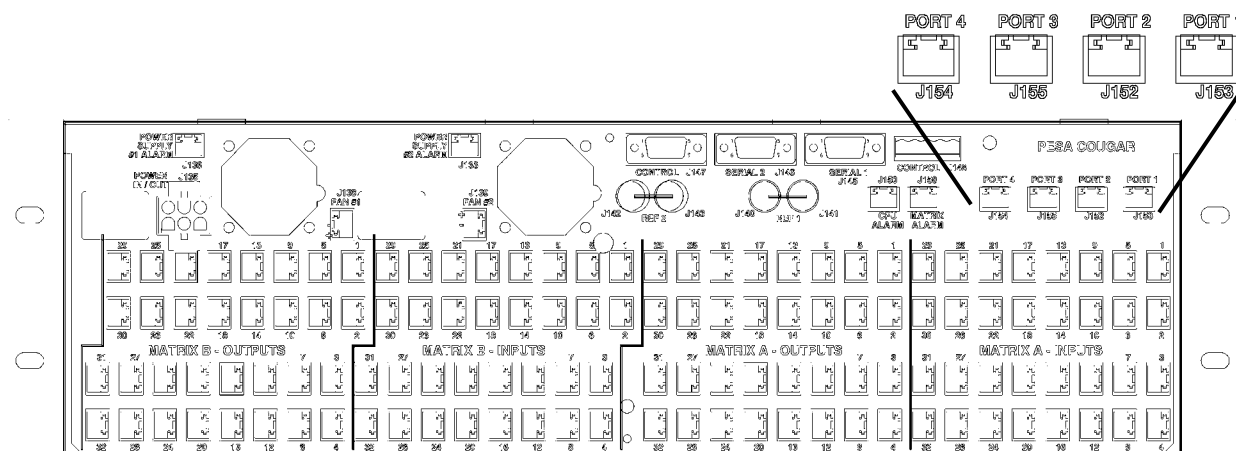


Figure 10. RCP Panel Connectors (J152-J155)

2.12.2 Serial (CPU Link) Connectors (J145 and J146)

Not used.

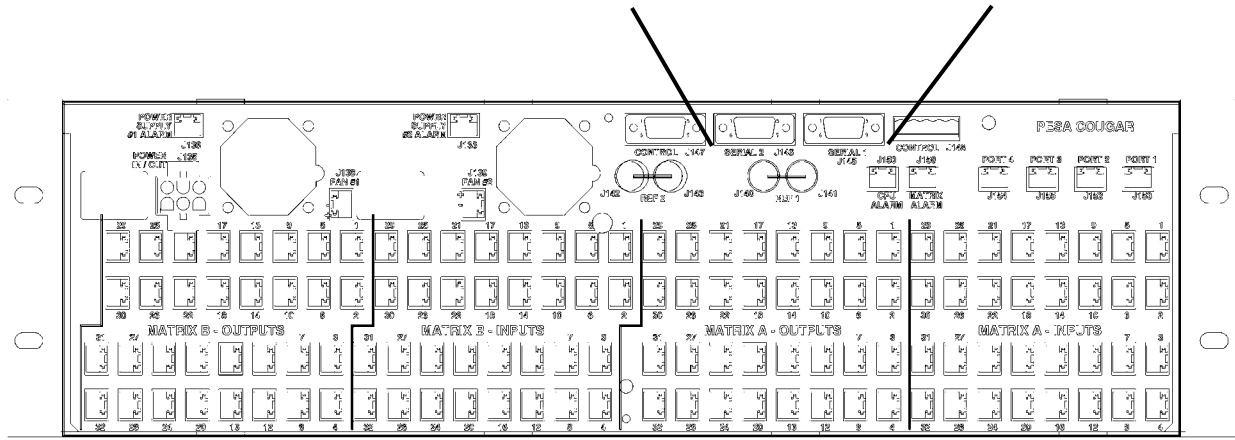
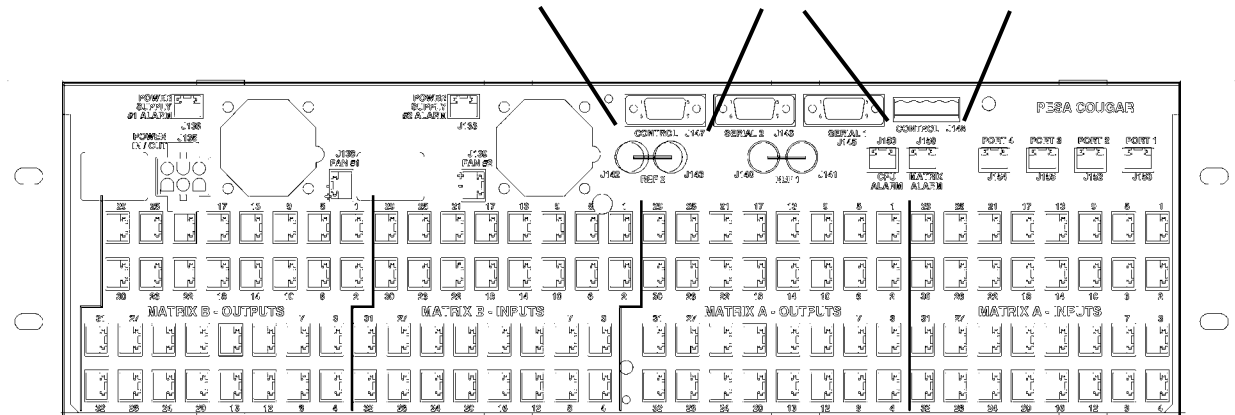


Figure 11. Serial (CPU Link) Connectors (J145 and J146)

2.12.3 Control (PRC) Connectors (J147 and J148)

J147 provides for the connection of an optional external controller to the Cougar Audio Routing Switcher. J148 provides for the connection of additional Cougar Audio Routing Switchers to form up to a 64X64 switching matrix. Both of the control connectors allow for the bi-directional transmission of data.



The pinout of control connector J147 is as follows:

Table 1. Control Connector J147 Pinout

PIN NO.	DESCRIPTION
1	GROUND
2	RX+ DATA
3	TX- DATA
4	GROUND
5	SPARE
6	GROUND
7	RX- DATA
8	TX+ DATA
9	GROUND

The pinout of control connector J148 is as follows:

Table 2. Control Connector J148 Pinout

PIN NO.	DESCRIPTION
1	TX+ DATA
2	TX- DATA
3	GROUND
4	RX+ DATA
5	RX- DATA

For serial communications, the user should use a direct pin-for-pin cable for interfacing between the optional 3300 Controller and the peripheral equipment.



DO NOT use a "NULL MODEM" cable.

2.12.4 CPU Alarm Connector (J150)

Not used.

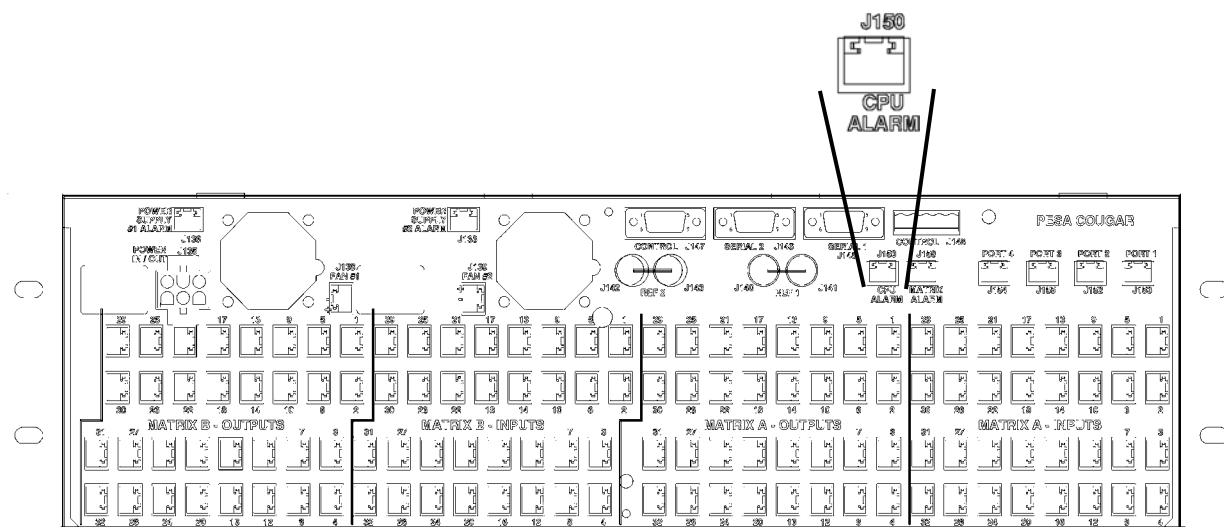


Figure 13. CPU Alarm Connector (J150)

2.12.5 Matrix Card Alarm Connector (J158)

An alarm circuit has been provided in the 32X32 Audio Matrix Card's circuitry. This circuit acts as a switch to trigger an optional external alarm in the event of a controller fault or failure. The controller alarm circuit supplies a contact closure but does not provide a voltage to the external alarm. The matrix card alarm connector, located on the backplane, allows connection of the matrix card alarm.

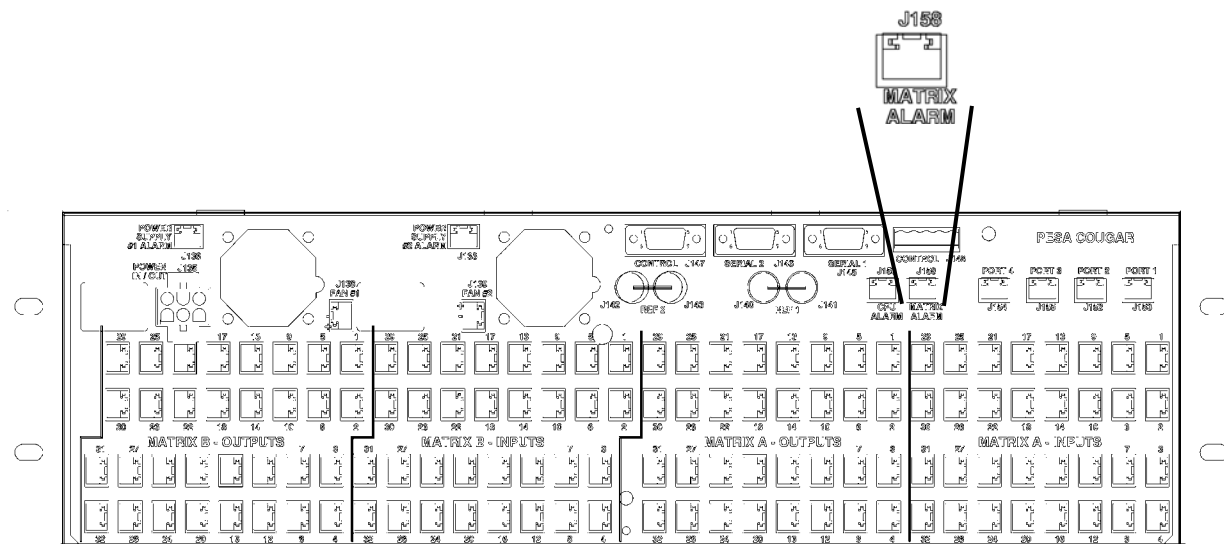


Figure 14. Matrix Card Alarm Connector (J158)

2.12.6 Power In/Out Connector (J135)

Power can be supplied to the Cougar Audio Routing Switcher by the use of an externally mounted power supply, by the use of an internal PS70V Power Supply, or by the use dual internal PS70V Power Supplies. The DC Power Connector can be used as DC power input (external power supply) or as DC power output (internal power supply or power supplies) to allow the Cougar Audio Routing Switcher to power additional equipment items.

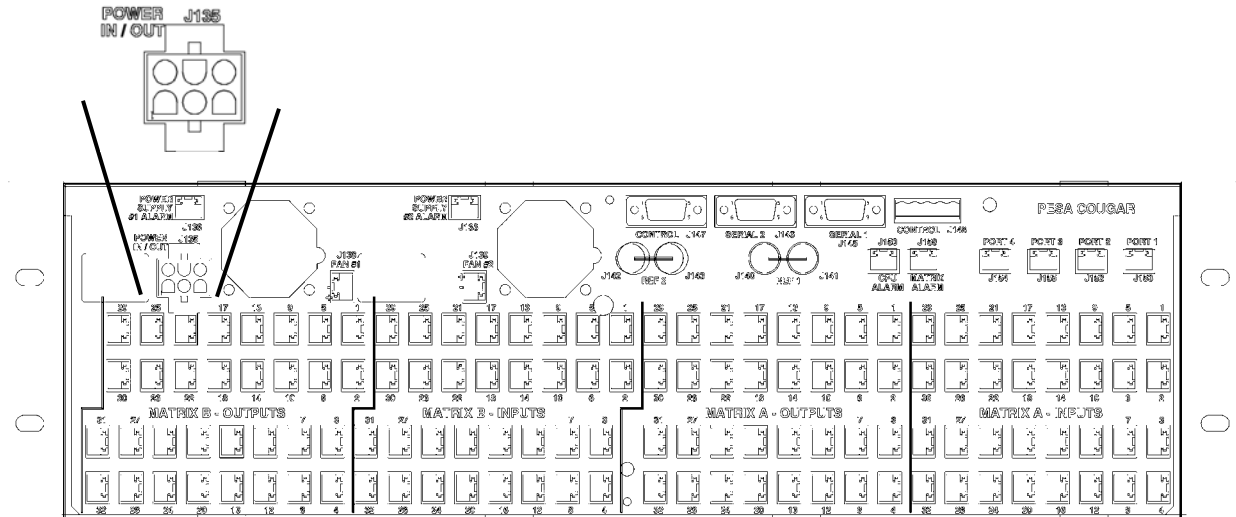


Figure 15. Power In/Out Connector (J135)

2.12.7 Power Supply Alarm Connectors (J133 and J136)

An alarm circuit has been provided in the PS70V Power Supply's circuitry. This circuit acts as a switch to trigger an optional external alarm in the event of a failure in the power supply or failure of the external 110VAC (220VAC for the international version) source. The alarm circuit supplies a "contact" closure but does not provide a voltage to the external alarm. The alarm connectors, located on the backplane, allow connection of external power supply alarms.

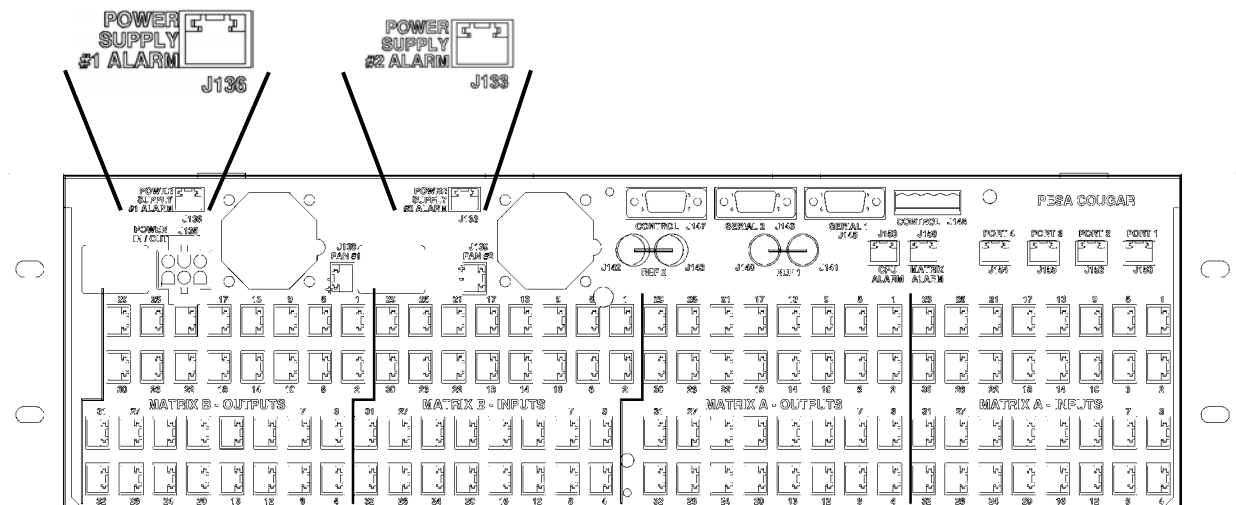


Figure 16. Power Supply Alarm Connectors (J133 and J136)

2.12.8 Reference (Sync) Connectors (1 and 2)

The sync connectors are used to connect an external sync signal to the Cougar Video Routing Switcher. The sync signal may be either a color black or composite video signal. The use of an external sync signal allows switch changes to be accurately timed in the vertical interval. The sync connectors are loop-thru connectors and must be terminated with 75 ohms if looping is not used.

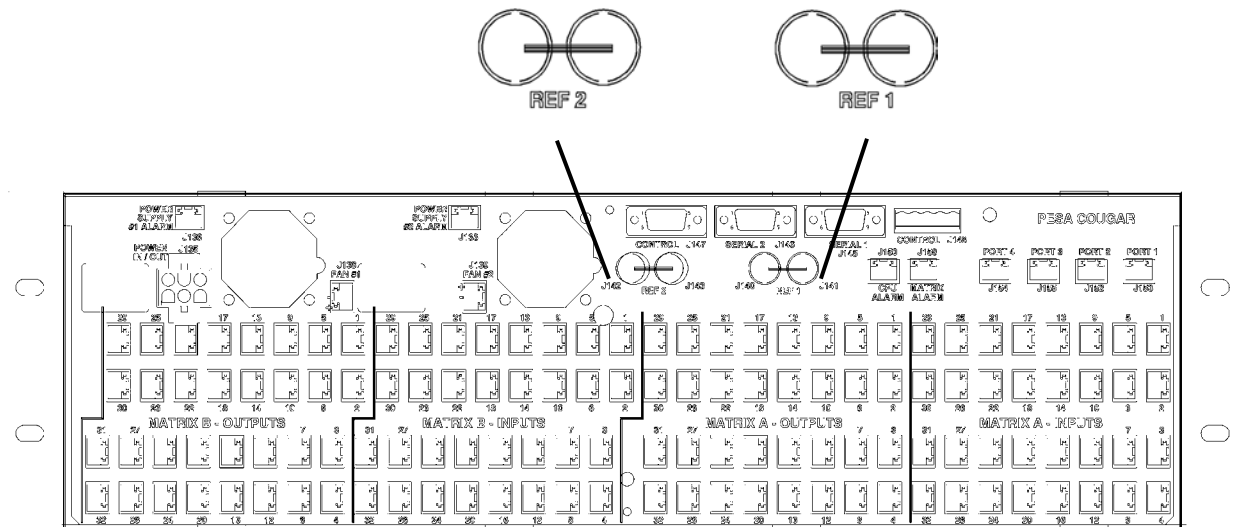


Figure 17. Reference (Sync) Connectors (1 and 2)

2.12.9 Audio Input and Output Connectors

There are 32 matrix A and B twisted pair audio input connectors and 32 matrix A and B twisted pair audio output connectors located on the Cougar Audio Routing Switcher's rear panel. These connectors allow the connection of the audio sources (input connectors) and audio destinations (output connectors) to the Cougar Audio Routing Switcher.

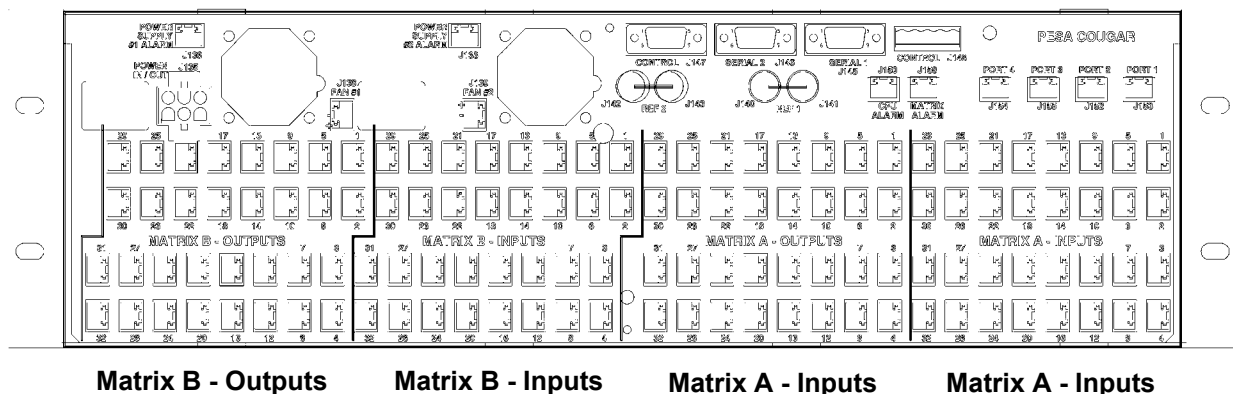


Figure 18. Audio Input and Output Connectors

2.12.9.1 Input Signal Connectors (A INPUTS, B INPUTS)

These 3-contact connectors provide the input signal interface. See Figure 19 for an orientation view showing contact locations.

The INPUT connectors are connected to the audio signal sources with cables constructed with 3-contact connectors (Part No. 81-9029-0811-0) and shielded, twisted-pair cable (Part No. 81-9028-0043-2, Belden 8451, or equivalent) as shown in Figure 21. The connector body has an integral strain relief which requires the use of a nylon cable tie (Part No. 81-9021-0028-8).

The following figure shows the contact locations when viewed from the rear of the chassis.

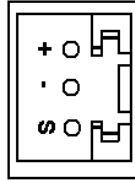


Figure 19. Input Signal Connector

The following figure shows a WECO connector. If the connector is not hot-stamped, refer to this figure for the contact locations.

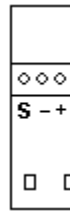


Figure 20. WECO Connector

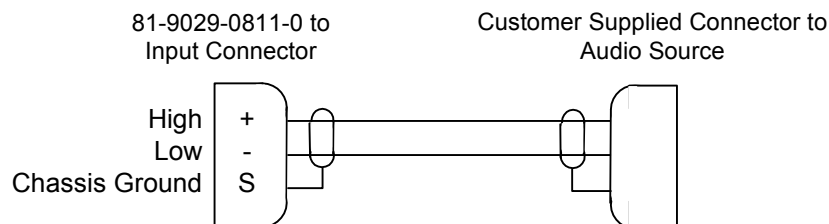


Figure 21. Input Signal Cable

2.12.9.2 Output Signal Connectors (A Outputs, B Outputs)

These 3-contact connectors provide the output signal interface. See Figure 22 for an orientation view showing contact locations.

The Output connectors are connected to the audio signal sources with cables constructed with 3-contact connectors (Part No. 81-9029-0811-0) and shielded, twisted-pair audio cable (Part No. 81-9028-0043-2, Belden 8451 or equivalent) as shown in Figure 24.

The connector body has an integral strain relief which requires the use of a nylon cable tie (Part No. 81-9021-0028-8).

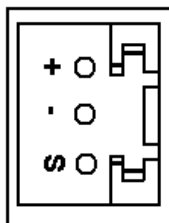


Figure 22. Output Signal Connector

The following figure shows a WECO connector. If the connector is not hot-stamped, refer to this figure for the contact locations.

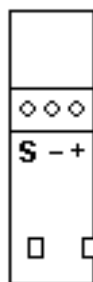


Figure 23. WECO Connector

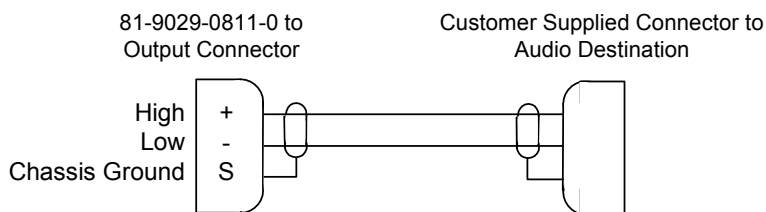


Figure 24. Output Signal Cable

2.13 System Connections

Once the Cougar Audio Routing Switcher is installed in the equipment rack, system connections can be made. Use the following guide to insure that the Cougar Audio Routing Switcher system interconnections are properly connected and that the control, power, sync, and audio cables are correctly installed.

2.13.1 Connection Guide

1. Connect the external sync sources to the reference inputs using Belden 8281 coaxial cable or equivalent. Be sure to properly terminate the external sync sources into 75 ohms.
2. If additional Cougar Audio Routing Switchers are to be utilized as part of the switching matrix, connect J148 on the primary Cougar Audio Routing Switcher to J148 on the secondary Cougar Audio Routing Switchers using a 5-pin ribbon cables.
3. If an external controller is to be utilized to control the Cougar Audio Routing Switcher, connect to external controller to J147 using 9-pin RS232 cable.
4. If desired, connect an external alarm to the matrix card alarm connector (J158).
5. If desired, connect an external alarm to the power supply #1 alarm connector (primary power supply). If a secondary (redundant) power supply is installed in the Cougar Audio Routing Switcher, connect an external alarm to the power supply #2 alarm connector, if desired. All alarm connections can be wired in parallel.
6. Connect the audio sources to the audio inputs using twisted pair cables.
7. Connect the audio outputs to the audio destinations using twisted pair cables.

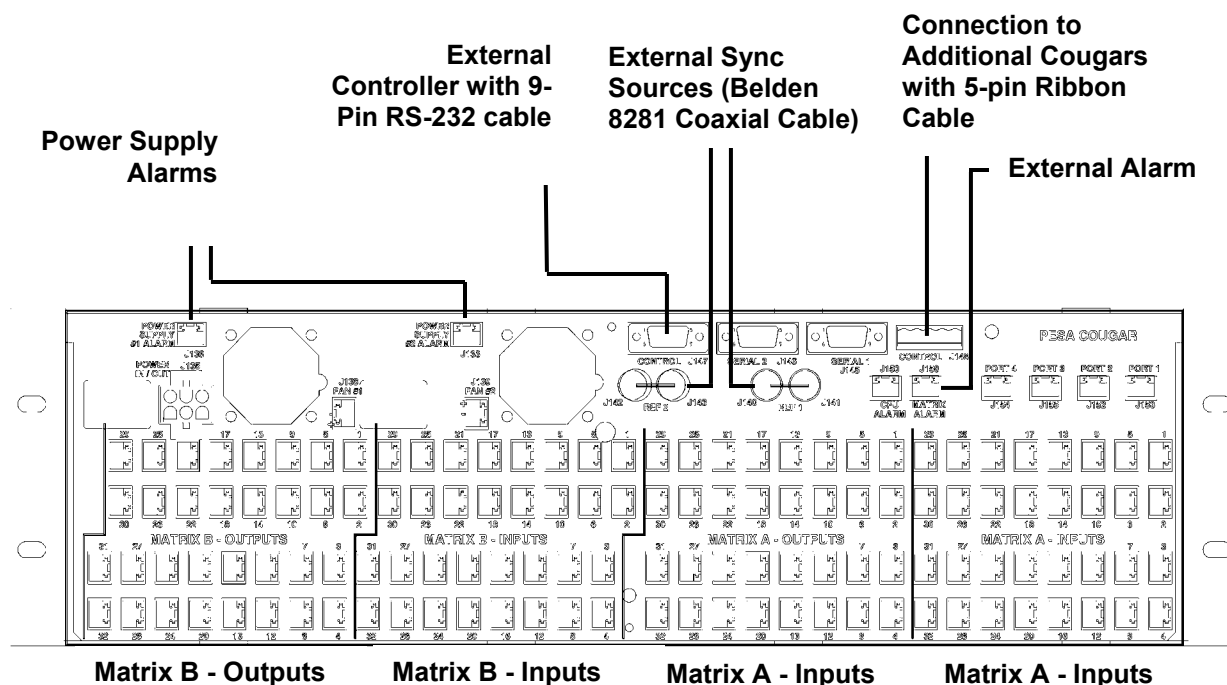


Figure 25. Connection Guide

Chapter 3 – Operation

The operation of the Cougar Audio Routing Switcher consists of periodically monitoring the 32X32 Audio Matrix Card LEDs. The matrix card LEDs and their proper indications are discussed in the following manual sections.

3.1 Regulator Fault LED (Red)

The Regulator Fault LED (CR4) is utilized to visually indicate a regulator problem on the matrix card. A problem with the power supply or regulator circuits will cause this LED to light. However, in the event of a total power outage this LED will be rendered inoperable.

3.2 CPU Fault LED (Red)

The CPU Fault LED (CR3) is utilized to visually indicate a microprocessor problem on the matrix card. A problem with the matrix card CPU or controller circuits will cause this LED to light.

3.3 Power OK LED (Green)

The Power OK LED (CR2) on the front edge of the matrix card is utilized to visually indicate that the proper power supply voltage is being supplied to the card. A decrease in the brightness of this LED indicates an approximate 12% drop in voltage and should be checked. A 25% drop in voltage will cause the LED to extinguish.

3.4 32X32 Audio Matrix Card Adjustments

The 32X32 Audio Matrix Card is adjusted at the PESA factory prior to shipment and should only have to be readjusted if equipment repairs are made or if the equipment configuration changes. The adjustment of the 32X32 Audio Matrix Card consists of adjusting the voltage adjustment, adjusting the common mode rejection ratio for each input, and adjusting the gain for each output. The following calibrated test equipment items or their equivalent is needed to accurately adjust the 32X32 Audio Matrix Card:

- Audio Generator
- Distortion Analyzer
- Digital Voltmeter
- Oscilloscope
- 600 Ohm Termination

3.4.1 Voltage Adjustment

The voltage adjustment provides the means to adjust the output of the 32X32 Audio Matrix Card's power regulator circuits. To adjust the voltage adjustment on the 32X32 Audio Matrix Card take the following steps:

1. Set the digital voltmeter to the 100V DC range.
2. Connect the digital voltmeter's high input to TP1 (+20V DC) and low input to TP3 (ground).
3. Set the voltage adjustment for a +20V DC ± 0.5 reading on the digital voltmeter.
4. Disconnect the digital voltmeter's high input from TP1 and connect it to TP2 (-20V DC). Check the digital voltmeter for -20V DC ± 0.5 reading.
5. Disconnect the digital voltmeter from the test points.

3.4.2 Common Mode Rejection Ratio (CMRR)

The input common mode rejection ratio adjustments provide the means to eliminate unwanted noise and hum on the 32X32 Audio Matrix Card's outputs. The CMRR adjustments are set at the PESA factory and should only need to be readjusted after port changes. To adjust the common mode rejection ratio adjustments on the 32X32 Audio Matrix Card take the following steps:

1. Short the high side (+ pin) of the selected audio input to the low side (- pin) of the same input (i.e. short the plus and minus pins together).
2. Connect the audio generator to the distortion analyzer.
3. Adjust the audio generator for a 60Hz at +28dB output as displayed on the distortion analyzer.
4. Disconnect the audio generator from the distortion analyzer.
5. Connect the high side of the audio generator's output to the short between the high side and low side of the selected audio input. Connect the low side of the audio generator's output to ground.
6. Connect the distortion analyzer to the one of the audio outputs.
7. Switch the selected audio input to the selected audio output.
8. Adjust the CMRR for the selected audio input for a null (lowest) reading on the distortion analyzer. The null reading should be at least -80dB below the input level.
9. Repeat steps 1-8 for each audio input. Once all of the CMRR adjustments have been completed, disconnect all test equipment.

3.4.3 Gain

The output gain adjustments provide the means to adjust the 32X32 Audio Matrix Card's outputs for unity gain (outputs equal to inputs). To adjust the gain adjustments on the 32X32 Audio Matrix Card take the following steps while referring to the matrix card's component:

1. Connect the audio generator to the distortion analyzer.
2. Adjust the high frequency generator for a 10KHz at +28dB display on the distortion analyzer.
3. Disconnect the audio generator from the distortion analyzer.
4. Connect the audio generator to one of the audio matrix card's inputs.
5. Connect the distortion analyzer to one of the audio matrix card's outputs.
6. Switch the selected input to the selected output.
7. Adjust the gain adjustment correlating to the selected output for a +28dB ± 0.1 dB display on the distortion analyzer.
8. Repeat steps 5-7 until all of the audio matrix card's gain adjustments have been completed. Once all of the gain adjustments have been completed, disconnect all test equipment.

The gain will change a little less than 1dB when a 600 ohm termination is used on an output. The gain adjustment is intended (only) to make up for the 1dB change. PESA recommends leaving the outputs unterminated. The Cougar Audio Routing Switcher is shipped with its outputs set for unity gain with no termination.

Chapter 4 – Maintenance

The Cougar Audio Routing Switcher provides 2 levels of switching within a 32X32 audio matrix. The 32 matrix A and B audio inputs and outputs are electronically balanced for improved slew rate and lower distortion levels.

4.1 32X32 Audio Matrix Card

The 32X32 Audio Matrix Card contains a 32X32 matrix consisting of several main circuits. This discussion will be broken down to the main circuits.

4.1.1 Control

The microprocessor controller (U316) is used to interface switch commands from the PRCI control port (U256) to the switch matrix and return status information to the controller. Communications to and from the system controller are through U246, a RS485 receiver and transmitter. System timing is provided to the microprocessor by U1411, a 7.3728MHz oscillator. The microprocessor divides the timing single from the oscillator by a factor of four to form the system clock single. Reset for the microprocessor is provided by U317.

U326, a power supply monitor, monitors the output of the 32X32 Audio Matrix Card's power circuits and reports power fault conditions to the microprocessor. CR3 is utilized by power supply monitor circuit to provide a visual indication of power supply fault conditions.

Matrix output, input, and level coding is read from the backplane through U290, U305, and U306 respectively for matrix A and U293, U292, and U291 respectively for matrix B. U277, U295, U276, and U307 provide address decoding for the 32X32 Audio Matrix Card.

U278 and U279 comprise the nonvolatile RAM for the processor. C156 provides memory backup voltage for approximately seven days as long as the matrix card is not removed from the Cougar Frame. CR3 is utilized by the processor on the 32X32 Audio Matrix Card to indicate a CPU fault condition. An external alarm connection is provided by U327. The external connection can be utilized to audibly indicate CPU fault conditions.

Two external sync signals are used for timing switches as set by SW1. The external sync can be color black or composite sync. U185 and U206 decode the composite signal to an even/odd field signal which is used by the microprocessor.

4.1.2 32X8 Control ICs

The 32X8 control ICs (U198, U225, U199, and U226) are responsible for the control and switching of 32 inputs to 8 outputs for matrix A. The 32X8 control ICs (U204, U227, U205, and U228) are responsible for the control and switching of 32 inputs to 8 outputs for matrix B. The control of the control ICs is accomplished by signals sent over the control bus by the microprocessor. The control ICs interpret the signals and provide control signals and the BUSEN to the 32X1 crosspoint switch circuits. U215 and U216 provide the reset, data, and clock signals for the 32X8 control ICs.

4.1.3 32X1 Crosspoint

The 32X1 crosspoint switches are responsible for switching one of 32 inputs to an output. The 32X1 crosspoint switches are comprised of two 16X1 crosspoints which form a 32X1 matrix. The switching of a selected input signal to a selected output by 32X1 crosspoint is controlled by the state of the associated BUS and BUSEN data lines. The 32X1 crosspoint switches are also responsible for providing the selected output to the associated output circuit on the 32X32 Audio Matrix Card.

4.1.4 Input

The input circuits on the 32X32 Audio Matrix Card provide the initial conditioning and termination of the audio input signals. The input circuits are comprised of an operational amplifier and its associated components. Common mode rejection ratio adjustments in each input circuit provide the means to eliminate unwanted hum and noise on the input audio signals. The input circuits also provide the connection of the audio input signals to the 32X1 crosspoint switch circuits.

4.1.5 Output

The output circuits on the 32X32 Audio Matrix Card are responsible for providing an electronically balanced output and driving the output lines. The output circuits are comprised of two dual staged operational amplifiers and their associated components. The first stage of primary operational amplifier is responsible for conditioning the audio output signal and the second stage of the primary operational amplifier is responsible for inverting the audio output to provide an electronically balanced output. The secondary operational amplifier is responsible for driving the audio output lines. The audio output lines are driven through precision 33.2 ohm resistors. An adjustment is provided in each output circuit to adjust the output for unity gain.

4.1.6 Power

The power regulator circuits on the 32X32 Audio Matrix Card are responsible for producing all of the regulated operational voltages required by the matrix card's electronic circuits. The heart of the power supply circuit on the video matrix card is a switching regulator (U300) which produces the +20V DC and -20V DC. Adjustment of the output of the switching regulator is provided by R492, a variable resistor. Regulation of the +5V DC supply is provided by U281. CR2 provides a visual indication that power is being applied to the input of the regulator circuits. Fuses F1 and F2 protect the power regulator circuits from overload conditions and protect the audio matrix card from overload damage. The power circuits also contain a fan speed regulator circuit which works in conjunction with fan regulator in the PS70V Power Supply to control the speed of the associated chassis fans. As the temperature of the matrix card's circuits increase the fan speed will

increase. Inversely as the matrix card's circuits decrease in temperature the fan speed will slow down dependent upon the temperature of the associated PS70V Power Supply's circuits.

4.2 PS70V Power Supply

The PS70V Power Supply is an unregulated power source that supplies positive and negative voltages to the Cougar Audio Routing Switcher.

The PS70V has an AC Select Switch that allows you to select the required voltage range. This switch is accessed by removing the plug-in supply. Insure that power is off before changing the switch setting. A separate jumper, located under the plastic safety cover surrounding the switch is used to add 15 volts to each switch setting. Using only the switch, nominal ($\pm 10\%$) voltages available are 100, 120, 140, 200, 220, and 240. If the jumper is also moved, these voltages become 115, 135, 155, 215, 235, and 255.

Access is provided to the jumper by removing the two screws that secure the cover. These screws also secure the PC card to the mounting tray. Be sure to replace both screws. Tighten securely but avoid cracking the plastic cover.

4.2.1 Circuit Description

Input fuses provide overcurrent protection from internal faults and output overloads. If a fuse opens, correct the overcurrent condition then replace the fuse(s). Both sides of the line are fused.

The AC selector switch interconnects the transformer primaries in series and/or parallel combinations to provide the proper ratio for the input line voltage.

The secondaries drive full wave rectifiers with capacitor input filters providing positive and negative voltages with respect to ground.

After the filters, series diodes are used to allow supplies to be paralleled for redundancy. The diodes assure that one supply cannot load the output of the others in case of a shorted diode or capacitor.

A temperature sensing circuit controls the fan speed according to the air temperature and the temperature of the rectifier diodes. The fan usually runs at half speed at normal temperature (25°C).

A circuit senses the voltages across the filter capacitors. If the combined voltages decrease by approximately 25% from normal, the green LED is turned off. The red LED, located on the PC card, is then lit and the alarm "closure" is activated. The green LED, located on the front panel, serves as a rough indicator of output voltage; it dims as the combined positive and negative voltages decrease.

These supplies are unregulated and follow input line changes and output load variations.