Cheetah

VIDEO MATRIX SWITCHER

TECHNICAL DOCUMENTATION PACKAGE

MODEL 448CX CHASSIS FRAME TECHNICAL MANUAL

Manual 81-9059-0599-0 Rev A
December, 2006

PRELIMINARY

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Thank You !! for purchasing your new video router from PESA Switching Systems, Inc. We appreciate your confidence in our products. PESA produces quality, state-of-the-art equipment designed to deliver our users the highest degree of performance, dependability and versatility available anywhere. We want you to know that if you ever have a concern or problem with a PESA product, we have a team of engineers, technicians and customer service professionals available 24/7/365 to help resolve the issue.

Our commitment is to continue earning the trust and confidence of our customers throughout the industry by incorporating cutting-edge technology into the highest quality, most cost effective products on the market. And we would like to invite you to tell us how we're doing. If you have any comments or suggestions concerning your PESA equipment, please contact our Customer Service Department.

Again thank you for choosing a PESA product. All of us at PESA Switching Systems look forward to a long-term partnership with you and your facility.

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As of publication, this product had not completed FCC compliance testing.December, 2006

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Chapter 1: About This Manual

1.1 DOCUMENTATION AND SAFETY OVERVIEW

It is the responsibility of all personnel involved in the installation, operation, and maintenance of the equipment to know all the applicable safety regulations for the areas they will be working in. ***Under no circumstances should any person perform any procedure or sequence in this manual if the procedural sequence will directly conflict with local Safe Practices. Local Safe Practices shall remain as the sole determining factor for performing any procedure or sequence outlined in this document.***

1.2 WARNINGS, CAUTIONS, AND NOTES

Throughout this document, you should notice various Warnings, Cautions, and Notes. These addendum statements supply invaluable information pertaining to the text that they address. It is imperative that audiences read and understand the statements to avoid possible loss of life, personal injury, destruction/damage to the equipment, and/or added information that could enhance the operating characteristics of the equipment (i.e., Notes). The following subsections represent a description of the Warnings, Cautions, and Notes statements contained in this manual:

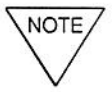
1.2.1 WARNING

	**Warning statements identify conditions or practices that can result in loss of life or permanent personal injury if the instructions contained in the statement are not complied with.**

1.2.2 CAUTION

	**Caution statements identify conditions or practices that can result in personal injury and/or damage to equipment if the instructions contained in the statement are not complied with.**

1.2.3 NOTE

	**Notes are for information purposes only. However, they may contain invaluable information important to the correct installation, operation, and/or maintenance of the equipment.**

Chapter 2: Introduction

2.1 CHEETAH 448CX PRODUCT OVERVIEW

PESA's Cheetah Series Video Matrix Switcher products are manufactured using a "building block" architecture of ***core components*** installed in a chassis frame that provides the infrastructure requirements of circuit card capacity, power, cooling and system control I/O connections. There are several different types of chassis frames in the Cheetah family, of which the 448CX is a member. Each frame is designed for a specific purpose – but most are built with a degree of flexibility to accommodate as wide a range of customer needs as possible. Circuit cards and modules identified as core components of all Cheetah switchers are introduced and discussed in the Core Components Technical Manual volume, supplied in the documentation suite.

While all frames do indeed serve the same basic purpose – to house the switcher "building block" components and provide the system infrastructure – component layout, internal signal routing through backplanes and mid-planes and frame-specific power supply components vary greatly between the frames. For this reason each frame type in the Cheetah family has its own Technical Manual Volume. All frame-specific data such as the items just mentioned plus connector locations, pin-outs and other pertinent information peculiar to the 448CX frame is contained in this Technical Manual.

Using the 448CX frame and the Cheetah Matrix CCA a routing switcher with the capacity of up to 256 inputs and 448 outputs can be configured in a single 27 rack unit (RU) frame. Table 2-1 indicates the maximum number of each core component type that can be installed in the 448CX frame. Figure 2-1 is a front view of the chassis layout with the access door open. Figure 2-2 is a rear view of the 448CX frame.

Table 2-1 448CX Frame - Active Components

CORE COMPONENT MAXIMUM QUANTITIES FOR THE 448CX CHASSIS FRAME										
Input Buffer CCA [1]	Matrix CCA [1]	Output Combiner CCA [1]	Matrix Frame Controller CCA	System Controller CCA	Power Supply Module	Dual BNC Output Option [2]	HD to SDI Output Option [2]	SDI to Analog Output Option [2]	Fiber Optic Output Option [2]	Output Monitor [3]
16	8	28	2	2	16	28	28	28	28	1

[1] Indicated quantities are maximum number of cards each frame can support. Quantities of each CCA type will vary by matrix configuration.

[2] Only one option card may be attached to an output card. Maximums indicated above are total number of option cards of any type that may be used in the frame.

[3] Output Monitor option is not available for analog signal outputs and is not available in all frame configurations.

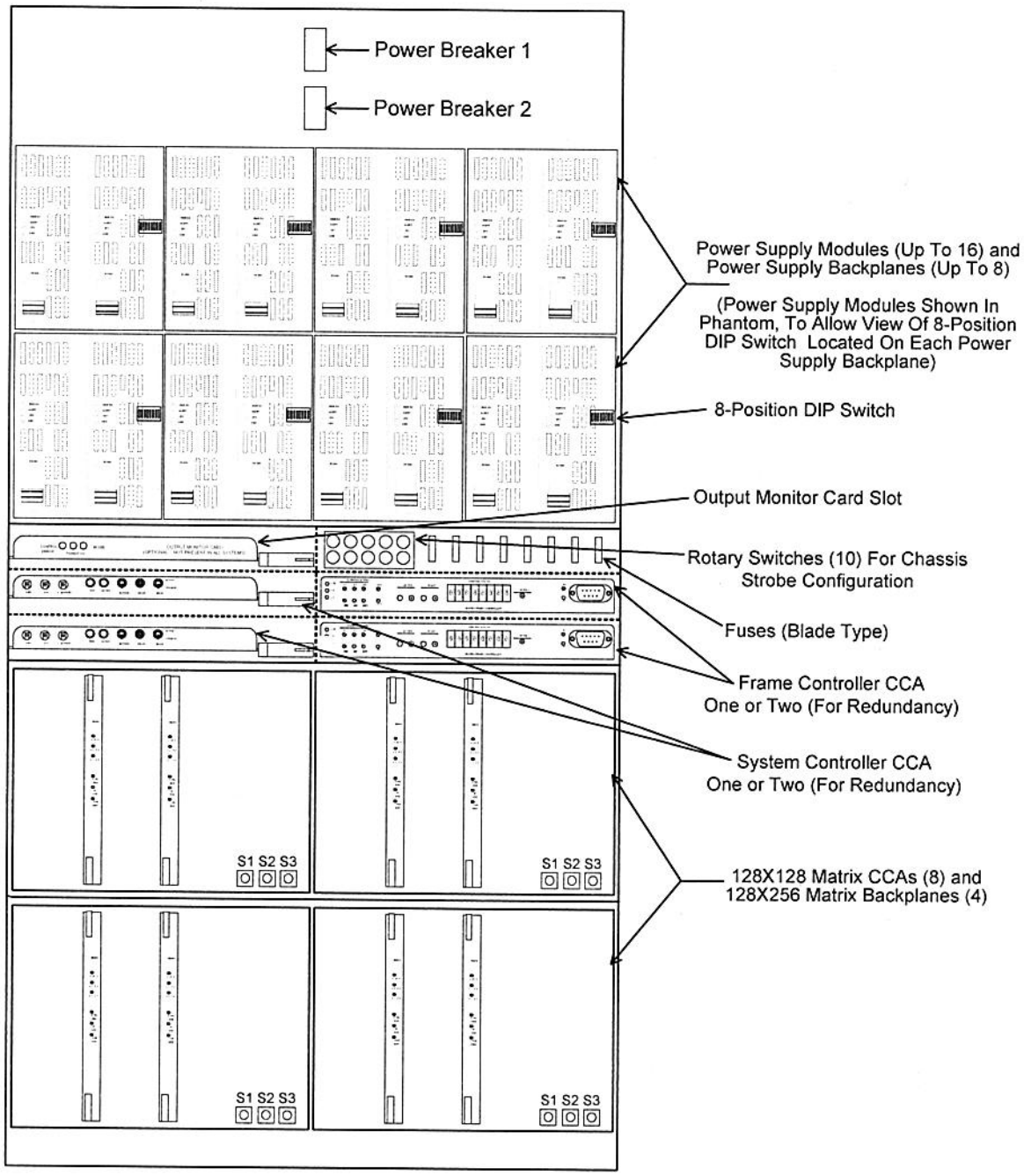


Figure 2-1 – 448CX Chasssis – Front View

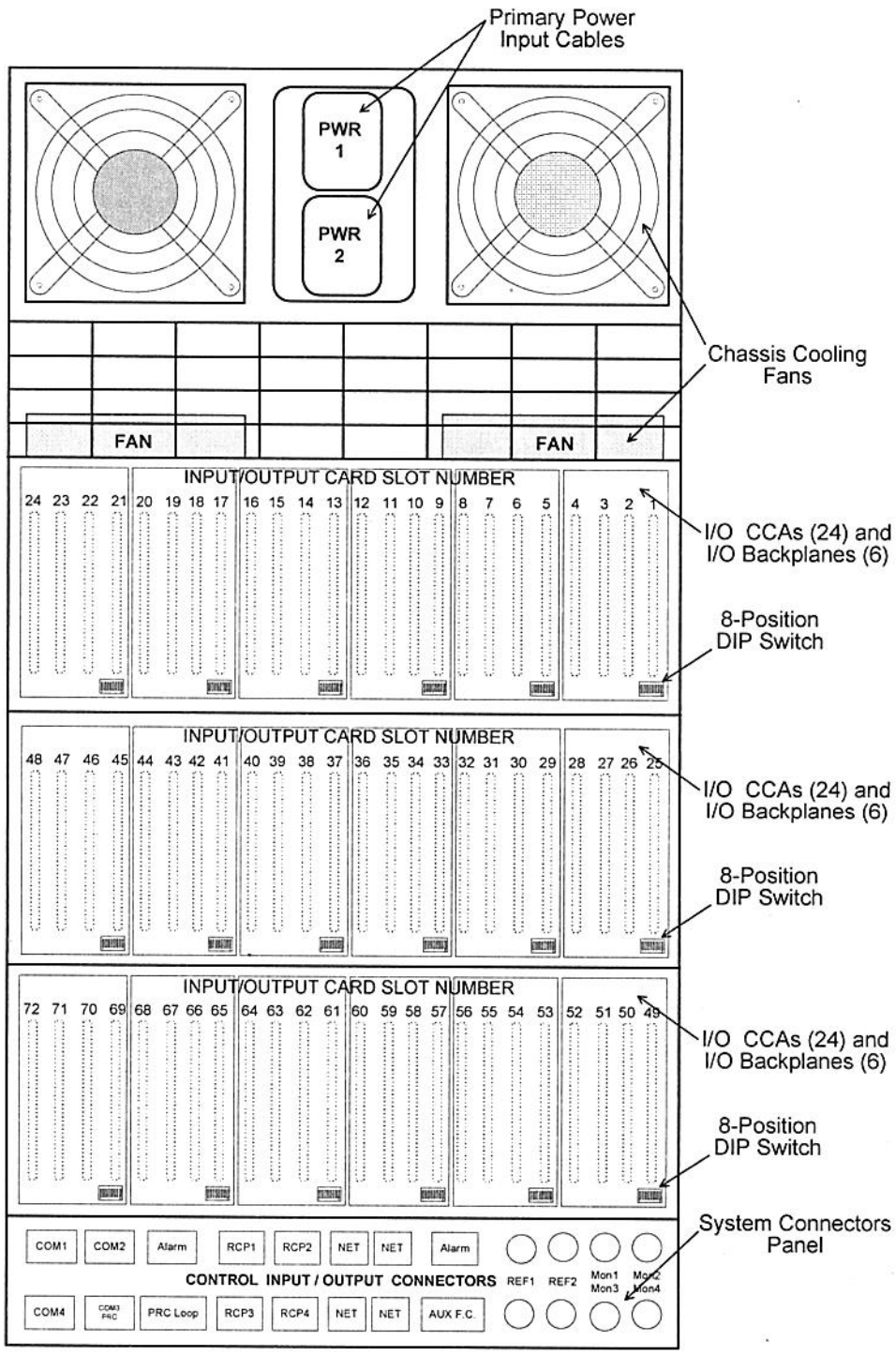


Figure 2-2 – 448CX Chassis – Rear View

2.2 REVIEW OF CORE SYSTEM COMPONENTS

The 448CX Frame is configured using combinations of the following Core System Components:

Input Circuit Card Assembly

Matrix Circuit Card Assembly

Output Circuit Card Assembly

Power Supply Module

Control System (System Controller CCA and Frame Controller CCA)

Option Cards

Output Monitor Circuit Card Assembly

Each core component is identified and a very brief look at the function of each is provided in the following paragraphs.

2.2.1 INPUT CIRCUIT CARD ASSEMBLY

As the name implies, the Input Circuit Card Assembly (CCA), often referred to simply as the input card, is the entry point for video signals into the routing switcher matrix. Each input card accepts up to 16 video input signals from various sources. There are six input card variations in the Cheetah Series product line, to accommodate different input signal types.

Each input card, regardless of signal type, contains the cable equalization circuitry, buffer amplifiers and signal drivers used to condition the incoming signal prior to entering the switching matrix. Each input card also contains circuitry to monitor the status of the input channels, power rails and other operational functions.

Input cards are physically attached to the rear panel of the chassis frame and provide the input connectors for attaching signals to the switcher. Each card is equipped with two status LEDs on the edge of the assembly close to the bottom input connectors. The user can very quickly perform a visual assessment of the status of the input cards by observing the state of the LEDs.

2.2.2 MATRIX CIRCUIT CARD ASSEMBLY

Each Matrix Card is where the actual crosspoint switching function takes place. In all Cheetah variations, the matrix cards are installed inside the chassis frame and are accessible by opening the front access door. Each card is equipped with LEDs on the assembly edge so that the user can quickly assess the status of each matrix card in the system with a visual inspection.

2.2.3 OUTPUT CIRCUIT CARD ASSEMBLY

The Output Card is the exit point for video signals leaving the routing switcher and each card provides up to 16 video output channels. There are seven output card variations to accommodate different signal output types.

Each output card contains the necessary channel combiner circuitry, buffer amplifiers, re-clocking circuitry and driver amplifiers to generate the signal output for each channel. Voltage comparators monitor the status of the power rails. On-board programmed logic circuitry interprets data from the comparators along with data relevant to the status of the output channels and other card operational functions to provide a real-time status monitor as to the health of each output card.

Output cards are physically attached to the rear panel of the chassis frame and provide the connectors for accessing the signal outputs from the switcher. Each card is equipped with two status LEDs on the edge of the assembly close to the bottom connectors. The user can very quickly perform a visual assessment of the status of the output cards by observing the state of the LEDs.

2.2.4 POWER SUPPLY MODULE

Cheetah video routing switchers use common 600 Watt power supply modules that provide a fully regulated source of ±28 VDC @ 22A for powering system components. The number of power supply modules used in a frame is dependent on several factors including the number of input, matrix and output cards required for system capacity and whether or not power redundancy is desired. Up to 8 Power Supply Modules may be installed in the 448CX Frame.

All of the power supply modules are physically and electrically identical. Each module is "hot-swappable" for easy removal and replacement without any disruption of switcher outputs. Circuitry internal to the power supply continuously monitors the operational parameters, output voltage and current level and the module operating temperature. Three LED display devices on the front panel of each module allow the user to quickly perform a visual assessment of the status of each supply module by observing the state of the LEDs.

2.2.5 CONTROL SYSTEM

Every switcher configuration requires a Control System. In the Cheetah family there are two core components of the control system that reside within the chassis frame: the System Controller Card and the Frame Controller Card.

The System Controller Card resides in the matrix switcher frame, however the term System Controller refers collectively to the System Controller CCA and its associated board-resident firmware and a software application that runs on a Microsoft Windows based PC platform. In the Cheetah product line there are two variations of System Controllers: the 3500PRO and the PERC2000. Regardless of which control system is used (3500 or PERC), at least one system controller card must be installed in the chassis frame. Each chassis frame can support up to two system controller cards although only one controller card is required. A second system controller card may be installed for redundancy capability.

The Frame Controller Card also resides in the matrix switcher frame. Just as with the system controller card, each chassis frame can support up to two frame controller cards, although only one is required. A second frame controller card may be installed for redundancy capability.

Consider the System Controller to be the master overseer of the entire system. The system controller card communicates bi-directionally with the frame controller circuitry. Think of the Frame Controller as a slave that is subservient to its master – the System Controller. The Frame Controller circuitry orchestrates all system switching commands and all other control functions for the entire switcher frame. It is the job of the System Controller to keep the entire system running as it is programmed to do. The System Controller provides programming functions and interface functions to various types of control panels that may be used by facility operators to control operations of the entire switching system. Also, the system may be operated from a Windows based PC interfaced to the system controller and running the controller software application.

2.2.6 OPTION CARDS

There are four option cards available in the Cheetah Series that enhance the function of standard output cards:

HD to SDI Down-Conversion Option Card

SDI to Analog Conversion Option Card

Dual Output Option Card

Fiber Output Option Card

Each standard output card, regardless of signal type, is equipped with a row of on-board connectors that allow an option card to be "piggy-backed" to it in a mezzanine card fashion. Each option card is fitted with connectors appropriate to its output signal that are mounted on a panel that rides parallel to the output connector panel of the standard card. Whenever an option card is used, each output card, with its option card in place, will occupy two I/O slots on the rear of the chassis frame. Since some of the option cards are specific for certain output signal types, it should be obvious that not all option cards are suitable for all output cards. Due to physical space limitations and backplane wiring configurations, not all Cheetah chassis frames allow option cards to be installed on the output cards used in the system.

You will find a more thorough discussion of each option card in Chapter 3. A very brief introduction to each and where it can be used is contained in the following paragraphs.

The HD to SDI Down-Conversion Option Card installs to the HD Multi-Rate Output Card and converts the High Definition video signal from each active output to a Standard Definition SDI digital video output. The HD and SDI outputs are both available from BNC connectors located on the frame rear panel.

In similar fashion, the SDI to Analog Option Card installs to the SDI Output Card and converts the SDI digital video signal from each active output to an NTSC/PAL composite analog video signal. Both the SDI digital and analog outputs are available from BNC connectors located on the rear panel of the chassis frame.

The Dual Output Option Card installs to a standard output card and provides a second set of output connectors for each output channel. Both output signals are available from BNC connectors located on the rear panel of the switcher frame. Although identical in appearance and installation, the HD/SDI dual output option cards and the analog or high level analog dual output option cards are not interchangeable.

The Fiber Output Option Card installs to a standard (HD, SDI or Fiber) output card and provides a set of fiber optic output connectors co-resident with the BNC output connectors. Both connectors for each output channel are located on the rear panel of the chassis frame. Note that this option card is not compatible with analog or high-level analog output cards.

2.2.7 OUTPUT MONITOR CIRCUIT CARD ASSEMBLY

Certain Cheetah chassis frames provide for a source of monitor video (SD and HD Only). When so equipped, this option allows the user to select up to two outputs of the switch matrix and have the selected signals available at the monitor output connectors on the frame rear panel. The monitoring option is not available for analog signals. There is a constraint on which output channels can be viewed simultaneously and that is that each requested channel must be associated with different output cards. It is not possible to monitor two output channels from the same output card.

The Output Monitor CCA, when installed, resides in the switcher chassis frame and contains a crosspoint device that receives the monitor output signal from each of the output cards in the frame. This device, under software control via the on-board control logic circuitry, selects up to two input signals as monitor output signals. The selected monitor sources are re-clocked to correct any jitter or other signal aberration, buffered and available at the monitor connectors on the frame rear panel.

Logic circuitry on the monitor output card monitors the status and health of the video output, power rails, on-board control circuitry and other operational parameters of the card. LEDs along the edge of the assembly allow the user to perform a visual assessment of the status of the monitor output card.

2.2.8 BACKPLANES

Note in Figure 2-1 that there are two power supply modules residing on each power supply backplane along with an 8-position DIP switch; and two matrix cards residing on each matrix backplane along with three rotary switches (S1 thru S3). In addition to the switches on the backplanes, also note the ten rotary switches used for chassis strobe configuration.

Figure 2-2 illustrates the rear panel of the chassis frame where the input and output cards are installed. Note in this figure that up to four input or output cards may reside on each I/O Backplane and that each backplane contains an 8-position DIP switch.

The DIP switches and rotary switches on the various backplanes and in the chassis frame are factory set to assign operational parameters to the system components. The switch settings assign such things as what channel numbers a bank of input or output cards will service, frame type, number of cooling fans, etc. Although the switches are set at the factory for every system, a guide to the proper settings for each switch peculiar to the 448CX Frame is included in Chapter 5 of this manual. This scheme of assigning identification to the backplane and interface ports allows full interchangeability between like CCAs in the system.

In every frame variation the input cards and the output cards are loaded through the rear panel card chassis into mating connectors located on an I/O backplane. Each card chassis is configured using I/O backplanes with four cards installed to each. All slots may or may not be used in a particular system dependent on the number of input and output channels and whether or not the output cards are fitted with option cards. When option cards are used, each output card will occupy two slots in the card chassis. In a typical Cheetah system, the input cards and output cards will be co-resident in the card chassis. Be aware that although input cards and output cards can be co-resident in the card chassis, they CAN NOT be co-resident on the same backplane. Each I/O backplane in the chassis is designated as either an input or an output backplane.

2.3 448CX FRAME SPECIFICATIONS

Physical

RUs	27
Height	47.25"
Width	19"
Depth	23"

Continued

448CX Specifications (cont.)

Supply Power Requirements

Operating voltage ..... 95-240 VAC, 47-63 Hz
Power consumption ..... 2000W Nominal

Power Supplies

DC Input (from the source rectification filter/breaker assy.) ..... 95 VDC to 240 VDC
DC Output ..... 28 VDC
Maximum Output Watts ..... 600 Watts

Digital Electrical Signals for Inputs

Standards: ..... High Definition video conforming to SMPTE 292M
..... Serial Digital video conforming to SMPTE 259M
Connector Type: ..... 75Ω BNC
Impedance: ..... 75Ω nominal
Return Loss: ..... HD >15 dB from 5MHz to 1.5 GHz
..... SD >15 dB from 5 MHz to 540 MHz
Cable Equalization: ..... HD Automatic up to 100 meters, Belden 8281
..... SD Automatic up to 300 meters, Belden 8281

Electrical Signals for Outputs

Connector Type: ..... 75Ω BNC (output card)
..... 75Ω BNC (dual output card)
Signal Level: ..... 800 mV p-p, ±10%
Signal Polarity: ..... Non-inverting with respect to input ports
Impedance: ..... 75Ω nominal
Return Loss: ..... HD >15 dB from 5MHz to 1.5 GHz
..... SD >15 dB from 5MHz to 540 MHz

Optical Signals (Fiber Optics) for Inputs (Receivers)

Connector Type: ..... SFP modules w/LC-type (fiber card)
Data Rates: ..... 1.0 Mbps to 1.485 Gbps
Optical Input Wavelength ..... Single Mode, 1200 to 1600 nm
Input Power ..... -20 dBm (minimum)

Optical Signals (Fiber Optics) for Outputs (Transmitters)

Connector Type ..... SFP modules w/LC-type (fiber card)
Data Rates: ..... 1 Mbps to 1.485 Gbps
Optical Output Wavelength ..... Single Mode, 1310 nm, ±20 nm
Output Power ..... -11 dBm

Continued

448CX Specifications (cont.)

Optical Loss Budget

10,000 km (minimum), Single Mode fiber w/2 optical couplings ..... 9 dB (minimum)

Signal Operational Specifications

Polarity: ..... All paths non-inverting
Re-clocking SD: ..... Automatic selection of 143 Mb/s, 177 Mb/s, 270Mb/s,
..... 360 Mb/s, 540 Mb/s
Re-clocking HD: ..... Automatic selection of 143 Mb/s, 177 Mb/s, 270 Mb/s, 360 Mb/s,
..... 540 Mb/s and 1.5 GB/s

Reference (Sync) Inputs

No. of Inputs: ..... 2 standard
Connector: ..... 75Ω BNC
Return Loss: ..... > 40 dB, 100 KHz to 30 MHz
Signal Formats: ..... NTSC, PAL (Black Burst), or HD Tri-Level
..... Sync per SMPTE 274, SMPTE 276 M
Signal Level: ..... Nominal 1.0 V p-p ±6dB

DAC Card Specifications

Connector Type: ..... 75Ω BNC
Connection/Card: ..... 16 Individual Outputs
Conversion: ..... 10 bit Serial Digital to Analog
Over sampling: 4X
Output: ..... NTSC/PAL

Cooling

Internal cooling fans with auto sensing speed adjustments

Control

Panel Com: ..... RS-485, 3 pin WECO, 4 per frame
Control Com: ..... RS-232 or PESA PRC for 3500 Series System
Connector Type: ..... 9 pin, D sub, female
Network Connector: ..... RJ-45, Ethernet, 2 per frame

Environmental

Operating Temperature: ..... 0-40 °C
Operating Humidity: ..... 10-90% non condensing

Continued

448CX Specifications (cont.)

Standard Analog Video Input Characteristics

Level: ..... 1.0V P-P nominal, 2.0V P-P max.
..... (Without obvious distortion)
Impedance: ..... 75Ω internally terminated
Return Loss: ..... > 40 dB to 5 MHz
..... > 15dB to 50 MHz
Coupling: ..... Direct (DC)
Type: ..... Balanced
Connector: ..... BNC

Standard Analog Video Output Characteristics

Level: ..... 1.0V P-P nominal, 2.0V P-P max.
..... (Without obvious distortion)
Impedance: ..... 75Ω internally terminated
Return Loss: ..... > 40 dB to 5.0 MHz
..... > 15 dB to 50 MHz
Coupling: ..... Direct (DC)
DC on Out: ..... <±30 mV
Connector: ..... BNC
Number: ..... One (Two Optional)

Standard Analog Video Gain Characteristics

Gain: ..... Unity
Gain Stability: ..... <±0.1 dB max.
Gain Adjust Range: ..... ±0.5 dB

Standard Analog Video Linear Distortion

Frequency Response: ..... ±0.1 dB to 10 MHz
..... ±0.5 dB to 35 MHz
..... -3.0 dB @50 MHz
Vertical Tilt: ..... 0.25% (50 Hz Square Wave)
Horizontal Tilt: 0.25%
Low Frequency: ..... +0.2% /ms max with 10% Overshoot
..... (10-90% or 90-10% change)

Standard Analog Video Pulse and Bar Responses

Factor (2T) Bar Slope: ..... 0.2% K
Pulse/Bar Ratio: ..... 0.2% K
Pulse Sharp: ..... 0.2% K

Continued

448CX Specifications (cont.)

Standard Analog Video Chrominance/Luminance

Gain Inequity: ..... ±1.0% max.
Delay Inequity: ..... ±1.0 ns

Standard Analog Video Non-Linear Distortions

Note: *All tests: 10 to 90% @ 3.58MHz or 12.5 to 87.5% @ 4.43Mhz.*

Differential Gain: ..... 0.25% @ 4.43 MHz
Envelope Delay: ..... <2.0ns, 50MHz to 85 MHz
Differential Phase: ..... 0.25° @ 4.43 MHz
Line Time Non-Linearity: 0.2%
Transient Gain: ..... 1.0% (Luminance, Chrominance, or Sync)
Video o Video Crosstalk: ..... ≤ -60 dB to 5.0 MHz (all Inputs and Outputs Hostile)
..... ≤ -35 dB @ 35 MHz

Standard Analog Video Switching Characteristics

Switching Time: ..... ≤ 1.0 µs
Switching Transient: ..... 22 mV (30 IRE Units)
Differential Delay (any Input to any Output) ..... Approx. 8.5ns
..... 11° @ 3.58 MHz
..... 13.5° @4.43 MHz

Standard Analog Video Signal to Noise

Video Filter: ..... -70 dB RMS Noise to P-P Signal to 5.0 MHz

Continued

448CX Specifications (cont.)

High-Level Analog Video Input Characteristics

Level: ..... ±5.0 V, Referred to Ground
Impedance: ..... 75Ω internally terminated
Return Loss: ..... > 40 dB to 5.0 MHz
..... > 15 dB to 50 MHz
Coupling: ..... Direct (DC)
Type: ..... Balanced
Connector: ..... BNC

High-Level Analog Video Output Characteristics

Level: ..... ±5.0 V, Referred to Ground
Impedance: ..... 75Ω internally terminated
Return Loss: ..... > 40 dB to 5.0 MHz
..... > 15 dB to 50 MHz
Coupling: ..... Direct (DC)
DC on Out: ..... <±50 mV
Connector: ..... BNC
Number: ..... One (Two Optional)

High-Level Analog Video Gain Characteristics

Gain: ..... Unity
Gain Stability: ..... <±0.1 dB
Gain Adjust Range: ..... ±0.5 dB

High-Level Analog Video Linear Distortion

Frequency Response: ..... ±0.1 dB to 10 MHz
..... ±0.5 dB to 35 MHz
..... -3.0 dB @50 MHz
Vertical Tilt: ..... 0.25% (50 Hz Square Wave)
Horizontal Tilt: 0.25%
Crosstalk: ..... <± -60 dB to 5.0 MHz (All Inputs and Outputs Hostile)
..... <± -35 dB @ 35 MHz

High-Level Analog Video Signal to Noise

Signal to Noise: ..... -70 dB, RMS Noise to P-P Signal to 5.0 MHZ

The Cheetah 448CX video matrix switchers offer alarm support, switch confirmation, block checking, and power-out-of-range indicators. Additional features of this frame include:

- Full feature control system using either standard PESA PRC Control or PESA Network Control
- Video and data signal from 3Mb/s to 1.5 GB/s
- Conforms to SMPTE 259M and 292M
- Input EQ to 300M SD, 100M HD
- Bypass mode for non-standard data signals
- Output option slots available for every Output Combiner Card. Option slots support the following option cards:

  Dual Output (BNC)

  Fiber Output

  Digital-To-Analog Converter (DAC) Module for converting SDI video to NTSC or PAL outputs

  SD Converter

  HD to SD Converter
- Full redundant controllers available
- N+1 redundant internal DC power; full redundant AC power
- All modules are hot-swappable for on-air maintenance
- Dual Output Monitor

Chapter 3: Installation

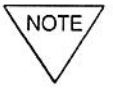
3.1 UNPACKING AND INSPECTION

This equipment contains electrostatic sensitive devices (ESD). Use a grounded wrist strap, grounding mat, and/or comply with local established ESD procedures when handling the internal circuit cards to prevent destruction from electrostatic discharge.

Immediately upon receipt, inspect all shipping containers. Carefully unpack the equipment and compare the parts received against the packing list. If any parts appear to be missing or damaged, please contact PESA immediately.

3.2 GENERAL CHASSIS INSTALLATION OVERVIEW

The physical size of each Cheetah Series Switcher chassis is determined by the chassis input/output capabilities. If specified when ordered, each Cheetah Switcher will be configured for the intended system at the factory. Before attempting to install any frame, matrix card, controller card, or power supply, carefully read and understand this section.



All Cheetah Switchers contain electrostatic sensitive devices (ESD). Care should be used when it is necessary to handle the internal circuit cards. It is recommended that a grounded wrist strap and grounding mat be used before attempting any equipment installations.

3.3 CHOOSING A LOCATION

For local electrical compliance, this equipment should be located near the primary power disconnect/breaker so that the AC supply disconnect is easily accessible.

This equipment is designed for installation in a standard 19" equipment rack located in an environment conforming to the specifications for each chassis. Locate each unit as close as possible to its associated equipment to minimize cable runs.

Consider the connection from this equipment to the supply circuit, and the effect that possible overloading can have on overcurrent protection circuits and supply wiring. Refer to nameplate ratings when addressing this concern.

3.4 MOUNTING THE 448CX CHASSIS IN AN EQUIPMENT RACK

	**The weight of a fully loaded 448CX chassis frame can exceed 500 lbs. Installation or removal of this equipment requires at least four persons in order to avoid possible personal injury or equipment damage. Install this equipment in such a manner as to avoid any tipping hazard from uneven loading of the equipment.**
	**Make sure that all power is disconnected and the chassis breakers are in the OFF position before installing the specific frame into the rack.**
	**Fans mounted on this equipment provide forced-air cooling. Do not block airflow around these fans. Replace all service panels and blank filler plates. Keep the front access door closed during normal operation.**

This equipment is designed for installation in a standard 19" equipment rack. Provide sufficient space behind the equipment racks to allow for control, signal, and power cables. Use all chassis mounting holes, and tighten mounting hardware securely by using the rack equipment manufacturer's suggested torque settings.

	**This unit is extremely heavy. Maneuvering and installation of this unit requires caution, planning, and adequate resources in order to prevent injury to personnel and/or damage to the equipment. It is strongly suggested to implement as many persons, jacks, blocks, etc., as possible to eliminate any unsafe condition that could result during the chassis mounting phase of installation.**

3.4.1 CHEETAH CHASSIS MOUNTING PROCEDURE

The following steps should be performed to reduce the weight of the system thus making it slightly easier to maneuver.

1. Have the wooden shipping crate standing upright before opening the crate.
2. Remove all the lag bolts from the top and sides of the wooden crate.
3. Using ESD precautions, remove the power supply modules from the top of the unit.

NOTE	**Prior to performing the next sequence, careful measurements should be completed to insure the proper location and alignment of equipment rack's screw holes to the Cheetah chassis.**

4. Using a pallet jack or similar equipment, align and place the 448CX Chassis as close as possible to the equipment rack opening where it will be installed.
5. Using as much manpower as necessary, CAREFULLY move the 448CX chassis from the wooden pallet to the equipment rack and slide the chassis into position in the rack.
6. With the chassis installed in the equipment rack, install the rack screws in the chassis ensuring that the unit is firmly and adequately secured to the equipment rack.

3.5 CONNECT EQUIPMENT CABLES

Once the Cheetah Video Matrix Frame is installed in the equipment rack, the associated system connections can be completed. The order of completion of installation steps is not critical, however, DO NOT apply power to a frame until all of the video signal, sync and control cables have been installed and their connections verified for proper placement and accuracy. Use the following guide to insure that all connections are made properly and that power, system interconnect and video signal cables are correctly installed.

Use the following guidelines when connecting equipment cables:

Install the equipment in the rack before connecting cables.

Relieve strain on all cables to prevent connector separation.

To the greatest extent possible, separate control, signal, and power cables to minimize any possible crosstalk or interference.

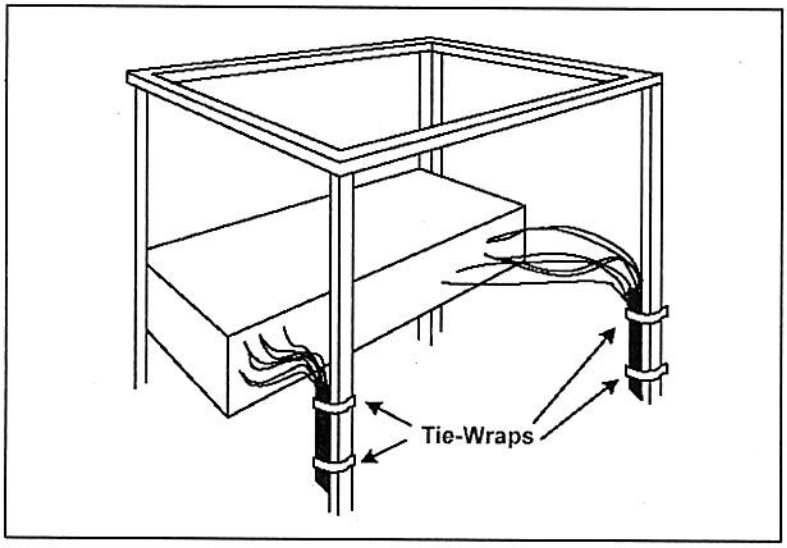


Figure 3-1 - Cables Attached To Supports

Use as many cable ties as necessary to secure cables to the rack, as shown in Figure 3-1. This will provide cable strain relief and help route cables away from hazardous areas.

Route cables away from physical traffic areas to avoid creating a safety hazard (trip or shock).

3.6 CHASSIS SUPPLY POWER CONNECTIONS (US MODELS)

The 448CX chassis frame has two AC primary power input cables. As shown in Figure 3-2, each AC power input is rectified, filtered and routed to the power supply module backplanes.

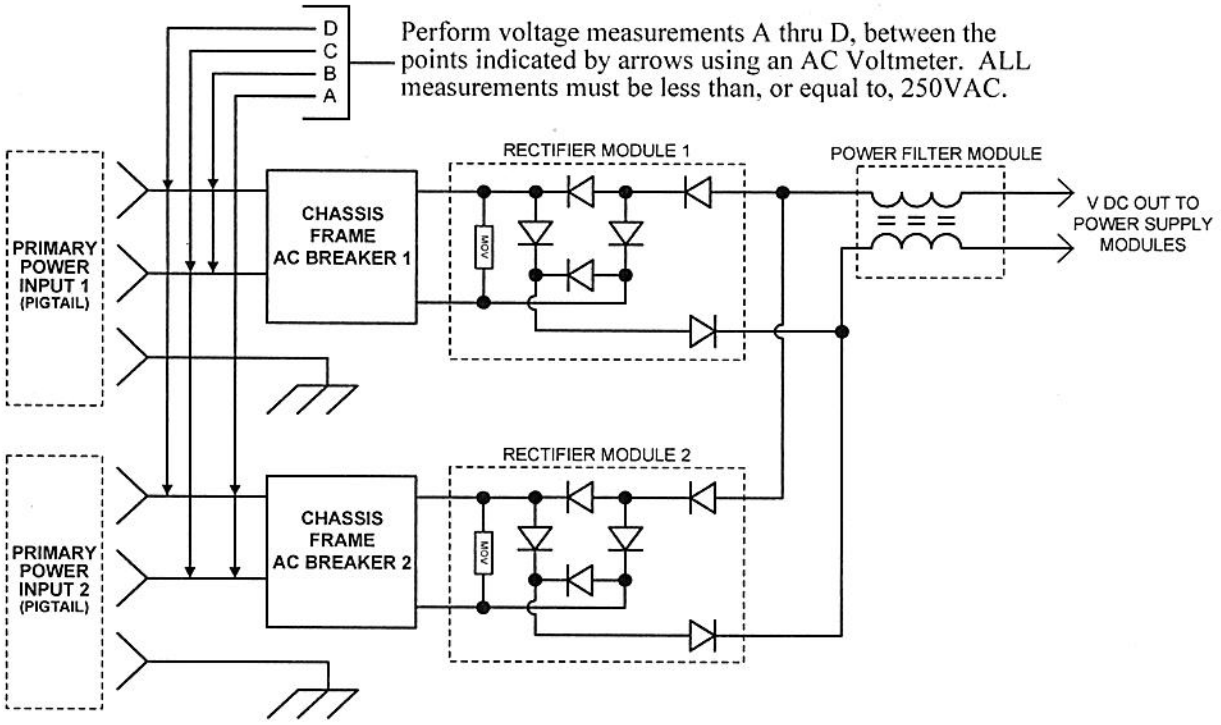


Figure 3-2 - Power Supply Configuration (US Models)

WARNING: The maximum applied voltage to either of the AC power inputs must not exceed 250VAC. In addition, the maximum applied voltage across both AC power inputs must not exceed 250VAC at any time. Whenever two phases of a three-phase power source are applied using different phases on each power input, the voltage between the phases must not exceed 250VAC. Failure to heed this warning will result in serious equipment damage. .

Figure 3-3 depicts a typical two-phase and three-phase AC line-phasing scenario. Note that in the three-phase line voltage, each voltage phase is 120 degrees out of phase with the other two voltage phases.

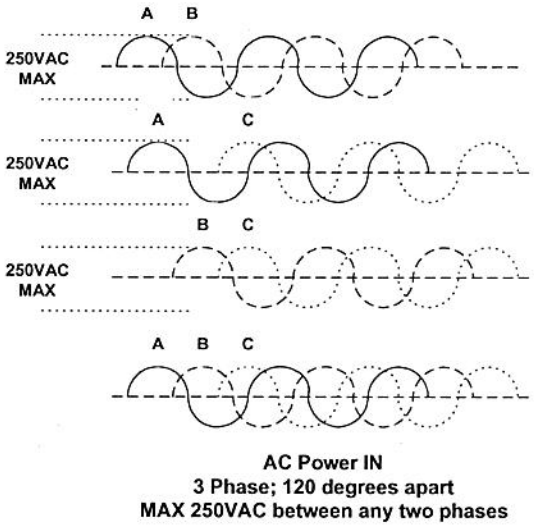


Figure 3-3 - Phase Relationships

Additionally, systems with one AC power input supplied from a normal, "in-house" AC line and the other AC power input supplied from an external generator ***must insure*** that, regardless of the voltage-phase relationship between the external generator and the "in house" AC line, the maximum applied voltage between the two AC power inputs ***does not exceed 250VAC***.

NOTE	**If your application requires two independent phases, which exceed the 250VAC maximum, PESA has an interface solution to address your needs. Please contact your PESA dealer or Area Sales Manager.**

CAUTION	**Additionally, it is NOT recommended to use single-phase GFCI circuit protection devices in the supply circuitry of any Cheetah series systems. Due to unbalanced currents in the neutral circuitry, single-phase GFCI devices will typically trip. However (if employed), a three-phase GFCI breaker will not trip except under fault conditions.**

3.6.1 448CX FRAME PRIMARY POWER

STOP	**Make sure that all power is disconnected and the chassis breakers are in the OFF position before completing the specific power connections.**

CAUTION	**To prevent damage to the equipment:** • **Read all instructions for proper input voltage ranges.** • **Use only a power circuit with the specified current capacity.** • **Follow static prevention precautions prior to handling equipment.**

3.6.1.1 Power Cabling and Circuit Breakers

The 448CX chassis is supplied with a power cabling assembly (see Figure 3-4) that meets and/or exceeds the requirements for dedicated input service lines rated for 200-240VAC at 30 amps minimum. Two main circuit breakers are mounted on the front side of the 448CX frame in the upper left corner. Table 3-1 describes the power connections for the associated pigtail cabling conductors.

Table 3-1 - Pigtail Cabling Conductor Power Connections

Color Code	*200-240V*
Green/Yellow Stripe	Safety Ground
Blue	AC Line
Brown	AC Line

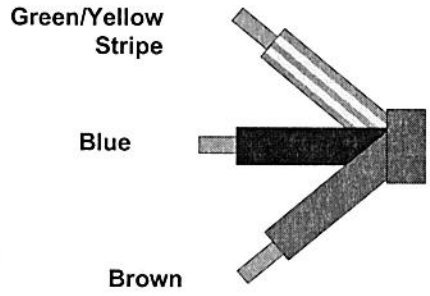


Figure 3-4 - Pigtail Cabling Conductors

3.6.1.2 External AC Power Requirements

Each 448CX chassis is supplied with pigtail cabling (see Figure 3-4 and refer to Tables 3-1) rated for 200-240VAC at 30 amps. The router is to be connected only to a dedicated service line capable of providing the power source specified in Table 3-2.

Table 3-2 - AC Power Filter Assembly

AC Power Cable	Minimum Amps Required	Service Drops
200-240V Attached Power Cable Pigtails	30A Service	1-Standard 1-Redundant

3.6.1.3 Internal Power Processing and Distribution

Figure 3-5 illustrates the internal rectifiers/filter and power distribution scheme of the 448CX Frame. Note that the power output from each Rectifier/Filter Assembly is in parallel. Either of the rectifier/filter assemblies can provide DC power to the Power Supply Backplanes. Two independent assemblies provide redundancy in the event of the loss of one of the power input lines. When both lines are active, the dual assembly arrangement distributes the power load between the modules. Note also that the +28 VDC voltage output from each Power Supply Backplane is in a parallel arrangement. This allows, in most configurations and operating conditions, power supply modules to be "hot-swap" removed and replaced with no interruption of power to the frame circuitry.

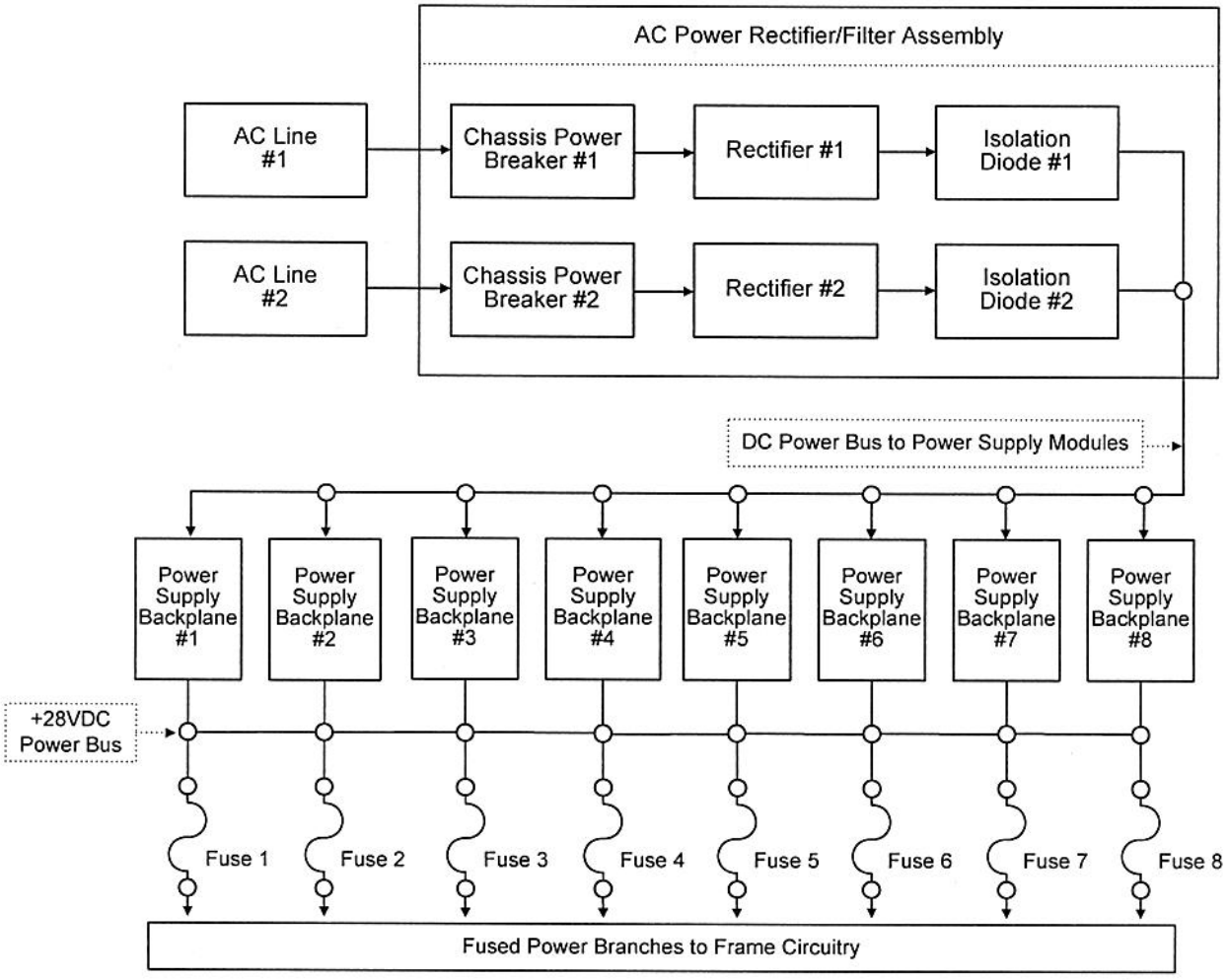


Figure 3-5 Filter And Power Distribution

3.7 INTERNATIONAL POWER REQUIREMENTS FOR THE 448CX CHASSIS

All 448CX frames have two AC main power feeds. For international use only, these power feeds are isolated from one another through a special wiring configuration that is completed at the factory (Figure 3-6).

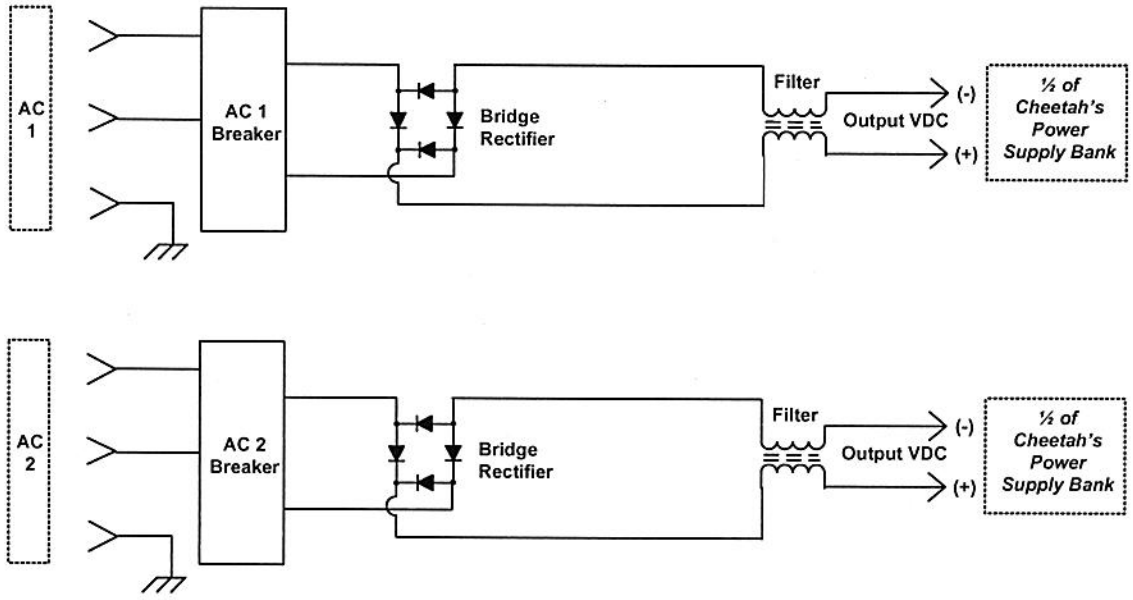


Figure 3-6 - International Power Supplies Configuration

In each Cheetah assembly, the entire power supply backplane is divided in half and each half is powered and isolated separately. The following apply to the Cheetah international power supply inputs:

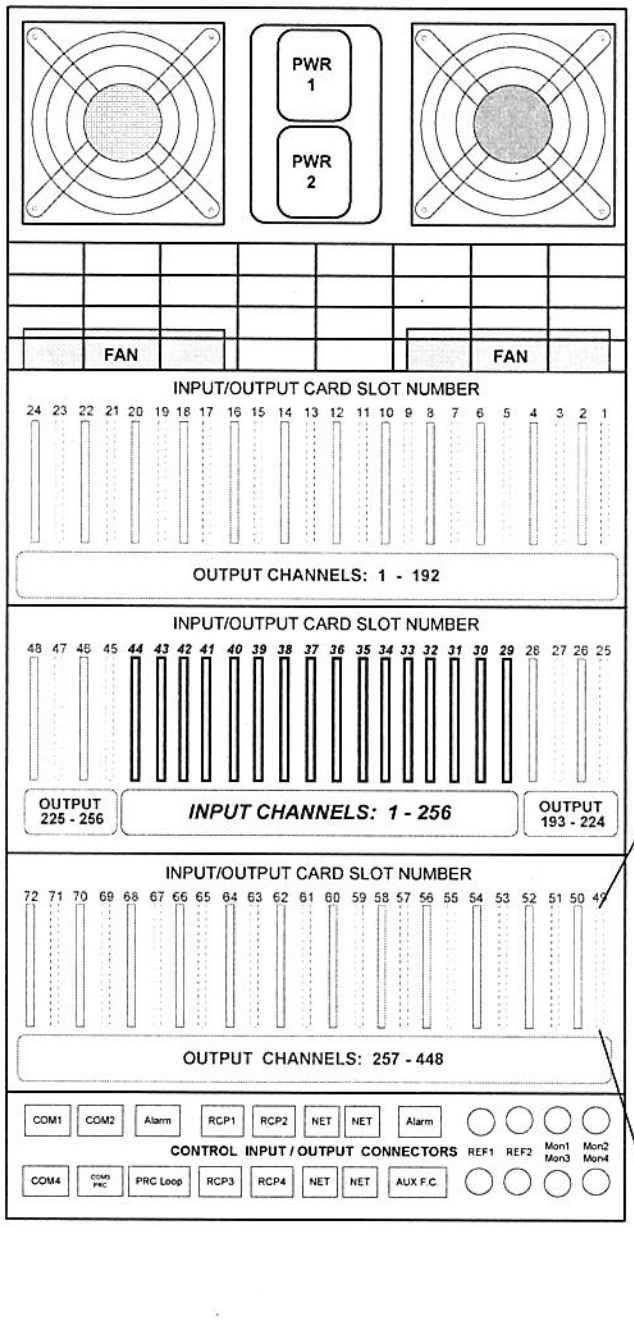
- Two banks of power supplies are required in each Cheetah switcher assembly and each bank must be capable of supplying ALL of the power that is required by the specific Cheetah switcher.
- Both banks must be powered under normal conditions.
- Loss of either AC supply power feed is considered a fault condition.
- When experiencing a loss of one AC supply power feed (fault condition), the remaining supplies will typically operate at 100% of their rated load. An increase in chassis operating temperature is normal as the supplies are typically changing from approximately 50% load to approximately 100% of their rated load.

WARNING: The maximum applied voltage between any leg of either of the isolated AC power inputs must not exceed 250VAC. In addition, the maximum applied voltage between any leg of one AC input and any leg of the other AC power input must not exceed 380VAC nominal at any time. That is, whenever two phases of a three-phase power source is applied using different phases on each power input, the voltage between the phases must not exceed 380VAC nominal. Failure to heed this warning will result in serious equipment damage.

3.8 VIDEO INPUT/OUTPUT CONNECTIONS

Once the rack frame is mounted and primary power connections have been completed, connecting the video input and output signals is the next step. Figure 3-7 illustrates the entire rear panel of the router and features a quick reference guide to the input and output connector configuration. Figures 3-8 provides a closer and more detailed view of the rear panel input and output connectors divided into sections from the top of the switcher to the bottom. Use these references when making video I/O connections to the 448CX router.

PESA recommends that you make a layout plan and connection drawing to document I/O connections to the router and follow this drawing when attaching video connectors to the input and output cards. Retain this documentation in a safe place in the event that service to the router should ever be needed. PESA also recommends that you label each video cable to identify its source or destination.



Quick Reference Chart
Input/Output Connector Channels By I/O Card Slot Number

OUTPUT CHANNELS

Input/Output Card Slot Number	Output Channels On Card	Input/Output Card Slot Number	Output Channels On Card	Input/Output Card Slot Number	Output Channels On Card
1	1 - 16 D	20	145 - 160	55	305 – 320 D
2	1 - 16	21	161 - 176 D	56	305 - 320
3	17 - 32 D	22	161 - 176	57	321 – 336 D
4	17 - 32	23	177 - 192 D	58	321 – 336
5	33 - 48 D	24	177 - 192	59	337 – 352 D
6	33 - 48	25	193 - 208 D	60	337 – 352
7	49 - 64 D	26	193 - 208	61	353 – 368 D
8	49 - 64	27	209 - 224 D	62	353 – 368
9	65 - 80 D	28	209 - 224	63	369 – 384 D
10	65 - 80	45	225 – 240 D	64	369 – 384
11	81 - 96 D	46	225 - 240	65	385 – 400 D
12	81 - 96	47	241 - 256 D	66	385 – 400
13	97 - 112 D	48	241 – 256	67	401 – 416 D
14	97 - 112	49	257 – 272 D	68	401 – 416
15	113 - 128 D	50	257 - 272	69	417 – 432 D
16	113 - 128	51	273 – 288 D	70	417 – 432
17	129 – 144 D	52	273 - 288	71	433 – 488 D
18	129 – 144	53	289 – 304 D	72	433 - 448
19	145 – 160 D	54	289 - 304		

NOTE: "D" Indicates Available Output Option Slot

INPUT CHANNELS

NOTE
Input Card Slots are indicated by **BOLD** outlines and ***BOLD ITALICS*** text on the figure and in this chart.

Input/Output Card Slot Number	Input Channels On Card	Input/Output Card Slot Number	Input Channels On Card	Input/Output Card Slot Number	Input Channels On Card
29	***1 - 16***	***35***	***97 - 112***	***41***	***193 - 208***
30	***17 -32***	***36***	***113 - 128***	***42***	***209 - 224***
31	***33 - 48***	***37***	***129 - 144***	***43***	***225 - 240***
32	***49 - 64***	***38***	***145 - 160***	***44***	***241 - 256***
33	***65 - 80***	***39***	***161 - 176***		
34	***81 - 96***	***40***	***177 - 192***		

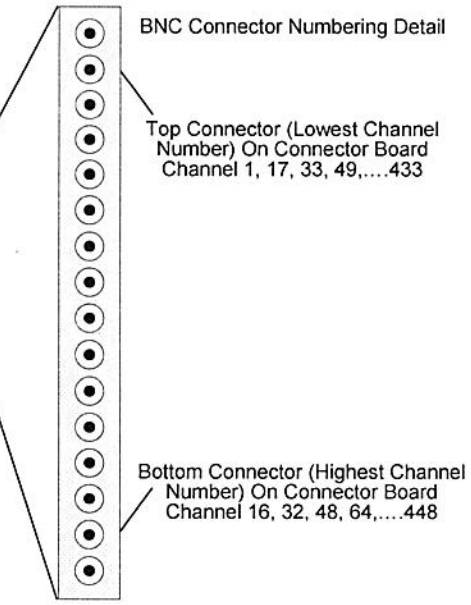


Figure 3-7 – 448CX Chassis – Rear View

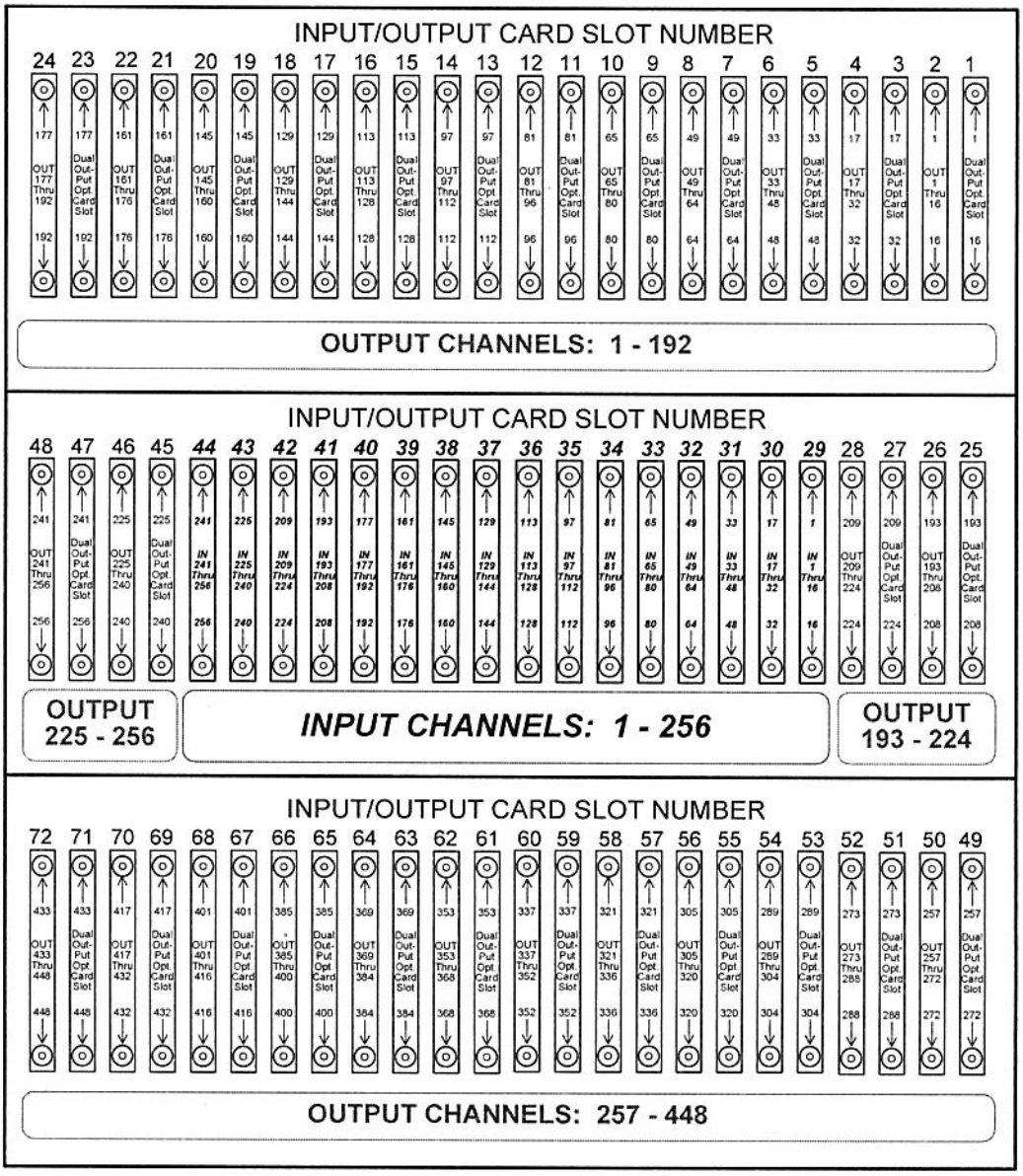


Figure 3-8 - Channel Assignments – I/O Card Slots 1 - 16

3.9 REAR PANEL SYSTEM CONNECTIONS

When the video I/O connections are completed, connecting the various system control and operational signals is the next step. The following paragraphs identify and define the operational and control connection points. Follow the information contained in each paragraph carefully when making control and system I/O connections to the 448CX router.

PESA recommends that you make a layout plan and connection drawing to document system connections to the router and follow this drawing when attaching cabling to the rear panel connectors of the router. Retain this documentation in a safe place in the event that service to the router should ever be needed. PESA also recommends that you label each cable to identify its source or destination.

3.9.1 RS-232 CONTROL CONNECTORS COM 1 AND COM 2

Connectors COM 1 and COM 2 (see Figure 3-9) are DB-9 male connectors that provide RS-232 serial communication interface points. Pin-outs are shown in Table 3-3.

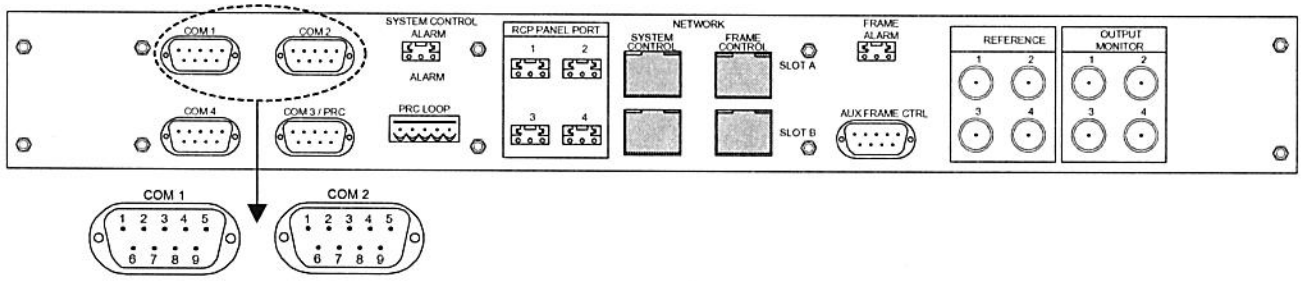


Figure 3-9 - RS-232 Control Connectors

Table 3-3 – COM 1 and COM 2 Pin Assignments

Pin	Signal	In/Out
1	CD	Input
2	RX	Input
3	TX	Output
4	DTR	Output
5	Ground	---
6	DSR	Input
7	RTS	Output
8	CTS	Input
9	RI	No Connect

- COM 1 is the primary RS-232 CPU Link and may be connected to a PC running the Cheetah Control System software, such as PERC2000, with a null modem cable (Part No. 81-9028-0393-0). Alternatively, COM 1 may be connected to an external control device.

  COM 1 may only be used with the P1E protocol at either 9600 or 38,400 baud. Set the baud rate with a switch on the controller board. Make sure the communication rate for COM 1 in the software matches the baud rate selected on the circuit card (in the software, select **System > Communications**).

- COM 2 is a secondary RS-232 CPU Link, which may also be connected to a PC or an external control device. COM 2 may be used with either of the protocols shown in Table 3-4 and may operate at either 9600 or 38,400 baud. Set the baud rate with a switch on the controller board. Make sure the communication rate for COM 2 in the system control software matches the baud rate selected on the circuit card (in the software, select **System > Communications**).

Table 3-4 - CPU Link Protocols

PROTOCOL	PESA DOCUMENT #
CPU Link Protocol No. 1 Extensions (P1E)	81-9062-0408-0
Unsolicited Status Protocol (USP)	81-9062-0409-0

3.9.2 RS-422 CONTROL CONNECTORS COM3/PRC AND COM4

Connectors COM 3/PRC and COM 4 (see Figure 3-10) are DB-9 male connectors that provide RS-422 serial communication interface points. Pin-outs are shown in Tables 3-5 and 3-6.

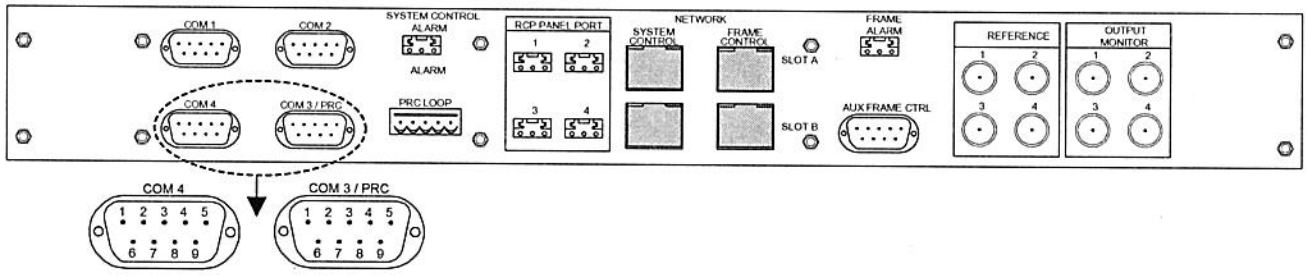


Figure 3-10 - RS-422 COM 3/PRC and COM 4 Control Connectors

COM 3/PRC is the system control communications interface with other PESA routing switchers within the facility using the PESA Router Control (PRC) control protocol and is connected between PRC routers using a serial control cable. Refer to Table 3-5 for pin assignments.

Table 3-5 - Com 3/PRC Pin Assignments

Pin	Signal	In/Out
1	CTS+	Input (not used)
2	MATRIX+	Bi-directional
3	CTLR-	Output
4	RTS-	Output (not used)
5	Ground	---
6	CTS-	Input (not used)
7	MATRIX-	Bi-directional
8	CTLR+	Output
9	RTS+	Output (not used)

COM 4 is an RS-422 CPU Link similar to the RS-232 CPU Link, except the interconnect cable may be up to and including 4,000 feet in length. When using this communication protocol an RS-422 interface card must be installed in the computer chassis used for system control. COM 4 may be used with either of the protocols listed in the previous Table 3-4. Refer to Table 3-6 for pin assignments)

Table 3-6 – COM 4 Pin Assignments

Pin	Signal	In/Out
1	CTS+	Input
2	RX+	Input
3	TX-	Output
4	RTS-	Output
5	Ground	---
6	CTS-	Input
7	RX-	Input
8	TX+	Output
9	RTS+	Output

3.9.3 SYSTEM CONTROL ALARM CONNECTOR

The three-pin System Control Alarm Connector, illustrated in Figure 3-11, provides an interface for an external, customer-supplied system control alarm notification device. An alarm condition is initiated by the system controller and is declared when the controller is in reset and when the standby controller is gathering configuration information from the primary controller. During an alarm condition, an optically isolated, electronically closed circuit exists between contacts 2 and 1 as shown in Figure 3-12. 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 an electronic contact closure, but does not provide a voltage to the external alarm. **The customer-supplied circuitry must not exceed 12VDC @ 10mA.**

The alarm is activated if the control system detects any of the following conditions:

- Encounters an interrupt that it does not expect or can not process
- Is unable to synchronize with the redundant system controller (dual controller installations)
- Does not receive configuration data from the redundant system controller (dual controller installations)

The customer supplied external alarm circuit is connected with a cable constructed as shown in Figure 3-13.

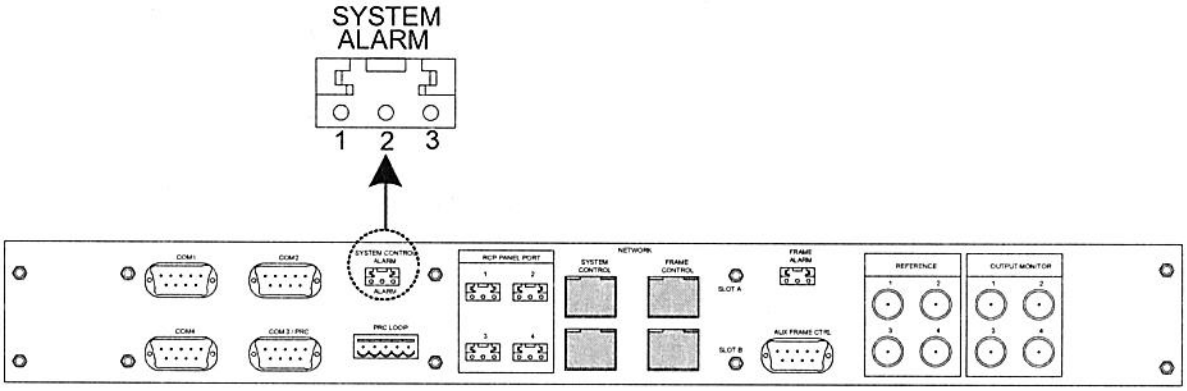


Figure 3-11 - System Control Alarm Connector

CAUTION	**The Customer-supplied alarm circuit voltage to this connector must not exceed 12VDC or 10mA.** **Connections to connector terminals 1 and 2 are polarity sensitive.**

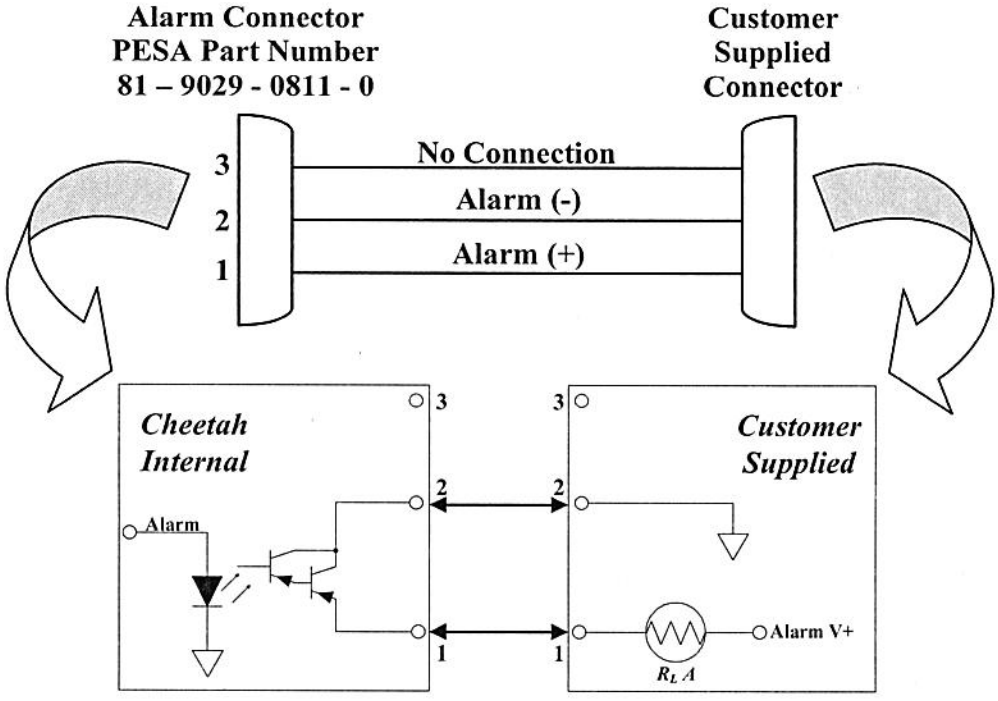


Figure 3-12 - System Alarm Cable Set and Associated Schematic

3.9.4 PRC LOOP CONNECTOR

The five-contact PESA Router Control (PRC) Loop Connector, located on the rear of the unit (Figure 3-13), is a loop-through connector that provides an RS-422 serial communication interface. This interface provides a system control link between the 448CX frame and other PESA routing switchers within the facility using the PRC Protocol as defined by PESA Document No. 81-9062-0316-0. It is wired in parallel with the DB-9-Male PRC Loop connector. Either connector may be used for frame-to-frame interface communications. Contact locations are illustrated in Figure 3-13. PRC Loop may be connected to PESA PRC compliant routers with a cable assembly (PESA part number 81-9028-0395-0) constructed as shown in Figure 3-14.

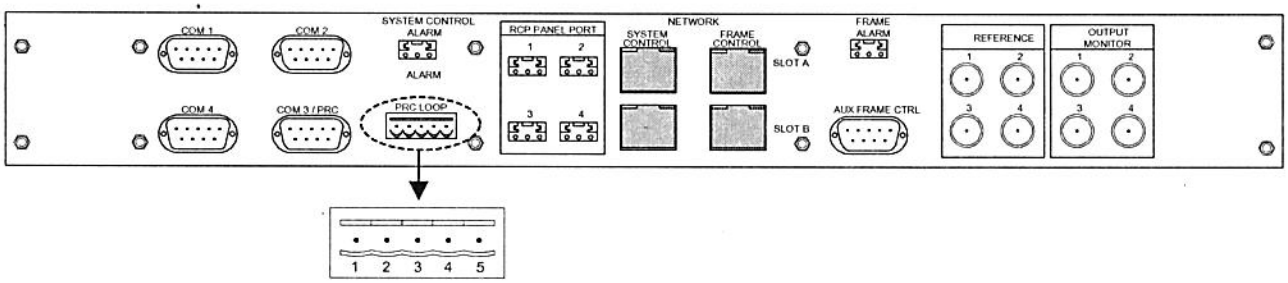


Figure 3-13 - PRC Loop Connector

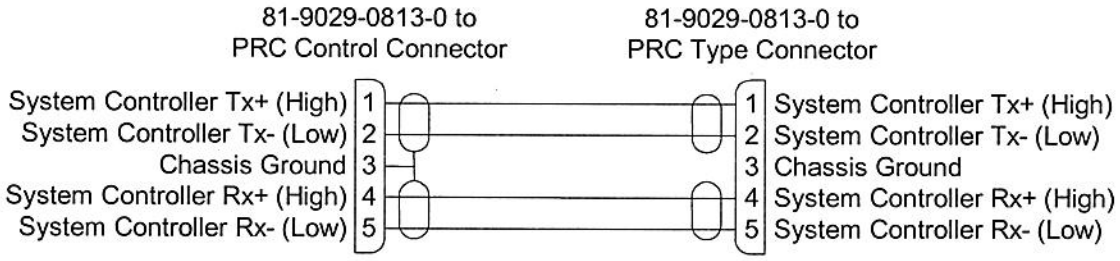


Figure 3-14 - RS-422 System Expansion Cable

3.9.5 RCP PANEL PORT CONNECTORS

There are four Remote Control Panel (RCP) Panel Port Connectors, located on the rear of the unit and illustrated in Figure 3-15. These connectors interface the 448CX frame with external remote system control panels via an RS-485 compliant serial communication interface using the PESA proprietary RCP Protocol defined by PESA Document No. 81-9062-0300-0. External remote control panels can be daisy-chained between one another and the 448CX frame. Any, or all, of the four connectors may be used to form up to four separate system control branches.

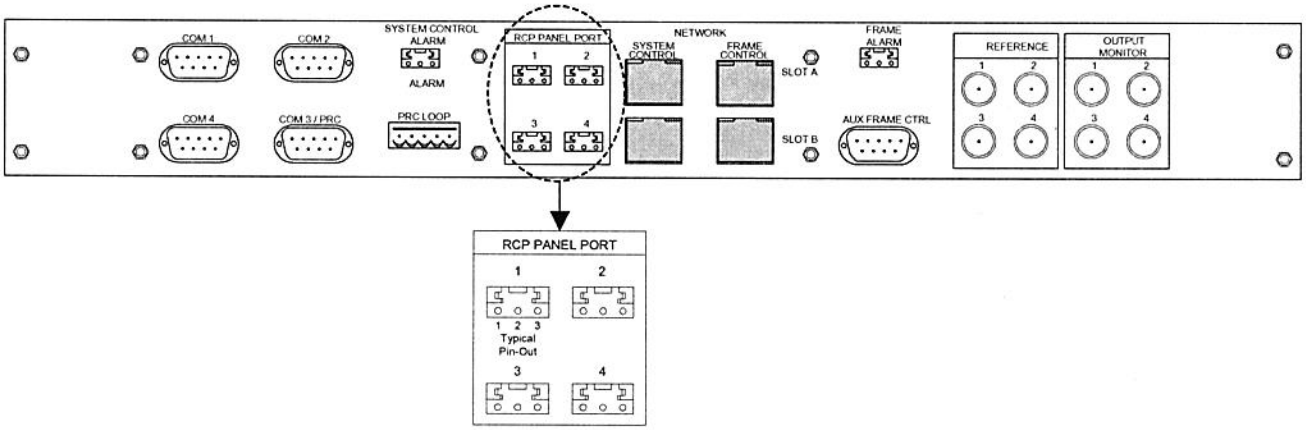


Figure 3-15 - RCP Panel Port Connectors

PESA Remote Control Panels are connected to the RCP Port Connectors in a daisy-chain fashion using cables constructed with RCP connectors (PESA Part No. 81-9029-0780-0) and shielded, twisted-pair cable (PESA Part No. 81-9028-0043-2, Belden 8451, or equivalent) as shown in Figure 3-16. The connector body has an integral strain relief requiring the use of a nylon cable tie, included with the connector. If additional cable ties are required, use PESA Part No. 81-9021-0028-8.

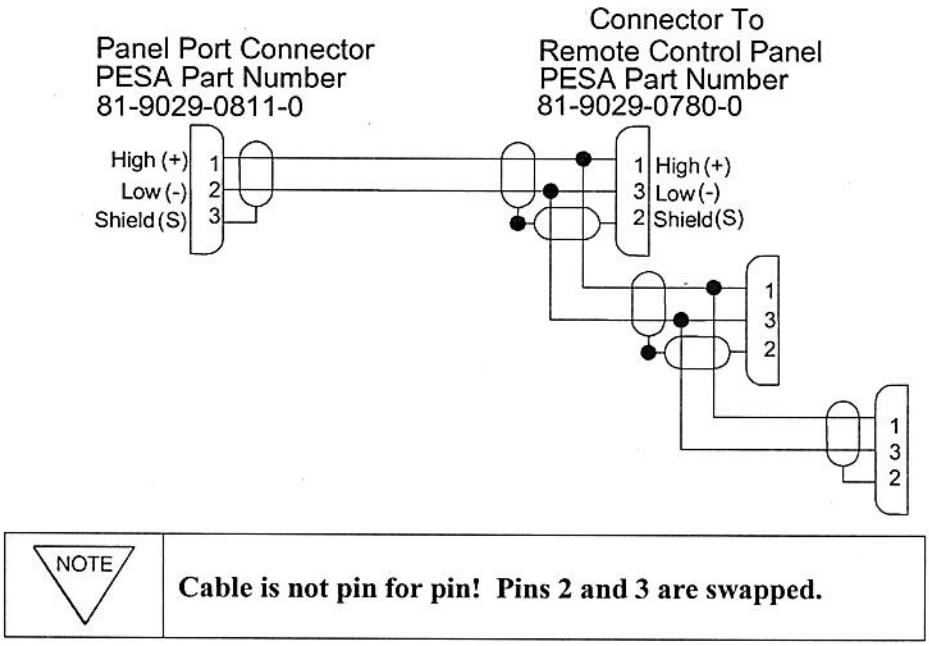


Figure 3-16 - RS-485 Cable Construction

3.9.6 NETWORK CONNECTORS

The rear panel RJ-45 Ethernet connectors, illustrated in Figure 3-17, interface the Matrix Frame Controller CCA(s) and the System Controller CCA(s) mounted in the 448CX chassis to external system components over a 10 or 100Mb/s TCP/IP network. You will notice there are two connectors for both Frame Control and System Control, one labeled Slot A and the other labeled Slot B. This nomenclature identifies which card is communicating through each connector. For example, the rear panel RJ-45 Connector labeled System Control, Slot A attaches to the system controller CCA installed in System Controller Slot A of the 448CX chassis, refer to Figure 3- 19. Likewise, the rear panel connector labeled Frame Control, Slot B attaches to the Frame Controller CCA installed in Frame Controller Slot B, etc. Note that two frame or system controller CCAs may not be present in all chassis. Two CCAs of each type are used in systems equipped for control system redundancy. In systems where only one frame or system controller CCA is used, ensure that the Ethernet cable is attached to the rear panel connector corresponding to the chassis slot in which the card is installed.

Every frame in a Cheetah routing system requires a frame controller and a system controller. The network connectors allow a control network to be installed between PESA components such that, for example, a system controller CCA installed in an 448CX frame may also communicate with and control frame controllers in other Cheetah Video Matrix routers or a DRS Audio Router. Likewise, using the Frame Control Ethernet Connectors allows the frame controller CCA in the 448CX chassis to communicate with a system controller CCA installed in another Cheetah router, or a stand-alone rack-mount System Controller Chassis.

Frame Control connectors allow communication with the frame controller CCA in the 448CX chassis and System Control connectors allow communication with the system controller CCA in the 448CX chassis.

Two LED indicators associated with each rear-panel connector provide a visual status of link activity. Refer to Figure 3-18 and Table 3-7.

All communication activities between frame controller and system controller CCAs and other external components of a control system follow the standard Ethernet protocol. Ethernet configuration options are discussed in Appendix A of this manual (TBS).

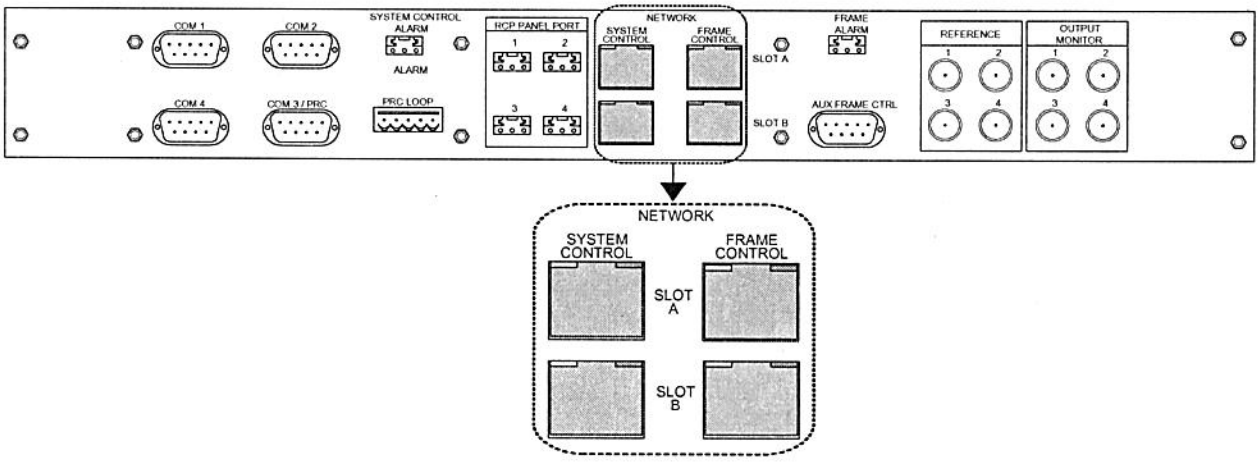


Figure 3-17 - Network Connectors

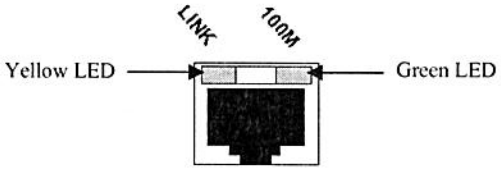


Figure 3-18 - Ethernet Connector

Table 3-7 - Ethernet LED Indicators

LNK	ON = Ethernet LINK established
100M	ON = The Ethernet connection speed is 100Mb/s OFF = The Ethernet connection speed is 10Mb/s

To connect the cards to the network, do the following:

1. Set the IP address, Subnet mask, Gateway address, and Trap address on Matrix Frame Controller to addresses approved by the Network Administrator.
2. Using a straight through RJ-45 Ethernet cable, connect the Ethernet jacks to a 10/100BASE-T hub or switch on the TCP/IP network.

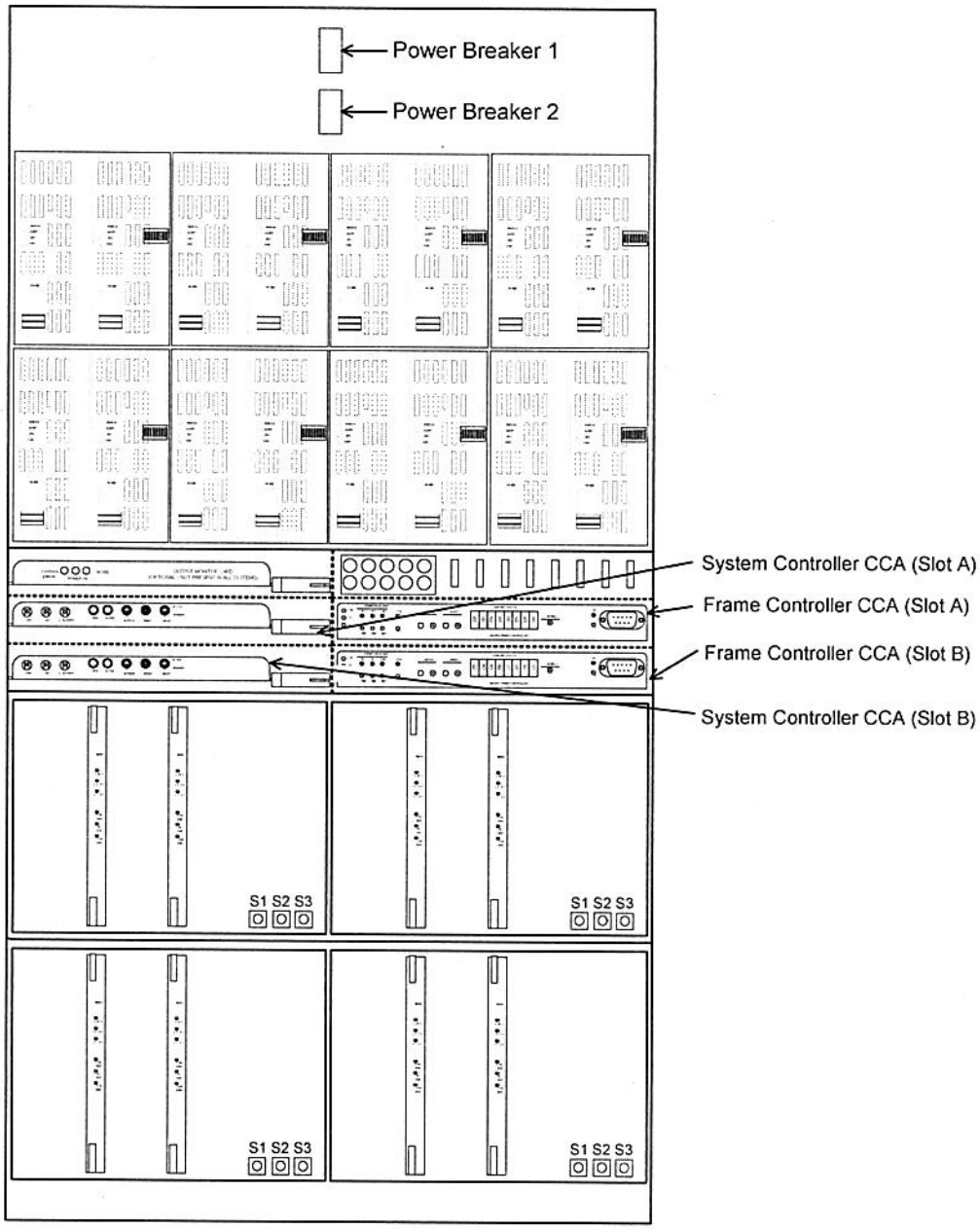


Figure 3-19 - Matrix Frame Controller and System Controller Card Locations, Slot A And Slot B

3.9.7 FRAME ALARM CONNECTOR

The three-pin Frame Alarm Connector, illustrated in Figure 3-20, provides an interface for an external, customer-supplied frame control alarm notification device. The Matrix Frame Controller determines when a frame alarm condition is declared. This circuit acts as a switch to trigger an optional external alarm device in the event of a controller fault or failure. The controller alarm circuit supplies an electronic contact closure, but does not provide a voltage to the external alarm. The customer-supplied external alarm circuit is connected with a cable constructed as shown in Figure 3-21.

CAUTION	**The Customer-supplied power input to this connector must not exceed 12VDC and the associated amperage must not exceed 10mA.**

NOTE	**Connections to connector terminals 1 and 3 are not polarity sensitive.**

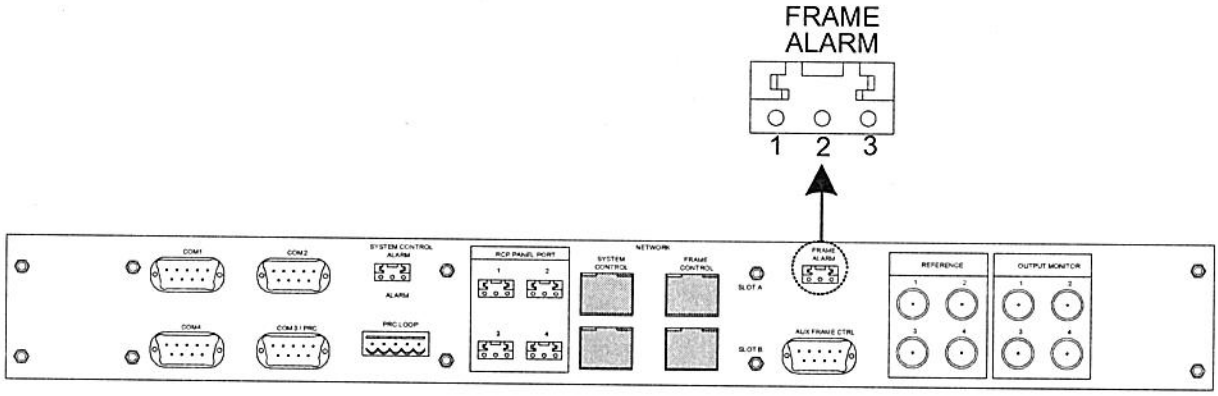


Figure 3-20 - Frame Alarm Connector

The alarm is activated if any of the following matrix frame controller conditions exist:

- Finds a card (input, output, matrix, output monitor, power supply, or matrix frame controller) with a temperature out of range (above 114 °F)
- Finds a fan's voltage out of range
- Finds a power supply's voltage or current out of range

The voltage or current must be out of range for three consecutive status poll events before the Matrix Frame Controller will indicate an alarm.

CAUTION	**The Customer-supplied alarm circuit voltage to this connector must not exceed 12VDC or 10mA.**

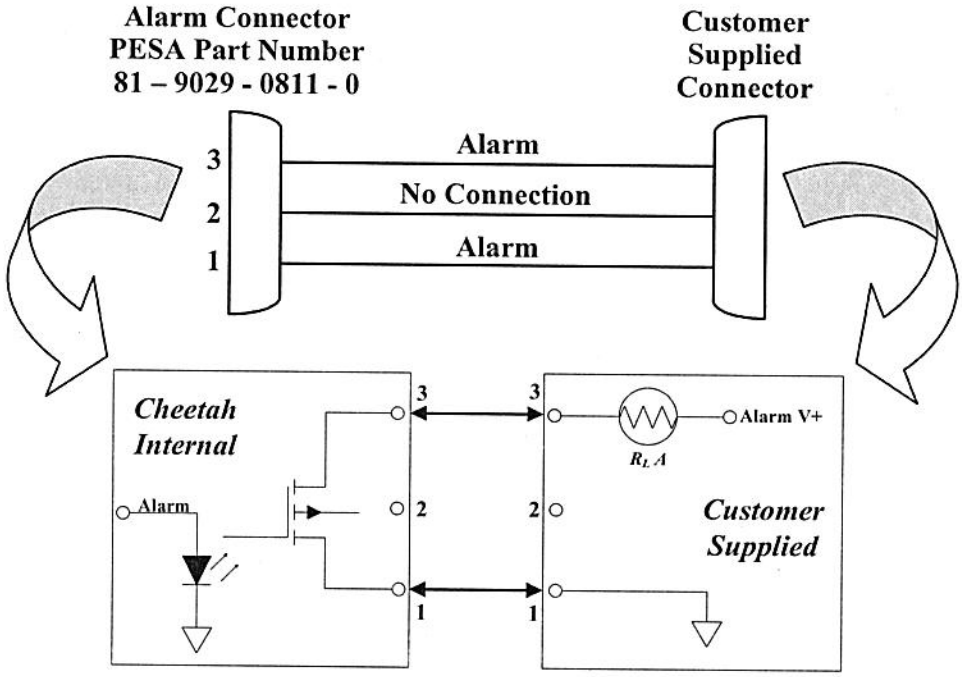


Figure 3-21 - Frame Control Alarm Cable Connection and Circuit Schematic

3.9.8 AUXILIARY FRAME CONTROL CONNECTOR

The Auxiliary Frame Control Connector (see Figure 3-22 and refer to Table 3-8) is used for Simple Network Management Protocol (SNMP) management of additional Cheetah switchers. Configuration and operation of the embedded SNMP agent is detailed in Appendix B of this manual (TBS).

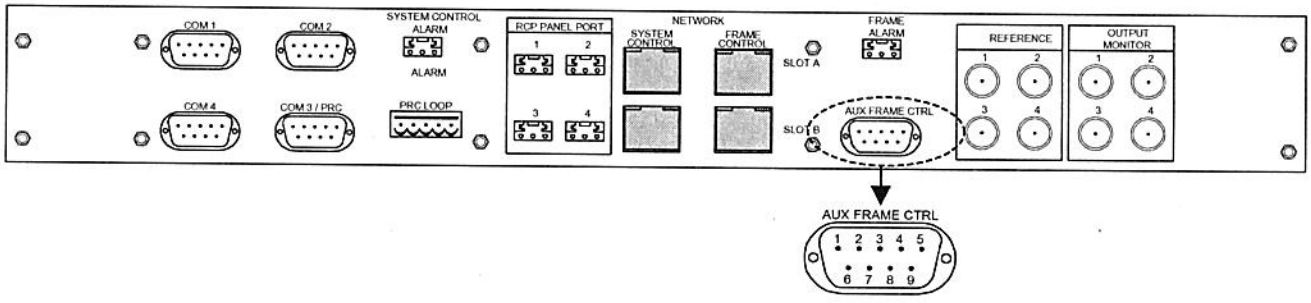


Figure 3-22 - Auxiliary Frame Control Connector

Table 3-8 - Auxiliary Frame Control Pin Assignments

Pin	Signal	In/Out
1	CTS+	Input
2	RX+	Input
3	TX-	Output
4	RTS-	Output
5	Ground	---
6	CTS-	Input
7	RX-	Input
8	TX+	Output
9	RTS+	Output

3.9.9 HOUSE SYNCHRONIZATION INPUT CONNECTORS

Two pair of loop-thru BNC coaxial connectors, illustrated in Figure 3-23, provide interface for two, sources of house synchronization signals (Analog Only - i.e. NTSC, PAL, 1080i, 1080P, and 720P). Each house sync input is a pair of BNC connectors wired in parallel (1 and 3 are a pair; 2 and 4 are a pair) allowing the external synchronization signal to be daisy-chained through the 448CX frame.

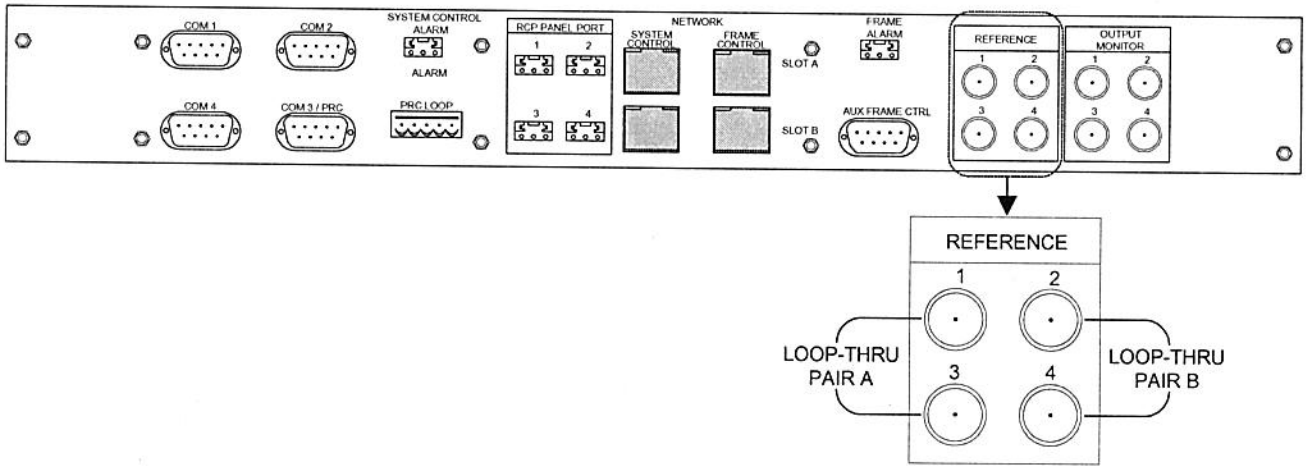


Figure 3-23 - House Sync Input Connectors

Using the system control software, such as PERC2000, the user can assign a specific reference signal for the system or individual chassis that is used as a synchronization signal for specific output synchronized switching. Once the output has been switched, the output signal remains synchronized to the initial reference assignment until it is switched again with a new reference assignment. An example of a sync assignment would be as follows:

Reference 1 is connected to an NTSC sync signal source and Reference 2 is connected to a PAL sync signal source. Using control system software the user assigns Reference 1 to outputs 6 through 10 and Reference 2 to outputs 11 through 16 for a specific chassis.

Reference connections 1 and 2 should be connected to the house sync source with coaxial cable and standard BNC connectors.

CAUTION	**Install 75Ω terminators on all unused connectors. Do not allow these connectors to float un-terminated.**

3.9.10 OUTPUT MONITOR CONNECTORS

These BNC coaxial connectors, illustrated in Figure 3-24, provide the interface for the output signal monitoring. Currently, connectors 1 and 2 are available. Connectors 3 and 4 are reserved for future use. You will generally use these for quality assurance or troubleshooting. For example, you would use these to monitor the quality of a specific output signal. You control the outputs you can monitor with the Control System software. Make sure the Output strobe is set correctly before using this option. Install 75Ω terminators on all unused connectors. Do not allow these connectors to float un-terminated

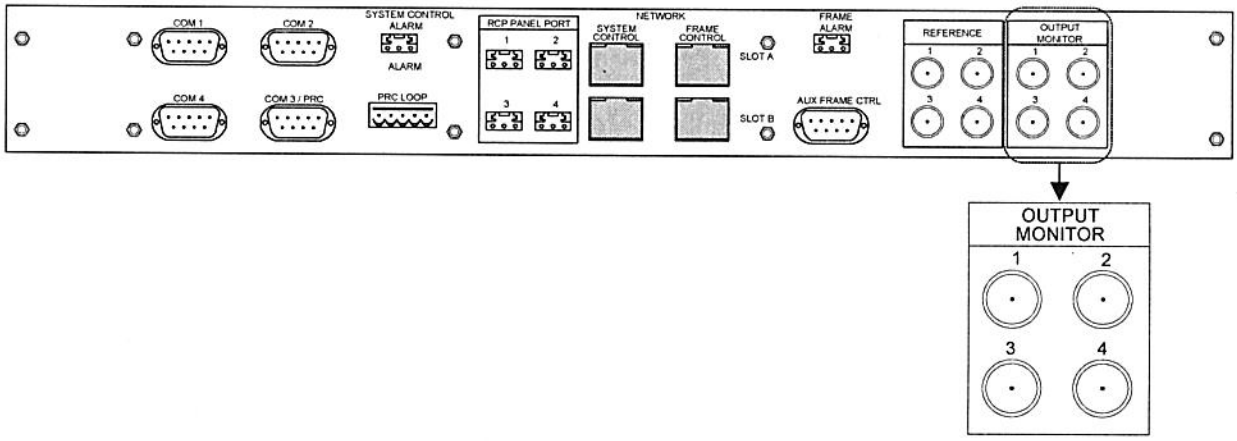


Figure 3-24 Output Monitor Connectors

Chapter 4: Frame And Control Verification

This section addresses the system components, frame, and control verification sequences that should be performed prior to energizing the system and placing the system in service. Attention to this section will minimize system startup and in-service malfunctions.

4.1 SYSTEM PRE-START VERIFICATION CHECKLIST

A system pre-start verification checklist includes a visual inspection to account for basic setup functions that, if incorrect, could result in immediate system startup malfunctions. The following basic checks should be performed prior to energizing any Cheetah chassis:

1) Verify main power source is OFF (de-energized).
2) Verify chassis breakers are in the OFF position.
3) Verify all cards/modules are latched and secure.
4) Verify all blank covers are in place and secure (no open slots in the frame).
5) Verify power cables are properly connected to primary power distribution system.
6) Inspect for unusual items such as loose wiring, frayed cabling, loose connections or components, and missing cards/modules (basically, check for anything that seems out of place or could present a problem).
7) Proceed to System Startup.

4.2 SYSTEM STARTUP

Perform the system startup sequence as follows:

1) Energize main power source to chassis.
2) Place both chassis breakers in the ON position (handles should be in the UP position).

   There is a 30 to 45 second delay prior to the system energizing frame components. Following this delay period the system will energize and the circuit cards and modules will perform initial self-diagnostics.

3) Verify the following LED conditions:

	**Should any status LED indicate an error on the card or module, perform troubleshooting sequences to correct the problem(s) prior to placing the system in service.**

   a. Observe each Power Supply module and verify the Power OK LED is illuminated (green)
   b. Observe each Matrix CCA and verify status of the following LEDs:

- +28 V (green)
- +2.5 V (green)
- +1.2 V (green)

c. Observe the Matrix Frame Controller CCAs and verify status of the following LEDs and the LED display (single or dual CCAs):

- Single CCAs: the Control Status display indicates - ØSNGL OK (red)
- Dual CCAs: the Control Status display of the active module indicates – Active OK while the other module indicates Standby.
- Active (green – illuminated on single and Active modules only)
- +28 (green)
- +5 (green)
- +3 (green)

d. On each of the Input and Output modules, the Power LED is illuminated (green).

At the end of this sequence, there should be no LED indicators that are blinking or any red LEDs illuminated on any of the I/O and Matrix modules/cards. If so, perform troubleshooting to correct the status before proceeding to the next section.

4.3 FRAME CONTROL VERIFICATION

4.3.1 FRAME CONTROL VERIFICATION OVERVIEW

Frame control verification is performed to verify proper operation of chassis components and isolate abnormalities prior to connecting peripheral equipment to the system. This verification sequence is performed using the ViewPort Diagnostic Software, supplied with your Cheetah 448CX Frame. The graphic user interface (GUI) provided by ViewPort provides a logical, straight-forward diagnostic tool for the user that communicates directly with the chassis Matrix Frame Controller (MFC). The following equipment/documentation is required:

- A Windows based PC loaded with PESA's ViewPort software.
- A null-modem serial cable (length determined by distance the PC will be from the chassis)
- ViewPort Technical Manual (P/N 81-9059-0558-0)
- Packing list or other specification sheet that accompanied shipment of the 448CX chassis.

4.3.2 FRAME STROBE SETTING VERIFICATION

While referring to the appropriate Chapter for the frame that is being verified, document and archive the frame's present strobe settings as follows: Using Figure 5-?? as a reference, locate the chassis strobe rotary switches. Verify that the switches are in the positions indicated by Figure 5-??. These switches are set at the factory and should never need to be changed. Proper setting of these switches is absolutely critical for proper operation of the video matrix.

4.3.3 FRAME CONTROL VERIFICATION PROCEDURE

Perform the following sequence:

1) If not already completed, perform the chassis pre-start verification checks and startup sequences as outlined in Paragraphs 4-1 and 4-2 of this manual.
2) Open the access door to gain access to the front of the 448CX chassis components.
3) With the chassis energized (ON), refer to Figure 4-1 and carefully connect the null-modem serial cable to the DB-9 serial connection port located on the Frame Controller card and the serial port of the PC running the ViewPort software.

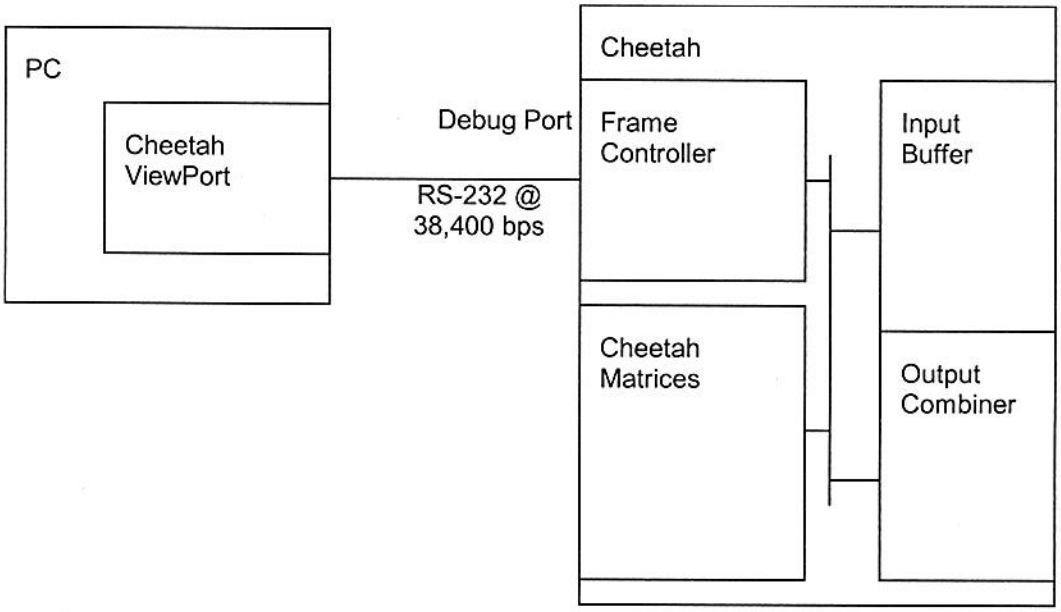


Figure 4-1 - PC to Frame Controller Connection

CAUTION	**If there are any errors noted while performing the following steps, perform troubleshooting sequences to correct the problem(s) prior to proceeding to the next step.**

4) Refer to the ViewPort Software Technical Manual as needed when performing the following steps.

5) Access the ViewPort software program from the computer and establish communication with the Frame Controller card: the RX and TX LEDs on the circuit card will be flashing green and yellow, respectfully.

6) Using the ViewPort software GUI and referring to the packing list/specification sheet, verify the following:

CAUTION	**Occasionally, there may be recorded errors during the initial startup sequence. However, they typically can easily be reset when the clear function is initiated.**

a) Under the Cheetah directory, click on Frame Controller Status. Verify there are no alarms and the MFC configuration (single or dual) is correct as per your specification.

b) Under the Cheetah directory, click on Inputs. Verify there are no errors and the input module (card) configuration is correct as per your specification.

c) Under the Cheetah directory, click on Outputs. Verify there are no errors and the output module (card) configuration is correct as per your specification.

d) Under the Cheetah directory, click on Matrices. Verify there are no errors and the matrix module (card) configuration is correct as per your specification.

e) Under the Cheetah directory, click on Power Supplies. Verify there are no errors and the power supply module configuration is correct as per your specification.

f) Under the Cheetah directory, click on Output Monitor. Verify the output monitor module (card) configuration is correct as per your specification. For each module, verify the Power Status conditions are green and no other errors are present.

g) Under the Cheetah directory, click on Communications Summary. (This display window is used as an overview of all system components.) Verify the status for each component (4) is indicating green and there are no errors being displayed.

7) Frame Control Verification is complete. Exit the ViewPort program and disconnect the serial cable from the PC and MFC. If your system includes the 3500 Series controller module(s), proceed to System Control, Section 10.4.

Chapter 5: Reference Data

5.1 REFERENCE DATA INTRODUCTION

In the following paragraphs you will find information that will prove useful in the event that system maintenance or repair should ever be required. Included are a diagram (Figure 5-1) showing the input and output channel assignments of the eight matrix crosspoint CCAs, plus setting information for all DIP and rotary switches used to configure the switcher.

5.2 DIP SWITCH/ROTARY SWITCH SETTINGS FOR THE 448CX FRAME

There are numerous switches used in configuring the 448CX Frame for any particular input/output matrix combination. Switch settings define the operational parameters for the various CCAs and modules used in the switcher and assign the "personality" to each group of backplanes and their associated CCAs. Using the switch configuration scheme prevents any "card specific" functions, settings or jumpers and allows any input, output, or matrix CCA or power supply module to be "hot swapped" on the fly with any other card or module, of the same type. These switches are all preset at the factory and should never need any maintenance or adjustment. This information is provided as a reference so that in the event any switch setting should inadvertently be changed, it can be restored to its correct setting.

Switches are of two type: rotary or DIP. A small screwdriver can be used to make adjustments to the rotary switches. The tip of a small screwdriver or other small pointed object may be used to select the ON or OFF position of the DIP switches. Please note that the DIP switches are very small and each switch section is very delicate and can easily be damaged. Use extreme care if it is ever necessary to change the position of any section of the DIP switches.

The following paragraphs discuss the configuration switch settings listed below:

- Chassis Level Codes (Strobes) Rotary Switch Settings (Paragraph 5.2.1)
- Chassis Power Supply Backplane DIP Switch Settings (Paragraph 5.2.2)
- Chassis Input/Output Backplane DIP Switch Settings (Paragraph 5.2.3)
- Chassis Matrix Backplane Rotary Switch Settings (Paragraph 5.2.4)

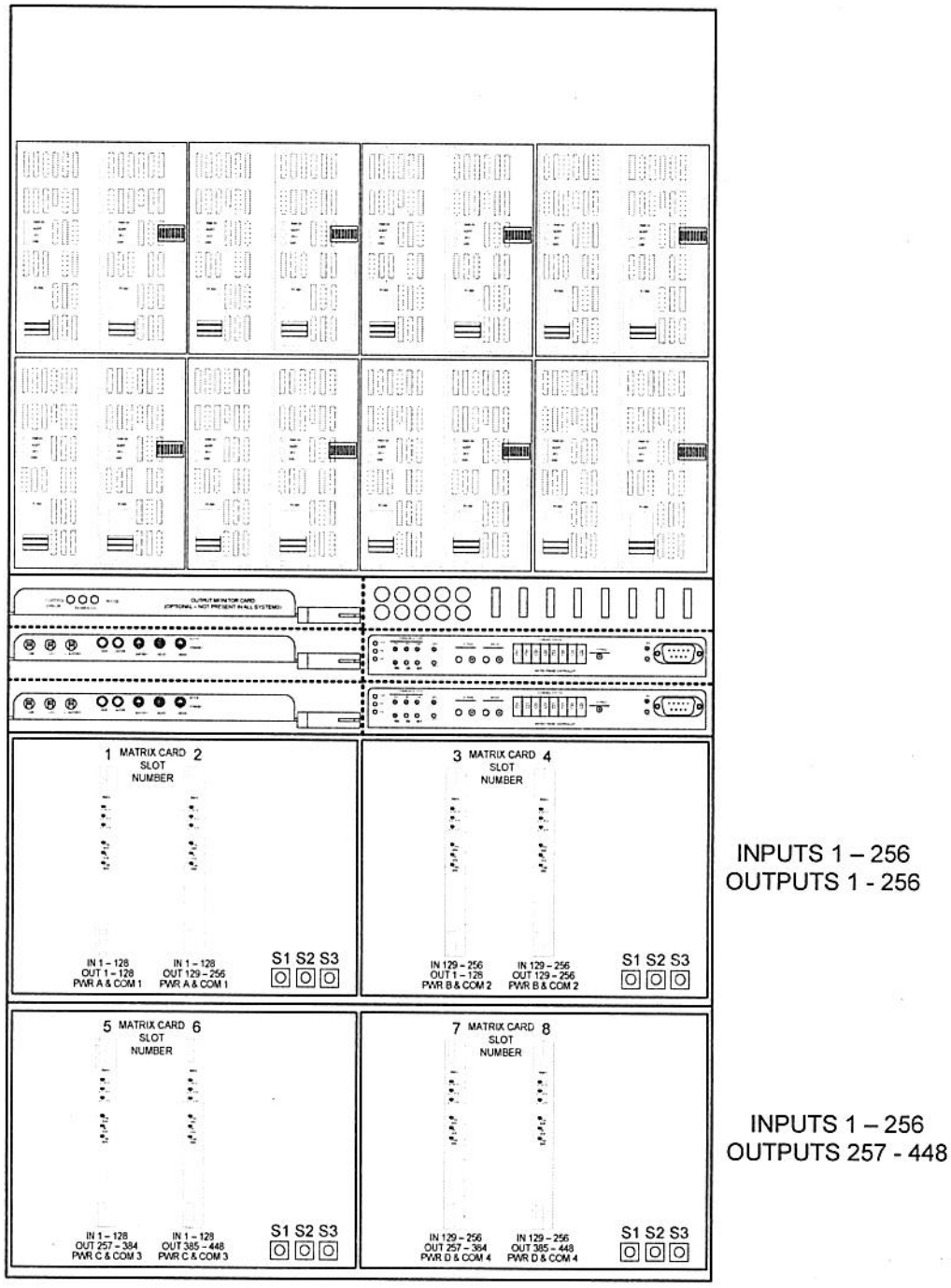


Figure 5-1 - Matrix Crosspoint CCA I/O Channel Assignments

5.2.1 CHASSIS LEVEL CODES (STROBES) ROTARY SWITCH SETTINGS

Chassis Level Codes (Strobes) assign operational parameters to the switcher frame. There are ten rotary switches, located just above the frame controller card(s), used to set the chassis level code and other frame operational characteristics. Proper setting positions for these ten switches are shown in Figure 5-2.

5.2.2 CHASSIS POWER SUPPLY BACKPLANE DIP SWITCH SETTINGS

Each Power Supply Backplane provides slots for up to two power supply modules. Located on the right side of each backplane is an eight position DIP switch used to assign identity data to the power supply module(s) installed on the backplane. Removing the power supply module installed on the right-hand side of the backplane allows access to this DIP switch. Proper setting positions for each switch section in the DIP package are shown in Figure 5-3. In this figure, the power supply modules are shown in dotted lines in order for the switch locations to be visible.

5.2.3 CHASSIS INPUT/OUTPUT CCA BACKPLANE DIP SWITCH SETTINGS

Each Input/Output CCA Backplane provides slots for up to four input or output CCAs. An eight-position DIP switch, located on the lower right-hand side of each backplane, assigns a unique identity to each backplane card. Among other functions, this switch setting allows the controller circuitry to assign the input or output channel number range to each I/O CCA – thus allowing any I/O card on the rear panel to be "hot swapped" with a card of like type. Proper setting positions for each switch section in the DIP package are shown in Figure 5-4. I/O CCAs must be removed from the backplane to gain access to the DIP switch. Figure 5-4 illustrates switch location and card slots on the backplanes with no I/O CCAs installed.

5.2.4 CHASSIS MATRIX BACKPLANE ROTARY SWITCH SETTINGS

Each Matrix CCA Backplane provides slots for up to four matrix crosspoint CCAs. There are six rotary switches located along the bottom edge of each backplane. Settings of these switches assign a unique identity to each matrix backplane and the set of matrix CCAs installed in it. These settings allow the controller circuitry to assign the input and output channel number range to each matrix backplane and each matrix CCA. Figure 5-5 shows the location of each of the six switches on each backplane board. The matrix card image used in this figure is smaller than actual size to allow the backplane components to be shown. Setting positions for each switch are provided in Table 5-1 and listed by individual backplane boards.

Switch	*Description*	*Setting*
S1	Level (MSB – Most Significant Bit)	According to Customer Configuration
S2	Level (LSB – Least Significant Bit)	
S3	Output (MSB)	
S4	Output (LSB)	
S5	Input (MSB)	
S6	Input (LSB)	
S7*	Frame (MSB)	0
S8*	Frame (LSB)	F
S9	Network (Fan Setting)	0
S10	Output Monitor	Customer Configuration

*NOTE: The setting of Switches S7 and S8 assign the "frame type" parameter to the switcher. In this configuration, the frame is a "Type 15."

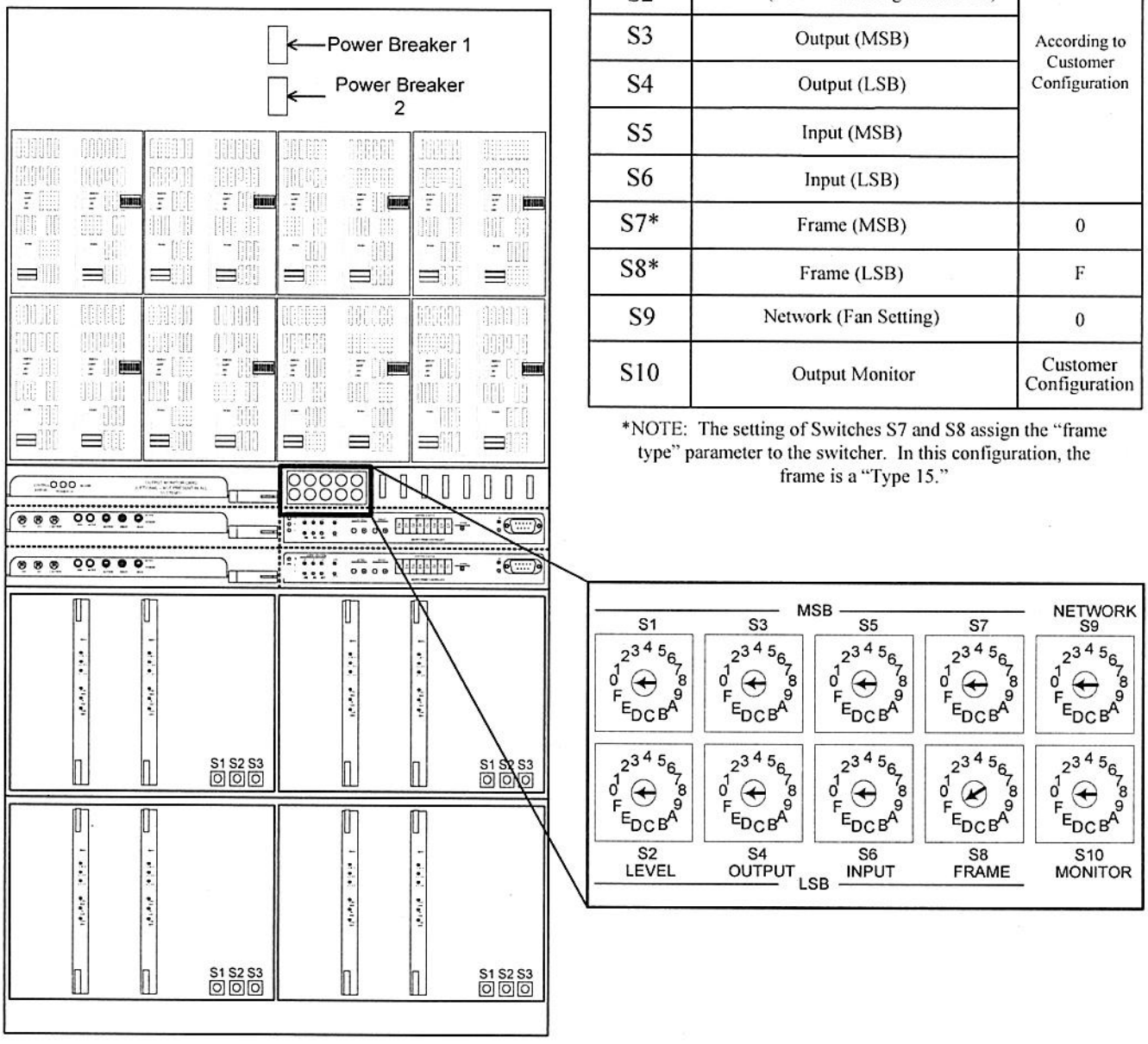


Figure 5-2 – 448CX Chassis And Level Code Switch Settings

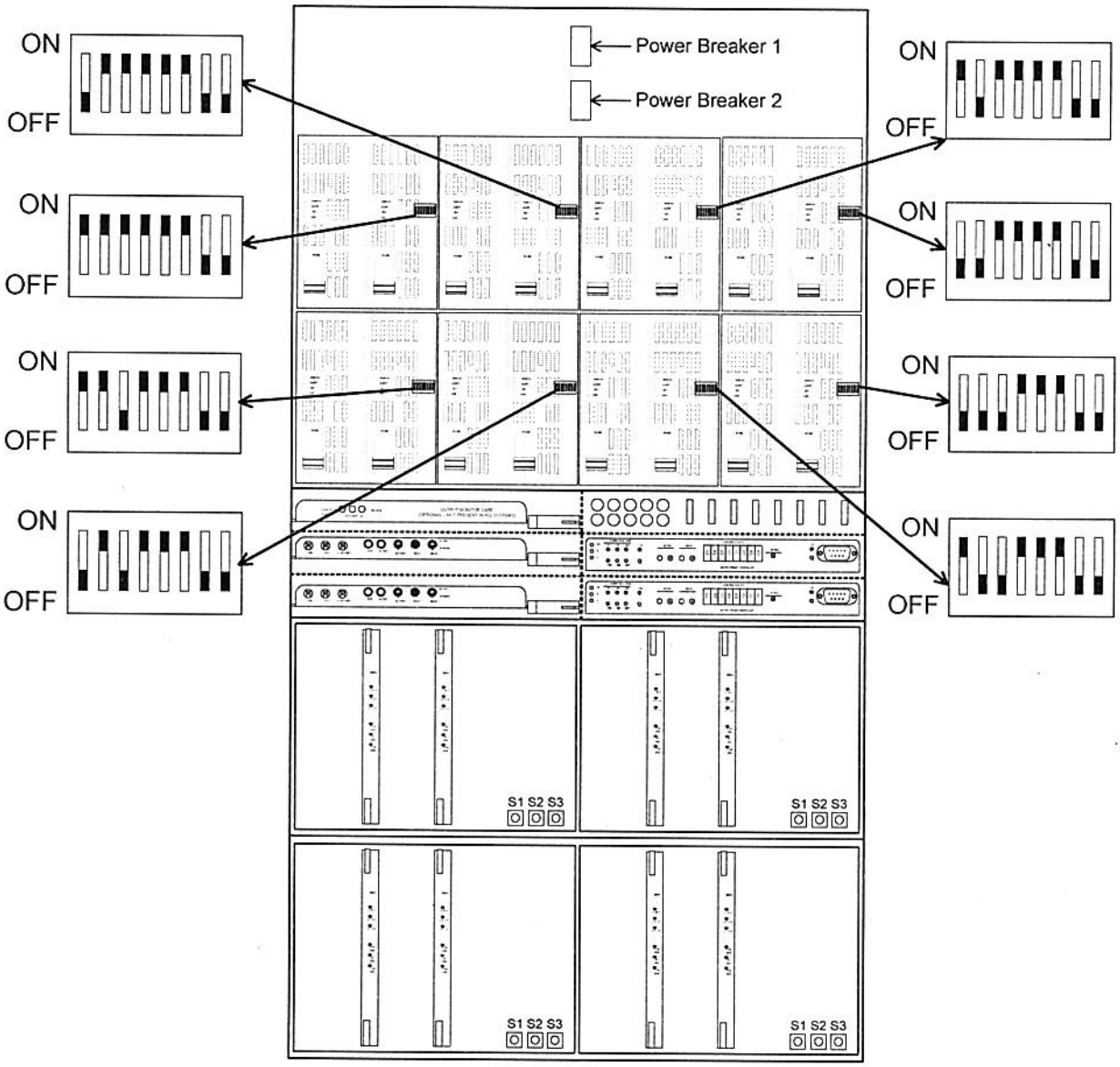


Figure 5-3 – 448CX Power Supply Backplane DIP Switch Locations And Settings

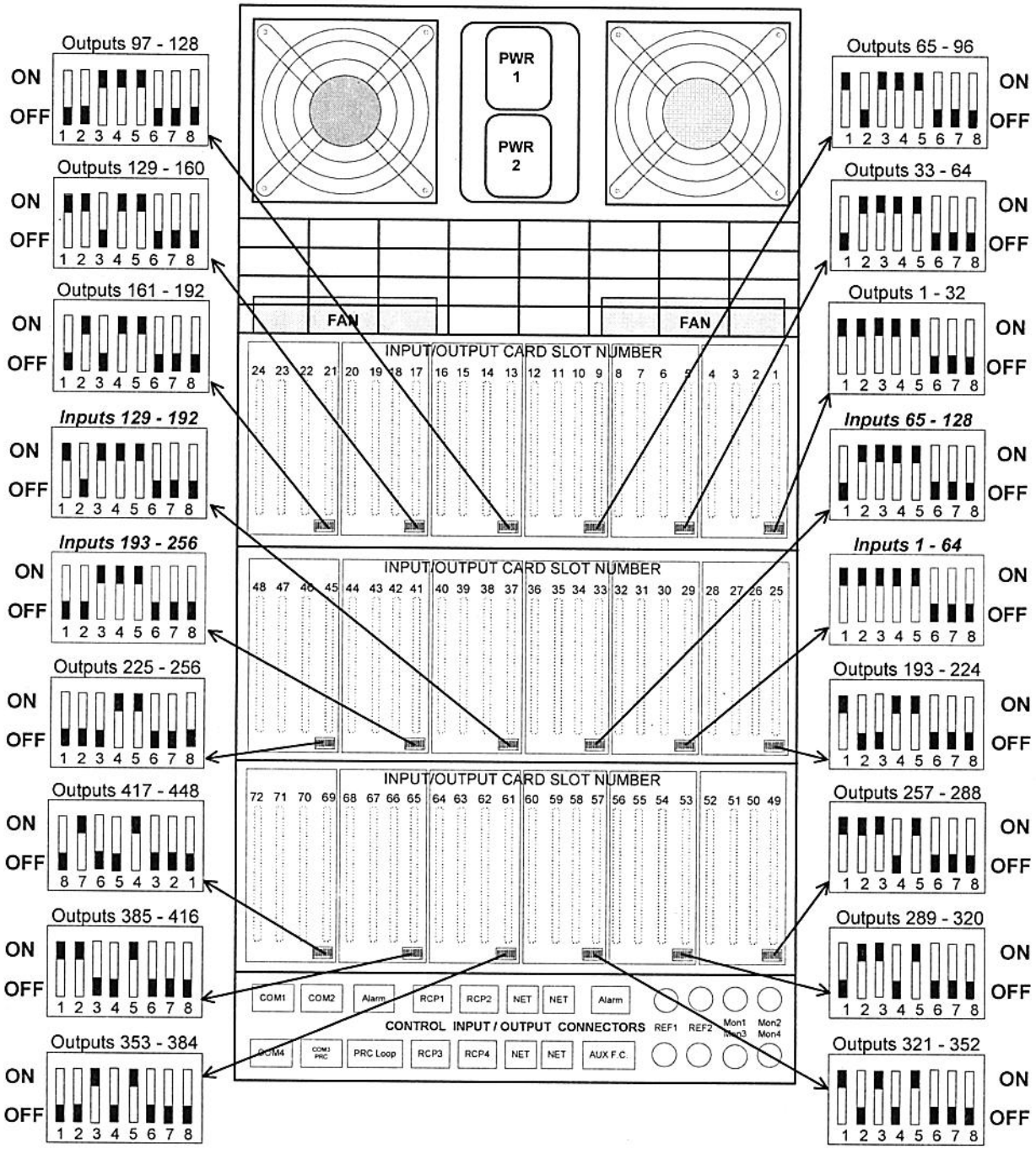


Figure 5-4 - Input/Output Backplane DIP Switch Settings

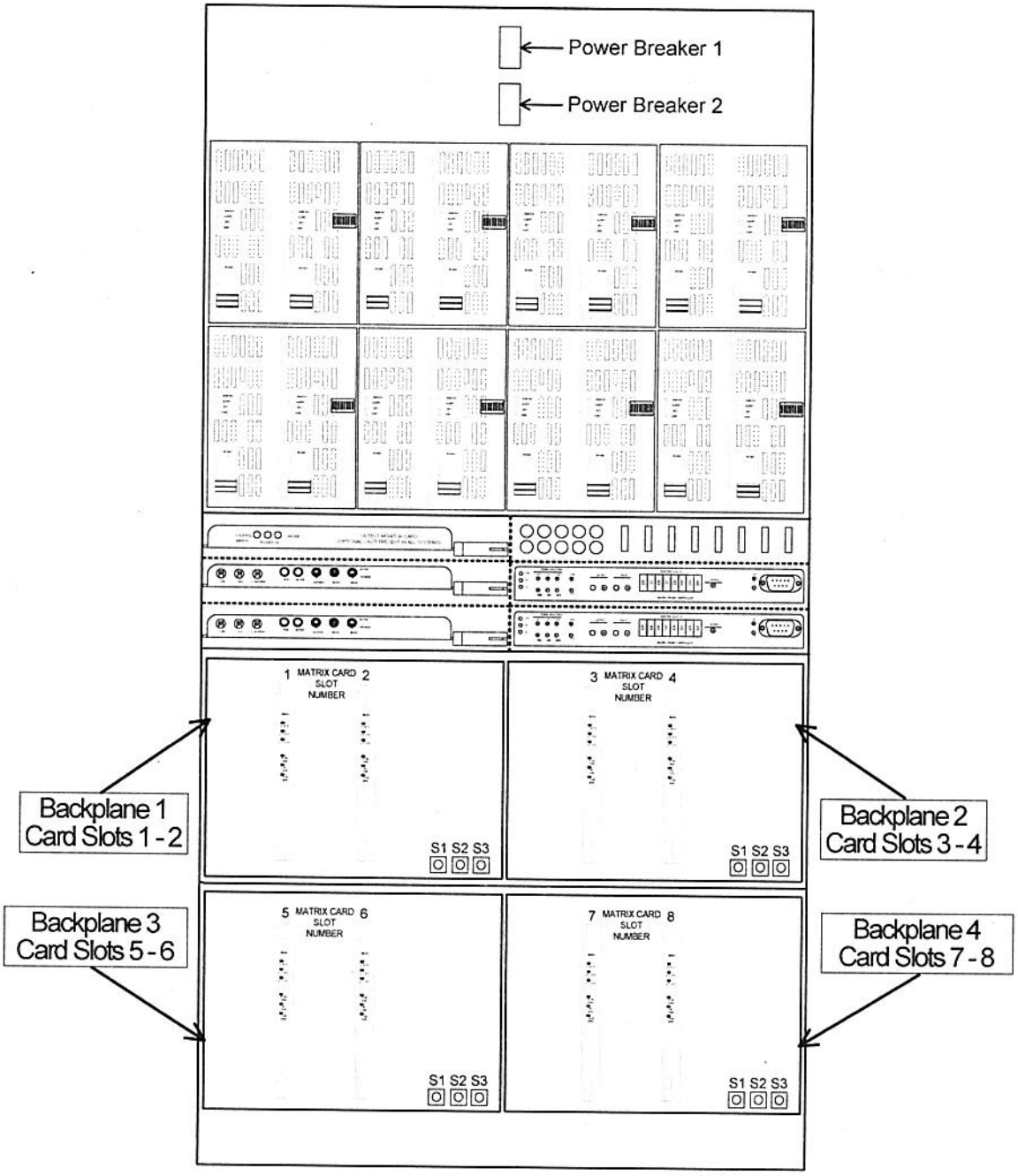


Figure 5-5 - Matrix Backplane Rotary Switch Locations

Table 5-1 - Matrix Backplane Rotary Switch Settings

MATRIX BACKPLANE 1 CARD SLOTS 1 - 2		
Switch	***Setting***	***I/O***
S1	0	Outputs: 1 – 128
S2	0	Inputs: 1 – 128
S3	1	Outputs: 129 – 256

MATRIX BACKPLANE 2 CARD SLOTS 3 - 4		
Switch	***Setting***	***I/O***
S1	0	Outputs: 1 – 128
S2	1	Inputs: 129 256
S3	1	Outputs: 129 – 256

MATRIX BACKPLANE 3 CARD SLOTS 5 - 6		
Switch	***Setting***	***I/O***
S1	2	Outputs: 257 - 384
S2	0	Inputs: 1 – 128
S3	3	Outputs: 385 – 448

MATRIX BACKPLANE 4 CARD SLOTS 7 - 8		
Switch	***Setting***	***I/O***
S1	2	Outputs: 257 - 384
S2	1	Inputs: 129 – 256
S3	3	Outputs: 385 – 448