USER GUIDE

CHEETAH 64NEX
3G COMPATIBLE DIGITAL VIDEO MATRIX SWITCHER

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Thank You !! for purchasing your new Video Routing Equipment from PESA. 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 PESA; and we look forward to a long-term partnership with you and your facility.

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Chapter 1 ABOUT THIS MANUAL

1.1 DOCUMENTATION AND SAFETY OVERVIEW

This manual provides information for the installation and maintenance of PESA's Cheetah 64NEX Video Routing Switcher.

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.***

Additionally, internal access to the frame compartments of the equipment that is described in this manual is restricted to qualified service personnel only.

1.2 WARNINGS, CAUTIONS, AND NOTES

Throughout this document, you should pay attention to various Warnings, Cautions, and Notes. These addendum statements supply necessary information pertaining to the text or topic they address. It is important that you read and understand the statements to avoid possible loss of life, personal injury, and/or destruction/damage to the equipment. These additional statements may also provide added information that could enhance the operating characteristics of the equipment (i.e., Notes). Examples of the graphic symbol used to identify each type of statement and the nature of the statement content are shown in the following paragraphs:

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 PRODUCT OVERVIEW

PESA's Cheetah 64NEX Router is a high performance, modular switch system for either ProAV or Broadcast HD-SDI and 3G-SDI applications, and fully supports SMPTE 259M, 292M, 372M and 424M standards. It's expandable in sizes from 16X16 up to 64X64 in a 4RU frame that supports redundant power, control, and a hot-swappable crosspoint matrix. I/O cards allow easy expansion in groups of 16 inputs or 16 outputs per card.

The Cheetah 64NEX is a modular design featuring four rear-panel slots for input buffer cards and four slots for output combiner cards. Input or output cards support up to 16 video connections, and are available with standard BNC connectors or SFP fiber optic modules.

With its small 4RU footprint, the Cheetah 64NEX Router can be configured as a partially loaded frame allowing for easy future field expansion. The system's integrated Matrix Frame Controller monitors the health of the unit and automatically recognizes any new I/O cards. Once the cards are installed, the router can be easily configured with PESA's PERC 2000 System Controller software. The Cheetah 64NEX router can be controlled from the PESA control system or by a third-party control system such as Crestron® or AMX®.

2.1.1 Cheetah 64NEX Standard Features

- Compact 4RU chassis
- Full feature control system using either standard PESA PRC Control or PESA Network Control (PERC2000)
- Video signals from 143Mb/s to 3Gb/s
- BNC and fiber optic Input and Output cards are available
- Supported signal types:
  - HD Multirate from 143Mbs up to 3Gbs
  - ASI, SDI. HD-SDI. 3G-SDI
- Compatible with SMPTE 259M, 292M, 372M and 424M broadcast standards
- Support for SNMP monitoring and diagnostics
- Full redundant controllers available
- All modules are hot-swappable for on-air maintenance

Chapter 3 CHASSIS VIEWS AND SPECIFICATIONS

This chapter pictorially displays internal component layout of the switcher, identifies input and output connections, and lists system specifications.

3.1 CHEETAH 64NEX FRAME VIEWS

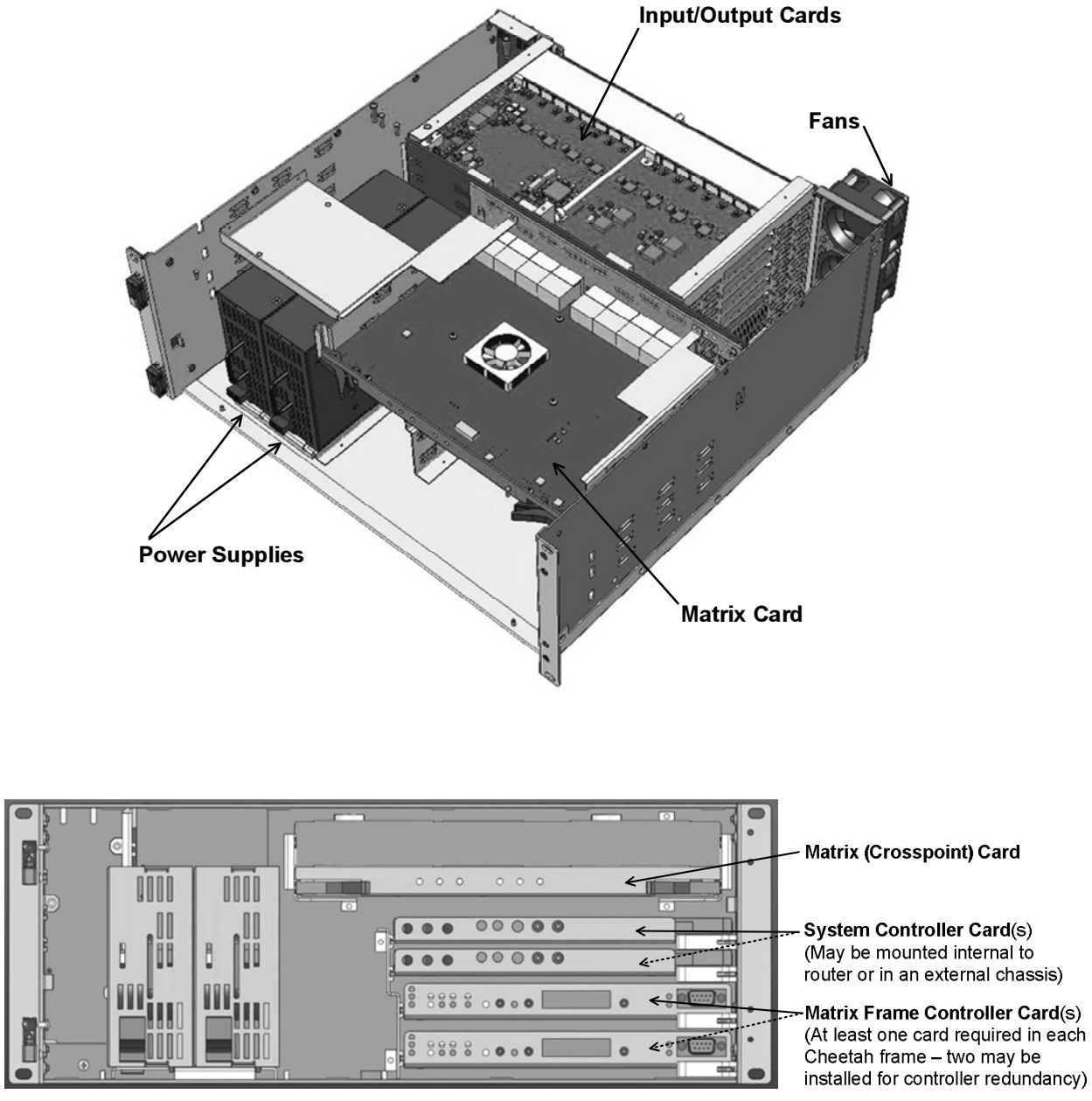


FIGURE 3-1 Cheetah 64NEX Front Views

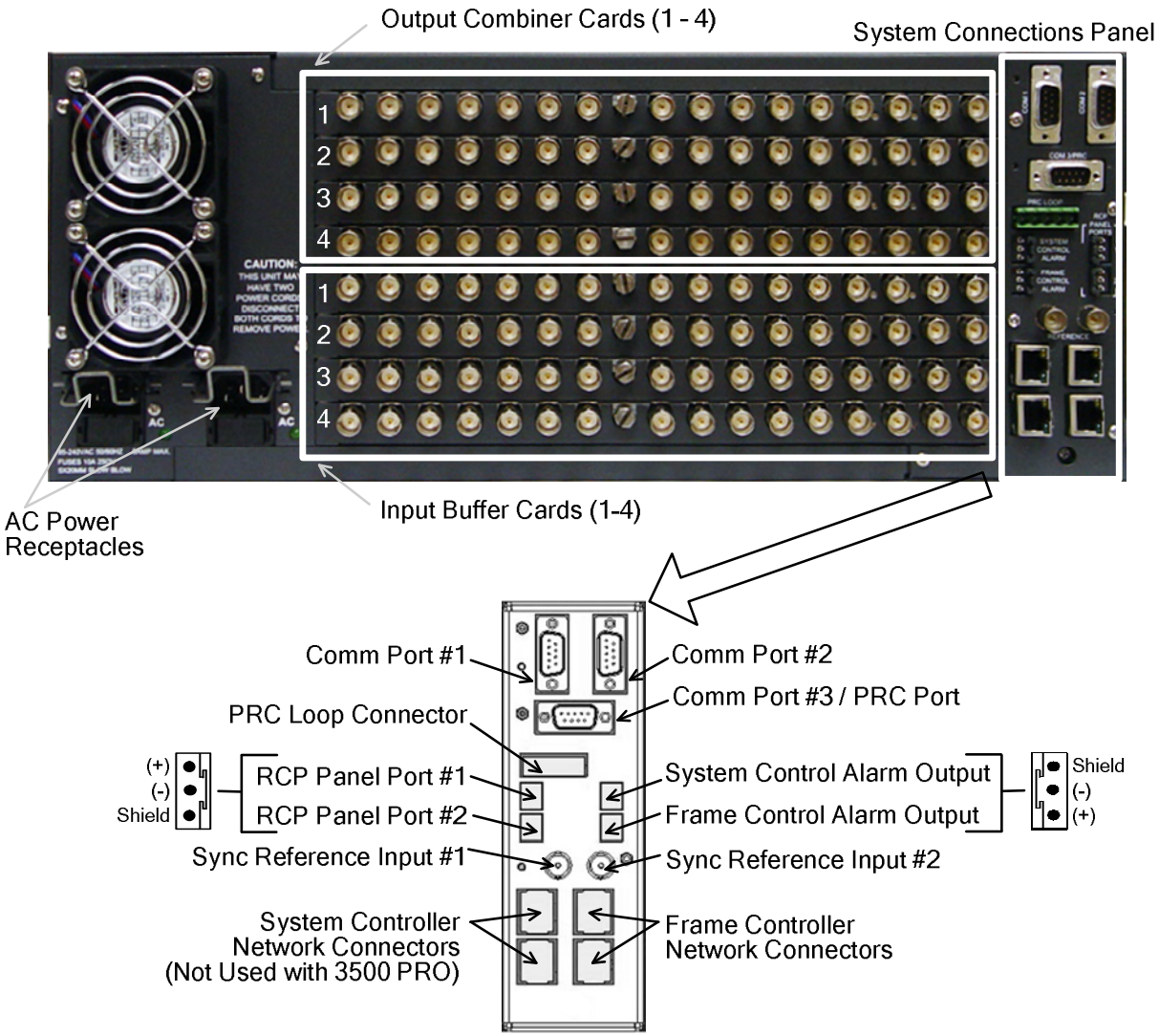


FIGURE 3-2 Cheetah 64NEX Rear View

3.2 SPECIFICATIONS

Digital Specifications

Inputs / Outputs for Coax

Connector Type	BNC - 75Ohm
Return Loss	>15dB from 5Mhz to 1.5Ghz
	>10dB, 1.5Ghz to 3GHz
Input cable equalization	SMPTE 259M - 300m
	SMPTE 292M - 100m
	SMPTE 424M - 80m
	Based on Belden 1694a or equal
Output Signal Level	800mV, p-p, +/-10%
Output Signal Polarity	Non-inverted

Inputs/Outputs for Fiber

Connector Type pluggable)	Dual Optical SFP (small form factor
	Compliance with ITU-T G.957
Connector Style	LC
Input Data Rates	143 Mbps to 1.5Gbps - ASI/SD/HD
	143 Mbps to 3.0Gbps - SD/HD/3G
Optical Input wavelength	Singlemode (1310 optimal)
Input Power	-20dBm (min)
	-1dBm (max)
Output Data Rates	143 Mbps to 3.0Gbps
	Auto reclocking to SMPTE 259M, 292M
	424M. Bypass mode - 143Mb to 3Gbps
Output Power	-9dBm (min)
	-3dBm (max)
Optical Loss Budget	Approx. 9dB
	assumes two optical connections over
	a 10Km singlemode fiber
Jitter	< 0.2UI, p-p, SMPTE 259M, 292M
	<0.3UI, p-p, SMPTE 424M
	compliant with RP-184
Fiber Transmission Specifications	IEC 61754-20-1
Typical Operating Distances	9/125u (10Km / 6.25 miles)
	50/125u (400m / 1200 feet)
	62.5/125u (200m / 600feet)

NOTE

Operating distances are approximate only. Cable loss and other interconnects can affect the total light loss between a TX and RX path. These are only estimates and may not reflect the actual lengths achievable.

Digital Signal Performance

Inputs / Outputs for Coax

Re-clocking	Auto-detect compliant with SMPTE 259M, 292M, 424M
Rise/Fall Time	< 600 ps, +/- 10% | SMPTE 259M < 270 ps, | SMPTE 292M < 135ps, | SMPTE 424M
Overshoot	< 10% of amplitude (max.)
Alignment Jitter	< 0.2UI , 100kHz to 150MHz < 0.3UI, 150MHz to 300MHz
Timing Jitter	<1.0UI from 10Hz to 100kHz | SMPTE 259/292 < 2.0UI from 10Hz to 100kHz | SMPTE 424M
Operational Mode Selections	AUTO - detects correct signal type MANUAL - force to a specific format BYPASS - allow signals to pass w/o reclocking
Data Rates Supported	143Mbps to 3.0Gbps

Sync Reference Specifications

Sync Input Connector	BNC X2
Sync Input Impedance	75 Ohm
Sync Input Return Loss	> 40dB, 100kHz to 5MHz
Sync Input Level	0.37V p-p to 4.0V p-p
Sync Input Type	NTSC, PAL, Black Burst, or HD Tri-Level

Environmental

Cooling	Forced air front to back
Operating Temperature	0-40 degrees (C)
Operating Humidity	10-90% non-condensing

AC power connections

64NEX	IEC - 60320 connector 95VAC to 240VAC, 47-63Hz 600 W Max

Safety and Conformance

	FCC, CE, UL, RoHS
Warranty	3 years parts and labor

Control and Interfaces

Panel communications	RS-485 / 3 pin detachable
Control communications	RS-232 / 422 / Ethernet
Connector type	9 pin D-SUB, RJ-45
Control system	PESA PERC2000
Third Party Interfaces	use PESA CPU Link
Network Software	Cattrax Net Control Software
Number of Panels per frame	256 (PERC2000 System Controller)

Cooling

Internal cooling fans with auto sensing speed adjustments

64NEX	2 fans

Mechanical

Dimensions	19.00W X 7.00H X 21.00D 482.6mm X 177.8mm X 533.4mm

Specifications subject to change without notice

Chapter 4 INSTALLATION

4.1 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.

4.2 CHOOSING A LOCATION

For local electrical compliance, this equipment should be located near the socket-outlet, power strip (if plugs are used), or the supply disconnect/breaker so that the AC line cord plugs or the supply disconnect are 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 closely 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.

4.3 MOUNTING A CHEETAH ROUTER CHASSIS IN AN EQUIPMENT RACK

The weight of a fully loaded 64NEX chassis is 60 lbs nominal. Installation or removal of this equipment requires at least two 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 rack.

Make sure that all power is disconnected (Lockout/Tagout) before installing the specific frame into the rack.

Fans that are 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 chassis 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, power cables, and free airflow after all cables are installed. Use all chassis mounting holes and tighten mounting hardware securely by using the rack equipment manufacturer's suggested torque settings.

Install the equipment into the rack as follows:

1. Carefully, remove the equipment from the packing container and place the unit near the rack where it will be installed.
2. Insert the chassis into the equipment rack and support the bottom of the chassis while the mounting hardware is being installed.
3. Install the bottom two chassis mounting screws.
4. Install the top two chassis mounting screws.
5. Install any remaining chassis mounting screws.
6. Tighten all of the chassis mounting screws until they are secure. Release/remove the support from the bottom of the chassis.

4.4 CONNECTING EQUIPMENT CABLES

Use the following guidelines when connecting equipment cables:

1. Install the equipment in the rack before connecting cables.
2. Relieve strain on all cables to prevent connector separation.
3. To the extent possible, separate control, signal, and power cables to minimize crosstalk and interference.
4. Use as many cable ties as necessary to secure cables to the rack (see Figure 4-1). This will minimize the amount of force transmitted to the equipment and help route cables away from hazardous areas.

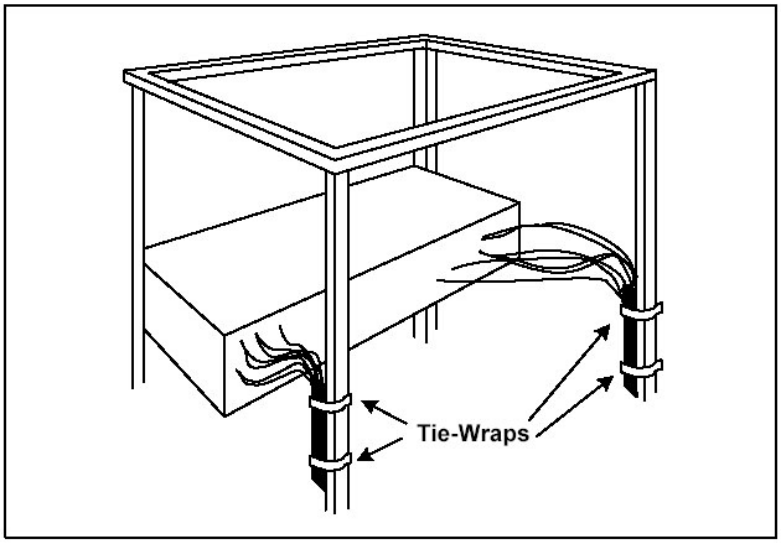


FIGURE 4-1 Cables Attached to Supports

5. Route cables away from physical traffic areas to avoid creating a safety hazard (trip or shock).
6. Bundle together any cables connected to a single input/output card and separate them from the other bundles with enough slack to create a service loop. This will permit individual card replacement without disruption to the other input/output cards.

4.5 CONNECTION GUIDE CHECKLIST

Once the Cheetah Video Matrix Switcher is installed in the equipment rack, the associated system connections can be completed. Use the following guide to insure that interconnections are properly connected and that the control, power, sync, and video cables are correctly installed (for further detailed information, refer to the corresponding sub-section in this Chapter).

1. Connect external sync sources to reference input BNC connectors using Belden 8281 coaxial cable or equivalent. Reference input BNC connectors are terminated into 75Ω internal to the switcher.
2. Connect the PERC2000 System Controller to an Ethernet interface.
3. Connect a host PC to the system controller through the Ethernet interface.
4. If additional Cheetah Switchers are to be utilized as part of the switching matrix, connect the PRC Loop jack on the primary Cheetah Switcher to PRC Loop jack on the other Cheetah Switcher using 5-pin ribbon cables.
5. If an external system controller is used to control the Cheetah 64NEX, connect the external controller to the COM 3 PRC port on the router rear panel using 9-pin RS-422 cable.
6. Connect the RCP control panels to the RCP Panel Ports (#1 and/or #2) using twisted pair cables while observing polarity (refer to Chapter 7). Connections to control panel may be daisy-chained.
7. Configure the Ethernet settings as described in Appendix A, paragraph 8.1 of this manual.
8. If SNMP management of additional Cheetah Switchers is to be utilized, connect the switchers using the Frame Controller Ethernet connectors.
9. Configure the Ethernet and SNMP settings as described in the Appendices.
    a. If desired, connect an external alarm to the System Control Alarm (for further connection compliance information, refer to Chapter 7 for connector pin-outs).
    b. If desired, connect an external alarm to the Frame Control Alarm (for further connection compliance information, refer to Chapter 7 for connector pin-outs).
    c. Connect video sources to router video input BNC connections.
    d. Connect video output signals through the rear panel BNC connections to video destinations.

4.6 CHASSIS SUPPLY POWER CONNECTIONS

All Cheetah frames have two AC receptacle power inputs. As depicted in Figure 4-2, each AC power input is filtered, full-wave bridge rectified, and then fed to the power supply to be diode OR'd with the other rectified power inputs to the system supply.

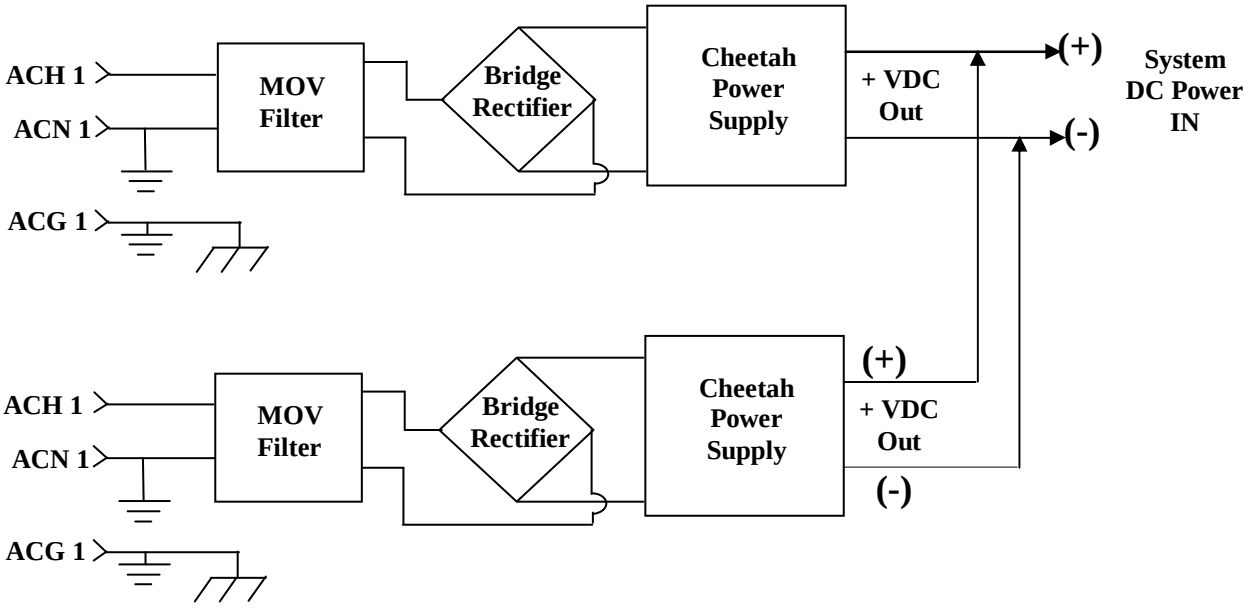


FIGURE 4-2 Power Supplies Configuration

4.6.1 Chassis Supply Power

	**Make sure that all source power is within the operating range of the equipment before completing the specific power connections. Read the Maximum Voltage requirements starting in this section (Chapter 6).**

	**To prevent damage to the equipment:** • **Read all instructions for proper input voltage ranges.** • **Use the recommended specified power branch circuit ampacity.** • **Follow static prevention precautions prior to handling equipment.**

4.6.1.1 Chassis Power Cord

AC power cords may differ depending on your power requirements. The chassis is supplied with two USA standard power cords for 120VAC-power service (or the standards for the country that the system is shipped to).

4.6.1.2 Chassis AC External Power Requirements

The Cheetah router chassis is supplied with redundant, prefabricated, UL/CSA approved power cords that include NEMA 5-15P male and IEC-60320-C13 female line connectors. These cords are for connection to a 120VAC-supply service (refer to Table 4-1).

TABLE 4-1 AC Power Connectors

AC Power Cable	Minimum Amps Required	IEC	Pigtail	Service Drops
IEC-type line cord (120VAC connectors)	10A Service	Yes	No	1-Standard 1-Redundant

NOTE	**This AC power filter assembly has been designed for 95-240VAC, which includes connectors and cords specified to handle maximum power requirements.**

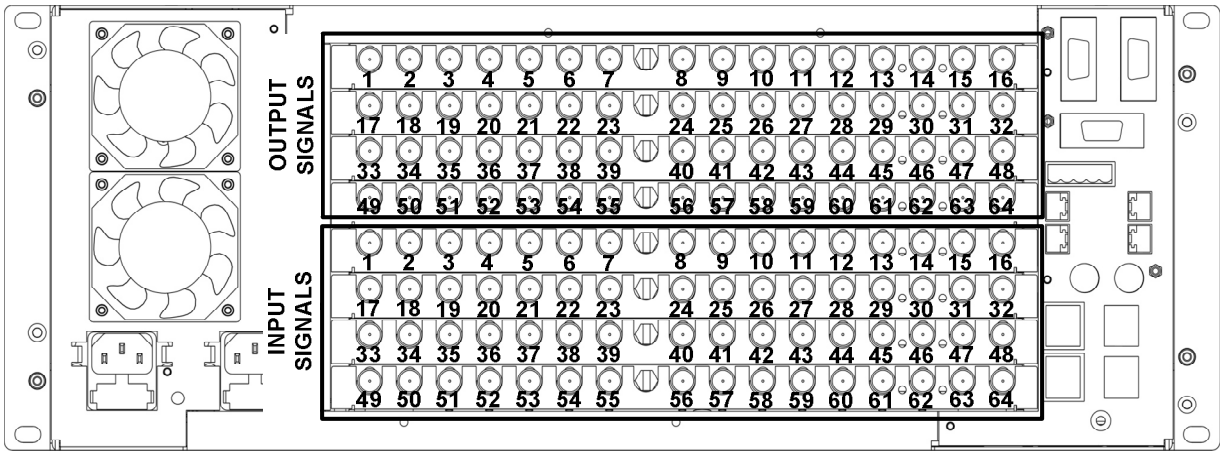
4.6.2 International Power Requirements

All Cheetah frames have two AC Main power feeds, which are isolated from each another. All international power requirements are pre-configured at the factory and commercially available, prefabricated power cords designed for the power source that the equipment will be operating are supplied with each unit.

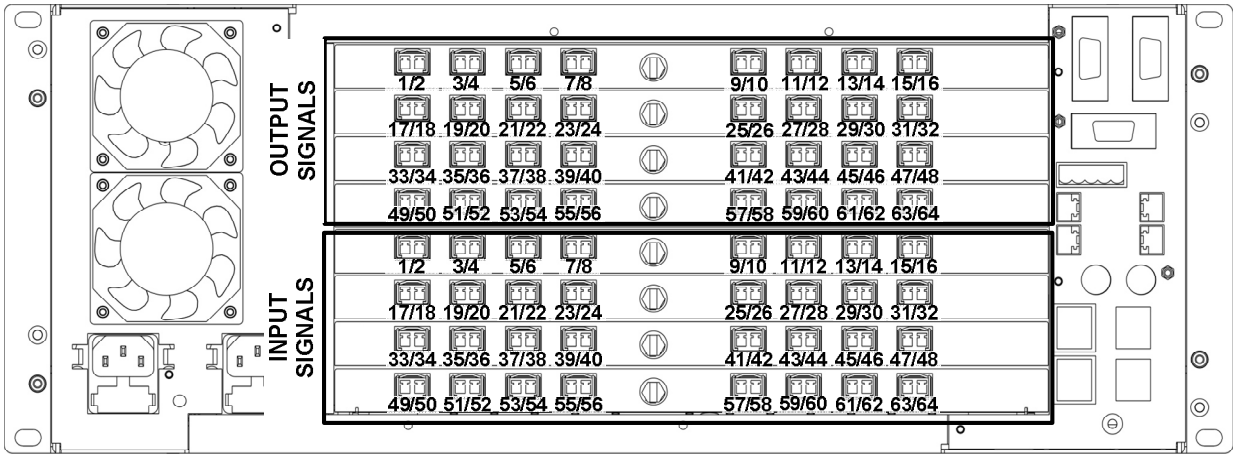
As in the United States, international operation with one power supply is the normal, non-option condition. An optional second (redundant/backup) power supply is available. Typical full-frame power consumption is approximately 6.0 Amps or approximately 650 Watts at 240 VAC nominal regardless of the number of power supplies in use.

4.7 CHEETAH 64NEX CHASSIS INPUT/OUTPUT SIGNAL CONNECTORS

Each input or output card supports 16 video signals and installs to the rear of the 64NEX frame. I/O card variants are available with BNC connectors or SFP fiber optic connectors. Figure 4-3 illustrates signal connections to each type of card. Use these illustrations as a guide when completing video connections to the router.



A) BNC I/O Connections



B) Fiber Optic I/O Connections

FIGURE 4-3 Cheetah 64NEX Input/Output Signal Connectors

4.8 CHASSIS SYSTEM CONNECTION LOCATIONS

System interface connections are made through rear panel connectors as shown by Figure 4-4. Each interface connection is discussed in the following paragraphs. Complete system connections to the router in accordance with the following procedures.

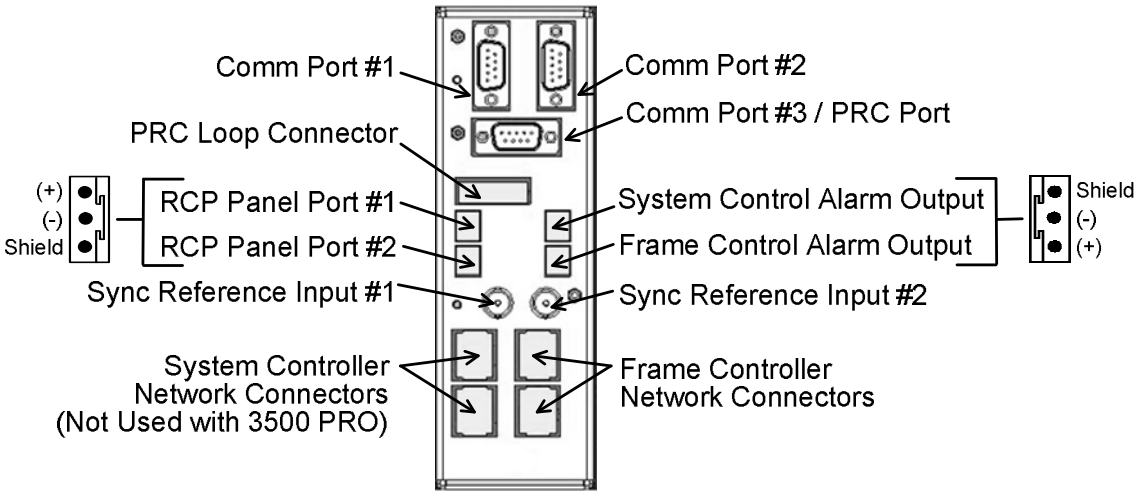


FIGURE 4-4 Chassis System Interface Connector Locations and Descriptions (Rear View)

4.9 REAR PANEL CONNECTORS

4.9.1 RS-232 Control Connectors COM 1 and COM 2

COM 1 and COM 2 (see Figure 4-5) are DB-9 Male connectors that provide RS-232 serial communication interfaces. Pin-outs are shown in Table 4-2.

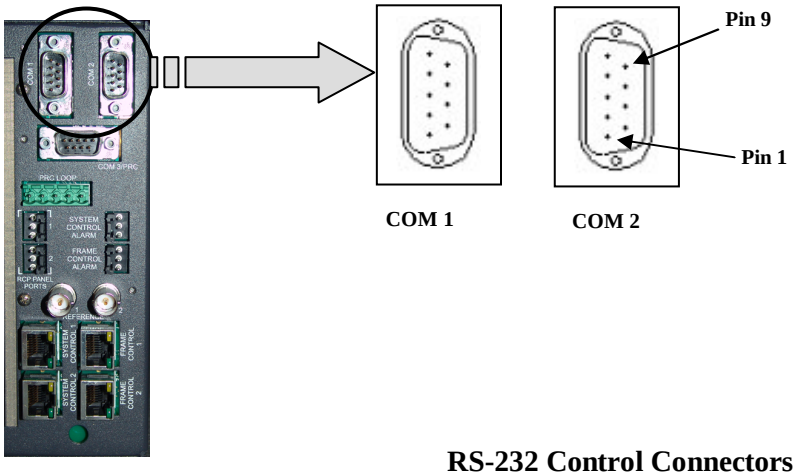


FIGURE 4-5 RS-232 Control Connectors

TABLE 4-2 COM1 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 with a null modem cable (Part No. 81-9028-0393-0) to an external control device, using 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 system controller software matches the baud rate you are using (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 4-3 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 controller software matches the baud rate you are using (in the software, select System > Communications).

TABLE 4-3 PESA CPU Link Protocols

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

4.9.2 RS-422 Control Connectors COM3/PRC

This DB-9 Male connector (see Figure 4-6) provides an RS-422 serial communication interface.

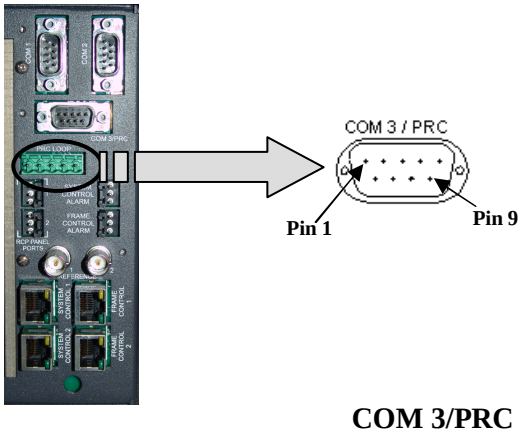


FIGURE 4-6 RS-422 COM 3/PRC Control Connector

COM 3/PRC is the communications interface to a PRC type routing switcher system and is connected to a routing switcher with a serial control cable (refer to Table 4-4 for pin assignments).

TABLE 4-4 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)

4.9.3 System Control Alarm Connector

This three-pin connector, illustrated in Figure 4-7, provides an interface for an external, customer-supplied, system control alarm (alarm contact locations are also shown).

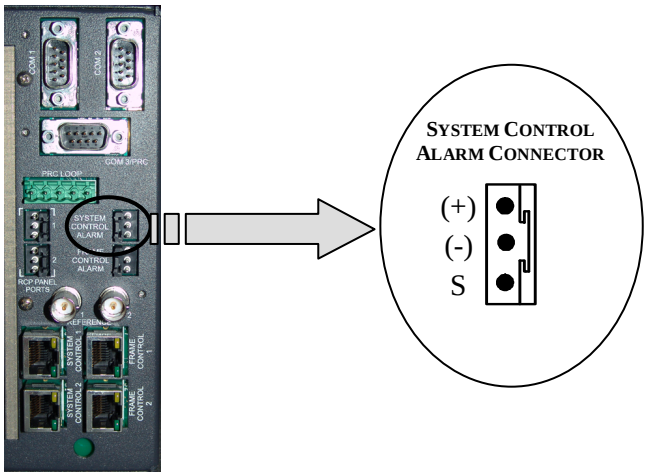


FIGURE 4-7 System Control Alarm Connector

The system controller initiates a system alarm 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 (see Figure 4-8 on next page) exists between contacts 3 and 1 for Controller A (top) and contacts 2 and 1 for Controller B (bottom). 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.

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

The alarm is activated if any of the following system controller software conditions exist:

- Encounters an interrupt that it does not expect or can not process.
- Is unable to synchronize with the second system controller (dual controllers).
- Does not get the configuration from the active system controller (dual controllers)

The customer supplied external alarm circuit is connected with a cable constructed as shown in Figure 4-8.

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

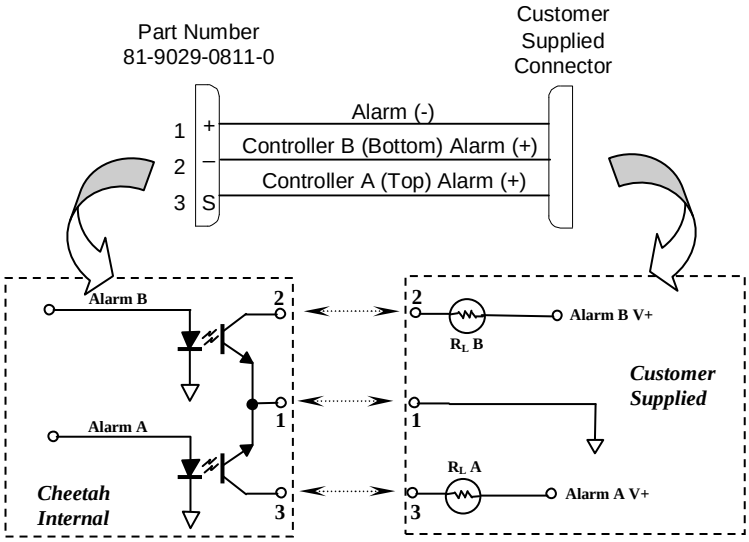


FIGURE 4-8 Alarm Cable Setting and Associated Schematic

4.9.4 PRC Loop Connector

This five-contact connector, located on the rear of the unit, is a loop-through connector used to provide an RS-422 serial communication interface using the PESA PRC Protocol (Document No. 81-9062-0316-0). It is wired in parallel with the DB-9-Male PRC Loop connector. Contact locations are illustrated in Figure 4-9.

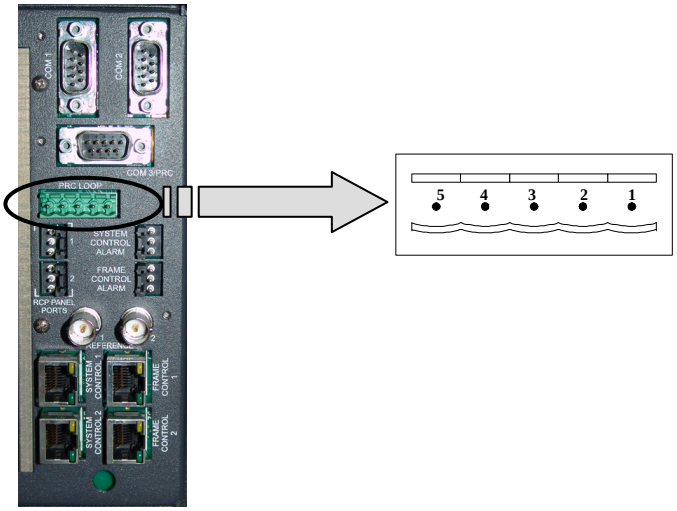


FIGURE 4-9 PRC Loop Connector

PRC Loop may be connected to PESA PRC-type equipment with a cable assembly (Part No. 81-9028-0395-0) constructed as shown in Figure 4-10.

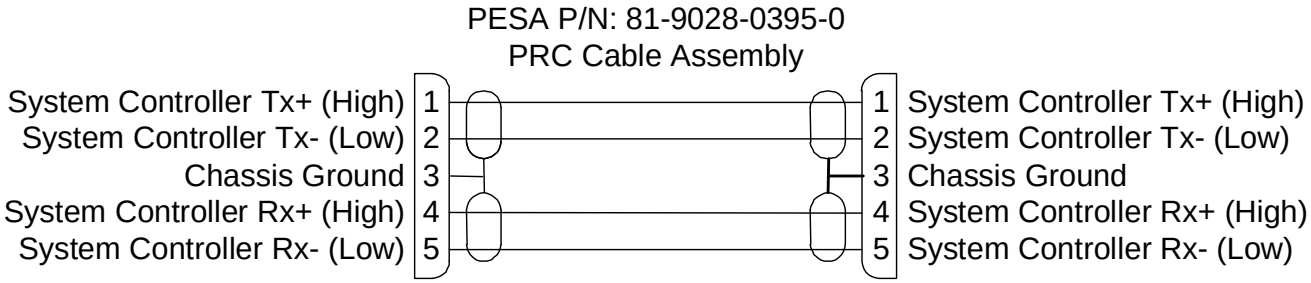


FIGURE 4-10 RS-422 System Expansion Cable

4.9.5 RCP Panel Port Connectors

Two RCP connectors, located on the rear of the unit and illustrated in Figure 4-11, provide RS-485 serial communication interfaces using the PESA RCP Protocol (Document No. 81-9062-0300-0).

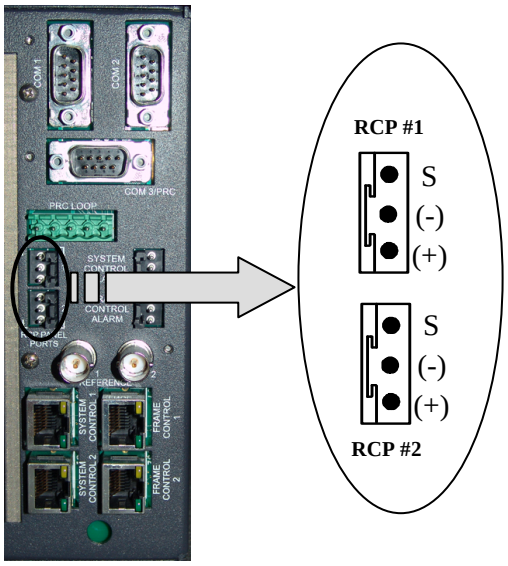
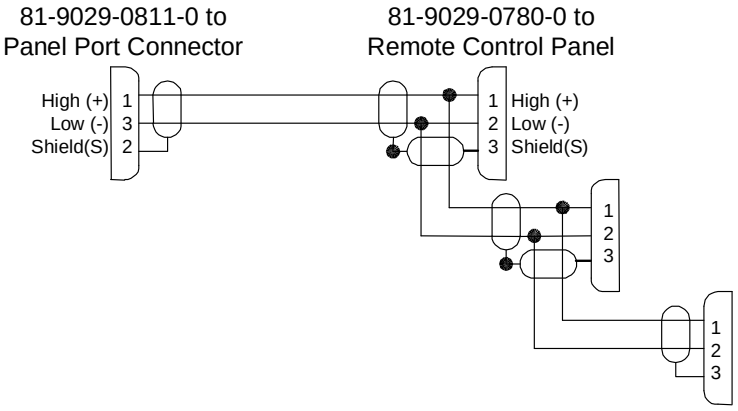


FIGURE 4-11 RCP Panel Port Connectors

These RCPs are connected to PESA Remote Control Panels with daisy-chained cables constructed with RCP connectors (Part No. 81-9029-0780-0) and shielded, twisted-pair cable (Part No. 81-9028-0043-2, Belden 8451, or equivalent) as illustrated in Figure 4-12. The connector body has an integral strain relief, which requires the use of a nylon cable tie, which is included with the connector. If cable tie is not available, use PESA Part No. 81-9021-0028-8.



NOTE	**Cable is not pin for pin! Pins 2 and 3 are swapped.**

FIGURE 4-12 RS-485 Cable Construction

4.9.6 Network Connectors

The RJ-45 Ethernet connectors, illustrated in the Figure 4-13, connect the Matrix Frame Controllers and System Controllers to a 10 or 100Mb/s TCP/IP network. Ethernet configuration options are detailed in the Appendix.

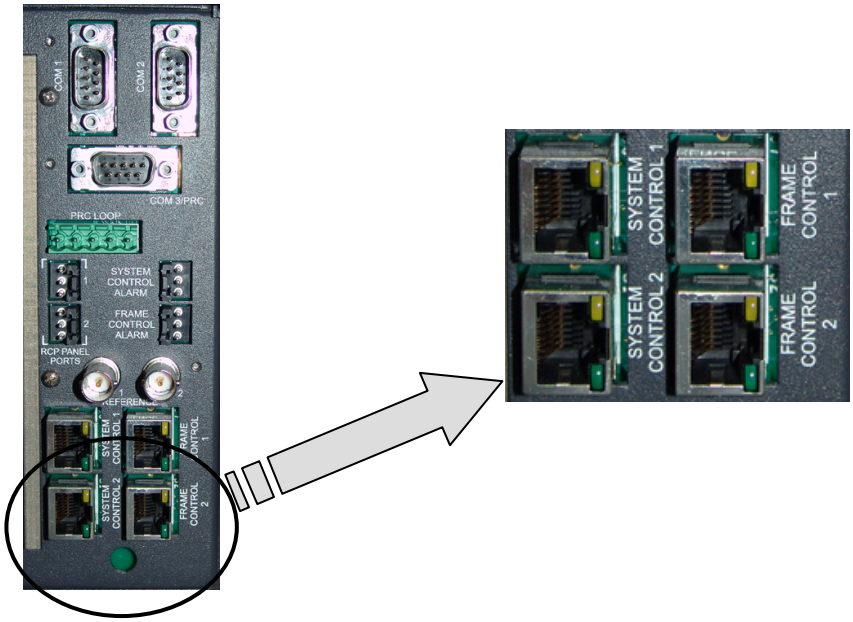


FIGURE 4-13 Network Connectors

LED indicators are provided as follows (see Figure 4-14 and refer to Table 4-5):

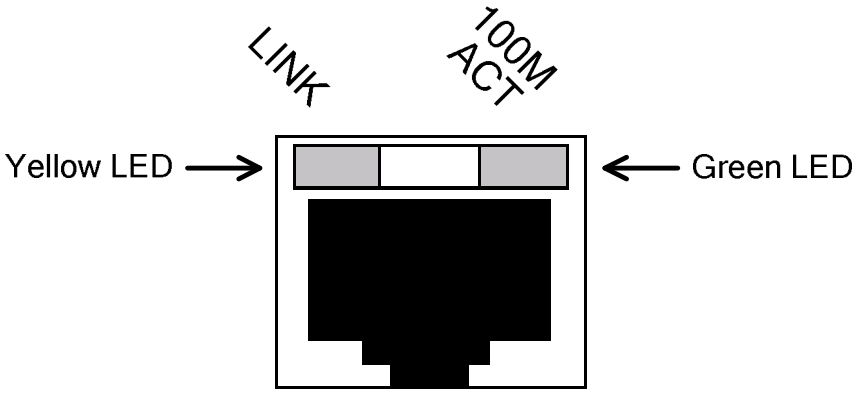


FIGURE 4-14 Ethernet Connector

TABLE 4-5 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 and System 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.

The Slot A Network Frame Control is for the Matrix Frame Controller in Slot A. The Slot B Network Frame Control is for the Matrix Frame Controller located in slot B. The Slot A System Control is for the System Controller located in Slot A. The Slot B System Control is for the System controller located in slot B (see Figure 4-15 for typical slot locations).

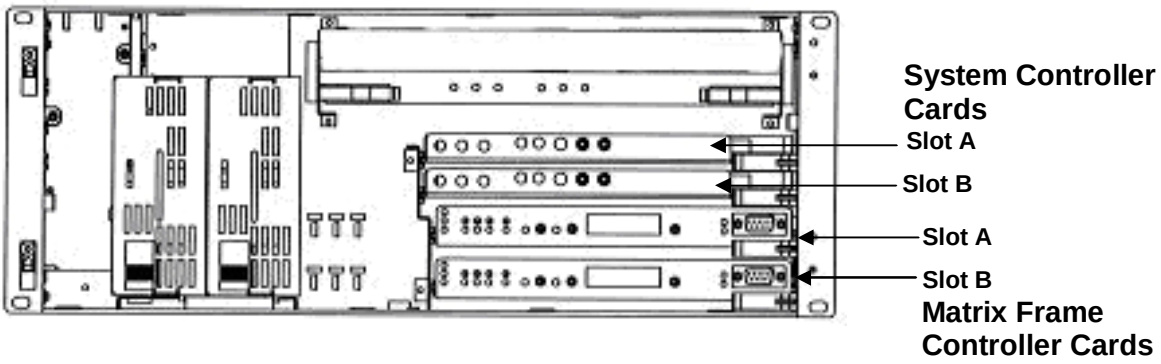


FIGURE 4-15 Typical Matrix Frame Controller Cards locations, Slot A and Slot B

4.9.7 Frame and System Alarm Connectors

The three-pin connectors, illustrated in Figure 4-16, provide an interface for an external, customer-supplied frame and system control alarm. The Matrix Frame Controller determines when a frame alarm condition is declared while the System controller determines when a system alarm condition is declared. Alarm contact location is illustrated in Figure 4-17 on the next page. This circuit acts as a switch to trigger an optional external alarm in the event of a controller/system fault or failure. The 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 4-17 (next page).

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

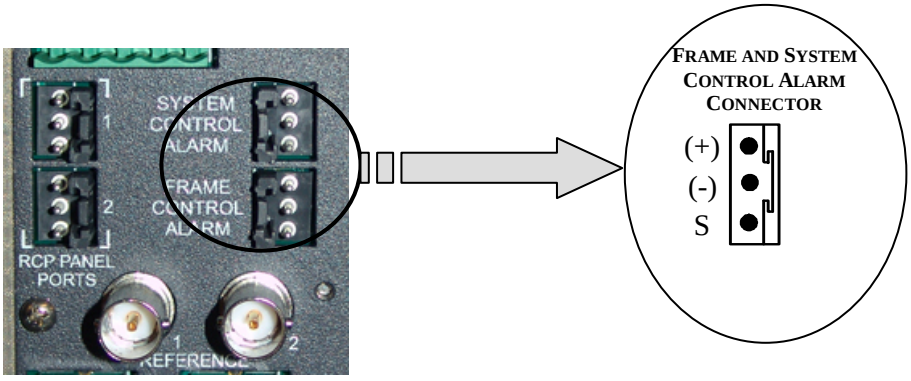


FIGURE 4-16 Frame and System Control Alarm Connector

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

- Detects a card (input, output, matrix, output monitor, power supply, or matrix frame controller) with a temperature out of range (above 114 ºF)
- Detects a fan's voltage out of range
- Detects a power supply's voltage or current out of range. The voltage or current must be out of range for three consecutive times before the Matrix Frame Controller will indicate an alarm.

The System Control alarm is activated if any of the following system conditions exist:

- Detects a system interrupt (i.e., a CPU failure/error, an address error, or an illegal instruction)
- Synchronization problem with dual system cards
- The system configuration is not properly relayed to the dual system cards
- Whenever the system software is being upgraded

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

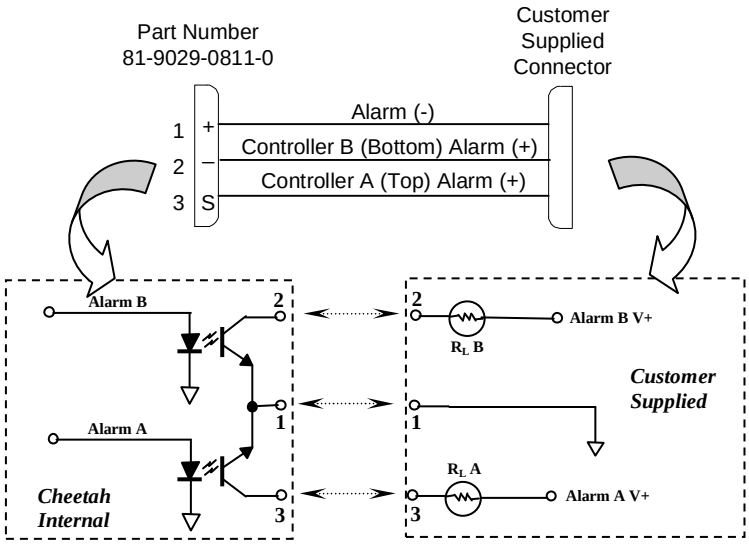


FIGURE 4-17 Alarm Cable Connection and Circuit Schematic

4.9.8 House Synchronization Input Connectors

These BNC coaxial connectors, illustrated in Figure 4-18, provide the interface for two, house synchronization signals (i.e., NTSC, PAL, 1080i, 1080P, and 720P only). The house sync inputs are individually terminated internally. The synchronization signal cannot be daisy-chained from one routing switcher to another.

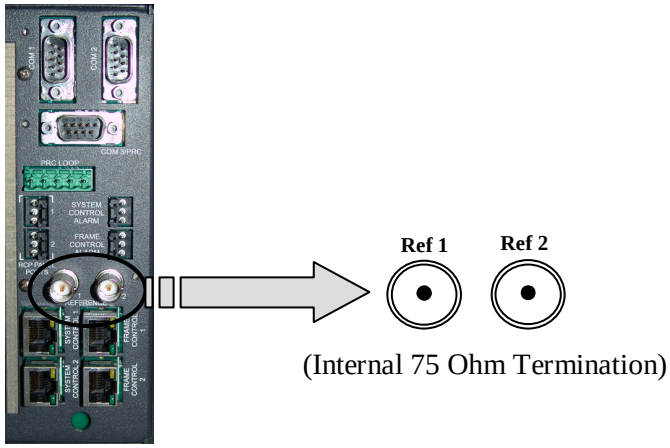


FIGURE 4-18 House Sync Input (Reference) Connectors

Using the Cheetah GUI, 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 the GUI, the user assigns Reference 1 to outputs 6 through 10 and Reference 2 to outputs 11 through 16 for a specific chassis.

Reference 1 or 2 should be connected to the house sync source or tri-level source with coaxial cable and standard BNC connectors.

4.10 SETTING CHASSIS LEVEL CODES (STROBES)

Chassis Level Codes (Strobes) assign operational parameters to the switcher frame. There are seven rotary switches, located just to the right of the power supply modules and accessible from the front of the router, used to set the chassis level code and other frame operational characteristics. Chassis switch settings are 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.

Proper setting positions for these switches are shown in Figure 4-19.

	**Prior to adjusting any of the chassis strobe switches, it is strongly recommended that you contact PESA's Customer Service Department for assistance.**

Example settings shown are for the 64NEX chassis.

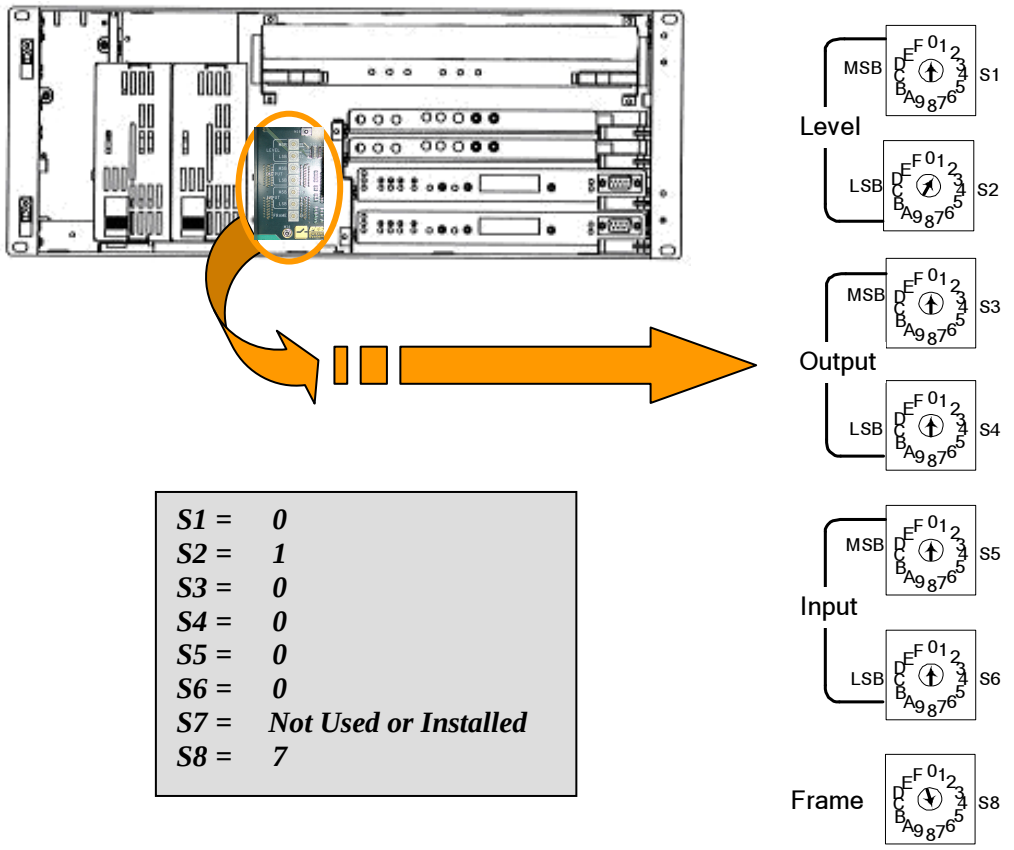


FIGURE 4-19 CHEETAH 64NEX CHASSIS STROBE SWITCH LOCATION AND SETTINGS (FRONT VIEW)

4.10.1 Chassis Strobe Switch Functions

ROTARY SWITCH	NAME	DESCRIPTION
S1	Most Significant Bit (MSB) Level Code	The level code identifies the matrix level of the router. This setting accepts 1 to 63 in binary (1 to 3F in hexadecimal). This setting must match the Strobe setting assigned through the System Controller.
S2	Least Significant Bit (LSB) Level Code	
S3	MSB Output Offsets	This strobe is used to offset output origin when frames are added to the system. This setting accepts 1 to 255 in binary (1 to FF in hexadecimal). Set this strobe to the first offset number you want to use in this unit. This setting must match the Output Offset setting in the System Controller.
S4	LSB Output Offsets	
S5	MSB Input Offsets	This strobe is used to offset input origin when frames are added to the system. This setting accepts 1 to 255 in binary (1 to FF in hexadecimal). Set this strobe to the first input number you want to use for this unit. This setting must match the Input Offset setting in the System Controller.
S6	LSB Input Offsets	
S7		Not Used or Installed with 64NEX Frame
S8	Frame	Specifies the type of frame the boards are plugged into.

Chapter 5 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.

5.1 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 the main power source is OFF (de-energized).
2. Verify all cards/modules are latched and secure.
3. Verify all blank covers are in place and secure (no open slots in the frame).
4. Verify the line cord(s) are connected to the chassis and are properly terminated to the source power distribution system (i.e., connectors plugged in or pigtails terminated).
5. 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).
6. Proceed to System Startup.

5.2 SYSTEM STARTUP

Perform the Cheetah system startup sequence as follows:

1. Energize the main power source to the chassis.

   Result: The system has a 30 to 45 second delay prior to energizing the components. When the delay has expired, the system will energize and the cards will perform initial self-diagnostics.

	**Verify the blank-cover panels are securely in place. These panels are an integral part of the chassis cooling system. A loose, broken, and/or missing blank-cover panel could result in destructive overheating of equipment components.**

2. Verify the following LED conditions:

	**If any LED conditions are different, perform troubleshooting sequences to correct the problem(s) prior to placing the system in service.**

a. On the Power Supply module, the Power OK LED is illuminated (green)

b. On the Matrix module, the following LEDs are illuminated:

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

c. On the Matrix Frame Controller (MFC), the following LEDs and LED display are illuminated (single or dual modules):

- Single module: the Control Status display indicates - ØSNGL OK (red)
- Dual modules: 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 step or section.**

Chapter 6 OPERATIONAL DESCRIPTIONS AND CARD/MODULE INSTALLATIONS

This section documents the operational descriptions of the various components of the Cheetah Series Switchers. Typically, this section is accessed for more concise component information and how each component is used in the Cheetah Series systems.

Additionally, this section will describe the installation of the various components of the Cheetah Series Switchers. Even though the unit is shipped with all of the components preinstalled, this section is typically accessed for basic component information and for their replacement (removal and installation) sequences.

6.1 CHEETAH SERIES POWER SUPPLIES

6.1.1 Cheetah Series Power Supply Information

	**Cheetah Series Power Supplies contain electrical shock hazards and should only be serviced by qualified service personnel with experience in servicing off-line switching regulators.**
	**There are no user serviceable parts contained in the Cheetah Series Power Supplies. All service performed on the Power Supplies should be performed by the PESA Service Department.**
	**High Leakage Current at 240VAC. The Cheetah Series Power Supply leakage current exceeds 7.0mA when used at 240 VAC because of leakage through emission filter capacitors.**

The Cheetah Power Supply is responsible for providing a regulated ±28VDC @22A to the switching frame. The Cheetah Power Supply is designed to operate automatically with input AC line voltage ranges from 95-240 VAC and with AC line frequencies of 50/60 Hz. All Cheetah power supplies have built-in, over-current protection circuitry. When two supplies are used, each supply is electrically connected to a common/dedicated buss within the chassis.

Additionally, each power supply contains dual internal fan controller systems that are isolated from the main DC power output buss connections. Depending on the chassis, there are dependent power supply installation configurations to satisfy the fan operations. In a two-supply system, one supply module becomes the master and the other becomes the slave.

In the event of a Cheetah Power Supply failure, return the malfunctioning unit to the PESA Service Department for replacement. The power supplies contain lethal voltages when operating and should be serviced only by the PESA Service Department. Please call the PESA Service Department for a RMA number before returning any units for replacement. The Service Department's phone number is listed on the front page of this manual.

6.1.2 *Cheetah Series Chassis Power Supplies Locations and Allocations*

The power supplies are located on the front of the frame as shown in Figure 6-1.

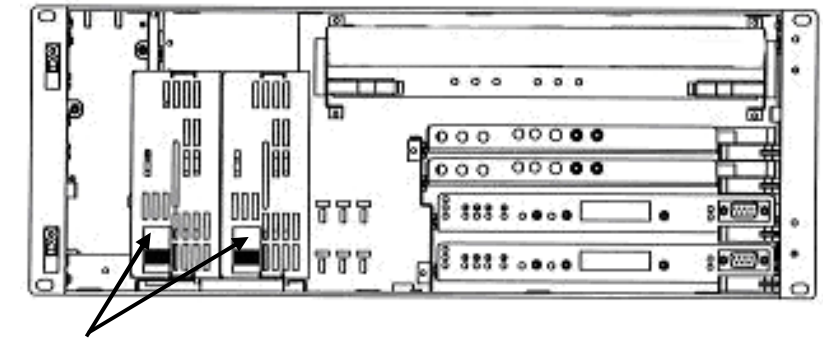


FIGURE 6-1 Cheetah 64NEX Chassis Power Supply Locations (Front Views)

6.1.3 *LED Indicators and Test Points*

Three LED indicators and one test point are located on the front of the power supply, as illustrated in Figure 6-2. The LED indicators are described in Table 6-1.

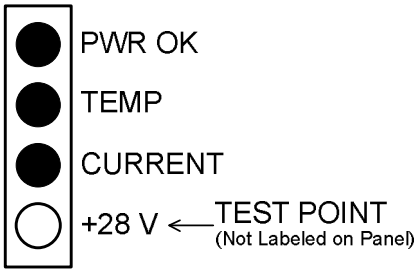


FIGURE 6-2 Power Supply LED Indicators and Test Points

TABLE 6-1 Power Supply LED Indicators

LED	COLOR	STATUS	DESCRIPTION
PWR OK	Green	**ON**	Indicates that the +28V power is stable and within normal operating parameters.
Temp	Red	**ON**	Indicates there is an over-temperature condition in the power supply. ***This must be corrected immediately!***
Current	Red	**ON**	Indicates there is an over-current condition in the power supply. ***This must be corrected immediately!***

6.1.4 +28V Test Points

The test point labeled +28V is used to determine by measurement whether +28VDC power is present (bare metal of the chassis can be used for the ground/negative potential).

6.1.5 Installing the Power Supplies

Install each power supply as follows:

1. Align the metallic support plate of the first power supply vertically with the card guides in the chassis.
2. Press upward on the power supply latch located on the front bottom of the assembly and carefully insert the power supply into the chassis until the connectors on the power supply make contact with the backplane connectors.
3. Firmly, push the power supply unit into the chassis until the power supply latch engages the corresponding slot in the chassis.

NOTE	**The latch on the power supply acts as a retainer latch and a power ON/OFF switch for the unit.**

3. Make sure the latch is *fully engaged* (down and secured/mated into the corresponding slot in the chassis) to enable (energize) the power supply.

6.1.6 Removing the Power Supplies

To remove a power supply, follow these steps (you may remove power supplies while the Cheetah system is operational [energized], which is called hot-swapping):

CAUTION	**Make sure you will still have the minimum number of power supplies installed before removing power supplies. The minimum number depends on your configuration, which is either one or two power supplies. If you only have one supply installed and you must remove it, de-energize the unit first.**

1. Open the Cheetah front cover.

NOTE	**When the latch on the power supply is moved to the full-upward position, the power supply is switched off and is freed from the retaining slot in the chassis.**

2. Push and hold the latch on the lower front of the power supply in the full-upward position.

3. Once the latch is pushed upward and held, use the unit handle and carefully pull the power supply out of the equipment chassis (the unit is held in place by connector plugs and requires a slight forceful-pulling motion to separate it from the connectors). Repeat for each power supply that you need to remove.

6.2 INSTALLING INPUT BUFFER AND OUTPUT COMBINER CARDS

Install the input/output cards as follows (see Figure 6-3):

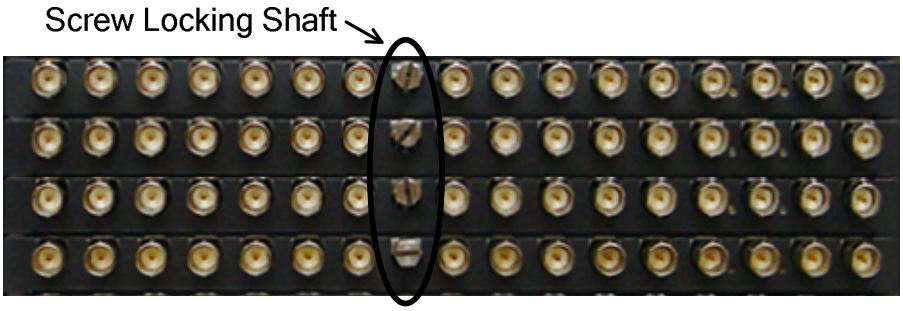


FIGURE 6-3 Input/Output Signal Connectors (rear view)

1. Align the first input/output buffer card with the card guides in the chassis.
2. Carefully insert the input/output buffer card into the chassis until the screw makes contact with the backplane. This will align the card with its' corresponding backplane contact block.
3. Secure the screw using a 5/16" hex socket or a flat head screwdriver. As the screw is tightened, the card is automatically seated into the contact block on the backplane.
4. Repeat the above steps for each additional input/output buffer card.
5. Reverse the order for removal of the card.

6.3 VIDEO MATRIX (CROSSPOINT) CARD

The digital matrix card accepts video sources (143Mbps to 3Gbps) from the input buffer cards and provides output signals to the output combiner cards. All switching is done by a special purpose device, controlled by commands from the matrix frame controller. Any input signal may be routed to any or multiple output channels of the card.

There are six LEDs located on the front edge of each matrix card that provide a visual indication of the operational status of the card; these are identified by Figure 6-4. Table 6-2 lists the possible states and interpretation data for the LEDs.

Figure 6-5 is a block diagram of the digital matrix card. Paragraph 6.4 presents a narrative description of the circuit functions shown on the block diagram.

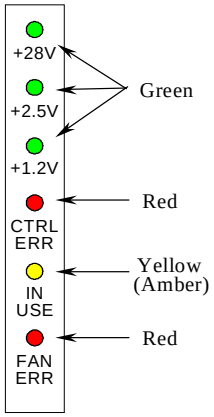


FIGURE 6-4 VIDEO CROSSPOINT MATRIX CARD LED INDICATORS

TABLE 6-2 VIDEO CROSSPOINT MATRIX CARD LED DESCRIPTIONS

LED	COLOR	STATUS	DESCRIPTION
+28V	Green	**ON**	Indicates that the +28Vpower is stable and within normal operating parameters.
		OFF	Indicates that +28V is not stable; power supplies are not working.
+2.5V	Green	**ON**	Indicates that the +2.5Vpower is stable and within normal operating parameters.
		OFF	Indicates that +2.5V is not stable; power supplies are not working.
+1.2V	Green	**ON**	Indicates that the +1.2Vpower is stable and within normal operating parameters.
		OFF	Indicates that +1.2V is not stable; power supplies are not working.
Ctrl Err	Red	**ON**	Indicates that a control error has occurred, or that a loss of receive clock from frame controller has been detected. A control error includes a bad CRC of the received data, incorrect number of words in the message being received, or corrupted data in the message being received. The LED will remain on until a message with a good CRC has been received.
		Blinking	Indicates a missing receive clock error.
		OFF	No alert conditions are present.
In Use	Yellow	**ON**	Indicates that a crosspoint on the matrix card is activated.
Fan ERR	Red	**ON**	Indicates a failure of the cooling fan on-board the crosspoint device. .

6.4 FUNCTIONAL DESCRIPTION - DIGITAL VIDEO MATRIX CARD

Refer to Figure 6-5 as we discuss the various circuit functions of this card. There are 64 identical input channel paths provided. Video signals are derived from the output channels of the input buffer cards and routed to the inputs of the matrix card. As a signal enters the card it is routed to an Input Buffer stage, internal to the crosspoint device. This device contains the switching circuitry to deliver a signal on any of its input channels to any of its output channels. Switching data for the crosspoint device is received from the on-board microcontroller circuitry. The crosspoint also contains output buffer stages, internal to the device, for isolation. Video from each device channel is available at the card edge connector where it is routed to the output combiner cards.

The On-Board Microcontroller is the interface between the matrix card and the frame control system. The microcontroller constantly monitors the status and health of the card and reports this data to the system frame controller. Commands from the frame controller are interpreted by the microcontroller circuitry and select the active inputs and outputs of the crosspoint device. Data indicating the status of the operating voltage rails is sent to the microcontroller by circuitry contained in the Voltage Regulator stage. The microcontroller also provides a visual indication of certain board functions by controlling the operating state of the status LEDs. Operating voltages necessary to power the matrix card circuitry are derived from on-board voltage regulator devices.

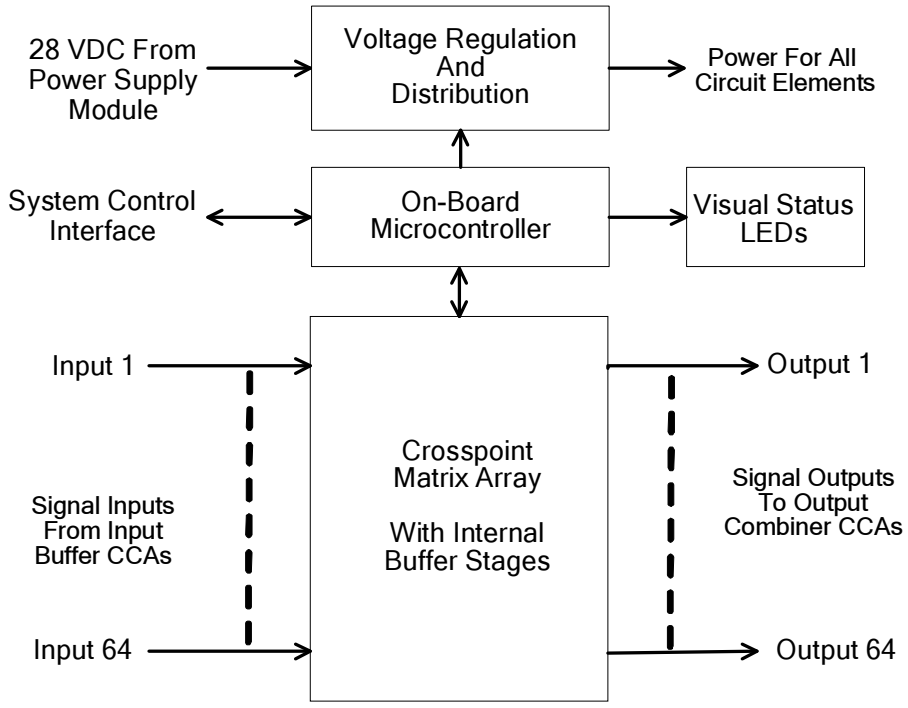


FIGURE 6-5 BLOCK DIAGRAM – DIGITAL VIDEO MATRIX CARD

6.5 MATRIX FRAME CONTROLLER (MFC)

The matrix frame controller, located on the right front of the unit, is illustrated in Figure 6-6. For every frame type, at least one Matrix Frame Controller (MFC) is required. The function of the frame controller is to determine frame size, level, input offsets, output offsets, plus other physical characteristics of the frame hardware. Both PESA's PRC protocol and NET PRC protocol are available to the MFC. With the NET-PRC protocol, the MFC has the ability to communicate to a system controller via Ethernet connection. More features include SNMP support and redundant MFC cards with auto changeover.

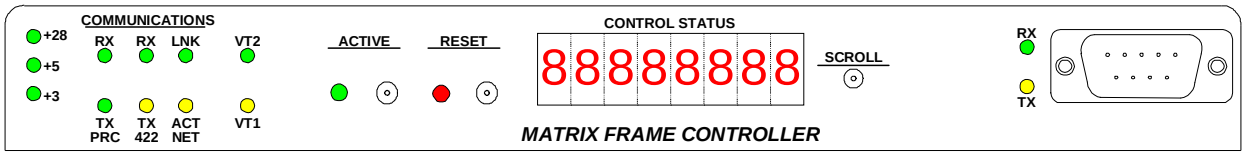


FIGURE 6-6 Matrix Frame Controller

The MFC has the ability to provide dual operations. By setting each MFC with its own Ethernet address, updates and active switching can be done in parallel that allows immediate crossover during a card failure or network interruption (refer to Chapter 8, Appendix A for details on Ethernet configuration options).

6.5.1 MFC LED Indicators

The matrix frame controller LED indicators are described in Table 6-3.

TABLE 6-3 Matrix Frame Controller LED Indicators

LED	COLOR	STATUS	DESCRIPTION
+28V	Green	**ON**	Indicates that the +28V power is stable and within normal operating parameters.
	Red	**ON**	Indicates that +28V power is not stable.
+5V	Green	**ON**	This LED, when on (green), indicates that the +5V power is stable and within normal operating parameters.
	Red	**ON**	Indicates that +5V power is not stable.
+3V	Green	**ON**	Indicates that the +3V power is stable and within normal operating parameters.
	Red	**ON**	Indicates that +3V power is not stable.
PRC Tx/Rx	Green	**ON**	Indicate that PRC traffic is being transmitted or received.
422 Tx/Rx	Green	**ON**	Indicate that RS-422 traffic is being transmitted or received.
ACT NET	Green	**ON**	Indicates that network activity is present.

TABLE 6-3 MATRIX FRAME CONTROLLER LED INDICATORS (CONT.)

LED	COLOR	STATUS	DESCRIPTION
LNK	Green	**ON**	Indicates that a network connection exists.
VT1/VT2	Green	**ON**	Indicates that a sync signal is present.
Active	Green	**ON**	Indicates the active controller (when dual controllers are in use).
Reset	Red	**ON**	Indicates that the controller is in Reset mode.
Rx	Green	**ON**	Indicates that Receive data is being received.
Tx	Yellow	**ON**	Indicates that Transmit data is being transmitted.

6.5.2 MFC 8-Character Display

An eight-character display (see Figure 6-7) is located on the front of the matrix frame controller.

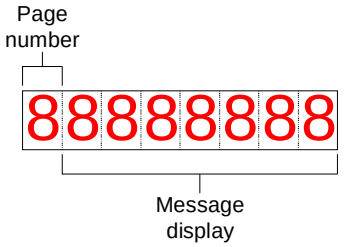


FIGURE 6-7 8-Character Display

The display is divided into two fields. The first character on the far left is the first field indicating the page number of the information being displayed. The second field is comprised of the next seven characters, and displays the actual message.

Press the "Scroll" button to view successive pages. Each page will appear for 30 seconds, then reset to page 0. Descriptions of the displayed messages are detailed in Table 6-4.

TABLE 6-4 8-Character Display Messages

PAGE	MESSAGE	DESCRIPTION
0	ACTV OK STDB ** SNGL OK SNGL **	Describes which frame controller is active, standby, or single operation. It also indicates whether there is an alarm condition present on the controller.
1	IN XXXX	Shows the number of inputs being controlled by the frame controller.
2	OUTXXXX	Shows the number of outputs being controlled by the frame controller.
3	IOFXXXX	Shows the input offset of the matrix.

TABLE 6-4 8-CHARACTER DISPLAY MESSAGES (CONT.)

PAGE	MESSAGE	DESCRIPTION
4	OOFXXXX	Shows the output offset of the matrix.
5	STRB XX	Shows the PRC strobe of the matrix.
6	TEMP OK TEMPBAD	Shows the alarm status of the over temp indicator.
7	PWR OK PWR BAD	Shows the alarm status of the power supply.
8	FAN OK FAN BAD	Shows the alarm status of the fan circuit.
9	PRC NO PRC OK PRC BAD	Describes whether the system is communicating via the PRC bus. If so, it indicates whether it has detected any errors on the PRC communication bus.
A	NET NO NET OK NET BAD	Describes whether the system is communicating via the Network Communication. If so, it indicates whether there have been any errors detected.
B	SYN1 NO SYN1 XX	This indicates whether a valid SYNC 1 is present. The type of sync is encoded in the XX.
C	SYN2 NO SYN2 XX	This indicates whether a valid SYNC 2 is present. The type of sync is encoded in the XX.
D	XXX.XXX	This is the first half of the IP address of the frame controller's network node.
E	XXX.XXX	This is the second half of the IP address of the frame controller's network node.
F	INE OK INE BAD	Indicates whether there are any errors detected on any input cards.
G	OTE OK OTE BAD	Indicates whether there are any errors detected on any output cards.
H	MTX OK MTX BAD	Indicates whether there are any errors detected on any matrix cards.
J	PSB OK PSB BAD	Indicates whether there are any errors detected on any power supply cards.
K	INE OK INE BAD	Indicates whether there are any errors detected on any input cards.
L	OTE OK OTE BAD	Indicates whether there are any errors detected on any output cards.
M	MTX OK MTX BAD	Indicates whether there are any errors detected on any matrix cards.
N	PSB OK PSB BAD	Indicates whether there are any errors detected on any power supply cards.

6.5.3 MFC Switch Locations and Settings (S1 and S2)

S1 and S2 are eight-position, slide-style dipswitches consisting of eight, single-pole single-throw (SPST) switches numbered 1 through 8, located on the face of the matrix frame controller card, as illustrated in Figure 6-8.

STOP	**These dipswitches are set at the factory. Do not change the settings!**

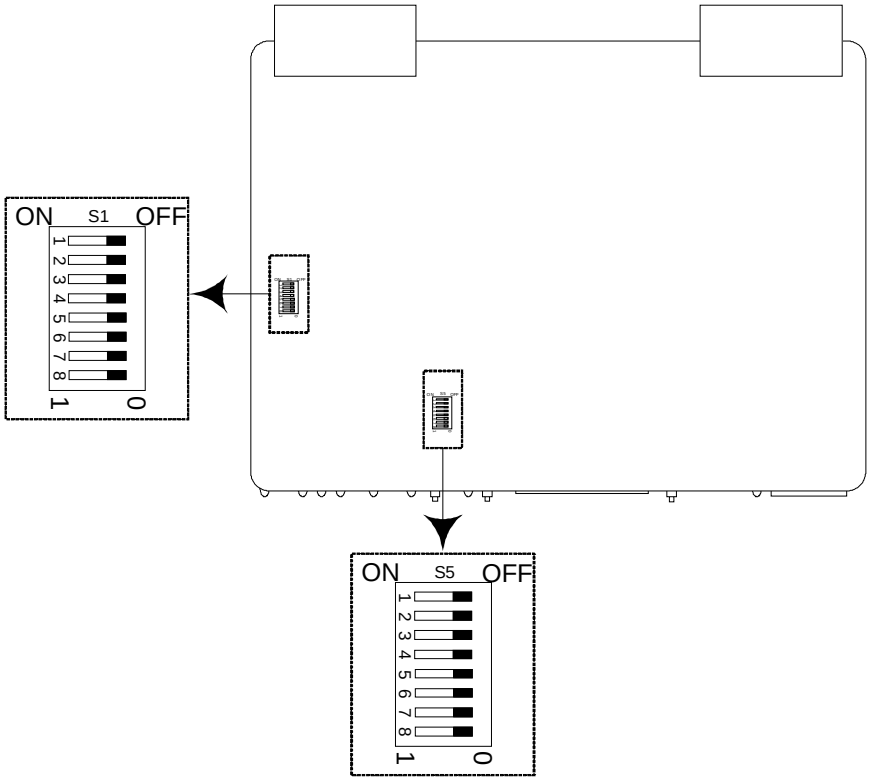


FIGURE 6-8 MFC Dipswitch Locations

Chapter 7 MAINTENANCE AND REPAIR

This section will address the normal system maintenance sequences, basic troubleshooting scenarios, minor system repairs, and ***PESA (PESA Switching Systems, Inc.)*** contact information.

Since it may become necessary to perform maintenance and repair on energized equipment, it is the responsibility of all personnel involved in the maintenance and repair of the equipment to be familiar with all of 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.***

7.1 MAINTENANCE

7.1.1 Maintenance Overview

This equipment has been designed to give long, trouble-free service with very little maintenance. Under normal service conditions, the only routine maintenance required is to monitor the air filter for cleanliness.

	**This equipment contains static sensitive devices. A grounded wrist strap and mat should be used when handling the internal circuit cards.**
	**This equipment has been designed so that maintenance operations can be performed while the equipment is operational (energized and performing switching functions). Only the power supply assemblies and the AC supply line circuits contain potentially lethal shock hazards.**

7.1.2 Air Filter

The air filter(s) should be checked monthly to ensure that an adequate supply of clean air is available to cool this equipment. If the air filter is dirty, either clean it with low-pressure air, vacuuming, or a mild soap-and-water solution (then dry); or replace it with a new air filter (PESA Part No. 81-9065-2360-0).

7.2 REPAIR

Before attempting to repair this equipment, consult your warranty documents and/or PESA's Customer Service Department. Unauthorized field repairs may void your warranty.

	**Only Qualified service personnel using appropriate equipment should service the Cheetah Series power supply assemblies in this equipment.**
	**Consult PESA Customer Service before attempting to repair any of the PC cards in this equipment.**

7.2.1 Replacement Parts

Only parts of the highest quality have been incorporated in the design and manufacture of this equipment. If the equipment's inherent stability and reliability are to be maintained, replacement parts must be of the same high quality. For selection of exact replacement parts or for acceptable replacement part substitutions, contact PESA's Customer Service Department before installing any parts not purchased from PESA, Inc.

7.2.2 Return Material Authorization (RMA)

Before returning any equipment for service or replacement, contact PESA's Customer Service Department for an RMA number. Contact information for the Customer Service Department appears in Paragraph 7.5.

7.3 PESA CUSTOMER SERVICE

7.4 CHEETAH SERIES SUPPORT DOCUMENTATION

81-9062-0316-0: PESA Router Control (PRC) Protocol

7.5 PESA (PESA SWITCHING SYSTEMS, INC.) CUSTOMER SERVICE CONTACT INFORMATION

- **SERVICE AND ORDERING ASSISTANCE**

  PESA (PESA Switching Systems, Inc.)
  103 Quality Circle
  Suite 210
  Huntsville, AL. 35806 - USA
  www.PESA.com

- **MAIN OFFICE**

  Tel: (256) 726-9200
  Fax: (256) 726-9271

- **SERVICE DEPARTMENT**

  Tel: (256) 726-9222 (Hours: 24/7)
  Toll Free: (800) 323-7372
  Fax: (256) 726-9268
  Email: *service@PESA.com*

Chapter 8 APPENDICES

This section is subdivided into the following topics:

- Appendix A: Ethernet Configuration
- Appendix B: SNMP
- Appendix C: PESA Matrix Frame Controller Debug Port Protocol
- Appendix D: Abbreviations, Acronyms, and Definitions (AA&D)

8.1 APPENDIX A: ETHERNET CONFIGURATION

The Matrix Frame Controller supports a variety of interfaces via the Ethernet interface. These include NET PRC, HTTP (HyperText Transfer Protocol - web), SNMP (Simple Network Management Protocol), and Telnet. To configure this access, the following items will need to be configured (refer to Table 8-1):

NOTE	**The network server automatically assigns the IP Address, Subnet Mask specification, and Gateway specification when the Dynamic Host Configuration Protocol (DHCP) is enabled.**

TABLE 8-1 Ethernet Configuration

NAME	USAGE	DEFAULT
DHCP On/Off	Automatically obtain an IP address from a (DHCP) server on the network.	On
IP Address	When DHCP is disabled, allows a fixed IP address to be assigned to the Matrix Frame Controller.	0.0.0.0
Subnet Mask	When DHCP is disabled, allows the specification of the subnet mask for the IP address.	0.0.0.0
Gateway	When DHCP is disabled, allows the specification on the default gateway.	0.0.0.0
Telnet On/Off	Enables or disables the Telnet server.	On
Telnet Port	Allows the specification of the TCP port to be used by the Telnet server.	23
Telnet Password	Specifies the password for telnet access.	<blank>
NETPRC Master/Slave	Enables or disables the NETPRC server. Note that the SNMP agent is disabled in Slave mode.	Slave

Table Continued on next page

TABLE 8-1 Ethernet Configuration (cont.)

NAME	USAGE	DEFAULT
NETPRC Port	Allows the specification of the TCP port to be used by the NETPRC server.	1000
Read Community	Specifies the read community string for the SNMP agent.	public
Write Community	Specifies the write community string for the SNMP agent.	Private
Trap Community	Specifies the trap community string for the SNMP agent.	public
Traps On/Off	Enables or disables SNMP trap generation.	Off
Authentication Traps On/Off	Enables or disables SNMP Authentication failure trap generation.	Off
Trap Target IP	Specifies the IP address to receive SNMP traps.	0.0.0.0

The configuration of these fields are accessed via the DB-9, RS-232 connector on the Matrix Frame Controller. Communication parameters for this serial interface default to 38400 baud, no parity, eight (8) data bits, and one (1) stop bit.

Upon connection to the serial interface (via a communications program such as HyperTerminal), enter the command 'ET' (for Ethernet) at the '>' prompt. The current Ethernet settings will be displayed (note that these settings are unavailable via the Telnet interface). For example,

```
>et
        MAC address: 02:02:02:02:02:02
        SERIAL #: AAAAAA000000001
        DHCP            : ON
        IP address      : 192.168.000.104
        Subnet mask     : 255.255.255.000
        Def Gateway     : 192.168.000.002
    NETPRC : MASTER
    NETPRC port     : 1000
    TELNET  : ON
    TELNET port     : 23
    TELNET pass     :
    RCOMM  : public
    WCOMM : private
    TCOMM  : public
    TRAP            : OFF
    AUTH            : OFF
    TARGET : 000.000.000.000
>
```

Help on how to change one of these settings can be obtained by entering the command 'HE ET' (for Help Ethernet) at the '>' prompt. For example,

```
>he et

     Syntax: ET < DHCP [ON|OFF]  | IP [addr]     | GW [addr]     |
          :      SN [addr]      | DP [port]     | TN [ON|OFF]   |
          :      TP [tport]     | TL [pass]     | RCOMM [str]   |
          :      WCOMM [str]    | TCOMM [str]   | TRAP [ON|OFF] |
          :      AUTH [ON|OFF]  | TARGET [addr] | NP [MASTER|SLAVE] >
     Where :  DHCP ON enables client automatic IP address negotiation.
          :  IP [addr] allows you to set the IP address of the PMFC.
          :  GW [addr] allows you to set the gateway address.
          :  SN [addr] allows you to set the subnet mask.
          :  DP [port] allows you to set the NETPRC IP port.
          :  TN ON enables the on-board telnet server.
          :  TP [port] allows you to set the telnet port.
          :  TL [pass] allows you to set the telnet login password.
          :     where addr is in dotted notation (ex. 192.168.1.1}.
          :     where port is in the range [1000...65535].
          :     where tport is in the range [23,1000...65535].
          :  RCOMM [str] allows you to set the SNMP read community string.
          :  WCOMM [str] allows you to set the SNMP write community string.
          :  TCOMM [str] allows you to set the SNMP trap community string.
          :  TRAP ON enables SNMP traps.
          :  AUTH ON enables authentication traps.
          :  TARGET [addr] allows you to set the trap target IP address.
          :  NP [MASTER|SLAVE] sets the NETPRC type of the PMFC.
>et

     MAC address : 02:02:02:02:02:0a
     SERIAL #    : EEEEEE000000001
     DHCP        : ON
     IP address  : 192.168.000.114
     Subnet mask : 255.255.255.000
     Def Gateway : 192.168.000.002
     NETPRC      : SLAVE
     NETPRC port : 1000
     TELNET      : ON
     TELNET port : 23
     TELNET pass :
     RCOMM       : public
     WCOMM       : private
     TCOMM       : public
     TRAP        : OFF
     AUTH        : OFF
     TARGET      : 000.000.000.000
```

For example, to set the read community string to 'pesa', enter

```
>ET RCOMM pesa
```

and press return. To view your changes, wait for the '>' prompt and enter 'ET'.

8.2 APPENDIX B: SNMP

The Cheetah Matrix Frame Controller contains an SNMP v2c agent, which is also compatible with SNMP v1 management stations. The agent supports the following standards:

RFC 1903 – SNMPv2 Textual Conventions
RFC 1904 – SNMPv2 Conformance Statements
RFC 1905 – SNMPv2 Protocol Operations
RFC 1906 – SNMPv2 Transport Mappings
RFC 1907 – SNMPv2 SNMP MIB Objects
RFC 1908 – SNMPv1 Coexistence
RFC 2011 – SNMPv2 IP MIB Objects
RFC 2012 – SNMPv2 TCP MIB Objects
RFC 2013 – SNMPv2 UDP MIB Objects

Two enterprise MIBs are used to provide full control of Cheetah Switchers. The first, PESA-TC.MIB, is a MIB, which defines some textual conventions. The second, PESA-MATRIX.MIB, contains objects, which allow SNMP-based control and monitoring of one or more Cheetah Switchers.

Note that the agent within the Matrix Frame Controller implements a subset of the PESA-MATRIX MIB. The optional Group tables are reserved for implementation within the System Controller.

The agent is capable of managing multiple Cheetah Switchers. This is accomplished in two steps:

a) Connecting the Cheetah Switchers via the RS-422 Aux Frame Port described in this manual.

b) Set the Matrix Frame Controller, which is to communicate with your SNMP management application to NETPRC Master. Note that if you have redundant Matrix Frame Controllers in the Switcher, BOTH must be configured as NETPRC Master. Refer to the Ethernet section described earlier in Appendix A to accomplish this.

c) Set all other Matrix Frame Controllers, which you have connected, to the NETPRC Master controller to NETPRC Slave.

The agent will then be able to configure and control all of the Cheetah Switchers in the connected collection.

Once you have configured the Matrix Frame Controller's SNMP agent (as described in Appendix A), you may issue SNMP commands. The following commands were issued on a PC running Linux against a pair of small Cheetah Switchers.

The first of these simply obtains the inventory for the two frames.

```
$ snmpwalk 192.168.0.106 pesaFrameInvDeviceType
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.1 = INTEGER: frameController(6)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.2 = INTEGER: frameController(6)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.3 = INTEGER: inputBoard(1)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.4 = INTEGER: inputBoard(1)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.5 = INTEGER: outputBoard(2)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.6 = INTEGER: powerSupply(3)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.7 = INTEGER: matrixCard(5)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.1.8 = INTEGER: outputMonitorCard(4)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.2.1 = INTEGER: frameController(6)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.2.2 = INTEGER: inputBoard(1)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.2.3 = INTEGER: outputBoard(2)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.2.4 = INTEGER: powerSupply(3)
PESA-MATRIX-MIB::pesaFrameInvDeviceType.2.5 = INTEGER: matrixCard(5)
```

The next set of commands creates a preset (a collection of switches that are to be taken as a group). In this case, the preset contains two switch definitions (preset members). The first connects source 1 to destination 1 on level 2. The second connects source 2 to destination 2, again on level 2. Both are set to utilize the synchronization signal A (REF 1 on the Cheetah back panel).

```
$ snmpset 192.168.0.106 -c private pesaPresetStatus.1 i 2
PESA-MATRIX-MIB::pesaPresetStatus.1 = INTEGER: active(2)
$ snmpset 192.168.0.106 -c private pesaPresetMemberRowStatus.1.2.1 i 1
PESA-MATRIX-MIB::pesaPresetMemberRowStatus.1.2.1 = INTEGER: active(1)
$ snmpset 192.168.0.106 -c private pesaPresetMemberSyncSource.1.2.1 b syncA
PESA-MATRIX-MIB::pesaPresetMemberSyncSource.1.2.1 = BITS: 80 syncA(0)
$ snmpset 192.168.0.106 -c private pesaPresetMemberSourceNum.1.2.1 u 1
PESA-MATRIX-MIB::pesaPresetMemberSourceNum.1.2.1 = Gauge32: 1
$ snmpset 192.168.0.106 -c private pesaPresetMemberRowStatus.1.2.2 i 1
PESA-MATRIX-MIB::pesaPresetMemberRowStatus.2.2.1 = INTEGER: active(1)
$ snmpset 192.168.0.106 -c private pesaPresetMemberSyncSource.1.2.2 b syncA
PESA-MATRIX-MIB::pesaPresetMemberSyncSource.2.2.1 = BITS: 80 syncA(0)
$ snmpset 192.168.0.106 -c private pesaPresetMemberSourceNum.1.2.2 u 2
PESA-MATRIX-MIB::pesaPresetMemberSourceNum.2.2.1 = Gauge32: 2
$ snmpset 192.168.0.106 -c private pesaTakePreset.0 u 1
PESA-MATRIX-MIB::pesaTakePreset.0 = Gauge32: 1
```

Note that if you specify sources, destinations, or synchronization sources which are unknown to the agent, the operations will fail.

8.3 APPENDIX C: PESA MATRIX FRAME CONTROLLER DEBUG PORT PROTOCOL

The PESA Matrix Frame Controller Debug Port protocol is an RS-232 connection that allows service personnel to directly interact with the PESA Matrix frame controller in order to determine the health of the matrix and to perform certain diagnostics. The same protocol is supported via the Telnet connection; however, the network parameters cannot be configured through the Telnet connection.

D1: Port Setup

Baud Rate: 38,400

Data Bits: 8

Stop Bits: 1

Parity: None

Flow Control: None

D2: Command Syntax

Commands consist of the first two non-whitespace ASCII character sequences entered in a command line.

Each command is followed by a series of optional data parameters. Data parameters start after the first whitespace following the command sequence. Commas delimit the data parameters. All data parameters have leading and trailing whitespaces trimmed.

A command is terminated by a Carriage return. A command is not acted on until the carriage return is received.

Command sequences are case insensitive.

D3: Command Line Character Input

The following indicates how characters input into the debug port are handled.

1) Command Entry

Commands are entered character by character onto the command line. All ASCII keys are concatenated onto a string. In addition, entry of the DELETE or BACKSPACE keys will cause the last character that was entered to be removed from the character string.

In verbose mode, all ASCII characters entered into the serial port are echoed back. The DELETE and BACKSPACE keys cause control characters to be echoed that cause the cursor to move back deleting the last character input.

In terse mode, the input characters are not echoed back.

After a command has been executed, the debug port will output the appropriate response (if any) followed by a Carriage Return/Linefeed and the '>' character. The receipt of the '>' character indicates that the next command is ready to be entered.

2) Verbose Mode

The verbose mode responses include text information and formatting that describe the command response in terms that can be read by a user that is using a terminal interface to the debug port – i.e., Human-Machine Interface (HMI).

- Ctl-C – Aborts the current command and starts new command line with a new prompt.
- Ctl-V – Verbose Response Mode (default) – Causes responses to be returned in a verbose mode fit for human consumption of data (plain language).

3) Terse mode

This mode outputs minimal information that fully describes the necessary response data. Its intent is to be read from an automated device such as a PC – i.e., Machine-Machine Interface (MMI).

- Ctl-C – Aborts the current command and starts new command line with a new prompt.
- Ctl-T – Terse Response Mode – Causes commands to be responded to in a terse mode fit for machine consumption of data (programming language).

D5: Command Enumeration

Command Characters in **BOLD** are those characters that are required for the command. The other characters may be entered to help describe the command to a user interface.

1) HE – Help Menu

Syntax:

- **HE**LP [<**cmd**>]

  Where: <**cmd**> is optional in order to receive more help on specific commands.

  AC - Active Status
  AL - Alarm
  AO - All Call (Outputs)
  AS - Output Aspect
  CL - Clear MFCHIP Board Errors
  CO - Communications Status
  DC - Dual Transition Changes
  DT - Dual Takeover
  EC - Error Count
  ET - Ethernet Configuration (local only)
  HE - Help Menu
  IB - Input Board Status
  LR - Output Combiner Force Lock Rate
  MB - Matrix Board Status
  MT - Matrix Type
  OB - Output Board Status
  OOB - Output Option Board Status

PM - Power Management
RC - Roll Call
RE - Reset Board
SB - System Board Status
SS - Switch Status
ST - System Temperature
SW - Switch Crosspoint
SY - Sync Status
TM - Get/Set Time
VE - Versions of Software
VT - Vertical Trigger

Keyboard Commands:
CNTL-T - Terse Mode (does not echo received characters)
CNTL-V - Verbose Mode (echoes received characters)

Response:

- **HE**LP provides a list of the available commands.

Comment:

- Displays a summary of the commands available with a brief description of what they do. Also displays a summary of the control key codes. The response for this is the same for both verbose and terse modes.

2) AL – Alarm

Syntax:

- **AL**

Response:

Comment:

- Responds with an enumeration of alarms that are currently active in the frame controller.

3) RE – Reset Board

Syntax:

- **RE**

Response:

Comment:

- The Reset Board command (**RE**) must be entered twice in a row before the frame controller will be reset.

4) SW – Switch Crosspoint

☛ **NOTE:** *Output Monitor only on digital matrix systems*

Syntax:

- **SW <Output>, <Input>[,M][,<sync>**

  Where: <**Output**> is the output to be switched.
  <**Input**> is the input to be switched.
  [**.M**] indicates to switch the monitor matrix (Default is the primary matrix.)
  <**sync**> is the sync number (0 or 1) to switch to.

5) AC – Active Status

Syntax:

- **AC**

Response:

- SINGLE – single frame controller in system.
  ACTIVE – active frame controller in dual system.
  STANDBY – inactive frame controller in dual system.

Comment:

- Indicates whether the board is active or standby.

6) CO – Communications Status

Syntax:

- **CO**

Response:

- PRC: <status> NET PRC: <status> NET PRC Connections: <num>

  Where: <status> is IDLE, ERROR, or OK
  <num> is the number of Ethernet PRC connections.

Comment:

- Indicates whether we are receiving commands from the PRC port or the NETPRC port. NETPRC indicates the number of connections currently active.

7) SS – Switch Status

☛ **NOTE:** *Output Monitor only on digital matrix systems*

Syntax:

- **SS <Output>[,M]**

  Where: <**Output**> is the output to be switched

  [**.M**] indicates to switch the monitor matrix (Default is the primary matrix.)

Response:

- Output: <out> Input: <in> Level: <lev>

  Where: <out> is the output number.
  <in> is the input number currently switched to the output.
  <lev> is the level (MAIN or MONITOR) for the switch status.

8) RC – Roll Call

Syntax:

- **RC <I | O | M | S| OO>,<A | B>**

  Where: **I** = Input
  O = Output
  OO = Output Option
  M = Matrix
  S = System Board
  A = Port A
  B = Port B

Response:

- Roll Call Port: <port> Type: <type>
  <**data**>

  Where: <port> is A or B.
  <type> is INPUT, OUTPUT, MATRIX, or SYSTEM.
  <**data**> is the multiple 8 bit data bytes used to indicate a boards exists in the frame.

Comment:

- Roll Call is used to determine if a board exists in the system, which port the board is used to communication on, which slot the board is in relative to the board type, and the boards general condition (Error and/or Over Temperature).

9) IB – Input Board Status

Syntax:

- **IB <Slot>**

  Where: <**Slot**> is the input board slot.

Response:

- WC = xxxx OD1 = xxxx OD2 = xxxx OD3 = xxxx CRC = xxxx
  Total Errors = xxxx

Comment:

- See "Matrix Frame Controller Hardware Interface Protocol MFCHIP" to get specific information on the response.

10) MB – Matrix Board Status

Syntax:

- **MB <Slot>**

  Where: <**Slot**> is the matrix board slot.

Response:

- WC = xxxx OD1 = xxxx OD2 = xxxx CRC = xxxx
  Total Errors = xxxx

Comment:

- See "Matrix Frame Controller Hardware Interface Protocol MFCHIP" to get specific information on the response.

11) OB – Output Board Status

Syntax:

- **OB <Slot>**

  Where: <**Slot**> is the output board slot.

Response:

- WC = xxxx OD1 = xxxx OD2 = xxxx OD3 = xxxx OD4 = xxxx
  OD5 = xxxx OD6 = xxxx OD7 = xxxx OD8 = xxxx OD9 = xxxx
  OD10 = xxxx CRC = xxxx
  Total Errors = xxxx

Comment:

- This syntax describes the status and/or the specific component information.

12) SB – System Board Status

Syntax:

- **SB <Addr>**

  Where: <**Addr**> is the system board address.

Response:

- Power Supplies (Address = 1 to 16):

  WC = xxxx OD1 = xxxx OD2 = xxxx OD3 = xxxx OD4 = xxxx
  OD5 = xxxx OD6 = xxxx OD7 = xxxx OD8 = xxxx CRC = xxxx
  Total Errors = xxxx

- Output Monitor (Address = 17):

  WC = xxxx OD1 = xxxx OD2 = xxxx OD3 = xxxx CRC = xxxx
  Total Errors = xxxx

Comment:

- This syntax describes the status and/or the specific component information.

13) CL – Clear Error

Syntax:

- **CL <I | O | OO| P| M | S>,<addr>**

  Where: **I** = Input
  O = Output
  OO = Output Option
  P = Power Supply
  M = Matrix
  S = System
  <**addr**> = slot or board address

Response:

Comment:

- Clears the total number of errors for the specified board.

14) ST – System Temperature

Syntax:

- **ST [<I | O |OO| M | P>**

  Where: **I** = Input
  O = Output
  OO = Output Option
  M = Matrix
  P = Power Supply

Response:

- **Temperature:**
  Frame Controller: <hex> (<dec>)
  Output Monitor: <hex> (<dec>)
  <type>:
  <hex> (dec)<hex> (dec) …

  Where: <**hex**> is the hex number for the temperature.
  <**dec**> is the decimal number for the temperature
  <type> is the board type (INPUT, OUTPUT, etc).
  The data following the type is the hex (dec) temperature in Celsius for each board of the specified type in the system.

Comment:

- This syntax describes the status and/or the specific component information.

15) VE – Version of Software

Syntax:

- **VE**

Response:

- LOADER: <ver> <date>
  INSTALLER: <ver> <date>
  PMFC: <ver> <date>
  FPGA: <ver>
  Matrix Cards:
  <ver> <ver> … <ver>
  Input Cards:
  <ver> <ver> … <ver>
  Output Cards:
  <ver> <ver> … <ver>
  Output Option Cards:
  <ver> <ver> … <ver>
  Power Supply Cards:
  <ver> <ver> … <ver>
  Output Monitor Card: <ver>

Comment:

- The version command provides the version number and date for each software module in the system. If a software module does not exist, then "Invalid" is displayed.

16) VT – Vertical Trigger

Syntax:

- **VT [<A | B>]**

  Where: **VT** – no port change.
  VT A – change to Port A.
  VT B – change to Port B

Response:

Comment:

- This syntax describes the status and/or the specific component information. The vertical trigger command forces the cards in the system to use the specified port (A or B) as the primary data link.

17) DT – Dual Takeover

Syntax:

- **DT**

Response:

Comment:

- Allows the Standby Frame Controller to take over control of the frame.

18) EC – Error Count

Syntax:

- **EC <I | O | OO | M | P | S>**

  Where: **I** = Input
  O = Output
  OO = Output Option
  M = Matrix
  P = Power Supply
  S = System

Response:

- <Board Type>:
  <error count> <error count> …

Comment:

- Response gives the number of error counts for all of the boards in the frame for the board type that was specified.

19) TM - Get/Set Time

Syntax:

- **TM** [<**mm**/**dd**/**yy**> <**hh**:**mm**:**ss**>]

Response:

Comment:

- Gets/sets the Frame Controller's real time clock.

20) SY - Sync Status

Syntax:

- **SY** <**1** | **2**>

  Where: **1** indicates sync 1 and **2** indicates sync 2

Response:

Comment:

- Indicates the sync reference being detected by the frame controller card.

21) PM - Power Management

Syntax:

- **PM** <**I** | **O** | **M** | **S** | **P** | **OO**>[<**slot**>[<**ON** | **OFF**>]]

  Where: **I** = Input
  O = Output,
  M => Matrix
  S => System
  P => Power Supply
  OO = Output Option
  Slot = is the specific card
  ON => DC Board Power is ON
  OFF => DC Board Power is OFF

PM <**I** | **O** | **M** | **S** | **P** | **OO**>	will display DC Power Status for every board of the specified type
PM <**I** | **O** | **M** | **S** | **P** | **OO**>,<slot>	will display DC Power Status for a specific board of the specified type

Response:

Comment:

- Allows you to remotely turn power on/off to individual cards in the system.

22) OOB - Output Option Board Status

Syntax:

- **OOB** <**Slot**>

  Where: <**Slot**> is the output option board slot address.

Response:

- WC = xxxx OD1 = xxxx OD2 = xxxx CRC = xxxx Total Errors = xxxx

Comment:

- Specify **Slot** in either a decimal or hex (i.e. 0x05) format (Slot is a one-based number)

23) MT - Matrix Type

Syntax:

- **MT**

Response:

- <**64x64 Matrix**> or <**128x128 Matrix**>

Comment:

- Returns the matrix type loaded in the system. (Used to differentiate between 64x64 and 128x128 digital matrix cards.)

24) AO - All Call (Outputs)

Syntax:

- **AO** <**Input**>

  Where: Input is the physical input for all outputs. Specify Input in either a decimal or hex (i.e. 0x0005) format.

Response:

Comment:

- Allows you to switch a single input to all outputs of the matrix

25) LR - Output Combiner Force Lock Rate

Syntax:

- **LR** <**slot** | **M**>[,<**output**>,<**rate**>]

  Where: **slot** = the output card
  M = the output monitor card
  output = the output on the card
  rate = (one of the following) :
  143 = 143 Mb/s
  177 = 177 Mb/s
  270 = 270 Mb/s
  360 = 360 Mb/s
  540 = 540 Mb/s
  HD = High Definition
  BYPASS = BYPASS mode
  AUTO = AUTO SELECT

Response:

Comment:

- Allows you to set the reclocker rate on the digital output combiners. If the card does not support the given rate, the command is ignored.

8.4 APPENDIX D: ABBREVIATIONS, ACRONYMS, AND DEFINITIONS (AA&D)

This Appendix includes a listing of the most commonly used abbreviations, acronyms and associated definitions that are used throughout this manual.

AA&D	*DESCRIPTION/DEFINITION*
BNC	Bayonet Neill-Concelman (connector used with coaxial cable that was invented by Mr. Neill-Concelman)
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DAC	Digital to Analog Converter
DHCP	Dynamic Host Configuration Protocol
ESD	Electrostatic Sensitive Device
FCC	Federal Communications Commission
FPGA	Field Programmable Gate-Array
Gbps	Gigabytes (1,024 megabytes) per second; or one billion bits of information per second
HD	High Definition
HDMR	High Definition Multi-Rate
HTTP	HyperText Transfer Protocol
IEC	International Electrotechnical Commission
IP	Internet Protocol
LAN	Local Area Network
LC	Inductor-Capacitor circuit (L is the symbol for inductance); or, Lucent Connector (fiber connector)
LED	Light Emitting Diode
LSB	Least Significant Bit
Mbps	Megabytes per second
MFC	Matrix Frame Controller

AA&D continued on next page

***AA&D** (continued)*

AA&D	*DESCRIPTION/DEFINITION*
MIB	Management Information Base
MSB	Most Significant Bit
NETPRC	NETwork PESA® Routing Controller
NTSC	National Television Standards Committee
PAL	Phase Alternating Line
PC	Personal Computer (typically, IBM-compatible)
PCB	Printed Circuit Board; or Parts Component Board (when populated with components)
P1E	Protocol number 1 Extensions (PESA defined)
PRC	PESA Router Controller
RCP	Remote Control Panel
RMA	Return Material Authorization
SD	Standard Definition
SDI	Standard Definition Interface
SFF	Small-Form-Factor
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
SPDT	Single Pole, Double Throw (switch)
SPST	Single Pole, Single Throw (switch)
syntax	The structural or grammatical rules that define how the symbols in a language are to be combined to form words, phrases, expressions, and other allowable constructs.
TCP	Transmission Control Protocol; or Transfer Control Point
TCP/IP	Transmission Control Protocol/Internet Protocol
Telnet	Telephone Network
USB	Universal Serial Bus (Intel®)


PESA