PESA
Switching
Systems

Tiger™

Video
Routing Switcher

PESA Switching Systems, Inc.
330-A Wynn Drive Northwest
Huntsville, AL 35805-1961
http://www.pesa.com
(256) 726-9200

Part No. 81-9059-0403-0 Revision I (September, 2005)

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Printed in the United States of America.

FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: PESA SWITCHING SYSTEMS, INC.

Manufacturer's Address: 330A Wynn Drive
Huntsville, AL. 35805
USA

The manufacturer hereby declares that the product

Product Name: Tiger Digital Video Routing Switcher

Model Number: All Tiger Digital Video Routing Switcher models

conforms to the following standards or other normative documents:

Electromagnetic Emissions: **EN 50081-1:1992**
EN 55022:1995

Electromagnetic Immunity: **EN 50082-1:1991**
EN 6100-4-2:1995
EN 6100-4-3:1995
EN 6100-4-4:1995

Safety: **EN 60950:1992**

The product herewith complies with the requirements of: **EMC Directive 89/336/EEC**
Low Voltage Directive 73/23/EEC

Supplementary Information:

Test reports and compliance documents are on file at the corporate office of PESA Switching Systems, Inc. in Huntsville, Alabama, USA.

Huntsville, November 12,1998
Place and Date

Paul Ethridge
Paul Ethridge
Quality Control Engineer

81905904100 11/98 REV.B

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: PESA SWITCHING SYSTEMS, INC.

Manufacturer's Address: 330A Wynn Drive
Huntsville, AL. 35805
USA

The manufacturer hereby declares that the product

Product Name: Tiger Analog Video Routing Switcher

Model Number: All Tiger Analog Video Routing Switcher models

conforms to the following standards or other normative documents:

Electromagnetic Emissions: **EN 50081-1:1992**
EN 55022:1995

Electromagnetic Immunity: **EN 50082-1:1991**
EN 6100-4-2:1995
EN 6100-4-3:1995
EN 6100-4-4:1995

Safety: **EN 60950:1992**

The product herewith complies with the requirements of: **EMC Directive 89/336/EEC**
Low Voltage Directive 73/23/EEC

Supplementary Information:

Test reports and compliance documents are on file at the corporate office of PESA Switching Systems, Inc. in Huntsville, Alabama, USA.

Huntsville, November 5,1998
Place and Date

Paul Ethridge
Quality Control Engineer

81905904110 11/98 REV. A

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Chapter 1 – Introduction

General

This manual provides instructions for the installation, operation, and maintenance of the PESA Tiger video routing switcher.

Safety Warnings

Safety warnings, and other important information, are emphasized in three ways:

WARNING

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

CAUTION

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

NOTE

Notes add emphasis to information that is important for the correct installation, operation, or maintenance of the equipment.

Product Description

Each Tiger video routing switcher can switch 144 inputs to 144 outputs and may contain a mix of both analog and digital components. Multiple chassis (both audio and video) may be connected into a system operated by a single controller.

Inputs for two different vertical sync inputs allow the switching of two different signal formats in the same chassis. Composite sync, black burst, and standard analog signals in either NTSC or PAL formats may be used.

All Tiger video routing switchers offer alarm support, switch confirmation, block checking, and power-out-of-range indicators.

Optional equipment includes:

1. An analog or digital output monitor control board. The output monitor control board controls an internal, 144x1 switching matrix which can be used to monitor any output in the frame downstream of the last amplifier and switch circuit. In a multi-frame system, one output monitor control board must be installed in each frame containing signals to be monitored.
2. A system controller with full software diagnostic capability.

Specifications

General

Power Requirements

Auto Range	90-260 VAC, 47-63 Hz
Power Consumption	1050 VA

Physical Characteristics

Height	21 in (534 mm) (12 Rack Units)
Width	19 in (483 mm)
Depth	18 in (457 mm)
Weight	130 lb (59 kg)

Operational Environment

Temperature	0-40° C
Humidity	0-90% Non-Condensing

Analog

Input Characteristics

Level	1 V p-p Nominal
Impedance:	75 Ω Internally Terminated
Return Loss	>40 dB to 5 MHz >15 dB to 60 MHz
Coupling	Direct (DC)
Connector Type	BNC

Output Characteristics

Level	1V p-p Nominal
Impedance	75 Ω
Return Loss	>40 dB to 5 MHz >15 dB to 60 MHz
Coupling	Direct (DC)
DC on Outputs	<±50 mV Max.
Connector Type (2 per output bus)	BNC
Equalization (Belden 8281)	50 Meters to 60 MHz

Gain Characteristics

Gain	Unity
Gain Stability	±0.01 dB
Adjustment Range	±1 dB

Linear Distortions

Frequency Response	±0.1 dB to 10 MHz ±0.5 dB to 35 MHz +1.0 dB to -3dB at 60 MHz
Vertical Tilt	0.25%
Horizontal Tilt	0.2%

Pulse and Bar Responses

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

Chrominance/Luminance

Gain Inequality .... ±1% Max.
Delay Inequality .... ±1 nS

Non-Linear Distortions

All Tests 10-90%, 3.58MHz or 12.5-87.5%, 4.43MHz
Differential Gain .... 0.1% at 4.43 MHz
Differential Phase .... 0.1° at 4.43 MHz
Line Time Non-Linearity 0.2%

Crosstalk

All Inputs and Outputs Hostile
Video to Video .... ≤-60 dB to 5 MHz
≤-35 dB at 35 MHz

Switching Characteristics

Switching Time .... ≤1 µS
Switching Transient .... 22 mV (30 IRE Units)
Differential Delay (Input to Input, Same Output) .... ±1.5° at 4.43 MHz
Differential Delay (Output to Output, Same Input) .... ±1.5° at 4.43 MHz

Signal to Noise

Luminance Weighting Filter .... -81 dB
(Std A, B, C, D, G, H, K, L)

Digital

Input Characteristics

Impedance .... 75 Ω Internally Terminated
Non-Looping BNC
Return Loss .... >15 dB 5 MHz to 270 MHz
Standard .... SMPTE 259M for
D1: 270 Mbps
D2 or D3, PAL: 177 Mbps
Compressed 16:9 HDTV: 360 Mbps
Equalization (Belden 8281) .... Automatic for 0-250 m to 270 Mbps
Automatic for 0-150 m to 360 Mbps

Output Characteristics

Impedance .... 75 Ω BNC
Return Loss .... >15 dB 5 MHz to 270 MHz
Signal Amplitude .... 800 mV ±10%, Terminated into 75 Ω
DC Offset .... ±0.5 V, Terminated into 75 Ω
Rise/Fall Times .... 0.6 nS ±100 pS (20-80%) Terminated into 75 Ω
Timing Jitter .... <0.2 ui p-p (SMPTE 259M)
Alignment Jitter .... <0.2 ui p-p (SMPTE 259M)
Standard .... SMPTE 259M for
D1: 270 Mbps
D2 or D3, NTSC: 143 Mbps
D2 or D3, PAL: 177 Mbps
Compressed 16:9 HDTV: 360 Mbps
Reclocking .... Auto Standards Selection at 143 Mbps, 177 Mbps, 270 Mbps, and 360 Mbps

Chapter 2 – Installation

Shipping Damage Inspection

Immediately upon receipt, all shipping containers should be inspected for damage caused in transit. If any damage is noted, save all packing material and contact both PESA and the carrier as soon as possible.

Unpacking

CAUTION

This equipment contains static sensitive devices. A grounded wrist strap and mat should be used when handling the internal circuit cards.

Carefully unpack the equipment and compare the parts received against the packing list and Table 1. If any parts appear to be missing, please contact PESA immediately.

Installation Location

WARNING

For safety reasons, this equipment must be located near the socket-outlet or power strip so that the AC line cord plugs are easily accessible (Ref. EN60950:1992 §1.7.2)

This equipment is designed to be installed in a standard 19-inch equipment rack located in an environment conforming to the specifications shown in Chapter 1. Each unit should be located as close as possible to its associated equipment to minimize cable runs.

Consideration should be given to the connection of this equipment to the supply circuit and the effect that possible overloading could have on overcurrent protection circuits and supply wiring. Refer to the nameplate ratings when addressing this concern.

Table 1. Equipment List

Part No. Description	Quantity Required
81-9065-2002-0 Tiger Video Mainframe Includes the following: 3 each Midplane (81-9065-1965-0) 1 each Controller Interface Board (81-9065-1969-0) 1 each Alarm/House Sync Board (81-9065-1970-0) 1 each System Connector Interface Board (81-9065-1971-0) 1 each Chassis Assembly (81-9065-2015-0) 1 each Power Bracket (81-9065-2018-0) 1 each Input Power Filter (81-9065-2058-0) 2 each Board Extractors (81-9065-2082-0)	1 each
81-9065-2049-0 Tiger Video Power Supply	2 each
81-9065-1964-0 Digital Video Output Monitor Crosspoint Board	Notes 1, 2 9 max per mainframe
81-9065-1967-0 Digital Video Output Combiner Board	Note 1 9 max per mainframe
81-9065-1968-0 Digital Video Output Monitor Control Board	Notes 1, 2 1 max per mainframe
81-9065-1972-0 Digital Video Input Buffer Board	Note 1 18 max per mainframe
81-9065-1973-0 48x16 Digital Video Crosspoint Board	Note 1 27 max per mainframe
81-9065-1975-0 Analog Video Output Monitor Control Board	Notes 1, 2 1 max per mainframe
81-9065-1979-0 Analog Video Output Combiner Board	Note 1 9 max per mainframe
81-9065-1980-0 48x16 Analog Video Crosspoint Board	Note 1 27 max per mainframe
81-9065-1981-0 Analog Video Input Buffer Board	Note 1 18 max per mainframe
81-9065-2041-0 Analog Video Output Monitor Crosspoint Board	Notes 1, 2 9 max per mainframe
81-9065-2087-0 Digital Output Combiner Board with Expansion	Note 1 9 max per mainframe
81-9065-2095-0 Analog Output Combiner Board with Expansion	Note 1 9 max per mainframe
81-9028-0442-0 AC Power Cable	2 each
81-9059-0403-0 Tiger Video Routing Switcher Manual	1 each
81-9065-2014-0 Dummy Load Board	Note 1
81-9065-2071-0 Output Combiner Board Extender	Note 1
81-9065-2072-0 48x16 Video Crosspoint Board Extender	Note 1
81-9065-2073-0 Input Buffer Board Extender	Note 1
81-9097-1744-0 3500Plus System Controller	Note 1 2 max per mainframe
Note 1: This item is optional or may be ordered in varying quantities. Please consult your purchase order to verify that you have received the correct quantity. **Note 2:** Although each mainframe may be populated with both analog and digital boards, only one output monitor control board (analog or digital) can be installed per mainframe. Output monitor crosspoint boards (analog or digital) must be also be installed to support the output monitor control board selected.	

Installation in Equipment Rack

WARNING

Due to the weight of this equipment, installation or removal requires at least two persons in order to avoid possible personal injury or equipment damage. This equipment should only be installed in a standard 19-inch equipment rack and only in such a manner as to avoid any tipping hazard from uneven loading of the rack.

CAUTION

Forced air cooling is provided by fans located within this equipment. Care should be taken not to block airflow around these fans.

This equipment is designed to be installed in a standard 19-inch equipment rack. Sufficient space must be provided behind the equipment racks to allow for control, signal, and power cables. All panel mounting holes should be utilized and mounting hardware tightened securely.

Install the equipment into the rack as follows:

1. Insert the panel assembly into the equipment rack and support the bottom of the panel assembly until all mounting hardware has been installed and properly tightened.
2. Install the bottom two panel mounting screws.
3. Install the top two panel mounting screws.
4. Install any remaining panel mounting screws.
5. Tighten all of the panel mounting screws until they are secure.

Interface Connections

For reasons of personal safety, and to prevent damage to the equipment or cables, the following guidelines should be followed when connecting cables to this equipment.

1. Install the equipment in the rack before connecting cables.
2. All cables should be carefully strain relieved to prevent connector separation.
3. To the extent possible, separate control, signal, and power cables to minimize crosstalk and interference.
4. The liberal use of nylon cable ties to secure cables to the rack is encouraged. This will minimize the amount of force transmitted to the equipment and help route cables away from hazardous areas.
5. Route cables away from walk areas to avoid creating a safety hazard.

All interface connections are made at the rear of this equipment as shown in Figure 1.

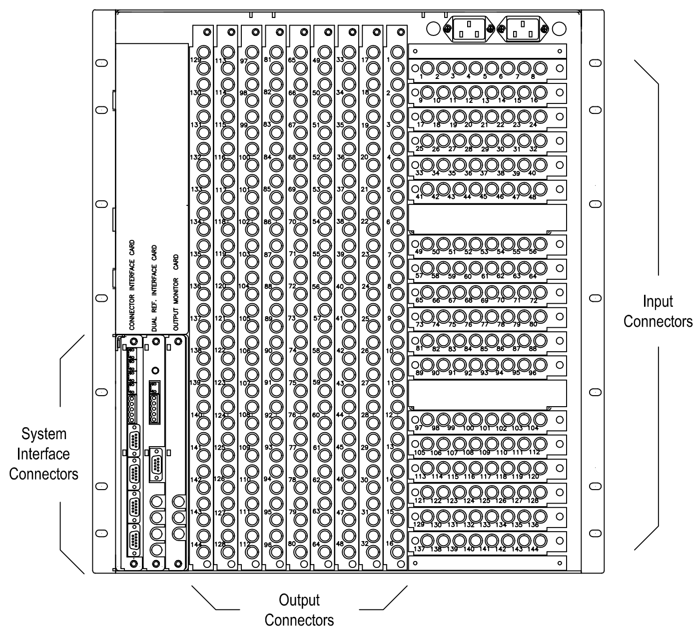


Figure 1. Interface Connections

Input Signal Connectors

These BNC coaxial connectors provide the input signal interface. Use coaxial cable and a standard BNC connector to connect each source.

See "Large Level Expansion Feature" on Page 20 for additional information when installing cables to a system utilizing this feature.

Output Signal Connectors

These BNC coaxial connectors provide the output signal interface. Use coaxial cable and a standard BNC connector to connect each destination.

See "Large Level Expansion Feature" on Page 20 for additional information when installing cables to a system utilizing this feature.

Connector Interface Board

Remote Control Panel Connectors (PANEL PORTS)

These 3-contact connectors provide RS-485 serial communication interfaces using the PESA RCP Protocol (Document No. 81-9062-0300-0). See Figure 2 for an orientation view showing contact locations.

The PANEL PORT connectors are connected to PESA Remote Control Panels with daisy-chained cables constructed with 3-contact connectors (Part No. 81-9029-0780-0) and shielded, twisted-pair audio cable (Part No. 81-9028-0043-2, Belden 8451, or equivalent) as shown in Figure 3. The connector body has an integral strain relief which requires the use of a nylon cable tie which is included with the connector. If this cable tie is not available, Part No. 81-9021-0028-8 may be used.

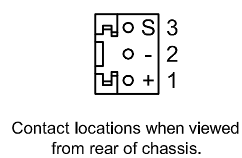


Figure 2. PANEL PORT Connectors

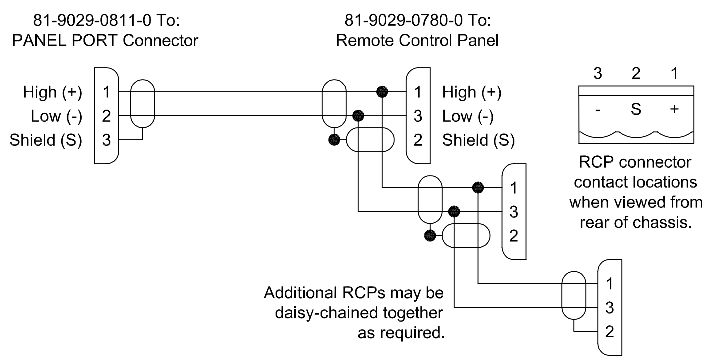


Figure 3. RS-485 Serial Cable

PRC System Expansion Connector (PRC CONTROL)

This 5-contact connector 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 CONTROL connector. See Figure 4 for an orientation view showing contact locations.

PRC CONTROL may be connected to PESA PRC-type equipment with a cable assembly (Part No. 81-9028-0395-0) constructed as shown in Figure 5. If this cable must be constructed in the field, consult Drawing No. WI50-0250 for assembly details.

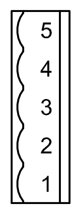


Figure 4. PRC CONTROL Connector

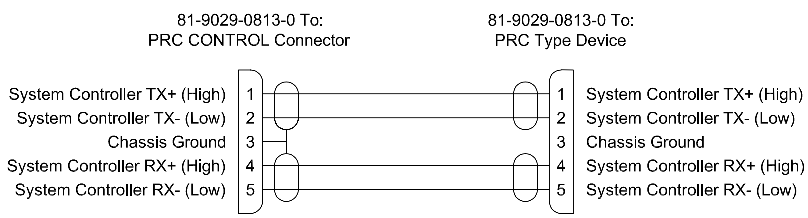


Figure 5. RS-422 System Expansion Cable

RS-232 Control Connectors (SERIAL 1, SERIAL 2)

These DB9-Male connectors provide RS-232 serial communication interfaces. See Figure 6 for an orientation view showing contact locations.

> **NOTE**
>
> Although two system controllers may be installed in a Tiger Video Routing Switcher, only one will be active at any given time. SERIAL 1 and SERIAL 2 will only communicate with the active system controller. The active controller will then relay any required data to the standby controller. For more information, please consult the manual for your system controller.

- SERIAL 1 is connected to COM 1 on the internal system controller. SERIAL 1 is the primary RS-232 CPU link and may be connected to the PC running the control system software (e.g. Win3500, Win3500Plus, etc.) with a null modem cable (Part No. 81-9028-0393-0). If necessary, a cable up to 50 feet in length may be fabricated in the field as shown in Figure 7 on page 12. If a 3500Plus system controller is installed, SERIAL 1 may only be used with the P1E protocol, at either 9600 or 38400 baud. Consult the manual for your system controller to determine how to set the communication rate.

  SERIAL 1 may also be connected to an external modem using an AT Serial Modem cable (Part No. 81-9028-0400-0). If necessary, a cable up to 50 feet in length may be fabricated in the field as shown in Figure 8 on page 12.

- SERIAL 2 is connected to COM 2 on the internal system controller. SERIAL 2 is a secondary RS-232 CPU link which may also be connected to a PC or external modem. SERIAL 2 may be used with any of the protocols shown in Table 2. Consult the manual for your system controller to determine how to set the communication rate.

Table 2. PESA CPU Link Protocols

Protocol	Document No.
CPU Link Protocol No. 1 (P1)	81-9062-0407-0
CPU Link Protocol No. 1 Extensions (P1E)	81-9062-0408-0
Unsolicited Status Protocol (USP)	81-9062-0409-0
Truck Link Protocol (TRK)	81-9062-0410-0

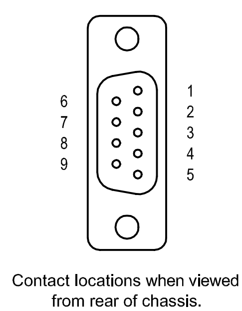


Figure 6. SERIAL 1, SERIAL 2 Connectors

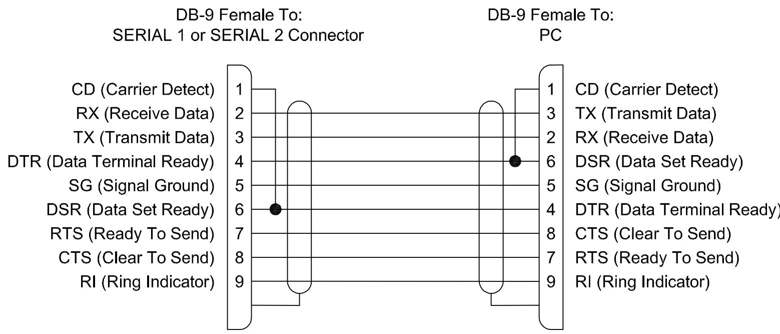


Figure 7. RS-232 CPU Link (Null Modem) Cable

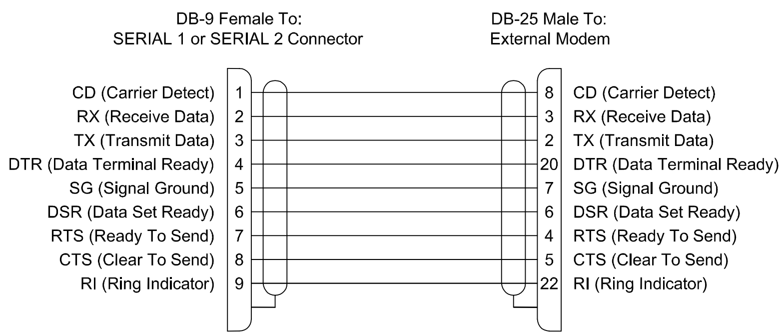


Figure 8. RS-232 CPU Link (AT Serial Modem) Cable

RS-422 Control Connectors (PRC CONTROL, SERIAL 4)

These DB9-Male connectors provide RS-422 serial communication interfaces. See Figure 9 for an orientation view showing contact locations.

> **NOTE**
>
> Although two system controllers may be installed in a Tiger Video Routing Switcher, only one will be active at any given time. PRC CONTROL and SERIAL 4 will only communicate with the active system controller. The active controller will then relay any required data to the standby controller. For more information, please consult the manual for your system controller.

- PRC CONTROL is connected to COM 3 on the internal system controller. PRC CONTROL is the communications interface to a PRC type routing switcher system and is connected to a routing switcher with an AT Serial Modem cable (Part No. 81-9028-0400-0). If necessary, a cable up to 4000 feet in length may be fabricated in the field as shown in Figure 10 on page 14.
- SERIAL 4 is connected to COM 4 on the internal system controller. SERIAL 4 is an RS-422 CPU Link similar to the RS-232 CPU Link, except the cable may be up to 4000 feet in length and an RS-422 interface card must be installed in the expansion bus. SERIAL 4 may be used with any of the protocols shown in Table 3. Consult the manual for your system controller to determine how to set the communication rate. If necessary, a cable may be fabricated in the field as shown in Figure 11 on page 14.

Table 3. PESA CPU Link Protocols

Protocol	Document No.
CPU Link Protocol No. 1 (P1)	81-9062-0407-0
CPU Link Protocol No. 1 Extensions (P1E)	81-9062-0408-0
Unsolicited Status Protocol (USP)	81-9062-0409-0
Truck Link Protocol (TRK)	81-9062-0410-0

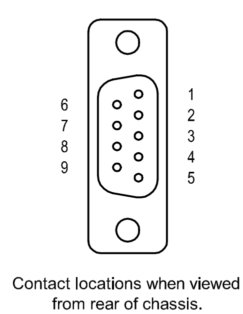


Figure 9. PRC CONTROL, SERIAL 4 Connectors

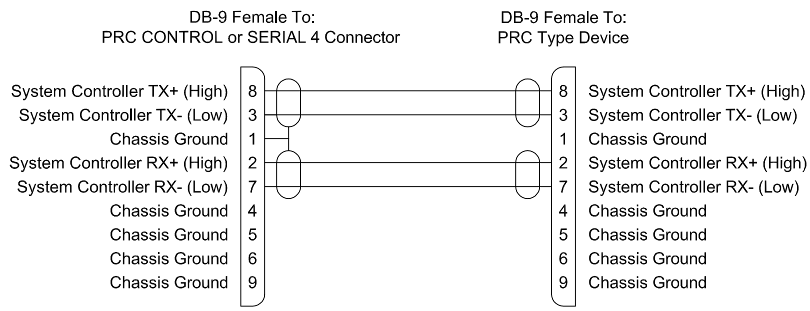


Figure 10. RS-422 Serial Cable

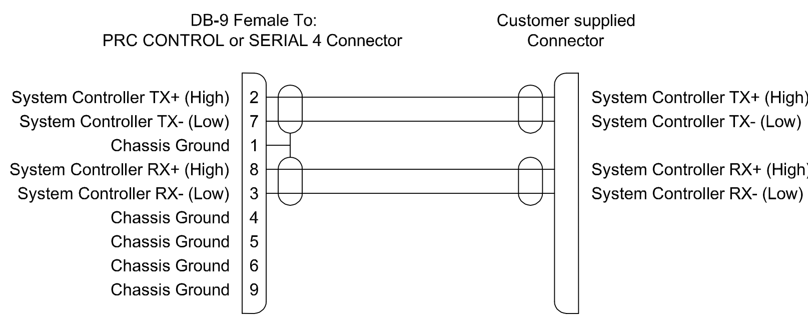


Figure 11. RS-422 CPU Link Cable

Dual Reference/Alarm Interface Board

Alarm Switch Connector (ALARM)

This 3-contact connector provides an optically isolated switch closure during an alarm condition. For more information on alarm conditions, see “Alarm Signal Monitoring” on page 37. See Figure 12 for an orientation view showing contact locations.

ALARM is connected to an external, customer supplied, monitoring circuit with a cable constructed with one 3-contact, screw-terminal connector (PESA Part No. 81-9029-0811-0) and customer supplied cable, as shown in Figure 13. The connector body has an integral strain relief, which requires the use of a nylon cable tie (PESA Part No. 81-9021-0028-8).

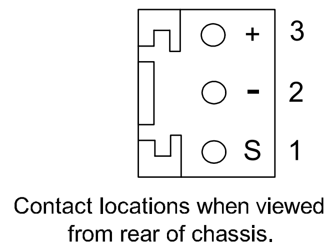


Figure 12. ALARM Connector

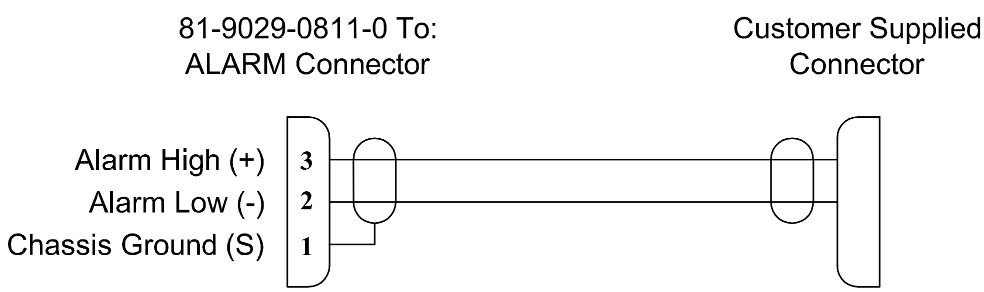


Figure 13. Alarm Switch Cable

> **CAUTION**
>
> The alarm circuit connected to this connector must not exceed 12VDC or 10mA.

Alarm System Expansion Connector (ALARM CONTROL PORT)

This 5-contact connector is used to provide an RS-422 serial communication interface using the protocol shown on page 39. It is wired in parallel with the DB-9 ALARM CONTROL PORT connector. See Figure 14 for an orientation view showing contact locations.

ALARM CONTROL PORT may be connected to other PESA PRC type equipment with a cable assembly (Part No. 81-9028-0395-0) constructed as shown in Figure 15. If this cable must be constructed in the field, consult Drawing No. WI50-0250 for assembly details.

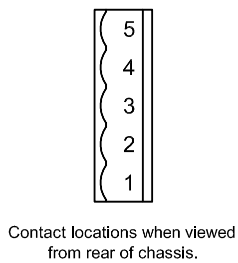


Figure 14. ALARM CONTROL PORT System Expansion Connector

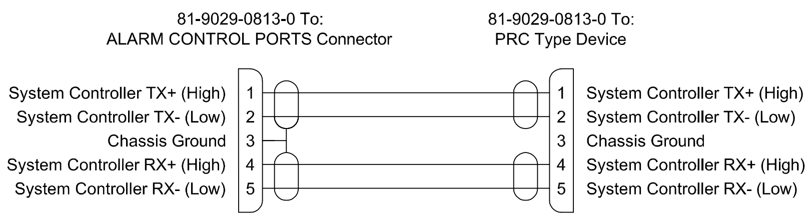


Figure 15. RS-422 System Expansion Alarm Cable

Alarm Interface Connector (ALARM CONTROL PORT)

This DB9-Male connector provides an interface for an external, customer supplied, alarm monitor and control system, usually a PC. See Figure 16 for an orientation view showing contact locations.

The Alarm System External Control Interface (ECI) may be operated in either RS-232 (point-to-point) mode or RS-422 (multidrop) mode. If RS-232 mode has been selected, this connector is connected to the PC with a cable constructed as shown in Figure 18. If RS-422 mode has been selected, this connector is connected to the PC with a cable constructed as shown in Figure 17.

For more information on selecting communication modes, see "J9, J10, J11 – Communication Mode Select Jumper" on page 25.

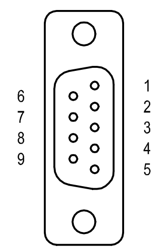


Figure 16. ALARM CONTROL PORT Control Connector

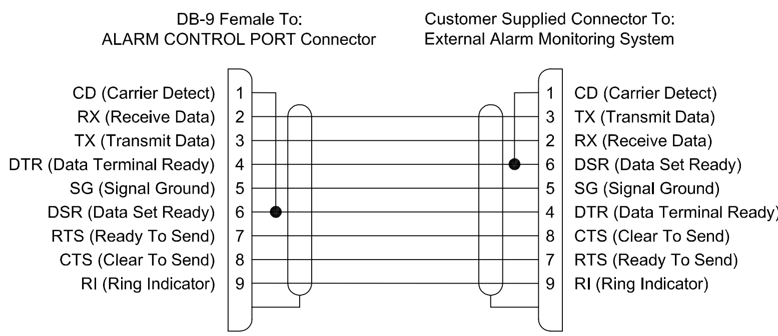


Figure 17. RS-232 Alarm Control (Point-to-Point) Cable

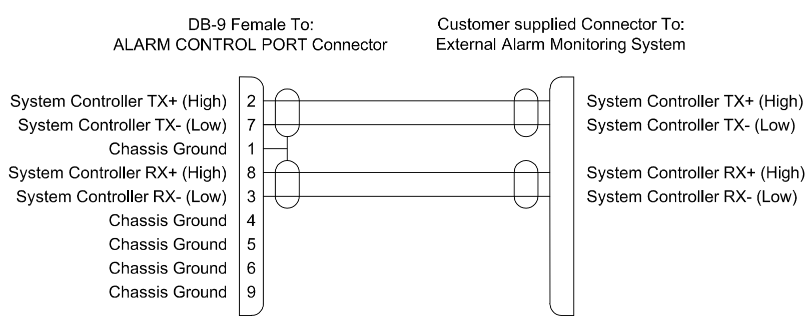


Figure 18. RS-422 Alarm Control (Multidrop) Cable

House Sync Input Connectors (REF #1, REF #2)

These BNC coaxial connectors provide the interface for two house sync signals (NTSC, PAL, etc.). Each house sync input (e.g. REF #1) is a pair of BNC connectors wired in parallel. This allows the signal to be daisy-chained from one routing switcher to another.

REF #1 and REF #2 should be connected to the house sync source with coaxial cable and standard BNC connectors. Install 75 Ohm terminators on all unused connectors.

Output Monitor Control Board

The optional output monitor control board controls an internal, 144x1 switching matrix which can be used to monitor any output in the frame downstream of the last amplifier and switch circuit. In a multi-frame system, one output monitor control board must be installed in each frame containing signals to be monitored.

Output Monitor Control Board Connectors (LOOP INPUT, OUTPUT)

These BNC coaxial connectors provide the interface for the output monitor control board. The two OUTPUT connectors are wired in parallel to allow multiple output monitor control boards to be daisy-chained together.

Connect one of the OUTPUT connectors to the monitor with coaxial cable and standard BNC connectors.

In a system containing multiple Tiger Video routing switchers, LOOP INPUT is used to daisy-chain the output monitor control boards together. This allows a single monitor to view any of the outputs in the system. Connect LOOP INPUT to one of the output monitor control board OUTPUT connectors on the next routing switcher.

Install 75 Ohm terminators on all unused connectors.

Power Connectors

> **WARNING**
>
> Always use a grounded AC receptacle to avoid a potentially lethal shock hazard in the event of an equipment power line fault.

> **NOTE**
>
> This equipment will not meet FCC EMI limits unless both AC line cords are plugged into properly grounded AC receptacles.

Connect the AC line cords (PESA Part No. 81-9028-0442-0) to the Backplane power connectors and then to an AC power source. This equipment is now powered-up and ready for the system controller software to be configured.

> **NOTE**
>
> This equipment contains two power supply assemblies connected in parallel. Only one power supply assembly is required to power this equipment. The second power supply assembly serves as a backup for the first. One power supply assembly may safely be removed while the other power supply assembly is connected to the power source.

Large Level Expansion Feature

Tiger Video routing switchers have a large level expansion feature which allows the creation of systems supporting levels with more than 144 physical inputs and/or outputs, without the need for video distribution amplifiers.

The circuitry already in place on the Input Buffer boards will allow the creation of systems supporting levels having more than 144 physical outputs (e.g. 144x288, 144x432, etc.). Special Output Combiner boards may be ordered which allow the creation of systems supporting levels having more than 144 physical inputs (e.g. 288x144, 432x144, etc.). These features may be combined to create systems supporting large levels such as 288x288, 432x432, etc. A typical 288x288 system is shown in Figure 19.

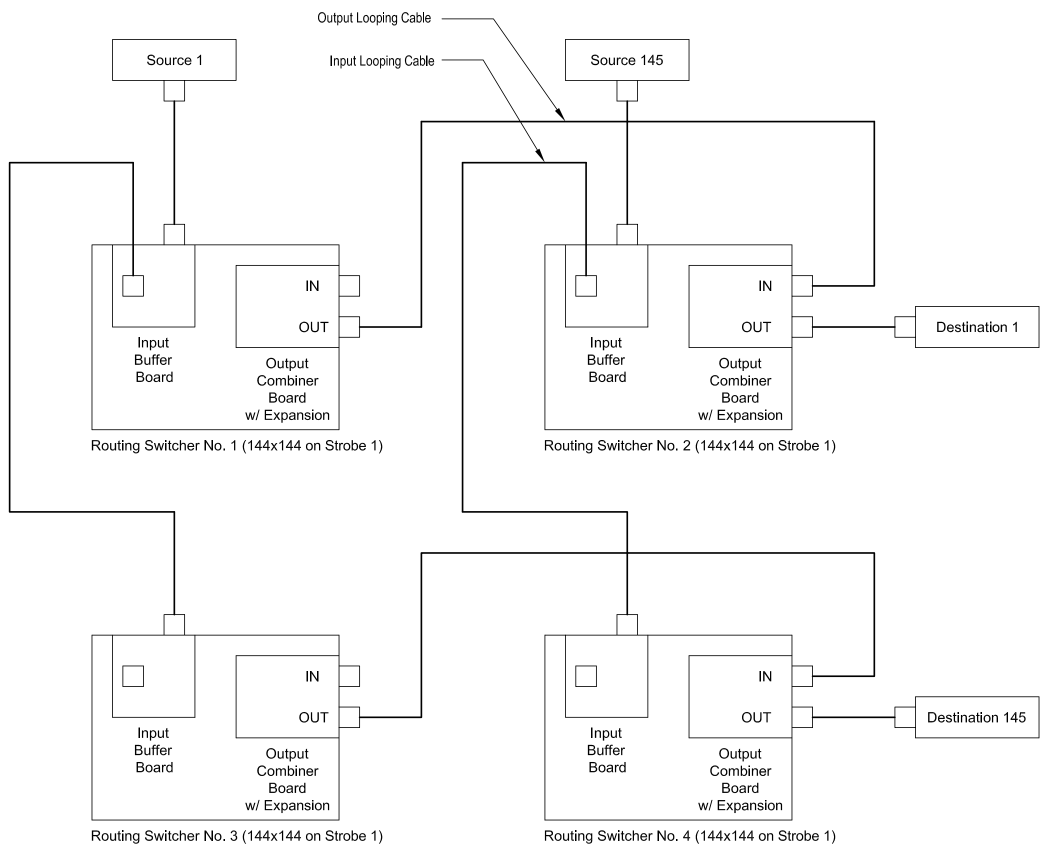


Figure 19. Large Level Expansion Feature - Cable Installation

Input Looping Cables

A standard 4-foot cable assembly (Part No. 81-9028-0444-0) is used to connect the Input Buffer board expansion connector on one routing switcher, to the input connector on the next routing switcher. These cables are used to expand the number of outputs available in a system. If this cable must be constructed in the field, please consult Drawing No. WI50-0269 for assembly details.

Output Looping Cables

A standard 8-foot cable assembly (Part No. 81-9055-0278-7) is used to connect the Output Combiner board output connector on one routing switcher, to the Output Combiner board input connector on the next routing switcher. These cables are used to expand the number of inputs available in a system. If this cable must be constructed in the field, please consult Drawing No. WI50-0150 for assembly details.

Switch and Jumper Settings

Connector Interface Board

The Connector Interface board switch (S1) is an eight-position, toggle-style, DIP switch which controls the strobe assignment and the selection of input and offset codes. See Figure 20 for the location of this switch.

- S1 Strobe Assignment, Input and Offset Code Select

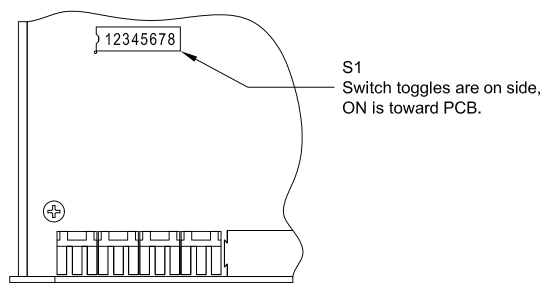


Figure 20. Connector Interface Board DIP Switch Location

S1 – Strobe Assignment, Input and Output Offset Code Select

S1 is an eight-position, toggle-style, DIP switch consisting of eight single-pole, single-throw (SPST) switches numbered 1 through 8. It is used to assign the routing switcher to one of fifteen strobes and select the input and output offset codes. The switch toggle levers are mounted on the side of the switch. When a toggle lever is placed in the position toward the PCB, the switch element is ON. See Table 4 for switch settings.

Table 4. Connector Interface Board Switch S1

Connector Interface Board S1 Strobe Assignment Output Offset Code Select Input Offset Code Select	Switch S1-1	Switch S1-2	Switch S1-3	Switch S1-4	Switch S1-5	Switch S1-6	Switch S1-7	Switch S1-8
Reserved	ON	ON	ON	ON				
Strobe 1	ON	ON	ON	OFF				
Strobe 2	ON	ON	OFF	ON				
Strobe 3	ON	ON	OFF	OFF				
Strobe 4	ON	OFF	ON	ON				
Strobe 5	ON	OFF	ON	OFF				
Strobe 6	ON	OFF	OFF	ON				
Strobe 7	ON	OFF	OFF	OFF				
Strobe 8	OFF	ON	ON	ON				
Strobe 9	OFF	ON	ON	OFF				
Strobe 10	OFF	ON	OFF	ON				
Strobe 11	OFF	ON	OFF	OFF				
Strobe 12	OFF	OFF	ON	ON				
Strobe 13	OFF	OFF	ON	OFF				
Strobe 14	OFF	OFF	OFF	ON				
Strobe 15	OFF	OFF	OFF	OFF				
Output Offset Code 1 (1-144)					ON	ON		
Output Offset Code 2 (145-288)					ON	OFF		
Output Offset Code 3 (289-432)					OFF	ON		
Output Offset Code 4 (433-576)					OFF	OFF		
Input Offset Code 1 (1-144)							ON	ON
Input Offset Code 2 (145-288)							ON	OFF
Input Offset Code 3 (289-432)							OFF	ON
Input Offset Code 4 (433-576)							OFF	OFF

Dual Reference/Alarm Interface Board (Analog and Digital)

The Dual Reference/Alarm Interface board switches (S1 and S2) are four-position, slide-style, DIP switches which control the selection of the CPU address, communication speed, and enable/disable house sync signal inputs. The Alarm Interface board jumper uses three eight-position SIP sockets to allow the selection of the communication mode. See Figure 21 for the location of these switches and jumpers.

- J9, J10, J11 Communication mode select jumper
- S1 CPU address select
- S2 Communication speed select, house sync signal alarm enable/disable

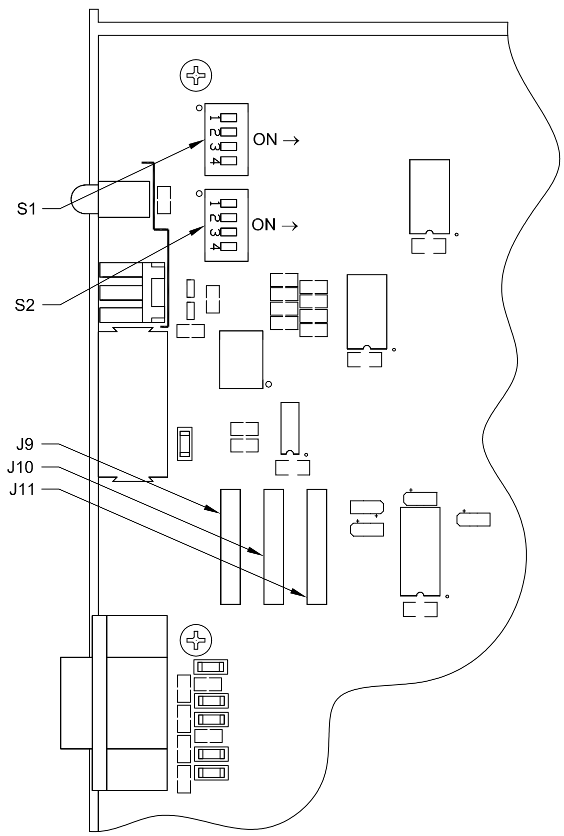


Figure 21. Dual Reference/Alarm Interface Bd DIP Switch and Jumper Locations

S1 – CPU Address Select

S1 is a four-position, slide-style, DIP switch consisting of four single-pole, single-throw (SPST) switches numbered 1 through 4. It is used to select one of sixteen CPU addresses. See Table 5 for switch settings.

NOTE

CPU Address 0 is only used to send unsolicited responses while in point-to-point mode (see "Point-to-Point and Multidrop Modes of Operation" on page 38 for more information. Otherwise, assign a unique CPU Address to each Alarm Interface in the switching system.

Table 5. Dual Reference/Alarm Interface Board Switch S1

Duel Ref./Alarm Intfc Board S1 CPU Address Select	Switch S1-1	Switch S1-2	Switch S1-3	Switch S1-4
CPU Address 0	OFF	OFF	OFF	OFF
CPU Address 1	ON	OFF	OFF	OFF
CPU Address 2	OFF	ON	OFF	OFF
CPU Address 3	ON	ON	OFF	OFF
CPU Address 4	OFF	OFF	ON	OFF
CPU Address 5	ON	OFF	ON	OFF
CPU Address 6	OFF	ON	ON	OFF
CPU Address 7	ON	ON	ON	OFF
CPU Address 8	OFF	OFF	OFF	ON
CPU Address 9	ON	OFF	OFF	ON
CPU Address 10	OFF	ON	OFF	ON
CPU Address 11	ON	ON	OFF	ON
CPU Address 12	OFF	OFF	ON	ON
CPU Address 13	ON	OFF	ON	ON
CPU Address 14	OFF	ON	ON	ON
CPU Address 15	ON	ON	ON	ON

S2 – Communication Speed Select, House Sync Error Alarm Enable/Disable

S1 is a four-position, slide-style, DIP switch consisting of four single-pole, single-throw (SPST) switches numbered 1 through 4. It is used to select one of two communication speeds, and to enable/disable the house sync input alarms. See Table 6 for switch settings.

> **NOTE**
>
> The communication speed should be selected to match that of the serial port on the PC being used as an alarm monitoring device.

Table 6. Dual Reference/Alarm Interface Board Switch S2

Duel Ref./Alarm Intfc Board S2 Communication Speed Select House Sync Error Alarm Enable/Disable	Switch S2-1	Switch S2-2	Switch S2-3	Switch S2-4
9600 Baud	OFF			
38,400 Baud	ON			
House Sync 1 Error Alarm Enable		ON		
House Sync 1 Error Alarm Disable		OFF		
House Sync 2 Error Alarm Enable			ON	
House Sync 2 Error Alarm Disable			OFF	
Reserved - Set S1-4 to OFF				OFF

J9, J10, J11 – Communication Mode Select Jumper

J9, J10 and J11 are eight-position SIP sockets installed on the Dual Reference/Alarm Interface board for use as the communication mode select jumper. The communication mode is selected by installing an eight-position DIP shunt (PESA Part No. 81-9029-0667-6) as follows:

- J9 to J10 to select the RS-422 Multidrop mode
- J10 to J11 to select the RS-232 point-to-point mode

For more information on communication modes, see “Point-to-Point and Multidrop Modes of Operation” on page 38.

Output Monitor Control Board

The Output Monitor Control board switches (S1 through S4) are four-position, slide-style, DIP switches which control the strobe assignment, selection of input and output offset codes, and selection of a house sync line for synchronized switching. See Figure 22 for the location of these switches.

- S1 Output offset code select
- S2 Input offset code select
- S3 Strobe assignment
- S4 House sync line select

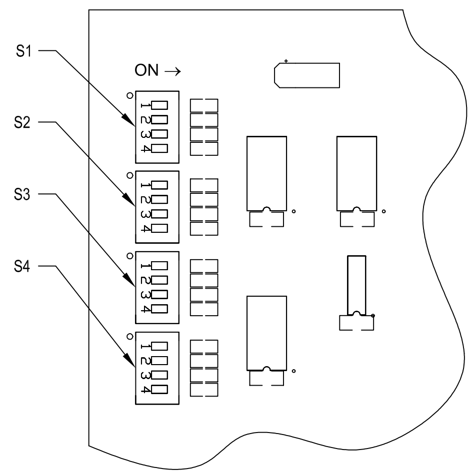


Figure 22. Output Monitor Control board DIP Switch Locations

S1 – Output Offset Code Select

S1 is a four-position, slide-style, DIP switch consisting of four single-pole, single-throw (SPST) switches numbered 1 through 4. It is used to select one of sixteen output offset codes. See Table 7 for switch settings.

> **NOTE**
>
> Each Tiger video output monitor control board has one output per matrix monitored. Each of these outputs must be assigned a unique output offset code.

Table 7. Output Monitor Control Board Switch S1

Output Monitor Control Board S1 Output Offset Code Select	Switch S1-1	Switch S1-2	Switch S1-3	Switch S1-4
Output Offset Code 1	OFF	OFF	OFF	OFF
Output Offset Code 2	OFF	OFF	OFF	ON
Output Offset Code 3	OFF	OFF	ON	OFF
Output Offset Code 4	OFF	OFF	ON	ON
Output Offset Code 5	OFF	ON	OFF	OFF
Output Offset Code 6	OFF	ON	OFF	ON
Output Offset Code 7	OFF	ON	ON	OFF
Output Offset Code 8	OFF	ON	ON	ON
Output Offset Code 9	ON	OFF	OFF	OFF
Output Offset Code 10	ON	OFF	OFF	ON
Output Offset Code 11	ON	OFF	ON	OFF
Output Offset Code 12	ON	OFF	ON	ON
Output Offset Code 13	ON	ON	OFF	OFF
Output Offset Code 14	ON	ON	OFF	ON
Output Offset Code 15	ON	ON	ON	OFF
Output Offset Code 16	ON	ON	ON	ON

S2 – Input Offset Code Select

S2 is a four-position, slide-style, DIP switch consisting of four single-pole, single-throw (SPST) switches numbered 1 through 4. It is used to select one of sixteen input offset codes. See Table 8 for switch settings.

> **NOTE**
>
> In a typical switching system, the output monitor control board input offset code is selected to match that of the matrix being monitored. For example, if the inputs in a routing switcher have been designated 433-576, the corresponding input numbers (Code 4) would be used for the output monitor control board associated with them.

Table 8. Output Monitor Control Board Switch S2

Output Monitor Control Board S2 Input Offset Code Select	Switch S2-1	Switch S2-2	Switch S2-3	Switch S2-4
Input Offset Code 1 (1-144)	OFF	OFF	OFF	OFF
Input Offset Code 2 (145-288)	OFF	OFF	OFF	ON
Input Offset Code 3 (289-432)	OFF	OFF	ON	OFF
Input Offset Code 4 (433-576)	OFF	OFF	ON	ON
Input Offset Code 5 (577-720)	OFF	ON	OFF	OFF
Input Offset Code 6 (721-864)	OFF	ON	OFF	ON
Input Offset Code 7 (865-1008)	OFF	ON	ON	OFF
Input Offset Code 8 (1009-1152)	OFF	ON	ON	ON
Input Offset Code 9 (1153-1296)	ON	OFF	OFF	OFF
Input Offset Code 10 (1297-1440)	ON	OFF	OFF	ON
Input Offset Code 11 (1441-1584)	ON	OFF	ON	OFF
Input Offset Code 12 (1585-1728)	ON	OFF	ON	ON
Input Offset Code 13 (1729-1872)	ON	ON	OFF	OFF
Input Offset Code 14 (1873-2016)	ON	ON	OFF	ON
Input Offset Code 15 (2017-2160)	ON	ON	ON	OFF
Input Offset Code 16 (2161-2304)	ON	ON	ON	ON

S3 – Strobe Assignment

S3 is a four-position, slide-style, DIP switch consisting of four single-pole, single-throw (SPST) switches numbered 1 through 4. It is used to assign the output monitor control board to one of fifteen strobes. See Table 9 for switch settings.

NOTE

In a typical switching system, output monitoring strobe assignments mirror the main system strobe assignments. For example, if the system has three strobes for video, left audio, and right audio, the output monitoring strobes would also be set up for video, left audio, and right audio.

Table 9. Output Monitor Control Board Switch S3

Output Monitor Control Board S3 Strobe Assignment	Switch S3-1	Switch S3-2	Switch S3-3	Switch S3-4
Reserved	OFF	OFF	OFF	OFF
Strobe 1	OFF	OFF	OFF	ON
Strobe 2	OFF	OFF	ON	OFF
Strobe 3	OFF	OFF	ON	ON
Strobe 4	OFF	ON	OFF	OFF
Strobe 5	OFF	ON	OFF	ON
Strobe 6	OFF	ON	ON	OFF
Strobe 7	OFF	ON	ON	ON
Strobe 8	ON	OFF	OFF	OFF
Strobe 9	ON	OFF	OFF	ON
Strobe 10	ON	OFF	ON	OFF
Strobe 11	ON	OFF	ON	ON
Strobe 12	ON	ON	OFF	OFF
Strobe 13	ON	ON	OFF	ON
Strobe 14	ON	ON	ON	OFF
Strobe 15	ON	ON	ON	ON

S4 - House Sync Signal Line Select

S4 is a four-position, slide-style, DIP switch consisting of four single-pole, single-throw (SPST) switches numbered 1 through 4. It is used to select which of four lines in the house sync signal, is to be used for synchronized switching. See Table 10 for switch settings.

Table 10. Output Monitor Control Board Switch S4

Output Monitor Control Board S4 House Sync Signal Line Select	Switch S4-1	Switch S4-2	Switch S4-3	Switch S4-4
Reserved – Set S4-1 to OFF	OFF			
Reserved – Set S4-2 to OFF		OFF		
House Sync Line 10			OFF	OFF
House Sync Line 11			OFF	ON
House Sync Line 12			ON	OFF
House Sync Line 13			ON	ON

Output Combiner Board (Analog and Digital)

The Output Combiner board switches (S1 and S2) are four-position, slide-style, DIP switches which control the selection of a house sync line for synchronized switching. See Figure 23 for the location of these switches.

- S1 House sync line select
- S2 Reserved for future use

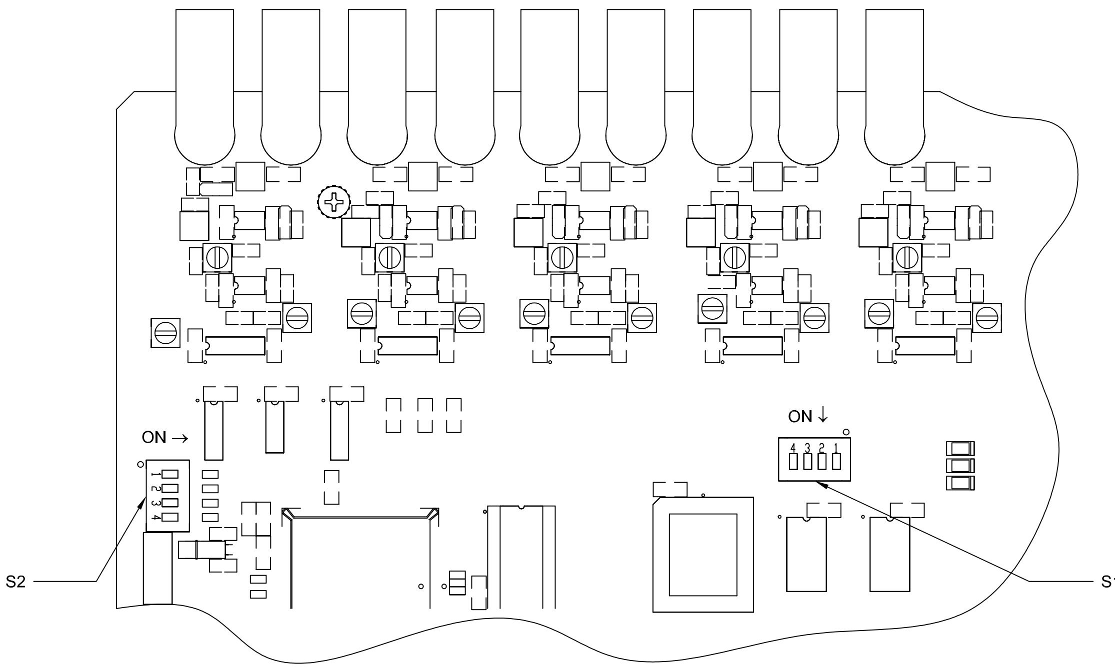


Figure 23. Output Combiner Board DIP Switch Locations

S1 – House Sync Signal Line Select

S1 is a 4 position DIP switch consisting of four single pole, single throw (SPST) switches numbered 1 through 4. It is used to select which of four lines in each house sync signal, is to be used for synchronized switching. See Table 12 for switch settings.

Table 11. Output Combiner Board Switch S1

Output Combiner Board S1 House Sync Signal Line Select	Switch S1-1	Switch S1-2	Switch S1-3	Switch S1-4
House Sync 1 (REF #1) Line 10	OFF	OFF		
House Sync 1 (REF #1) Line 11	ON	OFF		
House Sync 1 (REF #1) Line 12	OFF	ON		
House Sync 1 (REF #1) Line 13	ON	ON		
House Sync 2 (REF #2) Line 10			OFF	OFF
House Sync 2 (REF #2) Line 11			ON	OFF
House Sync 2 (REF #2) Line 12			OFF	ON
House Sync 2 (REF #2) Line 13			ON	ON

S2 – Reserved For Future Use

S2 is a 4 position DIP switch consisting of four single pole, single throw (SPST) switches numbered 1 through 4. It is reserved for future use. See Table 12 for switch settings.

Table 12. Output Combiner Board Switch S2

Output Combiner Board S2 Reserved for Future Use	Switch S2-1	Switch S2-2	Switch S2-3	Switch S2-4
Reserved - Set all switches to OFF	OFF	OFF	OFF	OFF

Subassembly Installation

If specified when ordered, the switches and jumpers on the subassemblies will already be properly configured. Otherwise, please refer to “Switch and Jumper Settings” on page 19 prior to installing these items.

Installation of Rear Subassemblies

Figure 24 shows the location of the subassemblies installed from the rear of this equipment.

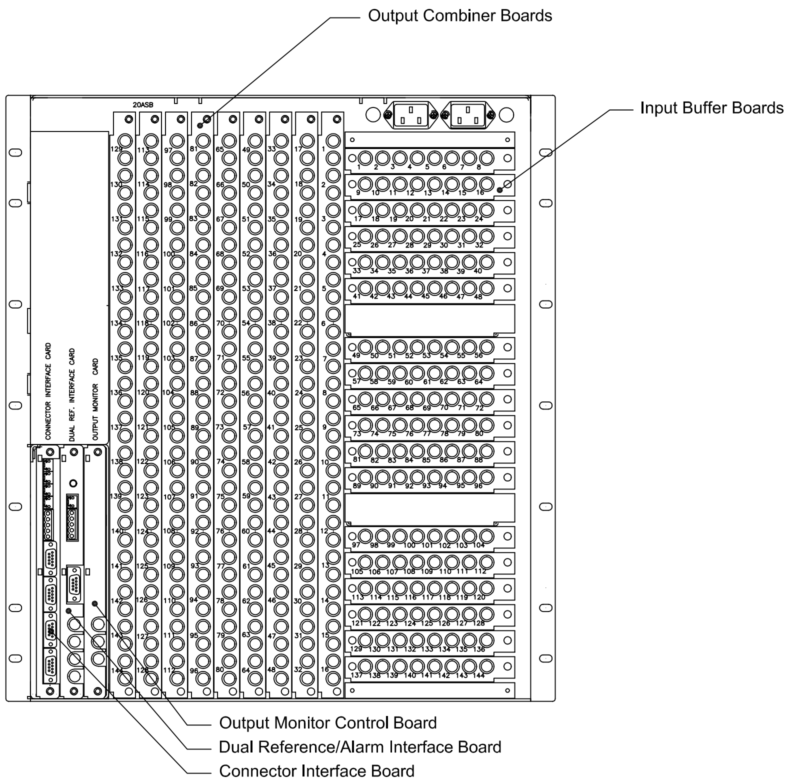


Figure 24. Rear Subassemblies

Connector Interface Board Installation

The Connector Interface board is located as shown in Figure 24 and is installed as follows:

1. Align the support plate of the Connector Interface board with the card guides in the chassis.
2. Carefully insert the Connector Interface board into the chassis until the connectors on the Connector Interface board make contact with the midplane connectors. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the Connector Interface board into the chassis until the connectors on the Connector Interface board are fully mated with the midplane connectors.
4. Tighten the two captive retaining screws until secure.

Dual Reference/Alarm Interface Board Installation

The Dual Reference/Alarm Interface board is located as shown in Figure 24 and is installed as follows:

1. Align the support plate of the Dual Reference/Alarm Interface board with the card guides in the chassis.
2. Carefully insert the Dual Reference/Alarm Interface board into the chassis until the connector on the Dual Reference/Alarm Interface board makes contact with the midplane connector. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the Dual Reference/Alarm Interface board into the chassis until the connector on the Dual Reference/Alarm Interface board is fully mated with the midplane connector.
4. Tighten the two captive retaining screws until secure.

Output Monitor Control Board Installation

The Output Monitor Control board is located as shown in Figure 24 and is installed as follows:

1. Align the support plate of the Output Monitor Control board with the card guides in the chassis.
2. Carefully insert the Output Monitor Control board into the chassis until the connector on the Output Monitor Control board makes contact with the midplane connector. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the Output Monitor Control board into the chassis until the connector on the Output Monitor Control board is fully mated with the midplane connector.
4. Tighten the two captive retaining screws until secure.

Input Buffer Board Installation

The Input Buffer boards are located as shown in Figure 24 and are installed as follows:

1. Align the printed circuit board of the Input Buffer board with the card guides in the chassis.
2. Carefully insert the Input Buffer board into the chassis until the connectors on the Input Buffer board make contact with the midplane connectors. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the Input Buffer board into the chassis until the connectors on the Input Buffer board are fully mated with the midplane connectors.
4. Tighten the two captive retaining screws until secure.
5. Repeat the above steps for each additional Input Buffer board.

Output Combiner Board Installation

The Output Combiner boards are located as shown in Figure 24 and are installed as follows:

1. Align the printed circuit board of the Output Combiner board with the card guides in the chassis.
2. Carefully insert the Output Combiner board into the chassis until the connectors on the Output Combiner board make contact with the midplane connectors. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the Output Combiner board into the chassis until the connectors on the Output Combiner board are fully mated with the midplane connectors.
4. Tighten the two captive retaining screws until secure.
5. Repeat the above steps for each additional Output Combiner board.

Installation of Front Subassemblies

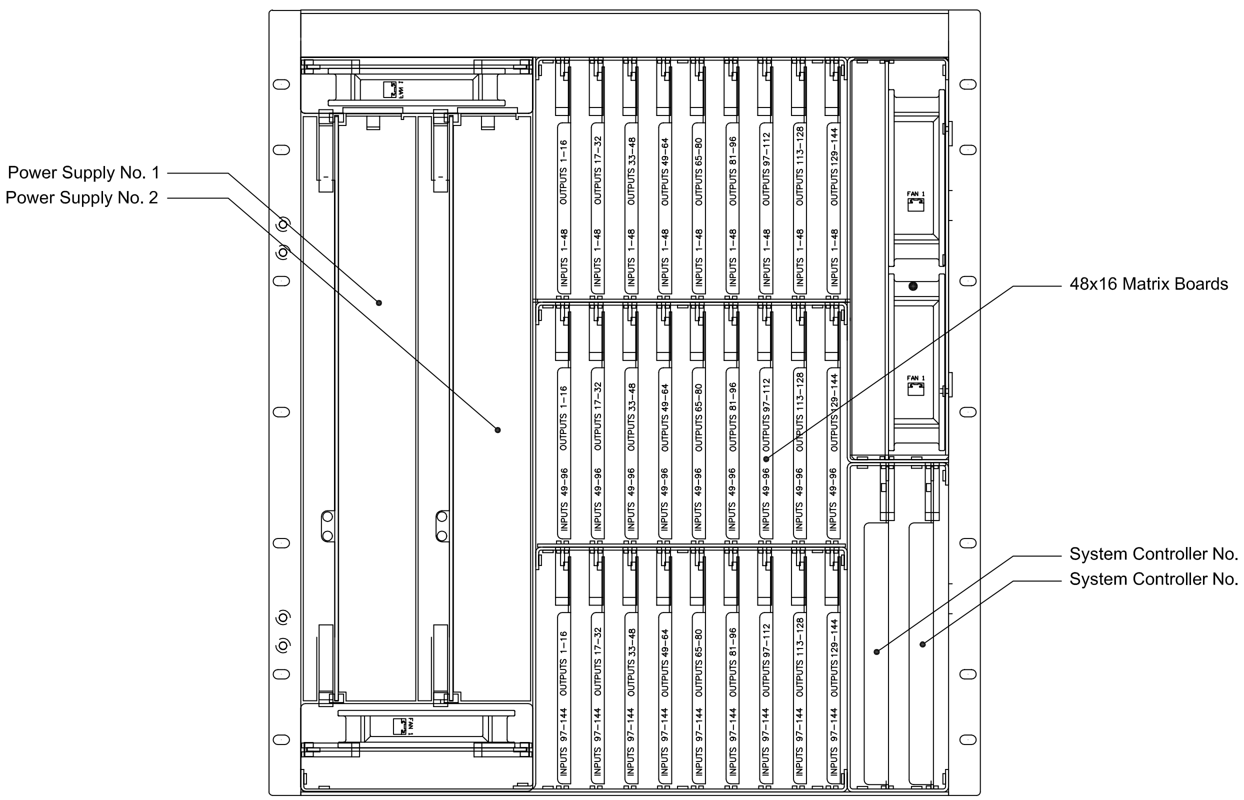


Figure 25. Front Subassemblies

Power Supply Installation

NOTE

This equipment contains two power supply assemblies connected in parallel. Only one power supply assembly is required to power this equipment. The second power supply assembly serves as a backup for the first. One power supply assembly may safely be removed while the other power supply assembly is connected to the power source.

The Power Supplies are located as shown in Figure 25 and are installed as follows:

1. Align the left side-plate of the Power Supply with the card guides in the chassis.
2. Carefully insert the Power Supply into the chassis until the connectors on the Power Supply make contact with the midplane connectors. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the Power Supply into the chassis until the connectors on the Power Supply are fully mated with the midplane connectors.
4. Tighten the two captive retaining screws until secure.
5. Repeat the above steps for the other Power Supply.

48x16 Matrix Board Installation

The 48x16 Matrix boards are located as shown in Figure 25 and are installed as follows:

1. Align the printed circuit board of the 48x16 Matrix board with the card guides in the chassis.
2. Carefully insert the 48x16 Matrix board into the chassis until the connectors on the 48x16 Matrix board make contact with the midplane connectors. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the 48x16 Matrix board into the chassis until the connectors on the 48x16 Matrix board are fully mated with the midplane connectors.
4. Repeat the above steps for each additional 48x16 Matrix board.

System Controller Installation

The System Controllers are located as shown in Figure 25 and are installed as follows:

1. Align the support plate of the System Controller with the card guides in the chassis.
2. Carefully insert the System Controller into the chassis until the connectors on the System Controller make contact with the midplane connectors. Inspect the mating connectors, if possible, to ensure proper alignment.
3. Firmly push the System Controller into the chassis until the connectors on the System Controller are fully mated with the midplane connectors.
4. Repeat the above steps for the other System Controller.

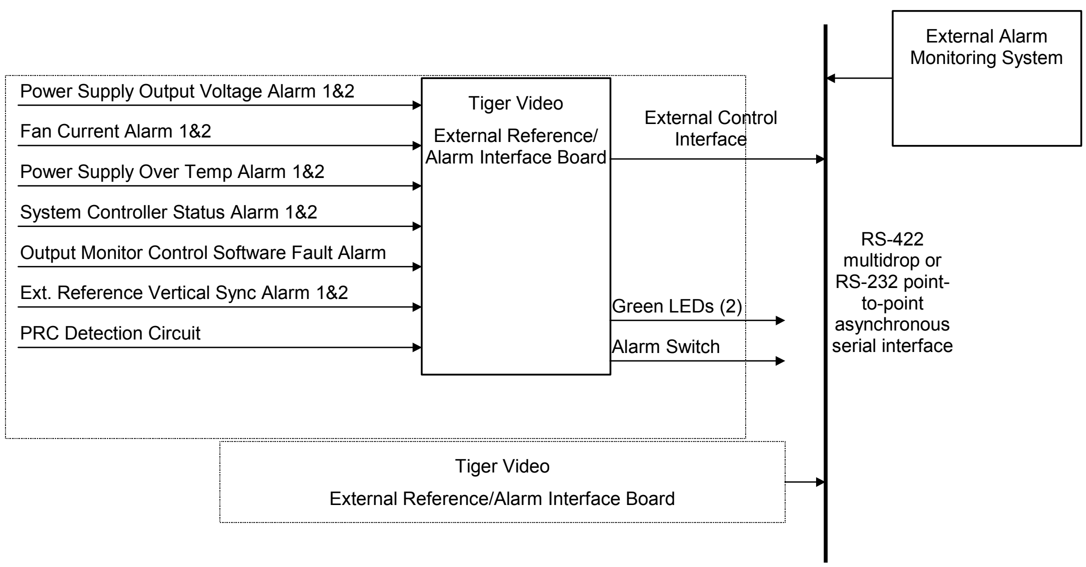
Chapter 3 – Operation

General

This equipment is designed to be operated by a system controller such as the PESA 3500Plus System Controller. For detailed operational information, please refer to the system controller manual.

External Reference/Alarm Interface Board

The External Reference/Alarm Interface board contains a single chip implementation of a 68HC11 controller surrounded by system monitoring circuits and an RS-232 or RS-422 serial port for external interface. When a monitored signal is outside of its normal operating envelope, the External Reference/Alarm Interface board reports the condition to an external alarm monitoring system via the serial link.



Alarm Signal Monitoring

The signals monitored by the External Reference/Alarm Interface board are as follows:

Power Supply Output Voltage Alarm (PS1/PS2)

An A/D converter is used to monitor the power supply output voltage alarm signals. If a signal is lower than 2.0 Volts for a period of 10mS, the alarm is considered active. Two alarm signals are monitored: one for Power Supply 1 and one for Power Supply 2.

Fan Current Alarm (FN1/FN2)

An A/D converter is used to monitor the cooling fan current alarm signals. If a signal is lower than 2.0 Volts for a period of 10mS, the alarm is considered active. Two alarm signals are monitored: one for Power Supply 1 and one for Power Supply 2.

Power Supply Over Temperature Alarm (OT1/OT2)

An A/D converter is used to monitor the power supply over temperature alarm signals. If a signal is lower than 2.0 Volts for a period of 10mS, the alarm is considered active. Two alarm signals are monitored: one for Power Supply 1 and one for Power Supply 2.

System Controller Status Alarm (CT1/CT2)

An A/D converter is used to monitor the alarm signal generated by a system controller (e.g. 3500Plus) installed in a Tiger video routing switcher. If the signal is lower than 2.0 Volts for a period of 10mS, the alarm is considered active. There are two system controller alarm signals that are monitored, one for each system controller installed in the Tiger video routing switcher.

Output Monitor Control Software Fault Alarm (MON)

An A/D converter is used to monitor the software fault alarm signal generated by the optional output monitor control board. If the signal is lower than 2.0 Volts for a period of 10mS, the alarm is considered active.

House Sync Error Alarm (RF1/RF2)

An A/D converter is used to monitor the house sync error alarm signals. If a signal is lower than 2.0 Volts for a period of 10mS, the alarm is considered active. Two alarm signals are monitored: one for each of the house sync signal inputs.

The External Reference/Alarm Interface board can be configured so that house sync error alarms will be ignored (see "S2 – Communication Speed Select, House Sync Error Alarm Enable/Disable" on page 25).

External Control Interface (ECI)

The External Reference/Alarm Interface board communicates to an external alarm monitoring system through the ECI, an RS-232 or RS-422 asynchronous serial interface. The ECI can be set to operate at either 9600 or 38400 baud.

Point-to-Point and Multidrop Modes of Operation

The system is able to operate in either a point-to-point or multidrop mode of operation.

Point-to-point mode provides a means of outputting alarm information when the alarm occurs. The information is sent out the serial port in an unsolicited fashion. It is also available through standard query.

The multidrop operation provides a means for a single external control element to communicate to multiple Alarm Interface boards. The Alarm Interface board operates the RS-422 port such that it stays off the transmit bus unless it is being queried for information.

Message Verification

The ECI has no per-byte handshaking. Instead all messages are confirmed on a per-packet basis using a simple checksum verification method.

Status Solicitation

The Alarm Interface board can be queried for information by the external control.

Alarm Latching

When an alarm is determined to be active, this information is stored in the Alarm Interface board until the ECI sends a clear command. Once cleared, the alarm is reevaluated to determine if it still active.

Time Stamping

The Alarm Interface board has no internal time basis and there is no time stamping of events as to when they occur.

Power Transitions

No data is retained over power transitions. Upon reset, all status is initialized and all current error conditions are reported to the external control interface.

Protocol

Message Format

<Address><Cmd><CmdInfo><Checksum><Terminator> (ASCII)

- Address identifies the Alarm Interface board to which the control is communicating.
- Cmd indicates the information being requested by the control or information being sent back to the control.
  - Query - Request Alarm Status
  - Reset - Resets the Alarm Interface board
- CmdInfo is the information that supplements the command.
- Checksum is a standard 2 character HEX ASCII checksum of the information in the message previous to the checksum.
- Terminator is a linefeed character

Command Set

Status Query

The status command allows the ECI to poll the Alarm Interface board for active alarms.

- Command Structure: <Address> Q <CS> <lf>
- Response Structure: <Address> R [<Alarm Codes>…..] <CS> <lf>

The alarm codes indicate those alarms that presently active. The codes concatenate in the response until all active alarms are listed. The codes are 3 letters in length and consist of the following:

- PS1 - Power Supply 1 Output Voltage Alarm
- PS2 - Power Supply 2 Output Voltage Alarm
- FN1 - Fan 1 Current Alarm
- FN2 - Fan 2 Current Alarm
- OT1 - Power Supply 1 Over Temperature Alarm
- OT2 - Power Supply 2 Over Temperature Alarm
- CT1 - System Controller 1 Alarm
- CT2 - System Controller 2 Alarm
- RF1 – External Reference 1 Vertical Sync Alarm
- RF2 – External Reference 2 Vertical Sync Alarm
- MON - Output Monitor Control Alarm
- RS0 - Alarm Interface board Reset since last Clear

Clear Alarms

The status command clears alarms returned by the Alarm Interface board. All alarms will continue to be reported (even if they have subsequently gone away) until the clear command is received.

- Command Structure: <Address> C <CS> <lf>
- Response Structure: <Address> A <CS> <lf>

Unsolicited Alarms

The response is sent by the Alarm Interface board when it is configured for unsolicited response mode of operation. It is sent whenever an alarm transitions to being active.

- Unsolicited Response Structure: <Address> U <Alarm Code> <CS> <lf>

Alarm Codes are the same as used by the Alarm Query command.

Sample Query and Response

Command is sent to query for alarm conditions

- 1Q82<lf>

where:

- 1 is a decimal number in ASCII representing the address of the Alarm Interface board
- Q is a query request for active alarm status
- 82 is the HEX-ASCII Checksum
- <lf> is the linefeed terminator

A response is sent indicating Power Supply 1 Output Voltage and Power Supply 2 Fan Current are active alarms

- 1RPS1FN21D<lf>

where:

- 1 is a decimal number in ASCII representing the address of the Alarm Interface board
- R indicates alarm Response information
- PS1 indicates the Power Supply No. 1 alarm is active
- FN2 indicates the Fan No. 2 alarm is active
- 1D is the HEX-ASCII Checksum
- <lf> is the linefeed terminator

Chapter 4 – Functional Description

Midplane Board

The Midplane boards are responsible for the distribution of power, control signals, house sync, alarm signals, and video signals throughout the routing switcher.

Controller Interface Board

The Controller Interface board is responsible for providing a passive interface between the Midplane boards and the System Controllers. The system control signals include communications port data, internal and external PRC communications port data, and control panel polling data.

Alarm/House Sync Board

The Alarm/House Sync board contains several main circuits which include power, sync, alarm monitor, alarm microprocessor, alarm control port, and alarm output circuits.

Power

The power circuit is comprised of X1, X2, LED4, D1, and their associated components. X1 and X2 provide over current protection for the electronic circuits. LED4, working in conjunction with D1, provides a visible means of checking for proper input voltages. Additional filtering of the regulated input voltages is provided by input filters and filter capacitors.

Sync

There are two sync circuits on this board, however, only Sync 1 will be described. The sync circuit is comprised of U17 (video sync separator), Q4 and Q5 (NPN transistors), U8 (quad AND gate), and their associated components. Q4 and its associated components provide input buffering for the video sync signal. The video sync signal is coupled to the video sync separator through capacitor C28. The video sync separator separates the input sync signal into an even-odd field signal which is provided to the alarm microprocessor and additional cards in the frame through U8. The composite sync from U17 is provided through Q5 (functioning as an output buffer) to additional circuit cards in the routing switcher. SYNC1 OUT is used by the Analog Video Output Combiners, REF1 OUT (Q5) is used by the System Controllers.

Alarm Monitor

The alarm monitor circuit is composed of U16 (16X1 multiplexer) and its associated components. The microprocessor uses U16 to select the various alarm outputs from the power supplies and circuit cards installed in the routing switcher.

Alarm Microprocessor

The alarm microprocessor circuit is comprised of U1 (68HC711E9 microprocessor), U3 (8K SRAM memory), and their associated components. Reset for the microprocessor is provided by U9 (microprocessor supervisor) and clock for the microprocessor is provided by U2 (7.3728MHz oscillator). U4 de-multiplexes the low-order address lines during bus cycles. Data is also cycled to and from the memory chip, U3, during the microprocessor's read/write cycles. U5 (octal transceiver) reads the settings of DIP switches, S1 and S2, and latches the switch setting information onto the data buss. U7 (3 to 8 decoder) serves as the address decoder for U3, U5, and U6 (octal register) respectively.

Alarm Control Port

The alarm control port can function either as an RS232 port or as an RS422 port depending on the J9-J11 jumper setting. U11 (RS485 receiver/transmitter) controls alarm control port communications when in the

RS422 communications mode. U15 (RS232 receiver/transmitter) controls alarm control port communications when in the RS232 communication mode.

Alarm Output

U6 (octal register) drives the indicator LEDs (LED1 - LED3) and the alarm output driver U10 (opto-coupler). When an alarm condition occurs, LED1 will be illuminated and U10 will provide an alarm closure for the optional external alarm. LED2 is illuminated during the reception of data over the alarm control port and LED3 is illuminated during the transmission of data over the alarm control port.

System Connector Interface Board

The System Connector Interface board provides a passive interface between external control devices (external controllers, control panels, system control computers) and the internal System Controllers. This board also contains the DIP switch utilized for setting the input, output, and levels codes.

Power Supply

The Power Supply assemblies are responsible for providing a regulated +5VDC at 80A, and a regulated -5VDC at 240A, to the routing switcher's internal interfaces and circuit cards. The Power Supply assemblies are also responsible for providing the fan control voltages. Visual indicators (LED1 - LED3) provide a visual indication of the health of the Power Supplies. LED1 indicates the health of the output voltages. LED2 provides a visual indication of a Power Supply over temperature condition. LED3 provides a visual indication of a routing switcher fan failure.

Digital Output Monitor Control Board

This board contains several main circuits which include power, monitor microprocessor, address, monitor control port, input, matrix control, and output circuits.

Power

The power circuit is comprised of X1, X2, LED1, D1, and their associated components. X1 and X2 provide over-current protection. LED1 working in conjunction with D1 provides a visible means of checking for proper input voltages. Additional filtering of the regulated input voltages is provided by input filters and filter capacitors.

Monitor Microprocessor

The monitor microprocessor circuit is comprised of U10 (68HC711E9 microprocessor), U4 (8K SRAM memory), and their associated components. Reset for the microprocessor is provided by U5 (microprocessor supervisor) and clock for the microprocessor is provided by U11 (7.3728MHz oscillator). U3 de-multiplexes the low-order address lines during bus cycles. Data is also cycled to and from the memory chip, U4, during the microprocessor's read/write cycles. U6 (3 to 8 decoder) serves as the address decoder for U1, U9, and U2 (octal register) respectively. U13 working in conjunction with the microprocessor enables the selection of the active Output Monitor Matrix.

Code Select

The code select circuit is comprised of U1 and U9 (octal transceivers), S1 through S4 (DIP switches), and their associated components. U1 reads the settings of S1 and S2 and latches the switch setting information onto the data bus. S1 enables the selection of the output code and S2 enables the selection of the input code. U2 reads the settings of S3 and S4 and latches the switch setting information onto the data bus. S3 enables the selection of the level code and S4 enables the selection of the desired vertical trigger.

Monitor Control Port

The monitor control port is comprised of U32 (RS485 receiver/transmitter), U26 (operational amplifier), and their associated components. U32 enables the receipt and transmission of data over the RS422 (PRC) control port. U26 buffers the data reception lines prior to the receive data being applied to U32.

Matrix

Two of the 4x1 matrix circuits are comprised of four input buffers, a 4x1 crosspoint, and their associated components. The third input circuit is comprised of one input buffer, a 4x1 crosspoint, and their associated components. The input buffers are responsible for conditioning the selected input signals from the Output Monitor Crosspoint boards. The 4x1 crosspoints are responsible for the selection of the input signal to be forwarded to the output circuit. The selection of the output signal is dependent upon the selection of an active crosspoint (enabling a selected crosspoint) and addressing the active crosspoint for the proper output selection (A0 and A1 lines).

Matrix Control

The matrix control circuit is comprised of U17 (serial to parallel converter) and U20 (3 to 8 decoder). U17 is responsible translating the serial data received from the microprocessor into address data. The address data determines which crosspoint line is selected. U17 also provides input to U20 which decodes the input and selects the crosspoint to be enabled.

Output

The output circuit is comprised of a 4x1 crosspoint (U24), a digital video re-timer (U29), an output line driver (U28), and their associated components. U24 is responsible for the selection of the desired output signal as determined by the matrix control circuit. U29 provides reclocking of the selected output signal and U28 drives the monitor output.

Digital Output Monitor Crosspoint Board

The circuits on this board are divided into the matrix, matrix control, and output circuits.

Matrix

There are four matrix circuits on each board. The matrix circuits are comprised of a 4x1 crosspoint and its associated components. Each matrix circuit is responsible for the selection of one output signal from four input signals depending upon the address buss data and the enable select setting. Input resistor and a filter capacitor provide initial conditioning of the input signals.

Matrix Control

The matrix control circuit is comprised of U8 (serial to parallel converter) and U7 (3 to 8 decoder). U8 is responsible for translating the serial data received from the microprocessor into address data. The address data determines which crosspoint line is selected. U8 also provides addressing input to U7 and U9. U7 decodes the addressing input and slot input (installed position) and provides a gating signal to U9. U9 decodes the addressing input provided by U8 and selects the crosspoint to be enabled. Additionally, U7 working in conjunction with Q1 provides an enabled signal to the Output Monitor Matrix's output stage (U5).

Output

The output circuit is comprised of a 4x1 crosspoint (U5), a digital video re-timer (U6), an output line driver (U10), and their associated components. U5 is responsible for the selection of the desired output signal as determined by the matrix control circuit. U6 provides reclocking of the selected output signal and U10 drives the Output Monitor Matrix's output line.

Digital Output Combiner Board

The electronic circuits on this board are divided into the microprocessor, code and confidence scan, input, matrix, output, control port, power, and matrix control circuits.

Microprocessor

The heart of the microprocessor circuit is the 68HC16Z1 processor (U65). Reset for U65 is provided by U66 (microprocessor supervisor) and clock for U65 is provided by Y1 (32.768KHz clock). Battery backup for the microprocessor's memory is provided by Q53 and its associated components. ROM memory for the microprocessor is provided by U63 and RAM memory is provided by U52 (64K X16 static RAM). The Digital Video Output Combiner's combiner active, communications active, and CPU error indicator LEDs are driven by U58 (octal latch).

Code and Confidence Scan

The code and confidence scan circuits are comprised of U64 (3 to 8 decoder); U54, U57, and U59 (8 input multiplexers); and their associated components. U56 is responsible scanning the slot position lines and the settings of DIP switch S1. The slot position lines indicate to the CPU on the Digital Video Output Combiner its position within the routing switcher. The setting of the dip-switch positions of S1 determine the sync reference and the frame-time switches will be taken on. U55 scans the settings of System Connector Interface board DIP switch S1 which determine the level, input, and output codes utilized by the routing switcher. U54 scans the condition of the input confidence lines 0-7 (ICONF0-ICONF7). U57 scans the condition of the input confidence lines 8-15 (ICONF8-ICONF15). U59 scans the condition of the input confidence lines 16 and 17 (ICONF16 and ICONF17). U59 also scans the condition of the matrix confidence lines 0-2 (MCONFO-MCONF2). The input confidence indicate the health and presence of the Digital Input Buffer boards. The matrix confidence line indicate the health and presence of the 48x16 Digital Crosspoint boards which provide input to the selected Digital Output Combiner board. U64 serves as an address decoder for U54-U57 and U59.

Input

Each Digital Output Combiner board is driven by 16 outputs from three different 48x16 Digital Crosspoint boards. This presents a total of 48 inputs to each Digital Output Combiner board. Each of these inputs is buffered as they enter. Input IN0_1 will be described as typical of all inputs.

The differential signal IN0_1 is generated by the associated 48x16 Digital Crosspoint board and is terminated by R131. The non-inverted signal is buffered by emitter follower Q2 (with base resistor R130 and emitter resistor R129). C198 provides power supply bypass for the input stage. R132 is a build-out resistor, and the video signal is AC coupled through C199.

Matrix

Each Digital Output Combiner board is driven by three 48x16 Digital Crosspoint boards. The matrix circuitry selects the video signal from the active 48x16 Digital Crosspoint board to drive the output stage. Output 1 (OUT1) will be discussed as typical of all matrix stages.

U3 is a 4x1 video crosspoint used to select either the video signal from the associated 48x16 Digital Crosspoint board serving inputs 1-48 (BIN0_1 on U3 pin 1), inputs 49-96 (BIN 1_1 on U3 pin 3), or inputs 97-144 (BIN2_1 on U3 pin 6). In the event that none of the inputs in the frame are selected for this particular output, U3 pin 8 (ground signal) is selected. Resistors R451, R452, and R458 terminate the signal from the input buffer to the crosspoint. U49 is a serial to parallel shift register that provides control signals for the crosspoint. The state of control pins A0_1 and A1_1 (U3 pins 14 and 13, respectively) determine which input is selected. C4, C9, and C163 provide power supply bypass.

Output

Each output stage consists of a reclocker and a cable driver. Output 1 (OUT1) will be discussed as typical of all output stages.

The active video signal from the combiner matrix stage is AC coupled into the output stage by C5. The reclocker (U2) expects a differential ECL level signal on its input (U2 pins 5 and 6). Resistors R456 and R457 bias the active video signal down to ECL levels. Resistors R461 and R462 and capacitor C389 provide a bias for the inverting input of the reclocker. U2 and components R1-R5, R453, C3, C387, and C388 reclock the video signal. C2 and C8 provide power supply bypass for the reclocker.

The differential output of the reclocker (U2 pins 24 and 25) is terminated by R459, R454, R463, and C391 at the input of the cable driver (U1 pins 6 and 7). The non-inverted output of the cable driver (U1 pin 1) is AC coupled to the Output Monitor Matrix by C10. It also passed through build-out resistor R464 before being AC coupled into BNC connector J1. Likewise, the inverted output of the cable driver (U1 pin 2) is AC coupled to the Output Monitor Matrix through C7. It also passes through build-out resistor R450 before being AC coupled to BNC connector J2.

Control Port

The control port circuit enables direct internal communications with the System Controllers over an RS-422 (PRC) communications port. The control port circuit is comprised of U62 (RS-485 receiver/transmitter), U70 (dual operational amplifier), and their associated components. U62 enables the receipt and transmission of data over the control port and U70 provides input buffering of the receive transmission lines.

Power

The power circuits provide over-current protection for the other circuits on this board. They also provide a visual indication of the health of the input voltages using LEDs in series with a 270 ohm resistor and a zener diode. Additional filtering of the regulated input voltages is provided by filter capacitors located throughout the other circuits.

Matrix Control

The microprocessor U65 generates a serial bitstream containing input information for each of the 16 outputs being controlled by the associated Digital Output Combiner board. The bitstream is contained in the signals SER_DATA, SER_CLK, and SER_STB. A fourth signal (VT) provides vertical trigger timing information for switch transitions.

The matrix control signals (SER_DATA, SER_CLK, SER_STB, and VT) are buffered by U67 and drive the three 48x16 Digital Crosspoint boards associated with the selected Digital Output Combiner board. The Digital Output Combiner board also provides a 2-bit ID code for each 48x16 Digital Crosspoint board (J55 pins 38 and 40, J58 pins 38 and 40, and J61 pins 38 and 40). The 48x16 Digital Crosspoint boards use this ID information to determine their input range and to decode the appropriate data from the control bitstream. U53 and U61 monitor the control bitstream and generate clock pulses on COMB_CLK. This signal is used to latch data from SER_DATA into the combiner matrix control chips U49, U50, U51, and U60. The information is shifted in serially, and is placed on the parallel output lines when VT occurs.

Digital Input Buffer Board

Each board contains eight input circuits. The input circuits are responsible for automatic input equalization and driving the signal inputs in to the associated 48x16 Digital Crosspoint boards in the routing switcher. The input circuits are each comprised of a precision 75 ohm resistor, a cable equalizer (CLC014), a cable driver (CLC007), and their associated components. The 75 ohm precision resistor provides a 75 ohm input termination for the digital video input signal. The cable equalizer provides automatic input equalization for the digital video input signal for up to 250 meters of Belden 8281 or equivalent for data rates up to 270Mbit/s and up to 150 meters for data rates up to 360Mbit/s. The cable driver is responsible for driving the digital video signal into precision resistors and into the associated 48x16 Digital Crosspoint boards installed in the routing switcher. The cable driver is also responsible for driving the digital video signal loop-back output.

48x16 Digital Crosspoint Board

The electronic circuits on this board are divided into the power, matrix control, input, matrix, output circuits.

Power

The power circuits are comprised of input fuses (X1 and X2), capacitors, and their associated components. The input fuses provide over-current protection for the associated 48x16 Digital Crosspoint boards. The capacitors provide additional filtering of the regulated power input voltages.

Matrix Control

The matrix control circuitry interprets the matrix control bitstream from the Digital Output Combiner board and generates the appropriate control signals for the matrix crosspoint chips.

The Digital Output Combiner board provides matrix control information in the form of a serial bitstream on signals MTX_DATA, MTX_CLK, and MTX_SB. Video reference timing is also provided on MTX_VT (vertical trigger). The serial bitstream is decoded by U24, U26, U28, U29, U31, and various support gates. U25 pins 1,2, and 3 gate the incoming clock signal such that MTX_DATA is shifted into U24 pin 1 only when MTX_STB is active (high) and MTX_CLK pulses are present. This data is presented in parallel format on the output of U24. Each set of 8 bits (one byte) represents the input data for one of the 16 outputs controlled by the Digital Video Output Combiner generated bitstream. Each of the three 48x16 Digital Crosspoint boards is assigned a slot ID (MTX_ID_1:0) of 0, 1, or 2. The input data in the bitstream contains encoded “slot” information in the two upper bits of each byte (U24 pins 12 and 13). If the embedded slot code matches the ID code, the input contained in the bitstream is intended for the 48x16 Digital Crosspoint board. XOR gates U30 pins 4, 5, 6, 8, 9, and 10 are used to compare the embedded slot code with the matrix ID code. When the code matches, U31 is enabled (U31 pins 4 and 5). The remaining bits of each byte contain additional input information. The lower four bits (U24 pins 3, 4, 5, and 6) contain the modulo-16 input number. The remaining two bits (U24 pins 10 and 11) contain encoded information representing with group of 16 inputs is selected. A code of 0 indicates that the input is active in the first group of 16 inputs (1-16). A code of 1 represents the inputs 17-32, and a code of 2 represents inputs 33-48. A code of 3 is reserved for the off state, where no input is active on the designated card. The crosspoint chips are eight inputs by eight outputs, requiring that the input information be expressed in modulo-8 format. In addition, each crosspoint has a tri-state input bit (T0-T5) that are used to force an output into the tri-state condition. Decoder U31 generates the tri-state control inputs based on the input number, the group code, and the ID. Only one of T0-T5 are active at any given time. If the ID doesn't match, none of T0-T5 are active for this output.

U29 is a modulo-8 counter that keeps track of the bit position currently being shifted into the control circuit. U26 decodes the bit count and provides output signals during certain bit times. Counter U28 keeps track of the output currently being addressed. The bitstream contains output 16 data followed by output 15, output 14, and etc. down to output 1. U28 is initialized to 0 whenever MTX_STB is inactive, and counts down during cycle 2 of each control byte (when U26 pin 13 is active). During cycle 7 of each control byte, U26 pin 7 becomes active, causing U27 to change states for one clock cycle. This single cycle pulse is used to gate the MTX_CLK signal (inverted by U30 pins 11, 12, and 13; gated by U25 pins 11, 12, 13) to provide the LOAD signal for the crosspoint ICs. When LOAD occurs, the current input data (T0-T5 and IA0-2) is latched into the crosspoint addressed by the output represented by OA0-3.

Input

Each of the 48 video input signals driving the 48x16 Digital Crosspoint board are buffered as they enter. Input IN1 will be discussed as typical of all inputs.

The differentiated signal IN1 (J2 pin 4 and J2 pin 6) is generated by the Digital Input Buffer board. R343 is a weak terminator that only comes into play when the Digital Input Buffer board is removed. Each leg of the differential pair are buffered by successive emitter follower circuits. Emitter follower Q101 (with base resistor R341 and emitter resistor R342) forms a buffer stage, followed by a second emitter follower formed from Q96 (with base resistor R344 and emitter resistor R320). R695 a build-out resistor, and the emitter resistor R320 double as a termination resistance for the signal. The two stage emitter follower (NPN followed by PNP) retains the DC level present at the input. In a similar manner, Q103 (with R347 and R348) and Q104 (with R346, R694, and R313) buffer the inverting input. Capacitors C142 and C143 provide power supply bypass for the input stage.

Matrix

The matrix circuits on each board are responsible for selecting from 48 inputs and switching the selected inputs to 16 outputs. There are six matrix circuits on each board, each of which is comprised of two 8x8 crosspoint matrices. Matrix circuit one is responsible for the selection of outputs 1-8 from inputs 1-8. Matrix circuit two is responsible for the selection of outputs 9-16 from inputs 1-8.

Output

The output circuits on this board are comprised of a cable driver (CLC006), precision 75 ohm resistors, and their associated components. The cable driver is responsible for driving the selected output signal into the precision 75 ohm resistors and for providing the selected output signal to the associated Digital Output Combiner board.

Analog Output Monitor Control Board

The Analog Output Monitor Control board contains several main circuits which include power, monitor microprocessor, address, monitor control port, input, matrix control, and output circuits.

Power

The power circuit is comprised of X1, X2, LED1, D1, and their associated components. X1 and X2 provide over current protection. LED1, working in conjunction with D1, provides a visible means of checking for proper input voltages. Additional filtering of the regulated input voltages is provided by input filters and filter capacitors.

Monitor Microprocessor

The monitor microprocessor circuit is comprised of U10 (68HC711E9 microprocessor), U4 (8K SRAM memory), and their associated components. Reset for the microprocessor is provided by U5 (microprocessor supervisor) and clock for the microprocessor is provided by U11 (7.3728MHz oscillator). U3 de-multiplexes the low-order address lines during bus cycles. Data is also cycled to and from the memory chip, U4, during the microprocessor's read/write cycles. U6 (3 to 8 decoder) serves as the address decoder for U1, U9, and U2 (octal register) respectively. U13 working in conjunction with the microprocessor enables the selection of the active Output Monitor Matrix.

Code Select

The code select circuit comprised of U1 and U9 (octal transceivers), S1 through S4 (dip-switches), and their associated components. U1 reads the settings of S1 and S2 and latches the switch setting information onto the data buss. S1 enables the selection of the Output Monitor Control's output code and S2 enables the selection of the input code. U2 reads the settings of S3 and S4 and latches the switch setting information onto the data buss. S3 enables the selection of the Output Monitor Control's level code and S4 enables the selection of the desired vertical trigger.

Monitor Control Port

The monitor control port is comprised of U32 (RS485 receiver/transmitter), U26 (operational amplifier), and their associated components. U32 enables the receipt and transmission of data over the RS422 (PRC) control port. U26 buffers the data reception lines prior to the receive data being applied to U32.

Matrix

Two of the 4x1 matrix circuits are comprised of four input buffers, a 4x1 crosspoint, and their associated components. The third input circuit is comprised of one input buffer, a 4x1 crosspoint, and their associated components. The input buffers are responsible for conditioning the selected input signals from the Output Monitor Crosspoint boards. The 4x1 crosspoints are responsible for the selection of the input signal to be forwarded to the output circuit. The selection of the output signal is dependent upon the selection of an active crosspoint (enabling a selected crosspoint) and addressing the active crosspoint for the proper output selection (A0 and A1 lines).

Matrix Control

The matrix control circuit is comprised of U17 (serial to parallel converter) and U20 (3 to 8 decoder). U17 is responsible translating the serial data received from the microprocessor into address data. The address data determines which crosspoint line is selected. U17 also provides input to U20 which decodes the input and selects the crosspoint to be enabled.

Output

The output circuit is comprised of a 4x1 crosspoint (U24), output driver U23, and their associated components. U24 is responsible for the selection of the desired output signal as determined by the matrix control circuit. U23 drives the monitor output.

Analog Output Monitor Crosspoint Board

The electronic circuits on this board are divided into the matrix, matrix control, and output circuits.

Matrix

There are four matrix circuits on each board. The matrix circuits are comprised of a 4x1 crosspoint and its associated components. Each matrix circuit is responsible for the selection of one output signal from four input signals dependent upon the address bus data and the enable select setting. Input resistor and a filter capacitor provide initial conditioning of the input signals.

Matrix Control

The matrix control circuit is comprised of U8 (serial to parallel converter) and U9 (3 to 8 decoder). U8 is responsible translating the serial data received from the microprocessor into address data. The address data determines which crosspoint line is selected. U8 also provides addressing input to U7 and U9. U7 decodes the addressing input and slot input (installed position) and provides a gating signal to U9. U9 decodes the addressing input provided by U8 and selects the crosspoint to be enabled. Additionally, U7 working in conjunction with Q1 provides an enabled signal to the output stage (U5).

Output

The output circuit is comprised of a 4x1 crosspoint (U5), an Analog video re-timer (U6), an output line driver (U11), and their associated components. U5 is responsible for the selection of the desired output signal as determined by the matrix control circuit. U10 drives the output line.

Analog Output Combiner Board

The electronic circuits on this board are divided into the microprocessor, code and confidence scan, input, matrix, output, control port, power, and matrix control circuits.

Microprocessor

The heart of the microprocessor circuit is the 68HC16Z1 processor (U58). Reset for U58 is provided by U52 (microprocessor supervisor) and clock for U58 is provided by Y1 (32.768KHz clock). Battery backup for the microprocessor's memory is provided by Q1 and its associated components. ROM memory for the microprocessor is provided by U56 and RAM memory is provided by U57 (64K X16 static RAM). The combiner active, communications active, and CPU error LEDs are driven by U53 (octal latch).

Code and Confidence Scan

The code and confidence scan circuits are comprised of U85 (3 to 8 decoder); U80, U81, and U83 (8 input multiplexers); and their associated components. U55 is responsible scanning the slot position lines and the settings of DIP switch S1. The slot position lines indicate to the CPU its position within the routing switcher. The S1 DIP switch settings determine the sync reference and the frame-time switches will be taken on. U54 scans the settings of DIP switch S1 on the System Connector Interface Board which determine the level, input, and output codes utilized by the routing switcher. U83 scans the condition of the input confidence lines 0-7 (ICONF0-ICONF7). U80 scans the condition of the input confidence lines 8-15 (ICONF8-ICONF15). U81 scans the condition of the input confidence lines 16 and 17 (ICONF16 and ICONF17). U81 also scans the condition of the matrix confidence lines 0-2 (MCONFO-MCONF2). The input confidence indicate the health and presence of the Analog Input Buffer boards. The matrix confidence line indicate the health and presence of the 48x16 Analog Crosspoint boards which provide input to the selected Analog Output Combiner board. U85 serves as an address decoder for U54, U55, U80, U81, and U83.

Input

Each Analog Output Combiner board is driven by 16 outputs from three different 48x16 Analog Crosspoint boards. This presents a total of 48 inputs to each Analog Output Combiner board. Each of these inputs is buffered as they enter. Input IN0_1 will be described as typical of all inputs.

The signal IN0_1 is generated by the associated 48x16 Analog Crosspoint board and is terminated by R260 and C157. The non-inverted signal is buffered by U62. The video signal output from U62 is coupled through R262 to the matrix.

Matrix

Each Analog Output Combiner board is driven by three 48x16 Analog Crosspoint boards. The matrix circuitry selects the video signal from the active 48x16 Analog Crosspoint board to drive the output stage. Output 1 (OUT1) will be discussed as typical of all matrix stages.

U3 is a 4x1 video crosspoint used to select either the video signal from the associated 48x16 Analog Crosspoint board serving inputs 1-48 (BIN0_1 on U3 pin 1), inputs 49-96 (BIN 1_1 on U3 pin 3), or inputs 97-144 (BIN2_1 on U3 pin 6). In the event that none of the inputs in the frame are selected for this particular output, U3 pin 8 (ground signal) is selected. Resistors R675, R676, and R685 terminate the signal from the input buffer to the crosspoint. U49 is a serial to parallel shift register that provides control signals for the crosspoint. The state of control pins A0_1 and A1_1 (U3 pins 14 and 13, respectively) determine which input is selected. C7, C128, and C129 provide power supply bypass.

Output

Each output stage consists of a dual-stage output amplifier. Output 1 (OUT1) will be discussed as typical of all output stages.

The active video signal from the combiner matrix stage is coupled into the output stage by R686. The first stage of the output amplifier (U2) in conjunction with adjustable resistors R2 and R14, provides the means to adjust the DC offset on the output and to adjust the high frequency response of the output. The video signal is coupled to second stage of the output amplifier (U1) through resistor R679. The second stage of the output circuit also includes the equalization circuit and the equalization adjustment (R6). The equalization circuit enables the output to equalized for up to 50 meters of Belden 75 ohm coaxial cable. Also included in the output circuit is the adjustment for output gain (R10). U1 functions as the output line driver. The active video signal is driven into precision 75 ohm resistors by U1.

Control Port

The control port circuit enables direct internal communications with the System Controllers over an RS-422 (PRC) communications port. The control port circuit is comprised of U92 (RS-485 receiver/transmitter), U92 (dual operational amplifier), and their associated components. U92 enables the receipt and transmission of data over the control port and U91 provides input buffering of the receive transmission lines.

Power

The power circuits provide over-current protection for the other circuits. The power circuits also provide a visual indication of the health of the input voltages, using LEDs in series with a 270 ohm resistor and a zener diode. Additional filtering of the regulated input voltages is provided by filter capacitors located throughout the circuits on this board.

Matrix Control

The microprocessor U58 generates a serial bitstream containing input information for each of the 16 outputs being controlled. The bitstream is contained in the signals SER_DATA, SER_CLK, and SER_STB. A fourth signal (VT) provides vertical trigger timing information for switch transitions.

The matrix control signals (SER_DATA, SER_CLK, SER_STB, and VT) are buffered by U86 and drive the three 48x16 Analog Crosspoint boards associated with the Analog Output Combiner board. This board also provides a 2-bit ID code for each 48x16 Analog Crosspoint board (J58 pins 38 and 40, J60 pins 38 and 40, and J62 pins 38 and 40). The 48x16 Analog Crosspoint boards use this ID information to determine their input range and to decode the appropriate data from the control bitstream. U60 and U61 monitor the control bitstream and generate clock pulses on COMB_CLK. This signal is used to latch data from SER_DATA into the combiner matrix control chips U49, U50, U51, and U60. The information is shifted in serially, and is placed on the parallel output lines when VT occurs.

48x16 Analog Crosspoint Board

The electronic circuits on this board are divided into the power, matrix control, input, matrix, output circuits.

Power

The power circuits are comprised of input fuses (X1 and X2), capacitors, and their associated components. The input fuses provide over-current protection for the associated 48x16 Analog Crosspoint board. The capacitors provide additional filtering of the regulated power input voltages.

Matrix Control

The matrix control circuitry interprets the matrix control bitstream from the Analog Output Combiner board and generates the appropriate control signals for the matrix crosspoint chips.

The Analog Output Combiner board provides matrix control information in the form of a serial bitstream on signals MTX_DATA, MTX_CLK, and MTX_STB. Video reference timing is also provided on MTX_VT (vertical trigger). The serial bitstream is decoded by U46, U47, U48, U50, U51, and various support gates. U46, U47, U45, and their support gates are responsible for providing the clocking signal

(CLKOUT) for the crosspoints. U48, U51, U50, and their support gates are responsible for decoding the position ID (MTX_ID_0 and MTX_ID_1) and for providing data signals (DATA0, DATA1, and DATA2) at the appropriate times to the crosspoints. Reset for the crosspoints is provided by U49 (microprocessor supervisor) and its associated circuits. LED2 provides a visual indication of power being applied to the board and LED1 provides a visual indication of activity.

Input

Each of the 48 video input signals driving this board are buffered as they enter. Input IN1 will be discussed as typical of all inputs.

The input video signal is coupled to the input buffer through R226, a precision resistor. Buffering of the input video signal is provided by U53, an operational amplifier. U53 is also responsible for driving the video signal input into the crosspoints through a precision resistor, R227. Feedback for U53 is provided by R230, a precision resistor. Power filtering is provided by C115 and C116.

Matrix

The matrix circuits are responsible for selecting from 48 inputs and switching the selected inputs to 16 outputs. There are three matrix circuits on each board, each of which is comprised of one 16x16 crosspoint matrix. U41 is responsible for the selection of inputs 1-16. U42 is responsible for the selection inputs 17-32. U43 is responsible for the selection of inputs 33-48.

Output

The output circuits are comprised of an operational amplifier and its associated circuits. Output 1 (OUT1) will described as typical of all outputs.

The video output signal is coupled U25 (operational amplifier) through a precision resistor (R323). U25 is responsible for driving the video output into a precision resistor, R98. R99, a precision resistor, provides feedback for the operational amplifier. Power by-pass and filtering is provided by capacitors C49 and C50.

Analog Input Buffer Board

Each board contains eight input circuits. The input circuits are responsible for input equalization and driving the signal inputs into the associated 48x16 Analog Crosspoint boards in the routing switcher. The input circuits are also responsible for providing loop-through video signal distribution. Input 1 will be described as typical of all inputs.

The video input to Input 1 is coupled through precision resistor (R102) to the first stage of the input amplifier (U9). U9 is responsible for providing input buffering and conditioning the input video signal. Precision resistors, in a feed-back loop, set U9 for unity gain. The input video signal is coupled from U9 to U1 and U17 (operational amplifiers) through precision resistors. U1 drives the video input into the corresponding 48x16 Analog Crosspoint board through precision output resistors. U17 is responsible for driving the loop-through output into a precision 75 ohm resistor. Equalization of the loop-through video signal is also provided by the circuits associated with U17. The loop-through video signal enables the distribution of the video signal to additional routing switchers without the use of external distribution amplifiers.

Chapter 5 – Maintenance and Repair

Periodic Maintenance

> **NOTE**
>
> This equipment has been designed so maintenance operations can be performed while the equipment is operational (has power applied). Only the power supply assemblies and the AC line circuits contain potentially lethal shock hazards.

Troubleshooting

Subassembly LEDs

In the rare event this equipment fails to operate correctly, check the appropriate LEDs listed below for information concerning operational status.

Dual Reference/Alarm Interface Board

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	RED	Frame Alarm	OFF	Indicates the absence of alarm conditions. If LED is ON: 1. Check the other system LEDs to determine the origin of the alarm and take appropriate corrective action. 2. Contact PESA Customer Service.
2	GRN	RX Data	OFF	Indicates that the alarm port is not receiving data. It is normal for this LED to flicker on and off as data is being received from the alarm bus.
3	GRN	TX Data	OFF	Indicates that the alarm port is not transmitting data. It is normal for this LED to flicker on and off as data is being transmitted over the alarm bus.
4	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.

Output Monitor Control Board (Analog and Digital)

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	GRN	Power OK	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.
2	RED	Fault	OFF	Indicates the absence of software errors. If this LED is ON: 1. Contact PESA Customer Service

Input Buffer Board (Analog and Digital)

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.

Output Combiner Board (Analog)

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	GRN	Combiner Active	ON	Indicates that the combiner is in use. This LED will be ON if at least one crosspoint on the board is active.
2	GRN	Com Active	ON	Indicates that the PRC bus is in use. It is normal for this LED to flicker on and off as data is being transmitted over the PRC bus.
3	RED	CPU Fault	OFF	Indicates the absence of software errors. If this LED is ON: 1. Contact PESA Customer Service
4	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.
5	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.
6	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.

Output Combiner Board (Digital)

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	RED	CPU Error	OFF	Indicates the absence of software errors. If this LED is ON: 1. Contact PESA Customer Service
2	GRN	Com Active	ON	Indicates that the PRC bus is in use. It is normal for this LED to flicker on and off as data is being transmitted over the PRC bus.
3	GRN	Comb Active	ON	Indicates that the combiner is in use. This LED will be ON if at least one crosspoint on the board is active.
4	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.
5	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.
6	GRN	n/a	ON	Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.

48x16 Matrix Board (Analog)

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	YEL	Module Active	ON	Indicates that the module is in use. This LED will be ON if at least one crosspoint on the board is active.
2	GRN	Power OK		Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.

48x16 Matrix Board (Digital)

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	GRN	Power OK		Indicates that input voltage to the PCB is within design parameters. If LED is OFF: 1. Remove and reinstall board to verify backplane connector is properly seated. 2. Check power supplies for proper operation. 3. Contact PESA Customer Service.
2	YEL	Module Active	ON	Indicates that the module is in use. This LED will be ON if at least one crosspoint on the board is active.

System Controller Board

Please refer to the system controller manual for troubleshooting information.

Power Supply Assemblies

LED	Color	Schematic Legend	Normal State	Troubleshooting Info
1	GRN	Power OK	ON	Indicates that output voltage is within design parameters. If LED is OFF: 1. Check input power connections. 2. Replace the power supply. 3. Contact PESA Customer Service.
2	RED	Over Temp	OFF	Indicates that the power supply operating temperature is within design parameters. If LED is ON: 1. Check for blocked air flow. 2. Check for low line voltage. 3. Replace the power supply. 4. Contact PESA Customer Service.
3	RED	Fan Fault	OFF	Indicates that all cooling fans are operating normally. If LED is ON: 1. Replace the inoperative cooling fan. 2. Contact PESA Customer Service.

PESA Customer Service

If the troubleshooting information above has not solved your problem, please contact the PESA Customer Service Department. Skilled technicians are available to assist you 24 hours per day, seven days per week.

Detailed contact information for the Customer Service Department is located inside the front cover of this document.

Adjustment (Analog)

Although the Tiger Video Routing Switcher is tested and adjusted before shipment from the factory, readjustment may be necessary when parts are replaced or the equipment configuration changes. All adjustments are made on the Output Combiner boards.

The following adjustments may be made in the field:

- DC offset
- Gain
- High Frequency Response
- Equalization

The following equipment is required to make these adjustments:

- Digital Voltmeter
- Oscilloscope
- Low Frequency Generator
- Sweep Generator (with low frequency markers)
- Waveform Monitor (high bandwidth calibrated oscilloscope)
- 75 Ohm Termination

DC Offset Adjustment

Set the DC offset voltage as follows:

1. Connect the digital voltmeter to the output under test.
2. Switch an open input to the output under test.
3. Set the digital voltmeter to the lowest DC voltage range.
4. Adjust the DC offset potentiometer until the digital voltmeter reads 0VDC ±50mVDC.
5. Repeat the above steps for all outputs to be adjusted.

Gain Adjustment

Set the gain adjustment as follows:

1. Adjust the low frequency generator for a 1.0V p-p output at 100KHz into a 75 ohm load.
2. Remove the 75 ohm load and connect the output of the frequency generator to an input connector on the routing switcher.
3. Switch the input connected to the frequency generator, to the output under test.
4. Connect the oscilloscope to the output connector and terminate into 75 ohms.
5. Adjust the gain potentiometer until the oscilloscope displays 1.0V p-p at 100KHz.
6. Repeat the above steps for all outputs to be adjusted.

High Frequency Response Adjustment

Set the high frequency response as follows:

1. Adjust the sweep generator for a 1.0V p-p sweep from 100KHz to 60MHz into a 75 ohm load. Set timing markers for 1MHz intervals.
2. Remove the 75 ohm load and connect the sweep generator to an input connector on the routing switcher.
3. Switch the input connected to the sweep generator, to the output under test.
4. Connect the waveform monitor to the output connector and terminate into 75 ohms.
5. Adjust the high frequency response potentiometer while observing the wave form monitor. The adjustment should be made to minimize the number of spikes and rolloff at the high end of the sweep. Use the timing markers as an amplitude guide.
6. Repeat the above steps for all outputs to be adjusted.

Equalization

Adjust the equalization as follows:

1. Connect the output cable to the output connector on the routing switcher. The maximum cable length is 150 feet of Belden 8281 or equivalent.
2. Connect the waveform monitor to the other end of the output cable and terminate into a 75 ohm load.
3. Adjust the sweep generator for a 20MHz sweep at 1V p-p amplitude, and set the timing markers for 1MHz intervals at 1V p-p amplitude.
4. Connect the sweep generator to an input connector on the routing switcher using the shortest cable possible.
5. Switch the input connected to the sweep generator, to the output under test.
6. Adjust the equalization potentiometer while observing the wave form monitor. The adjustment should be made to minimize the amount of signal rolloff, or an even amplitude throughout the sweep. Use the timing markers as an amplitude guide.

   If NTSC or PAL signals are used, set equalization for the best (flattest) sub-carrier frequency response. If high bandwidth signals are used, set equalization for the best overall flatness.
7. Repeat the above steps for all outputs to be adjusted.

Repair

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

WARNING

The power supply assemblies in this equipment are not field/user serviceable. These offline switching power supplies contain internal voltages in excess of 300VDC and are not isolated from the AC power source. They should only be serviced by qualified service personnel using appropriate equipment. Because of this, it is strongly suggested that power supplies be returned to the PESA Customer Service Department for service.

CAUTION

Many of the PC boards in this equipment contain large numbers of SMT (Surface Mount Technology) components. Special tools are required to replace these components without causing damage to adjacent areas. It is strongly recommended that PESA Customer Service be consulted prior to attempting to repair any of the PC boards in this equipment

Replacement Parts

Only parts of the highest quality have been used in the design and manufacture of this equipment. If the inherent stability and reliability are to be maintained, replacement parts must be of the same high quality. For this reason, we suggest that you consult our Customer Service Department before installing any parts not purchased from PESA.

Factory Service

Before returning any equipment to our factory for service or repair, please contact our Customer Service Department for an RMA number.

Detailed contact information for the Customer Service Department is located inside the front cover of this document.

PESA Documentation

IL35-1117	Drawing Tree, Tiger Video Switcher, 144 Inputs X 144 Outputs
WI50-0150	Cable, Coax, 75 Ohm, 8Ft, Video Looping, System Applications
WI50-0250	Wiring Diagram, Cougar Looping Control Cable
WI50-0267	Wiring Assembly, Bracket Assembly, Tiger Digital Video Power Supply
WI50-0269	Cable Assembly, Coax RG179, 4 Ft
81-9059-0403-0	Manual, Tiger Video Switcher
81-9062-0316-0	PESA Router Control Protocol (PRC)

81-9062-0407-0	CPU Link Protocol No. 1 (P1)
81-9062-0408-0	CPU Link Protocol No. 1 Extensions (P1E)
81-9062-0409-0	Unsolicited Status Protocol (USP)
81-9062-0410-0	Truck Link Protocol (TRK)
81-9062-0448-0	PESA Internet Remote Control Protocol (PIRC)

Glossary

(Revised: 02-19-01)

AES/EBU

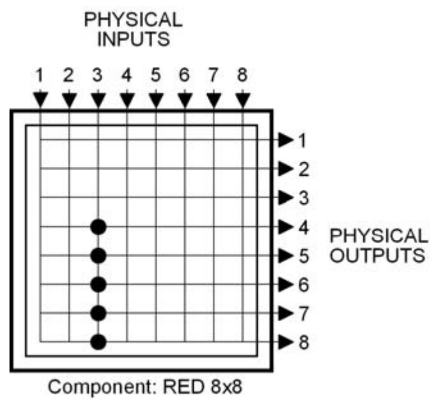
Informal name for a digital audio standard established jointly by the Audio Engineering Society (www.aes.org) and the European Broadcasting Union (www.ebu.ch).

All Call

A diagnostic procedure that causes a single physical input to be switched to a range of physical outputs, for a specified component, with a single command.

Example: Assume the existence of component RED which spans physical inputs 1 through 8 and physical outputs 1 through 8. All call could be used to switch physical input 3 to physical outputs 4 through 8 with a single command.

See also: Diagonal.



ANSI

American National Standards Institute (www.ansi.org).

Baud

The number of signaling elements that occur each second.

Below 1200 baud, only one bit of information (one signaling element) is encoded in each electrical change. At these speeds baud indicates the number of bits per second.

For example, at 300 baud, 300 bits are transmitted per second (300 bps). Assuming asynchronous communication, which requires 10 bits per character, this translates to 30 characters per second (cps).

Above 1200 baud, it is possible to encode more than one bit in each electrical change. At these speeds, data transmission rates are usually expressed in bits per second (bps) rather than baud.

For example, a 2400 bps modem conforming to CCITT V.22 operates at 600 baud.

Baud was originally a unit of telegraph signaling speed, set at one Morse code dot per second. It was proposed at the International Telegraph Conference of 1927, and named after French Engineer J.M.E. Baudot (1845-1903).

Black Burst

A composite color video signal which has sync, color burst, and black video. It is used to synchronize other video sources to the same sync and color information.

See also: House Sync.

Block

A group of contiguous crosspoints in a routing switcher which form the smallest unit on which confidence is checked.

Because of the nature of the circuits involved, individual crosspoints cannot be checked to see if they are operating correctly. Instead, the control circuitry shared by groups of crosspoints is monitored. These groups of crosspoints, called blocks, vary in size according to product type. Block size for RM5 routing switchers is 8 inputs by 2 outputs and block size for PRC routing switchers is 8 inputs by 8 outputs. If any block gives a confidence error, all crosspoints in that block are assumed to be non-functional.

Block Checking

The continuous, sequential monitoring of confidence for each block in a routing switcher.

Block checking occurs automatically and continuously but can be disabled for troubleshooting purposes.

Blocked Destination

See: Source Block.

Blocked Source

See: Source Block.

Breakaway Switch

A switch where more than one source is switched to a single destination on multiple levels.

Example: Assume the existence of two sources VTR1 and VTR2 which are defined on levels VIDEO and AUDIO, and a destination MON1 which is defined on the same levels. VTR1 is switched to MON1 on the VIDEO level and VTR2 is switched to MON1 on the AUDIO level. The signal reaching MON1 will have the video from VTR1 and the audio from VTR2.

See also: Follow Switch.

Category

The first portion of a source, destination, or reentry name.

Categories provide an easy means of classifying and grouping switching system devices.

An example of a category is VTR which could be used with the indices 1, 2, and 3 to create the source names VTR 1, VTR 2, and VTR 3.

Category names are one to six characters in length and are constructed using uppercase letters and numbers. The first character must be a letter. Embedded spaces are not permitted.

Chop

Rapidly switch two different video signals into a monitor or other piece of test equipment. This is done to compare some characteristic of the signals, usually for quality control.

Chop Rate

The parameter used to control the switching rate when chopping two signals. The signal switching rate is determined as follows:

$$\frac{\text{Video Frame Rate (Frames/Second)}}{\text{Chop Rate}} = \text{Signal Switching Rate (Switches/Second)}$$

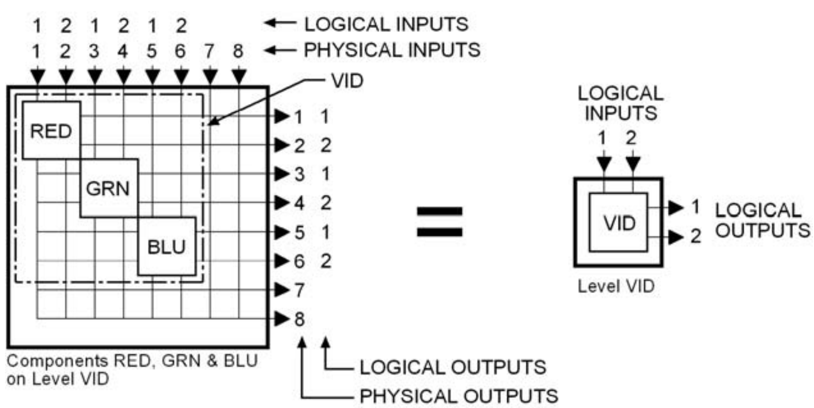
For example, a chop rate of 1 used with NTSC signals (30 Frames/Second) will cause the signals to be switched 30 times per second. A chop rate of 60 used with the same signals will cause them to be switched every two seconds.

Component

The most basic signal element which can be switched by a single crosspoint. For example, in RGB video, “Red”, “Green”, and “Blue” are components; in stereo audio, “Left” and “Right” are components

In Matrix Space, components of like type are usually grouped together into rectangular matrices of crosspoints having contiguous inputs and outputs. These matrices are also referred to as components and are grouped together into levels.

The example below shows a 2x2 RGB video level made up of three components, “RED”, “GRN”, and “BLU”.



As a general rule, users control the switching of levels, but component switching is handled automatically by the switching system. In the example above, a user could specify a single logical switch, such as VID Input 1 to VID Output 2. This would result in the control system software taking three physical switches by activating crosspoints (1,2), (3,4), and (5,6).

Component names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Composite Video

A type of video signal which contains luminance, chrominance, blanking, and synchronizing information. NTSC, PAL, and SECAM are composite video signals, as opposed to RGB video which is not.

See also: Vertical Sync Signal.

Confidence

A property of a block that indicates whether or not the circuitry controlling the crosspoints in the block is functioning correctly.

When block checking determines that a block is not functioning correctly, the block is said to have a confidence error.

Confidence Error

See Confidence.

Configuration

A collection of system definitions that define the environment in which the system controller operates.

The files which comprise a configuration are stored on a PC as either .dbf format files or text files. Each configuration requires its own separate subdirectory.

Configuration names may have up to 32 alphanumeric characters.

Configuration Lock

A security measure enabled when a configuration is being uploaded or downloaded.

A configuration lock is used to ensure that only one user at a time may download a configuration to the controller.

Control Panel

See: Panel.

CPU Link

A bi-directional, communications interface on a system controller. A CPU link has two components: a serial port (RS-232 or RS-422), and a communications protocol to govern how the port is used.

Crosspoint

The circuitry and components on a printed circuit board which constitute a single physical switch.

See also: Physical Switch.

Data Key

A user configurable control panel key, whose assigned function is used when the panel is in any mode except Salvo Select Mode.

Many control panels have user configurable keys. Each key can be assigned two functions, one as a data key and one as a salvo key. When the keys are pressed, the data key functions are used except when the panel is in salvo mode.

Data Key List

A named list of the functions assigned to each data key on a panel.

Multiple panels may share a data key list as long as they are the same type of panel. Different panel types may not use the same data key list.

Data key list names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Default Destination

The destination for which status will be displayed when power is applied to a panel, or when a new configuration is downloaded to the controller.

Although not mandatory, it is recommended that a default destination be selected for each panel.

Destination

One or more logical outputs (limited to one per level), on one or more levels, which are switched together as a group.

Destination names are constructed using one category followed by 0, 1 or 2 indices. If no index is selected, the default “00” (which is not displayed) will be used.

Destination Block

See: Source Block.

Destination Group

See: Destination.

Destination Include List

A named list of the destinations a specific control panel is authorized to control.

A destination include list may be shared by multiple panels.

The default destination assigned to a panel may be controlled even if it is not on the destination include list.

Destination include list names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Destination Number

A number assigned to each destination by the controller and used by CPU Protocol 1.

Destination numbers are also assigned to reentries.

Destination Status

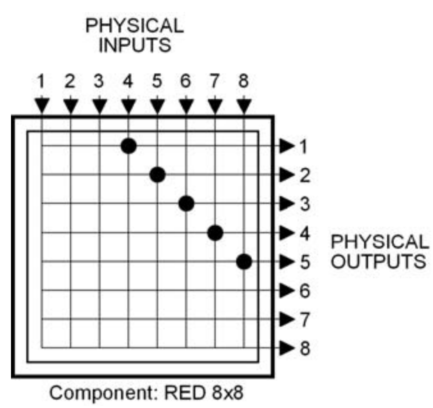
See: Status.

Diagonal

A diagnostic procedure that causes a range of physical inputs to be switched to a range of physical outputs, in a diagonal pattern starting from a specified coordinate and continuing until the either the inputs or outputs are exhausted, for a specified component, with a single command.

Example: Assume the existence of a component RED which spans physical inputs 1 through 8 and physical outputs 1 through 8 on a routing switcher. A diagonal with a starting input of 4 and a starting output of 1 would cause the following physical switches to be taken: (4,1), (5,2), (6,3), (7,4), and (8,5).

See also: All Call.



EIA

Electronic Industries Alliance (www.eia.org).

Follow Switch

A switch where a single source is switched to a single destination on all levels.

Example: Assume the existence of a source VTR1 which is defined on levels VIDEO and AUDIO, and a destination MON1 which is defined on the same levels. VTR1 is switched to MON1 on both the VIDEO level and AUDIO level. The signal reaching MON1 will have the video and audio from the same source, VTR1.

This is the most common manner in which switches are taken on a routing switcher.

See also: Breakaway Switch.

House Black

See: House Sync.

House Sync

A composite color video signal which has sync, color burst, and black video. It is used to synchronize other video sources to the same sync and color information.

Index

The last portion of a source, destination, or reentry name.

Indices provide an easy means of differentiating similar switching system devices.

Each source, destination or reentry name may use 0, 1 or 2 indices. If no index is used, "00" is the default but is not displayed. An example of indices are 1, 2, and 3 which could be used with the category VTR to create the destination names VTR 1, VTR 2, VTR 3, VTR 12, and VTR 22.

Indices are one character in length and are constructed using uppercase letters and numbers. The character 0 (zero) is a default index which may not be changed or deleted.

Input Offset

In matrix space, the amount by which the origin of a component on strobe x, is offset from the origin of strobe x, measured along the input axis.

The coordinates of crosspoints in matrix space are determined by the strobe they reside on, and their input and output numbers. They are given in the form (input,output) on strobe x. The origin of a component (a matrix of crosspoints) is designated by the point which falls nearest the origin of its strobe (1,1). In Figure A below, the 3x4 component bounded by coordinates (3,2), (5,2), (5,5), and (3,5) has its origin at (3,2).

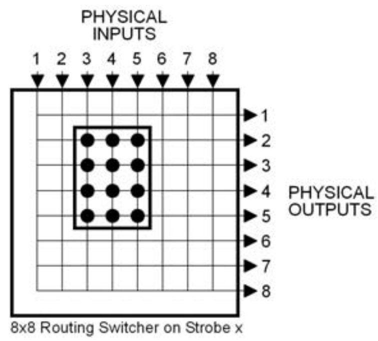


Figure A

Input offset is the amount by which the origin of a component is offset from the origin of its strobe, measured along the input axis. A component whose origin coincides with that of its strobe (1,1) will have an input offset of 0. The component shown in Figure A above, has an input offset of 2.

When multiple routing switchers are assigned to the same strobe, the input and output connectors are renumbered to provide a unique coordinate for each crosspoint. Crosspoint coordinates are then determined in the same manner as above. The component shown in Figure B below, has its origin at (12,7) and an input offset of 11.

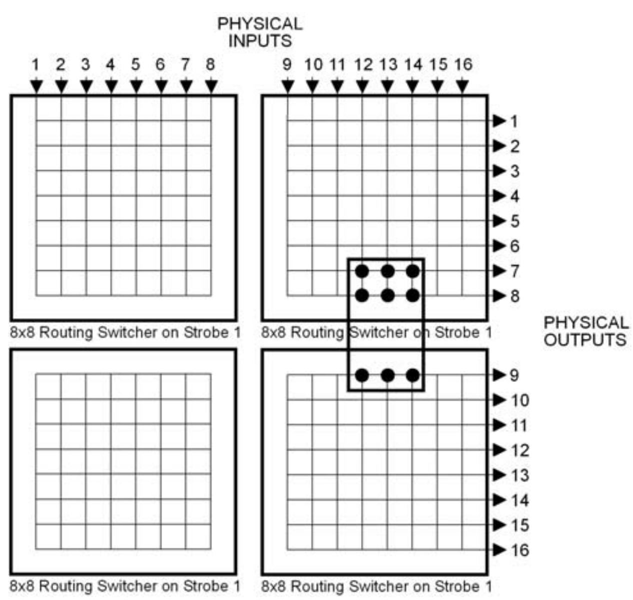


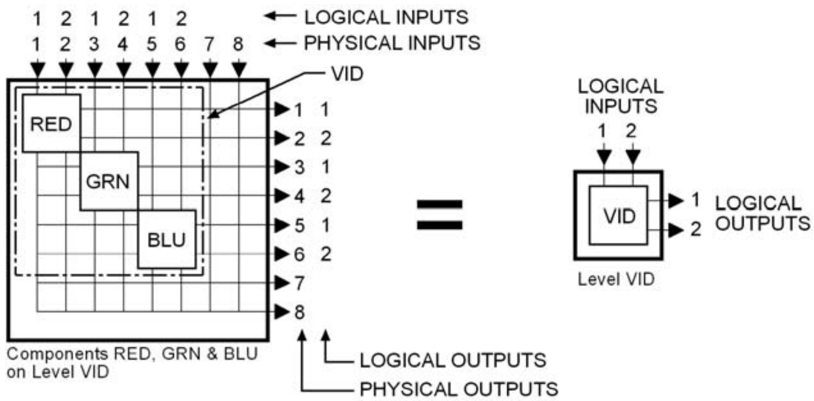
Figure B

Level

A group of related components that are switched together.

A level is sometimes referred to as a level of control and is the basic granularity seen by a user. The components which comprise a level will always be switched together except when performing diagnostic operations.

The example below shows a 2x2 RGB video level made up of three components, “RED”, “GRN”, and “BLU”, all of which are switched together at the same time.



As a general rule, users control the switching of levels, but component switching is handled automatically by the switching system. In the example above, a user could specify a single logical switch, such as VID Input 1 to VID Output 2. This would result in the control system software taking three physical switches by activating crosspoints (1,2), (3,4), and (5,6).

Level names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Level Order

A property assigned to a level which controls the order of display when levels are displayed on a control panel or addressed in CPU link protocols.

Levels of Control List

A named list of the levels a specific control panel is authorized to control.

Multiple panels may share a levels of control list.

Levels of control list names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Local Modem

A modem connected to a PC running control system software such as Win3500Plus.

See also: Remote Modem.

Lock

A property placed on a destination that prevents all panels and ports from taking a switch on that destination, including the panel or port that locked it.

Locks may be cleared by any panel or port that has the same requester code and lock priority as the panel that locked the destination, that has a higher lock priority, or that has a lock priority of 0 (zero).

See also: Lock Priority, Protect.

Lock Priority

A property of panels and ports which allows them to be grouped with other panels or ports for the purpose of establishing lock and protect authority.

The lower the lock priority number, the higher the priority. Panel lock priorities not explicitly defined automatically default to “0” which gives absolute authority to clear any lock or protect on the system.

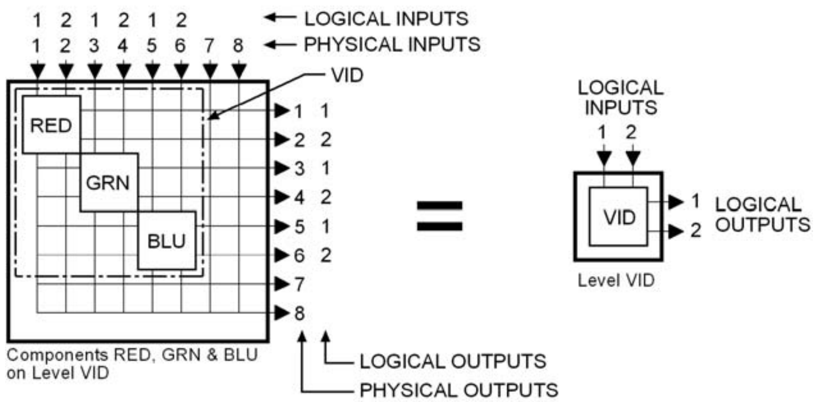
See also: Lock, Protect.

Logical Input

One or more physical inputs which are switched together as a group.

Logical inputs and outputs are switched level-by-level. Since each level may have more than one component, switching a single logical input or output may involve switching more than one physical input or output.

For example, a RGB input signal represents three physical inputs because it is connected to three input connectors on the routing switcher. However, since all three components (R, G, and B) are switched together as a level, it is a single logical input.



Logical inputs are numbered sequentially, level-by-level, beginning with 1. Input numbers are assigned in the same order as the physical inputs to the component(s) of the level. Since a routing switcher may be configured to have more than one level, it may have more than one logical input designated as number 1. However, within each level, every logical input will have a unique number. Logical outputs are numbered in the same manner. Logical input/output numbering is handled automatically by the control system software as components are configured.

See also: Physical Input.

Logical Output

See: Logical Input.

Logical Switch

The control system software command that switches a logical input to a logical output.

See also: Physical Switch.

Matrix Breakup

The division of a single physical matrix into one or more components.

Matrix breakup allows complex signal types to reside within a single physical matrix. For example, a video matrix is often broken into R, G, and B components.

Matrix breakup is a software function handled by the control system software.

Matrix Space

A three-dimensional mathematical model of the crosspoints in a switching system.

The coordinates of crosspoints in matrix space are given in the form (input,output) on strobe x.

When a switching system is physically made up of only one routing switcher, the crosspoint coordinates are the same as the input and output connector numbers, and the resulting matrix space has only two dimensions. For example, the coordinates of the crosspoint indicated in Figure A is (4,2) on strobe 1.

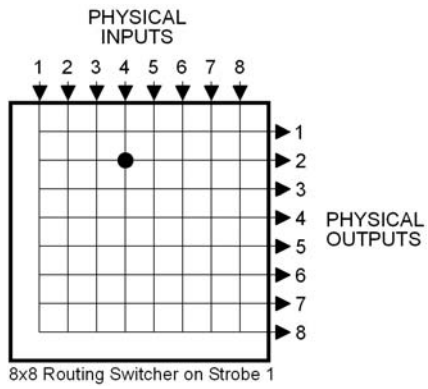


Figure A

Two-dimensional matrix space can also be composed of the crosspoints located in multiple routing switchers. The input and output connectors on the additional routing switchers are renumbered as required to ensure that each crosspoint can be identified by a unique (input,output) coordinate. When switching systems are constructed in this manner, matrix space size is no longer constrained by routing switcher size. The switching system shown in Figure B consists of four 8x8 routing switchers assigned to the same strobe. The coordinates of the indicated crosspoint are (12,14) on strobe 1.

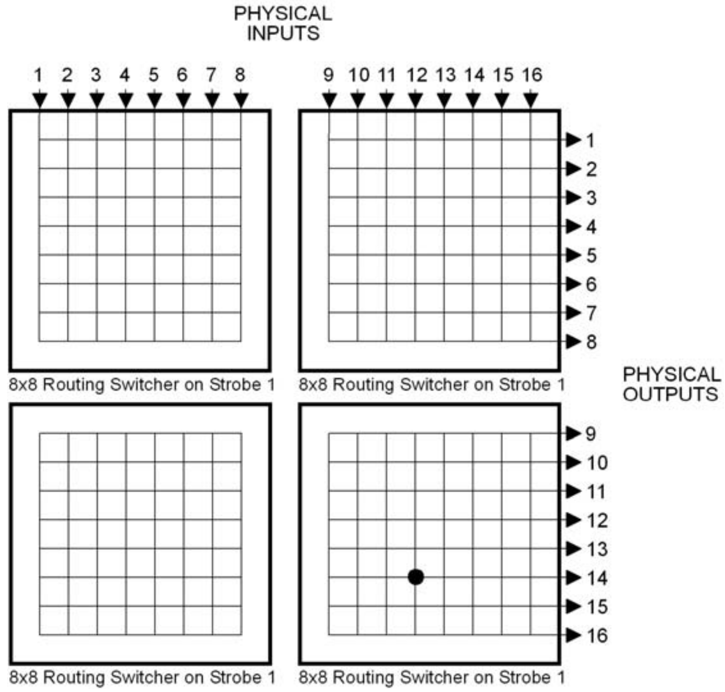


Figure B

Strobe numbers are used to introduce a third dimension into matrix space. Every routing switcher in a switching system is assigned to a strobe. In systems using more than one strobe (and, therefore having three-dimensional matrix space), crosspoint coordinates are given in the form (input,output) on strobe x. In Figure C, the coordinates of the indicated crosspoint in the left routing switcher are (4,2) on strobe 1. The coordinates of the crosspoint on the right are (4,2) on strobe 2.

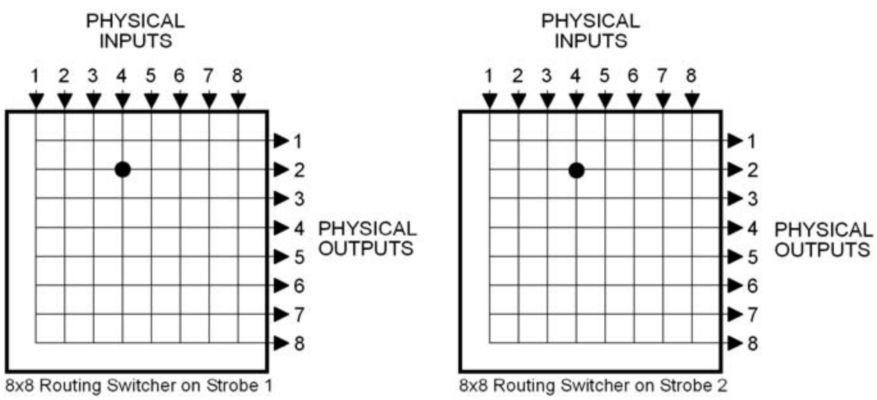


Figure C

NTSC

National Television Standards Committee. The NTSC was responsible for setting television and video standards in the United States. The NTSC standard for television defines a composite video signal with a refresh rate of 60 half-frames (interlaced) per second. Each frame contains 525 lines and can contain 16 million different colors.

See also: PAL, SECAM.

Output Offset

In matrix space, the amount by which the origin of a component on strobe x, is offset from the origin of strobe x, measured along the output axis.

The coordinates of crosspoints in matrix space are determined by the strobe they reside on, and their input and output numbers. They are given in the form (input,output) on strobe x. The origin of a component (a matrix of crosspoints) is designated by the point which falls nearest the origin of its Strobe (1,1). In Figure A below, the 3x4 Component bounded by coordinates (3,2), (5,2), (5,5), and (3,5) has its origin at (3,2).

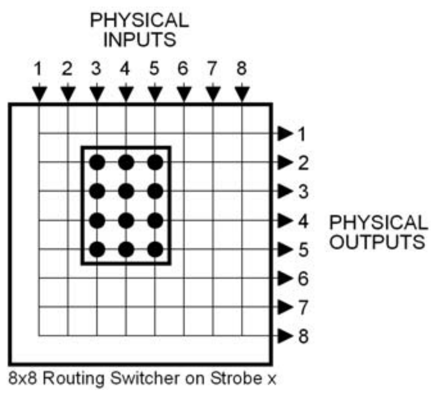


Figure A

Output offset is the amount by which the origin of a component is offset from the origin of its strobe, measured along the output axis. A component whose origin coincides with that of its strobe (1,1) will have an output offset of 0. The component shown in Figure A above, has an output offset of 1.

When multiple routing switchers are assigned to the same strobe, the input and output connectors are renumbered to provide a unique coordinate for each crosspoint. Crosspoint coordinates are then determined in the same manner as above. The component shown in Figure B below, has its origin at (12,7) and an output offset of 6.

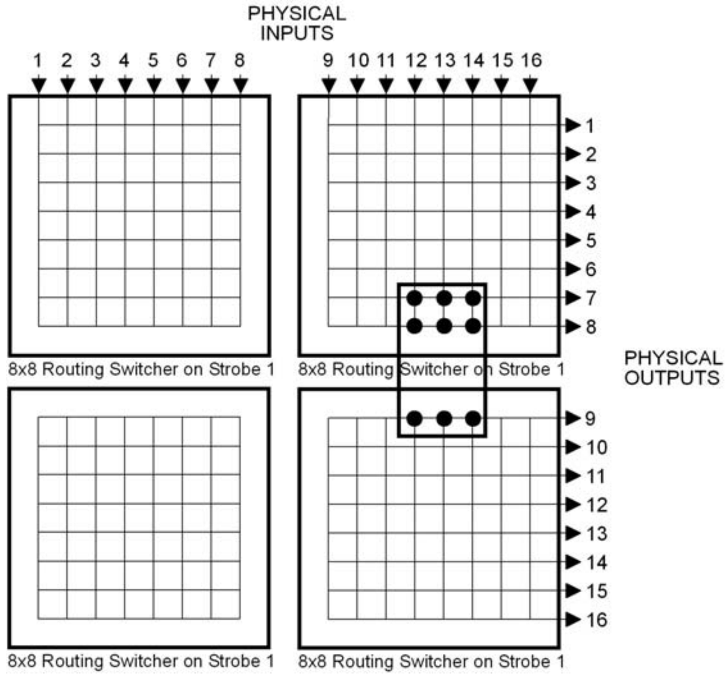


Figure B

PAL

Phase Alternating Line, the dominant television standard in Europe. The United States uses a different standard, NTSC. Whereas NTSC delivers 525 lines of resolution at 60 half-frames per second, PAL delivers 625 lines at 50 half-frames per second.

See also: NTSC, SECAM.

Panel

A user interface, usually mounted in a standard 19” rack, containing alphanumeric displays, push buttons, LEDs, etc. Sometimes referred to as a control panel.

A panel is used to control a switching system by taking switches, obtaining status, etc.

Panel names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Panel Address

A unique identifier, set by DIP switch on every panel, which allows the system controller to differentiate between panels.

Panel Name

An optional identifier for a control panel.

Individual panels are identified by panel address. Because of this, a panel name is not required when configuring a panel.

Panel names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Password

Each User Account and Configuration may be protected with an eight-character, upper case, alphanumeric password.

PC

Personal computer. Typically used to run control system software such as Win3500Plus.

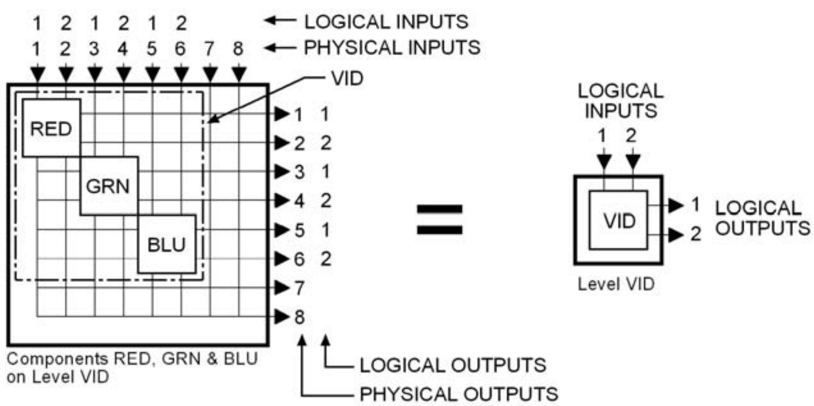
PESA control system software is designed to operate on any IBM® compatible personal computer (AT® or later) with a Microsoft Windows™ operating system (3.1, 95, 98, or NT).

Physical Input

The electrical signal coming from a device connected to an input connector on a routing switcher.

Physical inputs and outputs are the electrical signals passing through the input and output connectors of a routing switcher. Each connector represents one input or output.

For example, a RGB input signal would represent three physical inputs since it would be connected to three input connectors on the routing switcher.



Physical inputs are numbered sequentially beginning with 1, and have the same number as the corresponding input connector on the routing switcher. This includes connectors which have been renumbered with input offset when multiple routing switchers have a common strobe. Physical outputs are numbered in the same manner.

See also: Logical Input.

Physical Switch

The hardware that switches a physical input to a physical output. Sometimes referred to as a crosspoint.

See also: Logical Switch, Crosspoint.

Physical Output

See: Physical Input.

Port

Any of the serial communications bus interface connectors on a system controller.

Port names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter. Port names are optional because a port is identified by its address.

PRC Device

A device designed to be compatible with the PESA Routing Control protocol (PRC).

Ocelot, Cougar, Jaguar, Tiger, and Cheetah routing switchers are PRC devices.

See also: RM5 Device.

Protect

A property placed on a destination that prevents all panels and ports from taking a switch on that destination, unless taken from a panel or port that has the same requester code as the panel or port that protected it.

Destination protection may be cleared by any panel or port that has the same requester code and lock priority as the panel or port that protected the destination, that has a higher lock priority, or that has a lock priority of 0 (zero).

See also: Lock, Lock Priority, Requester Code.

Protect Priority

See: Lock Priority.

Protocol

The format to be used when sending data between two devices.

Protocol names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Readback

Information received from a routing switcher reporting which physical input is currently switched to a specified physical output.

To ensure that the configuration in the controller, and the actual state of the physical switches in a routing switcher agree, the routing switcher can be made to read back the status of each physical output. Where the routing switcher reports a different physical input from that expected by the controller, a readback error is declared.

Readback Error

See Readback.

Reentry

An entity which exists as both a source and destination at the same time, whose function is to facilitate switching a single source to multiple destinations, with a single logical switch.

Reentries are virtual entities that exist in the control software only. Their creation and use does not require any physical modification to the switching system hardware.

Example: Assume the existence of source SRC1 and destinations DST1, DST2, and DST3. Reentry REENT1 is created and switched to the three destinations. With a single logical switch, SRC1 can now be switched to REENT1 and the signal will arrive at all three destinations at the same time.

A reentry is assigned both a source number and a destination number.

Reentry names are constructed using one category followed by 0, 1 or 2 indices. If no index is selected, the default “00” (which is not displayed) will be used.

Remote Modem

An external modem connected to a system controller.

The remote modem must be an external type capable of being configured to automatically answer incoming calls. Because the system controller does not output any modem configuration information, the remote modem must be completely transparent to the controller. The only modems tested by PESA for use as remote modems are the Practical Peripherals PM288MT II and the U.S. Robotics Sportster 28.8 using the following initialization strings:

PM288MT II: AT S0=2 Q1 X4 &C1 &D0 &K3 &S1 &W0 &Y0

Sportster 28.8: AT &F1 S0=2 &H1 &R2 &I0 L2 Q1 &C1 &D0 Y0 &W0

For more information about these modems and their initialization strings, see the Practical Peripherals web site at http://www.practical.com/ or the U.S. Robotics web site at http://www.usr.com/. Before using any other type of remote modem, please consult with PESA Customer Service.

See also: Local Modem.

Requester Code

A property of panels and ports which allows them to be grouped with other panels or ports for the purpose of establishing lock and protect authority.

Panel requester codes not explicitly defined automatically default to the panel address.

See also Lock, Lock Priority, Protect.

RM5 Device

A device designed to be compatible with the System 5 (RM5) control protocol.

The RM4000, RM5000, and Lynx routing switcher families are RM5 devices.

See also: PRC Device.

Salvo

A group of predefined logical switches taken in the same vertical interval.

Example: Assume the existence of two sources, CART1 and CART2; and three destinations, MON1, VTR1, and VTR2. All of these sources and destinations are defined on two levels, AUD and VID.

By pressing a single control panel key, the user desires to take the following switches: audio and video from CART1 to MON1; audio from CART2 and video from CART1 to VTR1; and audio and video from CART2 to VTR2.

Destination (Salvo Entry)	Level: AUD	Level: VID
MON1	CART1	CART1
VTR1	CART2	CART1
VTR2	CART2	CART2

Salvo SAL1 is created which will consist of three salvo entries (one salvo entry per destination in the salvo). Each salvo entry is then configured to switch the selected sources on the appropriate levels. Once salvo SAL1 is assigned to a salvo key on the control panel, the user will be able to take all the specified switches with the press of a single key.

All switches in a salvo are taken within the same vertical interval.

Salvo names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Salvo Entry

One or more logical switches assigned to a specific destination that is part of a salvo.

Salvo entry names are the same as the destination they are associated with.

Salvo Include List

A named list of the salvos a specific control panel is authorized to control.

A salvo include list may be shared by multiple panels.

Salvo include list names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Salvo Key

A user configurable control panel key, whose assigned function is used when the panel is in salvo select mode.

Many control panels have user configurable keys. Each key can be assigned two functions, one as a data key and one as a salvo key. When the keys are pressed, the data key functions are used except when the panel is in salvo mode.

When a panel is in salvo select mode, a salvo will be executed immediately when the salvo key is pressed.

Salvo Key List

A named list of the functions assigned to each salvo key on a panel.

Multiple panels may share a salvo key list as long as they are the same type of panel. Different panel types may not use the same salvo key list.

Salvo key list names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

SECAM

Sequential Couleur Avec Memoire, the line sequential color system used in France, Russia, Eastern Europe, and some Middle Eastern countries. Like PAL, SECAM is based on a 50 Hz power system, displaying interlaced lines at 50 fields per second. The color information is transmitted sequentially (R-Y followed by B-Y, etc.) for each line and conveyed by a frequency modulated sub carrier that avoids the distortion arising during NTSC transmission.

See also: NTSC, SECAM.

Serial Port

See: Port.

Shared Input

A logical input which is used by more than one source.

Note that shared outputs are not permitted.

See also: Source Block.

SMPTE

Society of Motion Picture and Television Engineers (www.smpte.org). A professional organization that recommends standards for the television and film industries.

Soft Destination Key

See: Soft Key.

Soft Key

A special type of data key whose assigned function may be changed locally by a panel user.

Control system software is used to designate a data key as either a soft source key or a soft destination key. The assignment of a specific source or destination to the soft key may then be made with either the control system software, or locally at the panel by using Store Mode.

Soft Source Key

See: Soft Key.

Source

One or more logical inputs (limited to one per level), on one or more levels, which are switched together as a group.

Source names are constructed using one category followed by 0, 1 or 2 indices. If no index is selected, the default "00" (which is not displayed) will be used.

Source Block

A means of ensuring that a particular source will not be switched to a specific destination, inadvertently or without adequate permission.

When configuring a switching system, it may be desirable to use source blocking to restrict the switching of certain logical inputs. This may be done while configuring either sources or destinations.

Since a blocked source may contain a logical input that is shared (used by more than one source), care should be taken to ensure that all sources using the logical input are blocked from the destination to be protected.

Source Group

See: Source.

Source Include List

A named list of the sources a specific control panel is authorized to control.

A source include list may be shared by multiple panels.

Source include list names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

Source Number

A number assigned to each source by the controller and used by CPU Protocol 1.

Source numbers are also assigned to reentries.

Status

A list of all sources on all levels currently switched to a selected destination.

Sometimes also used to refer to the operational state of the control system (lock status, switch status, and panel status).

Status Level

The default level to be used when displaying the status of a destination receiving signals from multiple sources, on a panel in all levels mode (ALL LEVS).

One function of the LCD display on a panel is to show which source is currently switched to a selected destination. This is known as destination status. Although more than one source can be switched to a single destination (limited to one source per level), the status display can only show one source at a time. When the panel is in all levels mode (ALL LEVS), Status Level is used to designate a default level to be used when displaying status. Only the source on this default level will be displayed. On panels which do not have LCD displays, this is indicated by a continuous, bright, pushbutton light.

If one or more other sources are also switched to the destination (on other levels), an octothorp (the "#" symbol) will be appended to the source name. The other source names can be viewed by toggling each level key in turn to show, level-by-level, which source has been switched to the destination. On panels which do not have LCD displays, this is indicated by an alternating bright/dim push button light.

Status Method

One of two possible ways to display status when a panel is in all levels (ALL LEVS) mode and the destination is not defined on the Status Level.

When a panel is in all levels mode (ALL LEVS), the status shown will be the source on the Status Level assigned to that panel. If the destination is not defined on the Status Level, Status Method is used to control the resulting display:

If DEF (Default Method) is selected, NO XXXXX will be displayed where XXXXX is the Status Level assigned to the panel.

If GRP (Group Method) is selected, the controller will examine every level sequentially, starting with the level designated as Level Order 1. The source switched on the first level found where the destination is defined, will be displayed as the destination status.

Stop Bit

In asynchronous communications, a bit that indicates that a byte of data has just been transmitted.

Every byte of data is preceded by a start bit and followed by a stop bit.

Strobe

The third dimension of matrix space.

Every routing switcher in a switching system is assigned a strobe. This is usually accomplished by setting a DIP switch on the back of the routing switcher. Strobes do not have to be unique and, in larger systems, each strobe might be associated with several routing switchers.

In many switching systems, strobes are used to group levels of the same type together. For example, video may be on Strobe 1, audio on Strobe 2, etc.

Sync Reference

A vertical sync signal used to ensure that switching occurs in the vertical interval of a video signal.

Sync Reference names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

See also: Vertical Sync Signal.

System 5 Device

See: RM5 Device.

TIA

Telecommunications Industry Association (www.tiaonline.org).

Tieline

A special type of logical switch that allows a logical input on one level to be switched to a logical output on a different level.

Example 1 - Switch a signal from analog camera ANCAM into an analog-to-digital converter (A/D) and then into digital video tape recorder DIGVTR: (Figure A) Connect a cable between the appropriate output connector of the analog routing switcher and the input of the A/D, and a cable between the output of the A/D and the appropriate input connector on the digital routing switcher. Configure levels ANAVID and DIGVID and tieline TLINE1 to connect them. Configure destination DIGVTR on level DIGVID. Configure source ANCAM on level ANAVID to use tieline TLINE1. ANCAM may now be switched to DIGVTR with a single logical switch even though they are on different levels.

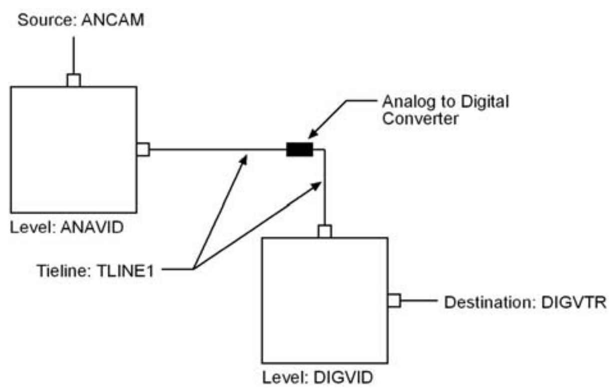


Figure A

Example 2 - Switch a signal from camera CAM1 (connected to a routing switcher in Room A) to video tape recorder VTR1 (connected to a routing switcher in Room B): (Figure B) Connect a cable between the appropriate output connector of the routing switcher in Room A and the appropriate input connector on the routing switcher in Room B. Create levels VIDA and VIDB and configure a tieline connecting the output of VIDA to the input of VIDB. Define source CAM1 on level VIDA and destination VTR1 on level VIDB. CAM1 may now be switched to VTR1 with a single logical switch even though they (and their respective routing switchers) are located in two separate rooms.

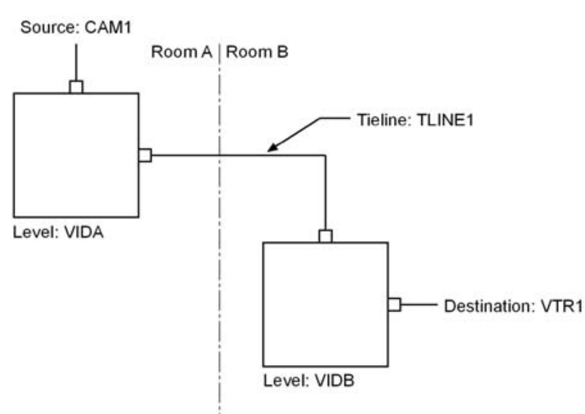


Figure B

Tieline names are one to eight characters in length and are constructed using uppercase letters, numbers, and spaces. The first character must be a letter.

User Account

A set of privileges and an optional user password saved as a user name.

User accounts provide a means of restricting access to certain system functions on a user-by-user basis.

User Name

An eight-character string consisting of upper case letters, numbers, spaces, and some symbols:

Permitted: ! @ # $ % ^ & * _ + - = [ ] \ : " ; ' < > . ? /

Forbidden: { } | , ( )

User Password

An eight-character string consisting of letters, numbers, and spaces. A User Password may begin with either a number or a letter. Leading spaces are discarded.

Vertical Interval

The portion of the video signal in which image information is absent to allow for the video device to prepare for the next frame of information.

Vertical Sync Signal

A short pulse generated at the beginning of each video timing frame which tells the video monitor when to start a new video timing field. For switching purposes, the vertical sync signal may be derived from house sync.

See also: Sync Reference.

Vertical Trigger

See: Vertical Sync Signal.

Video Timing Field

A package of information that contains information required to complete a full scan across a video monitor. There are two types of video fields denoted as odd and even.

Video Timing Frame

A package of information that contains all the information required to draw an image on a video device. Generally considered with respect to NTSC and PAL signals where the information is transmitted over a fixed time frame. A frame consists of two video timing fields denoted odd and even.

Working Directory

The location on the PC hard drive where control system software such as Win3500Plus is installed.

If the default settings of the Win3500Plus installation program were used, this will be c:\win3500p for 16-bit versions of the Microsoft Windows OS, and c:\program files\win3500p for 32-bit versions. Configurations may not be saved in the working directory or any subdirectory of the working directory.

Revision History

Rev.	Date	Description	By
A	01-31-98	Initial release.	C. Jaynes
B	07-24-98	Added Section 1.4 and revised warning statements to conform with CE marking requirements.	G. Tarlton
C	02-07-00	Added analog video Declaration of Conformity per ECO-3152. Added digital video Declaration of Conformity per ECO-3155. Extensively revised per ECO-3560.	G. Tarlton
D	02-16-00	Revised Figures 2, 3 and 10 per ECO-3572.	G. Tarlton
E	06-28-00	Revised Figure 17 per ECO-3688.	G. Tarlton
F	02-28-01	Deleted Printing Specification per ECO CE00160.	G. Tarlton
G	02-28-01	Deleted bills of material, drawings, and schematics per ECO CE00161.	G. Tarlton
H	03-20-01	Complete revision. Incorporated RS-422 cable information per ECO CE00034.	D. Buie

PESA
Switching Systems