PESA Switching Systems

# 3300 System Controller

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Document No. 81-9059-0361-0 Rev. D

**Manual Updates:**

10/15/95 Manual released for preliminary printing.

12/15/96 Manual updated to include 3300 Dual Controller technical information and released for printing as REV A.

8/30/97 Manual updated to include latest drawing and bill of materials revisions. Released as REV B.

03-05-01 Rev C: Deleted Printing Specification per ECO CE00113. GLT

03-16-01 Rev D: Deleted bills of material, drawings, and schematics per ECO CE00130. GLT

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### Tables

## 1.1 Manual Overview

This manual provides detailed instructions for installing and operating all models of the 3300 Controller . This manual is divided into five sections as shown.


Section 1, **INTRODUCTION**, summarizes the manual, describes the product, and provides the minimum system requirements for installing and operating the Win3300 software package.


Section 2, **INSTALLATION**, provides the 3300 Controller Board installation and setup instructions.


Section 3, **OPERATION**, describes the 3300 Controller and Win3300 operational procedures.


Section 4, **FUNCTIONAL DESCRIPTIONS**, presents an signal flow description of the 3300 Controller.


Section 5, **MAINTENANCE**, explains procedures for maintaining the 3300 Controller.



## 1.2 General Description

The 3300 Controller is a low cost, full-featured microprocessor-based unit designed to interface with various configurations of PESA's video and audio routing switchers. The 3300 Controller, working in conjunction with PESA's Win3300 Control System software package, enables users to configure and operate a routing switcher system from a standard 486 IBM compatible computer. Both the 3300 Controller and Win3300 Control System are inherently flexible and easily configured.

The 3300 Controller utilizes the Motorola 68332 embedded microprocessor. In addition, the 3300 Controller is equipped with 512K of RAM, 256K of EPROM, and 256K of non-volatile memory making the 3300 Controller a high-powered control platform for its size. Additionally, the 512K of RAM is non-volatile, making it possible for the 3300 Controller to maintain router status information through power failures.

The 3300 Controller is capable of controlling up to a 192 input by 192 output, eight level routing switcher system. Standard features include independent control of each level, audio-follow-video switching, virtual matrix mapping, and software reentry. Matrix segmentation (breakup) is also a standard feature. Matrix segmentation enables RGB, Y/C, or multiple levels of audio to be configured as smaller matrixes within a larger matrix. Multiple levels of lock priority, 128 salvo capability, full diagnostics, and all-call switching are also included in the 3300 Controller's standard features plus the ability to configure 224 sources and destinations.

The controller supports up to 127 of PESA's low-cost RCP control panels. The control panels are connected via twisted pair to each other as well as the controller and can be remotely located up to 4000 feet from the controller. The control panels communicate with the 3300 Controller over a standard RS485 interface. Two RS422 ports and two RS232 ports are provided for communications interface with the routing switcher system, the control system computer, and additional equipment items.

The 3300 Controller is available as a stand-alone unit (rack mountable) or as a plug-in unit for smaller routing switcher systems. The 3300 Controller is fully compatible with PESA's System 5, Lynx, Cougar, and Jaguar lines of audio and video routing switchers.

## 1.3 Models of the 3300 Controller

There are serveral models of the 3300 Controller available. The following table lists and describes the various models of the 3300 Controller. All models of the 3300 Controller are fully compatible with the Win3300 Control System software package.

| NAME | DESCRIPTION | CONTROLS |
|---|---|---|
| 3300 | Designed to be installed in the Cougar or Jaguar Video Frames. One or two (single or dual) may be installed in the Cougar or Jaguar Video Frames. | Cougar and Jaguar Frames only |
| 3300S | 3300 Single Controller designed as stand-alone single controller. Cannot be expanded to a dual. | Cougar, Jaguar, or 37-pin parallel bus (System 5 or Lynx) |
| 3300D | 3300 Dual Controller designed as stand-alone dual controller. Single upgradable to a dual. | Cougar, Jaguar, or 37-pin parallel bus (System 5 or Lynx) |
| 3300 EX | 3300 Controller designed to be installed in the RM4000 Video Routing Switcher Frame. Cannot be expanded to a dual. | Cougar, Jaguar, or 37-pin parallel bus (System 5 or Lynx) |

## 2.1 Introduction

This section details the 3300 Controller installation procedures. The following topics are discussed:

- Receipt Inspection
- Unpacking
- Location (3300S Controller Frame)
- Mounting (3300S Controller Frame)
- Cabling (3300S Controller Frame)
- 3300 Controller Card Installation (Cougar Frame)
- 3300 Controller Card Installation (Jaguar Frame)
- 3300 Controller Card Installation (RM4000 Frame)
- 3300 Controller Card Installation (3300S Frame)
- 3300 Controller Card Installation (3300D Frame)
- PS130 Power Supply Installation (3300D Frame)
- Rear Panel Connectors (3300S Frame)
- Rear Panel Connectors (3300D Frame)
- System Connections (3300S Controller)
- System Connections (3300D Controller)

**NOTICE**

THE 3300 CONTROLLER CONTAINS STATIC SENSITIVE DEVICES. CARE SHOULD BE USED WHEN IT IS NECESSARY TO HANDLE THE 3300 CONTROLLER CARD. IT IS RECOMMENDED THAT A GROUND WRIST STRAP AND GROUNDING MAT BE USED BEFORE ATTEMPTING ANY EQUIPMENT INSTALLATIONS.

## 2.2 Receipt Inspection

All models of the 3300 Controller are tested and inspected prior to leaving the PESA factory. Upon receipt, inspect the control card and software package for shipping damage. If any damage is found, contact the carrier immediately and save all packing material.

## 2.3 Unpacking

Standard 3300 Controller shipments are comprised of a controller card and a Win3300 Control System software package. The 3300S Controller shipments are comprised of a frame, a controller card, and a Win3300 Control System software package. The 3300D Controller shipments are comprised of a frame, two controller cards, and a Win3300 Control System software package. A null modem cable is also included in the 3300S and 3300D shipments to connect the system computer to the controller. Prior to discarding packing material compare the parts received against the packing list. Carefully inspect the layers of packing material for any components which may have been overlooked during the initial unpacking.

## 2.4 Location (3300S and 3300D Frames)

The 3300S Controller Frame or the 3300D Controller Frame may be located anywhere power is available. However, the unit should be mounted as close as possible to its associated equipment to minimize cable runs. Installation should be in an area where the ambient temperature does not exceed 40°C (104°F) inside the equipment rack.

## 2.5 Mounting (3300S and 3300D Frames)

The 3300S and 3300D Controller Frames are rack mountable in a standard 19” equipment racks. The 3300S Controller Frame will occupy one rack unit and the 3300D Controller Frame will occupy two rack units. Sufficient space must be provided behind the equipment racks to allow for the control cables and power cable. All mounting holes should be utilized and mounting hardware tightened securely. As with all equipment installed in a rack, the bottom screw on each side should be installed before proceeding with the remainder of the screws. Then all screws should be securely tightened. Support the frame's bottom while installing it in the rack. Figure 2-1 illustrates chassis installation in the equipment rack.

## 2.5 Mounting (3300S and 3300D Frames) Continued:

To install a 3300S Controller Frame or a 3300D Controller Frame in an equipment rack follow these steps:

1. Align the frame with the slotted opening in the rack.

2. Install the bottom screws first.

3. Install the two top screws

4. Tighten all four screws securely.

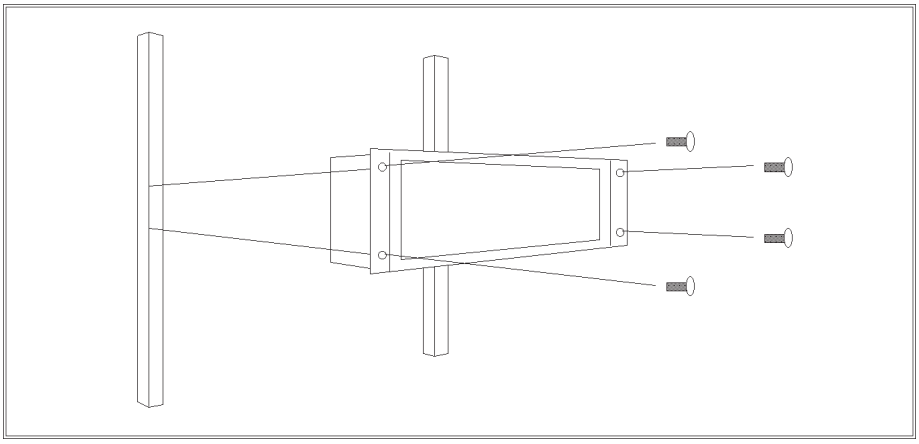


**Figure 2-1 Chassis Installation**

## 2.6 Cabling (3300S and 3300D Frames)

Considerable weight will be added to the rear panel of the 3300S Controller Frame or the 3300D Controller Frame by the control cables and power cables. Therefore, all cables should be strained relieved and secured to racks or other supporting structures. Failure to provide adequate cable support can result in cables separating from connectors. If cable runs are to be stored under an elevated floor, they should be tied to the racks as a guide. If cables are run along the floor, do not allow them to lay in the work area behind the racks. Stepping or tripping on the cables may result in connections being pulled free or wire breakage inside the insulation. The 3300S Controller Frame or the 3300S Controller Frame should be installed in the equipment rack prior to attaching cables.

Use the following rules when cabling the 3300S Controller Frame or the 3300D Controller Frame:

## 2.6 Cabling (3300S and 3300D Frames) Continued:

1. Lay all cables in their intended positions, separating control and power cables wherever possible.

2. Provide proper support for each cable during the cabling process. The use of tie-wraps is recommended, as shown below in Figure 2-2.

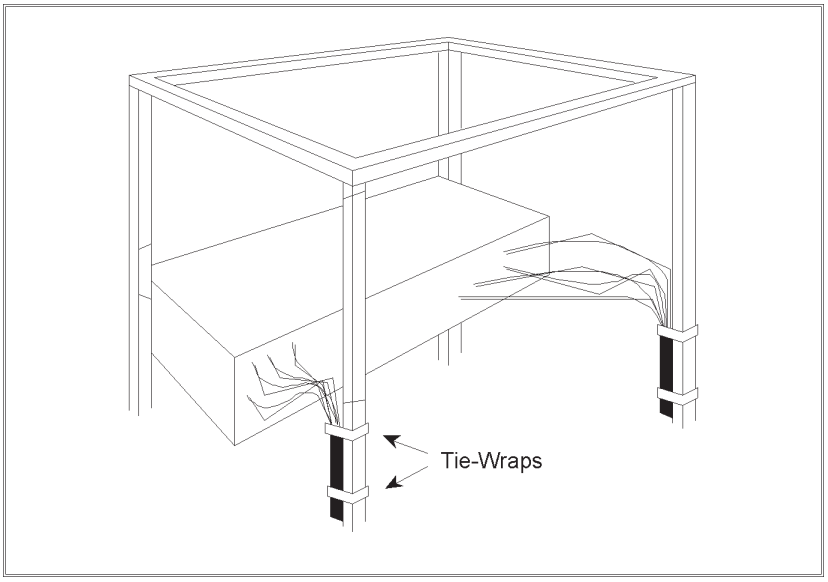



**Figure 2-2 Cables Attached to Supports**

## 2.7 3300 Controller Card Installation (Cougar Frame)

The 3300 Controller Card(s) are installed in the upper left-hand portion of the Cougar Video Routing Switcher . The Cougar Video Routing Switcher is designed for the installation of up to two 3300 Controller Cards. If only one 3300 Controller Card is to be installed in the Cougar Video Routing Switcher, install it in the upper card slot.

To install the 3300 Controller Card(s) in the Cougar Video Routing Switcher take the following steps:

1. Align the first (primary) 3300 Controller Card with the upper set of circuit card guides in the upper left-hand portion of the Cougar Video Routing Switcher.

## 2.7 3300 Controller Card Install. (Cougar Frame) Cont:

2. Carefully push the 3300 Controller Card into the Cougar Video Routing Switcher until the circuit card connectors make initial contact with backplane connectors. At this point, firmly but carefully continue pushing the controller card into the frame while making sure the connectors are properly aligned. Continue pushing the controller card until it is in place and the connectors are firmly mated.

3. Align the second (redundant) 3300 Controller Card with the lower set of circuit card guides in the upper left-hand portion of the Cougar Video Routing Switcher and repeat step 2.

4. Once the 3300 Controller Card(s) are installed in the Cougar Video Routing Switcher, install the controller card locking brace and secure it with a twist nut to hold the controller card(s) in place. **NOTE:** The controller locking brace may be removed after shipment to ease the replacement of 3300 Controller Card(s) if necessary.

## 2.8 3300 Controller Card Installation (Jaguar Frame)

The 3300 Controller Card(s) are installed in the upper, left-hand portion of the front of the Jaguar Video Routing Switcher. The Jaguar Video Routing Switcher is designed for the installation of up to two 3300 Controller Cards. If only one 3300 Controller Card is to be installed in the Jaguar Video Routing Switcher, install it in the upper card slot.

To install the 3300 Controller Card(s) in the Jaguar Video Routing Switcher take the following steps:

1. Align the shield plate attached to the first (primary) 3300 Controller Card with the upper set of circuit card guides in the upper, left-hand portion of the front of the Jaguar Video Routing Switcher.

2. Carefully push the 3300 Controller Card into the Jaguar Video Routing Switcher until the controller card connectors make initial contact with the corresponding Power Mid-Plane connectors. At this point, firmly but carefully continue pushing the controller card into the frame while making sure the connectors are properly aligned. Continue pushing the controller card until it is in place and the connectors are firmly mated.

## 2.8 3300 Controller Card Install. (Jaguar Frame) Cont:

3. Align the shield plate attached to the second (redundant) 3300 Controller Card with the middle set of circuit card guides in the upper, left-hand portion of the front of the Jaguar Video Routing Switcher and repeat step 2.

## 2.9 3300EX Controller Card Installation (RM4000 Frame)

The 3300EX Controller Card is installed in the bottom card slot in the RM4000 Frame. To install the 3300EX Controller Card in the RM4000 Frame take the following steps while referring to Figure 2-3:

1. Align the shield plate attached to the 3300EX Controller Card with the lower set of circuit card guides in the RM4000 Frame.

2. Carefully push the 3300EX Controller Card into the RM4000 Frame until the circuit card connectors make initial contact with backplane connectors. At this point, firmly but carefully continue pushing the controller card into the frame while making sure the connectors are properly aligned and that no connector pins are being bent. Continue pushing the controller card until it is in place and the connectors are firmly mated.

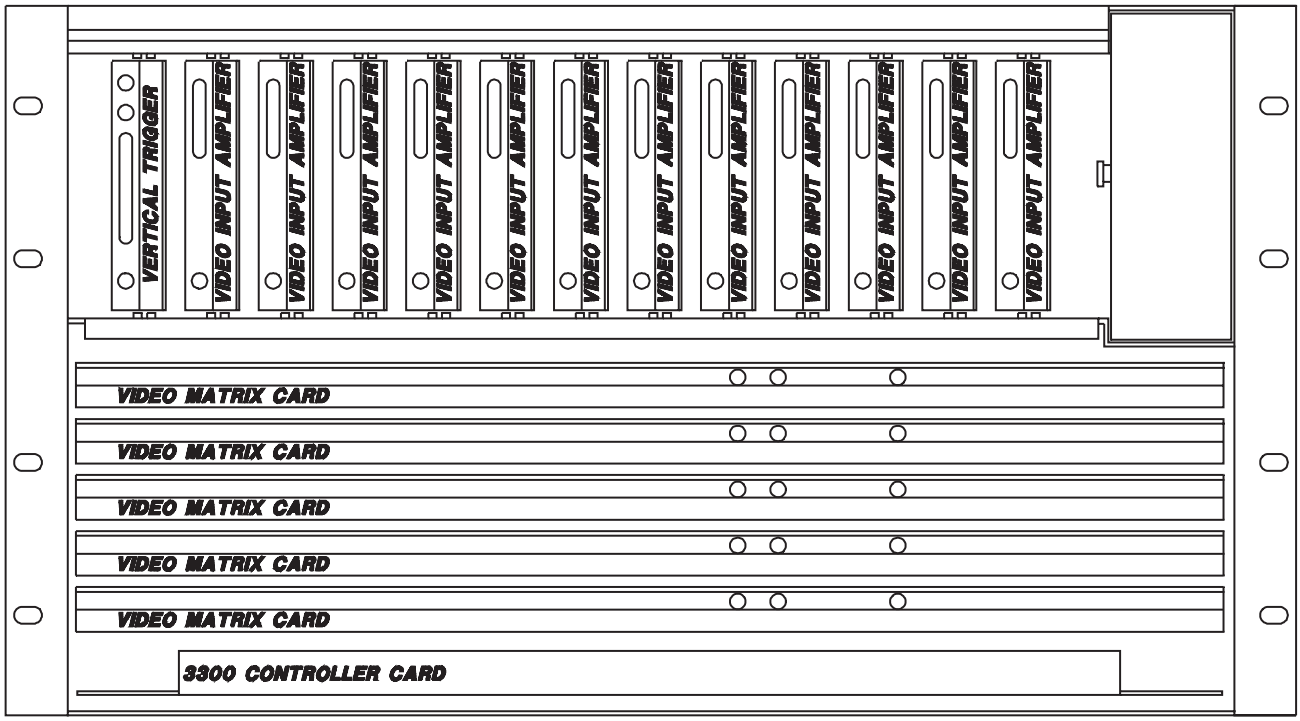



**Figure 2-3 3300EX Controller Installation in RM4000 Frame**

## 2.10 3300 Controller Card Installation (3300S Frame)

To install the 3300 Controller Card in the 3300S Frame take the following steps:

1. Align the shield plate attached to the 3300 Controller Card with the set of circuit card guides in the 3300S Frame.

2. Carefully push the 3300 Controller Card into the 3300S Frame until the circuit card connectors make initial contact with backplane connectors. At this point, firmly but carefully continue pushing the controller card into the frame while making sure the connectors are properly aligned and that no connector pins are being bent. Continue pushing the controller card until it is in place and the connectors are firmly mated.

## 2.11 3300 Controller Card Installation (3300D Frame)

To install the 3300 Controller Cards in the 3300D Frame take the following steps:

1. Align the shield plate attached to the first 3300 Controller Card with the lower set of circuit card guides in the left-hand side of the 3300D Frame.

2. Carefully push the 3300 Controller Card into the 3300D Frame until the circuit card connectors make initial contact with backplane connectors. At this point, firmly but carefully continue pushing the controller card into the frame while making sure the connectors are properly aligned and that no connector pins are being bent. Continue pushing the controller card until it is in place and the connectors are firmly mated.

3. Align the shield plate attached to the second 3300 Controller Card with the upper set of circuit card guides in the left-hand side of the 3300D Frame and repeat step 2.

## 2.12 PS130 Power Installation (3300D Frame)

To install the PS130 Power Supplies in the 3300D Frame take the following steps:

1. Align the shield plate attached to the first PS130 Power Supply with the lower set of circuit card guides in the right-hand side of the 3300D Frame.

2. Carefully push the PS130 Power Supply into the 3300D Frame until the power supply connectors make initial contact with backplane connectors. At this point, firmly but carefully continue pushing the power supply into the frame while making sure the connectors are properly aligned and that no connector pins are being bent. Continue pushing the power supply until it is in place and the connectors are firmly mated.

3. Align the shield plate attached to the second PS130 Power Supply with the upper set of circuit card guides in the right-hand side of the 3300D Frame and repeat step 2.

## 2.13 Rear Panel Connectors (3300S Frame)

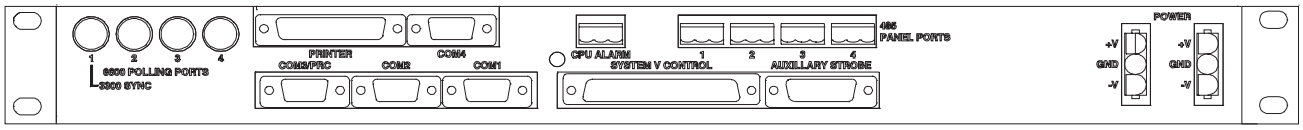



**Figure 2-4 3300S Controller Rear View**

### System V Control Connector

3300S Controller is connected to System 5 and Lynx Series equipment items through the System V Control Connector. The System V Control Connector provides a port for bi-directional data exchange between the switching matrix and the controller.

### Auxiliary Strobe Connector

NOT USED AT THIS TIME

## 2.13 Rear Panel Connectors (3300S Frame) Continued:

### Power Loop Through Connectors

Two 3-pin power loop through connectors are located on the right-hand side of the rear of the 3300S Frame. Power from the external video power supply is supplied through these connectors. Power can also be looped from external video frames.

### RS422 Connectors

Two RS422 I/O connectors are located on the rear of the 3300S Controller for RS422 data exchange. These are the COM3/PRC Connector and the COM4 Connector.

#### COM3/PRC Connector (CPU)

3300S Controller is connected to the Cougar Routing Switchers or to the Jaguar Routing Switchers through the COM3/PRC Connector. The COM3/PRC connector provides a port for bidirectional data exchange between the switching matrix and the 3300S Controller. The pinout of the COM3/PRC Connector is as follows:

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

#### COM4 Connector (LAN)

The COM4 Connector provides a secondary port for bidirectional data exchange between additional equipment items and the 3300S Controller. The pinout of the COM3/PRC connector is as follows:

## 2.13 Rear Panel Connectors (3300S Frame) Continued:

**RS422 Connectors Continued:**

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

**RS232 Connectors**

Two RS232 I/O connectors are located on the rear of the 3300S Controller for RS232 data exchange. These are the COM2 Connector and the COM1 Connector. Both the COM2 Connector and the COM1 Connector are utilized as CPU Link Connectors

**COM2 (CRT-1) and COM1 (CRT-2) Connectors (CPU Links)**

The CPU Link Connectors (COM2 and COM1) allow serial communications between the 3300S Controller and up to two external computers. **NOTE:** COM1 is the primary CPU link connection and COM2 is the secondary CPU link connection. The 3300 Controller supports asynchronous, bidirectional communications, at 9600 baud. The protocols used in communication via these ports are proprietary protocols developed by PESA for switcher control. Refer to Section 8 of this manual for protocol details. The pinout for CPU Link Connectors is as follows:

| PIN NO. | DESCRIPTION |
|---|---|
| 1 | CD |
| 2 | RX DATA |
| 3 | TX DATA |
| 4 | DTR |
| 5 | GROUND |
| 6 | DSR |
| 7 | RTS |
| 8 | CTS |
| 9 | N/C |

## 2.13 Rear Panel Connectors (3300S Frame) Continued:

### CPU Alarm Connector

NOT USED AT THIS TIME

### 3300 Sync Connector (Polling Port 1)

The sync connector is used to connect an external sync signal to the 3300S Controller. The sync signal may be either a color black or composite video signal. The use of an external sync signal allows switch changes to be accurately timed in the vertical interval.

### Printer Connector

NOT USED AT THIS TIME

### RS485 Panel Port Connectors

The RS485 panel port connectors allow the daisy-chained connection of up 128 remote control panels to the 3300S Controller. Bidirectional communications between the 3300S Controller and the various models of PESA's low cost RCP control panels are sent and received over RS485 bus.

## 2.14 Rear Panel Connectors (3300D Frame)

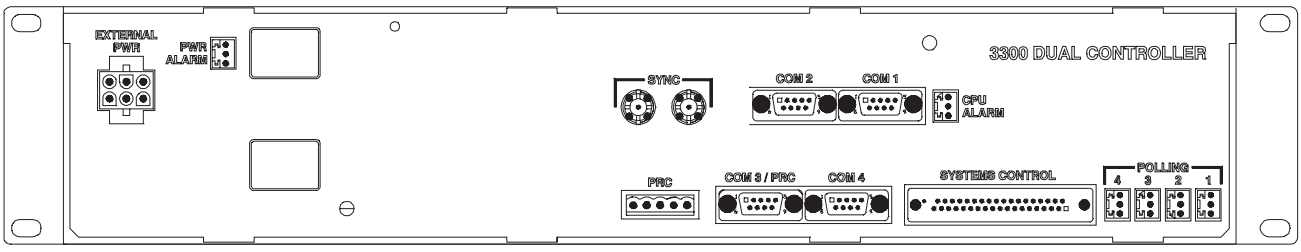



**Figure 2-5 3300D Controller Rear View**

### System Control Connector

3300D Controller is connected to System 5 and Lynx Series equipment items through the System Control Connector. The System Control Connector provides a port for bi-directional data exchange between the switching matrix and the controller.

### Auxiliary Strobe Connector

NOT USED AT THIS TIME

## 2.14 Rear Panel Connectors (3300D Frame) Continued:

### External Power Connector

The External Power Connector is located on the left-hand side of the rear of the 3300D Frame. Power from an external power supply can be supplied through this connector. Power can also be supplied to the 3300D Controller Frame through the External Power Connector from video frames.

### RS422 Connectors

Two RS422 I/O connectors are located on the rear of the 3300S Controller for RS422 data exchange. These are the COM3/PRC Connector and the COM4 Connector.

#### COM3/PRC Connector

3300D Controller is connected to the Cougar Routing Switchers or to the Jaguar Routing Switchers through the COM3/PRC Connector (the 3300D Controller can also be connected Cougar or Jaguar Frames through the 5-pin PRC Connector). The COM3/PRC connector provides a port for bidirectional data exchange between the switching matrix and the 3300D Controller. The pinout of the COM3/PRC Connector is as follows:

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

#### COM4 Connector

The COM4 Connector provides a secondary port for bidirectional data exchange between additional equipment items and the 3300D Controller. The pinout of the COM3/PRC Connector is as follows:

# 2.14 Rear Panel Connectors (3300D Frame) Continued:

**RS422 Connectors Continued:**

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

**RS232 Connectors**

Two RS232 I/O connectors are located on the rear of the 3300D Controller for RS232 data exchange. These are the COM2 Connector and the COM1 Connector. Both the COM2 Connector and the COM1 Connector are utilized as CPU Link Connectors

**COM2 and COM1 Connectors (CPU Link Connectors)**

The CPU Link Connectors (COM2 and COM1) allow serial communications between the 3300D Controller and up to two external computers. **NOTE:** COM1 is the primary CPU link connection and COM2 is the secondary CPU link connection. The 3300 Controller supports asynchronous, bidirectional communications, at 9600 baud. The protocols used in communication via these ports are proprietary protocols developed by PESA for switcher control. Refer to Section 8 of this manual for protocol details. The pinout for CPU Link Connectors is as follows:

| PIN NO. | DESCRIPTION |
|---|---|
| 1 | CD |
| 2 | RX DATA |
| 3 | TX DATA |
| 4 | DTR |
| 5 | GROUND |
| 6 | DSR |
| 7 | RTS |
| 8 | CTS |
| 9 | N/C |

## 2.14 Rear Panel Connectors (3300D Frame) Continued:

### 5-Pin PRC Connector

The 5-Pin PRC Connector provides the primary port for bidirectional data exchange between the switching matrix and the 3300D Controller. The pinout of the COM3/PRC Connector is as follows:

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

### CPU Alarm Connector

NOT USED AT THIS TIME

### Sync Connector

The sync connector is used to connect an external sync signal to the 3300D Controller. The sync signal may be either a color black or composite video signal. The use of an external sync signal allows switch changes to be accurately timed in the vertical interval.

### RS485 Panel Port Connectors

The RS485 panel port connectors allow the daisy-chained connection of up 128 remote control panels to the 3300D Controller. Bidirectional communications between the 3300D Controller and the various models of PESA's low cost RCP control panels are sent and received over RS485 bus.

## 2.15 System Connections (3300S Controller)

Once the 3300S Controller is installed in the equipment rack, system connections can be made. Use the following guide and the sample connection illustration, Figure 2-6, to insure that the 3300S Controller system connections are properly connected and that the control, power, and sync cables are correctly installed.

## 2.15 System Connections (3300S Controller) Continued:

**Connection Guide**

1. Connect the external sync sources to the Sync Input using Belden 8281 coaxial cable or equivalent. Be sure to properly terminate the external sync sources into 75 ohms.

2. Connect the primary external computer to the COM1 Connector using a 9-pin RS232 cable. Please note that this connection has to be made in order to configure the 3300 Controller Card using the Win3300 Control System software package. If a secondary external computer is to be used, connect it to the COM2 Connector.

3. Connect the primary Cougar or Jaguar Routing Switcher's 9-pin RS422 control line to the COM3/PRC Connector, if applicable.

4. Connect the System V Routing Switchers (RM4000, RM5000, SD5000, Lynx Routing Switchers) 37-pin control line to the System V Control Connector, if applicable.

5. Connect the RCP control panels to the RS485 Panel Ports using twisted pair cables. The connections to the control panels may be daisy chained.

6. Connect an external video power supply to one of the power loop through connectors or loop a power cable from a video routing switchers to one of the power loop through connectors to power up the 3300S Controller. **Do not attempt to use an audio power supply or audio device to power the 3300S Controller as severe circuit damage will occur.** The acceptable voltage range input to the 3300S Controller is typically 8.5 VDC ± 1.5 VDC.

## 2.16 System Connections (3300D Controller)

Once the 3300D Controller is installed in the equipment rack, system connections can be made. Use the following guide and the sample connection illustration, Figure 2-7, to insure that the 3300D Controller system connections are properly connected and that the control, power, and sync cables are correctly installed.

## 2.16 System Connections (3300D Controller) Continued:

**Connection Guide**

1. Connect the external sync sources to the Sync Input using Belden 8281 coaxial cable or equivalent. Be sure to properly terminate the external sync sources into 75 ohms.

2. Connect the primary external computer to the COM1 Connector using a 9-pin RS232 cable. Please note that this connection has to be made in order to configure the 3300 Controller Card using the Win3300 Control System software package. If a secondary external computer is to be used, connect it to the COM2 Connector.

3. Connect the primary Cougar or Jaguar Routing Switcher's 9-pin RS422 control line to the COM3/PRC Connector, if applicable, or connect the primary Cougar or Jaguar Routing Switcher's 5-pin RS422 control line to the 5-Pin PRC Connector.

4. Connect the System V Routing Switchers (RM4000, RM5000, SD5000, Lynx Routing Switchers) 37-pin control line to the System V Control Connector, if applicable.

5. Connect the RCP control panels to the RS485 Panel Ports using twisted pair cables. The connections to the control panels may be daisy chained.

6. If desired, connect an external power supply to the External Power Connector. The external power supply should be diode isolated from the internal power supplies. 1N5821 or equivalent type diodes may be used for this purpose.

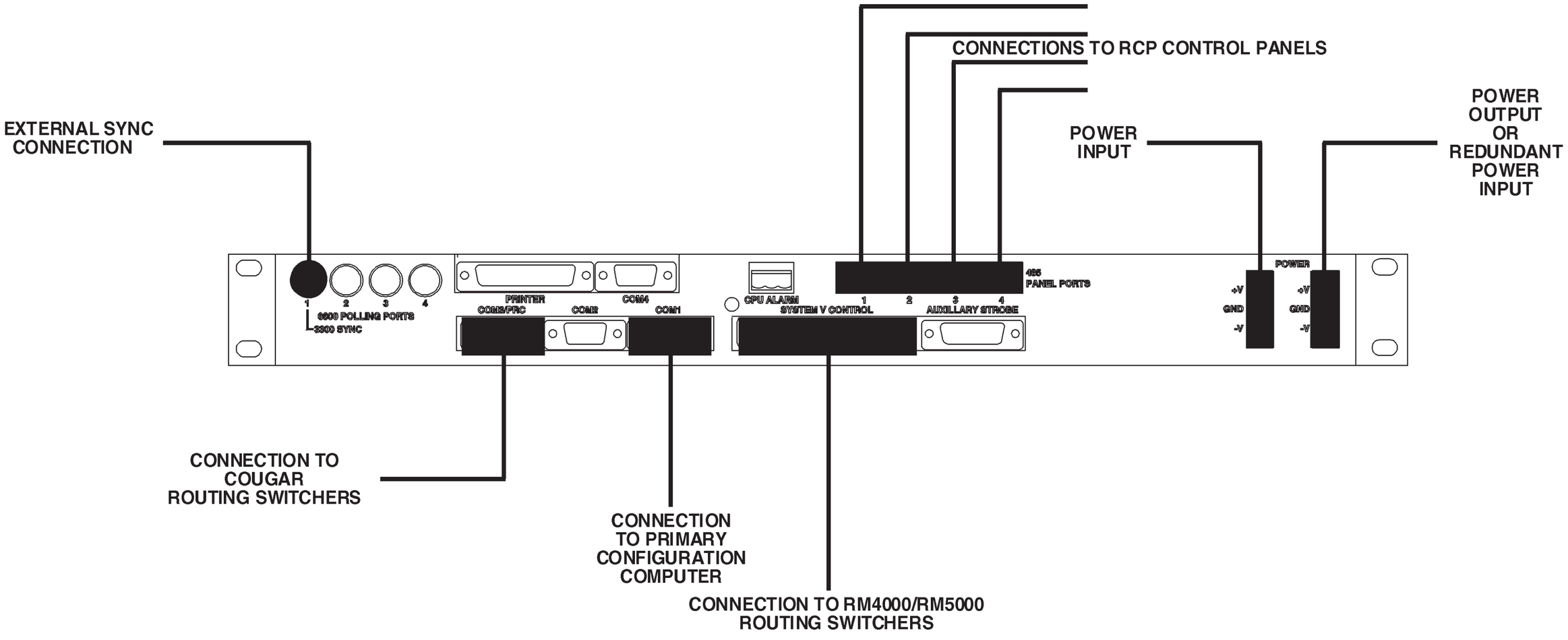



*Figure 2-6 3300S Controller System Connections*

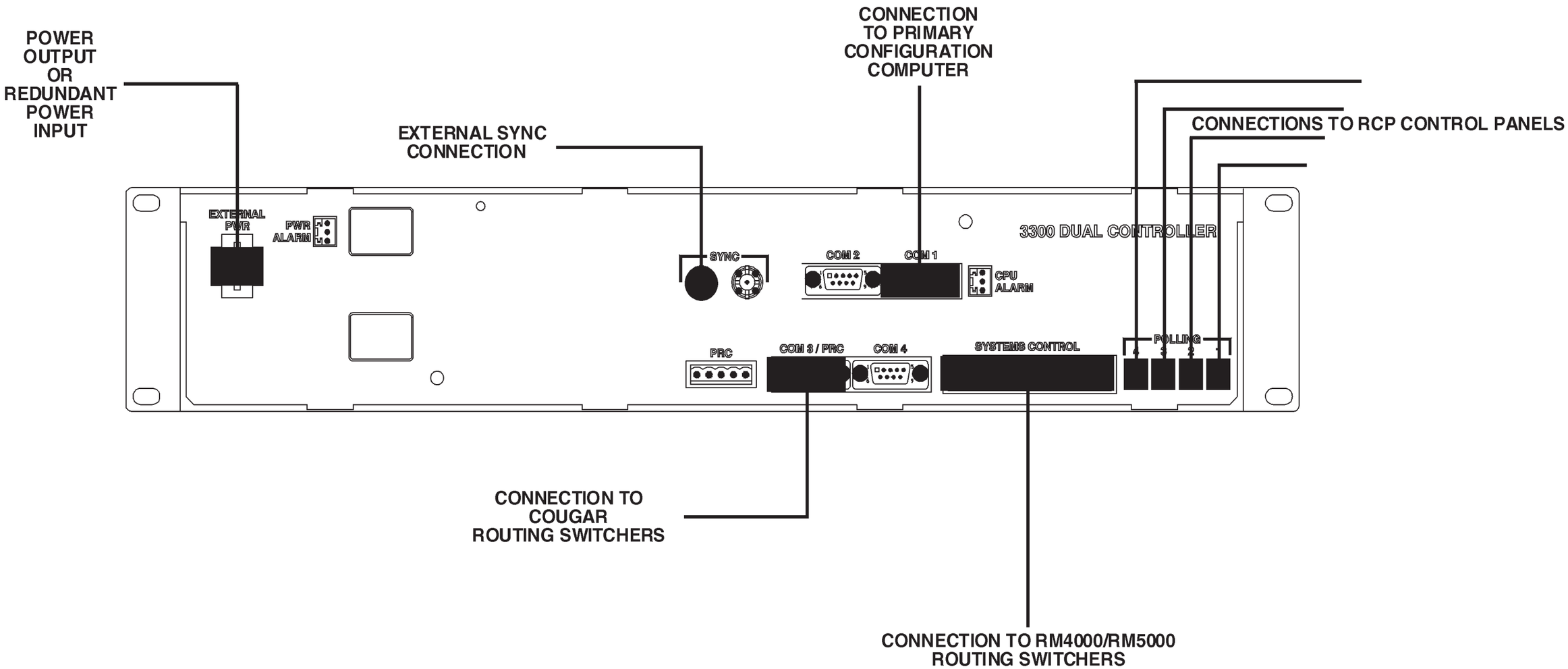



*Figure 2-7 3300D Controller System Connections*

# 3.1 Introduction

This section details the 3300 Controller operational procedures. The following topics are discussed:

- 3300 Controller Operation

# 3.2 3300 Controller Operation

The operation of the 3300 Controller consists of monitoring the RUN and ACTIVE LEDs, making periodic checks of the voltages on the +5V and +BATTERY testpoints, and making sure that BATTERY and MODE switches are the proper positions. A RESET button is also provided to reset the controller in the event of a system lockup. See Figure 3-1 for the locations of the testpoints, switches, and LEDs.

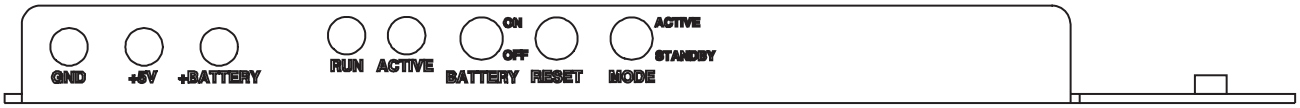



**Figure 3-1 Win3300 Controller Front View**

## Testpoints

There are three testpoints located on the front panel of the 3300 Controller (GND, +5V, and +BATTERY).

**GND**
The GND testpoint provides a convenient connection to ground when checking the voltages on the +5V and +BATTERY testpoints.

**+5V**
The +5V testpoint provides an easily accessible means of monitoring the health of the 3300 Controller's regulator circuits. The voltage on the +5V testpoint should be +5V DC ±0.1V DC when the 3300 Controller's regulator circuits are functioning properly.

**+BATTERY**
The +BATTERY testpoint provides a convenient means of monitoring the battery backup voltage. The voltage on the +BATTERY should be approximately 4.0 - 4.25 VDC when fully charged.

## 3.2 3300 Controller Operation Continued:

### LEDs

There are two LEDs located on the front panel of the 3300 Controller (RUN and ACTIVE). The LED labeled RUN will illuminate when power is applied to the 3300 Controller. The LED labeled ACTIVE will illuminate when the 3300 Controller board is actively in control of the routing matrix. In a system with dual 3300 Controllers, only one controller will have the ACTIVE LED illuminated.

### Switches

There are three switches located on the front panel of the 3300 Controller (BATTERY, RESET, and MODE).

**BATTERY**
The BATTERY switch enables you to switch the battery backup OFF when 3300 Controller Card is to be stored or shipped. During normal operation the BATTERY switch should be left in the ON position.

**RESET**
The RESET switch enables you to reset the 3300 Controller in the event of a system failure or lockup.

**MODE**
The MODE switch enables you to place the 3300 Controller in either Active or Standby mode. In the Active mode the 3300 Controller is actively controlling the switching system. In the Standby mode the 3300 Controller maintains configuration information but does not actively control the switching system. During normal operation the MODE switch should be left in the active position.

## 4.1 Introduction

**General**

The 3300 Controller, working inconjunction with PESA's Win3300 Control System software package, enables users to configure and operate a routing switcher system from a standard 486 IBM compatible computer.

## 4.2 3300 Controller Card

The 3300 Controller Card contains a microprocessor based controller consisting of several main circuits. This discussion will be broken down to the main circuits.

## 4.3 Microprocessor

The heart of the 3300 Controller is the Motorola 68332 microprocessor (U26). The 68332 contains a 32 bit processor, most of the address decoder and bus interface circuitry, and several peripheral functions. The microprocessor derives all its timing from the 16 MHz master oscillator U25. The 3300 Controller provides 256 Kbytes of EPROM (U33, U34), 512 Kbytes of static RAM (U29, U30, U31, U32), and 256 Kbytes of flash ROM (U23, U24). The EPROMs contain the software instructions for the microprocessor. The RAM is used to provide dynamic data storage during controller operation. The RAMs are battery backed up to retain their status when power is removed from the controller. The flash ROMs provide non-volatile storage for configuration information.

## 4.4 Reset/Battery Backup

The reset circuit on the 3300 controller is centered around the MAX691 chip U28. This circuit monitors the +5V supply (U28 pin 3) and provides a low-active reset pulse (pin 15) to the controller during power-up and when the voltage drops out of range. A manual reset is provided by S2 located on the front edge of the controller card. To manually reset the controller board, press and hold S2 for 2-3 seconds, and then release. The MAX691 is also an integral part of the battery backup circuit. The IC monitors the battery voltage (pin 1) and the +5 supply (pin 3) and switches the higher of the two voltages out to VSTBY (pin 2). VSTBY is used to power the RAM chips and some internal RAM on the microprocessor. The battery voltage is provided by C56. R14 and Q5 provide charging current for the capacitor when power is applied to the board. Q5 also prevents the cap from overcharging from leakage current out of U28. The resistor divider R21/R22 sets the maximum charge voltage for C56.

## 4.5 Sync

The sync circuit on the 3300 Controller Card contains U27 (a video sync separator), Q3, and their associated components. The video sync separator decodes the sync signal and provides ODD/EVEN. BURST, CSYNC, and VSYNC signals to the 3300 Controller Card.

## 4.6 Power

The power circuit on the 3300 Controller Card consists of U19 (a switching regulator), T1, Q2, and their associated components. The power circuit is responsible for providing a regulated +5 volts to power all of the 3300 Controller Card's circuits.

## 4.7 System 5 Bus

The 3300 Controller provides an interface to the PESA System 5 Bus. U12, U13, and U14 are used to latch data to the System 5 bus. U1, U2, and U3 provide buffering and tri-state control for the bus. U22 is used to read data back from the System 5 bus. U15 provides chip select signals for each of the memory-mapped components.

## 4.8 RCP Panel Ports

The 3300 Controller provides four RCP style panel ports. U4, U5, U7, and U8 are RS485 transceivers that translate the internal logic levels to differential RS485 levels and vice-versa. U16 is a memory-mapped latch that provides transmitter and receiver enable signals to the transceivers. Filters FL1-FL8 provide EMI filtering for the polling signals.

## 4.9 Serial Port Controller

The 3300 Controller provides two RS232 ports and two RS422 ports. The RS232 ports may be used by an external computer to control our system. The RS422 port is dedicated to PRC style switching frames. U17 and U18 are Motorola 68681 dual UARTs (universal asynchronous receiver/transmitter). The UARTs provide the interface between the microprocessor and the serial ports. They serialize data going out to the port and deserialize incoming data. The UARTs provide baud rate generation based on the 3.6864 MHz oscillator U9. U15 provided chip selects to each UART, and U20 provided data bus isolation between the microprocessor and the UARTs.

## 4.10 RS232 Ports

U10 and U11 are RS232 driver/receiver circuits. They operate from +5V and use internal charge pump technology to generate +/- 10VDC for the RS232 levels. Capacitors C13, C14, C25 and C26 are part of the charge pump circuit for U10. Likewise, C15, C16, C27, and C28 are part of the charge pump for U11. The driver sections of U10 and U11 translate logic levels to RS232 levels (U10, pins 5 and 2, typical). The receiver sections translate incoming RS232 levels to logic levels (U10 pins 7 and 6, typical). Relays K1, K2, and K3 isolate the RS232 drivers from the outside world when the 3300 board is in standby (not active). EMI filtering is provided for each RS232 signal that leaves the board.

## 4.11 RS422 Port/PRC Port

The RS422 port on the 3300 controller is dedicated to the PRC bus interface. The PRC bus is used to control PESA routers. U6 contains a driver (pins 4, 13, 14, and 15) and a receiver (pins 1, 2, and 3). Serial data is sent from the UART to the driver on U6 pin 15. The driver converts the logic level to differential data on pins 13 and 14. Incoming serial data is received on U6 pins 1 and 2. R1 and R2 provide a bias to force the receiver into a known state when tri-stated. The receiver translates the differential signal to logic levels and presents received data on U6 pin 3. EMI filtering is provided on transmit and receive signals.

## 4.12 Dual CPU Port

The 3300 Controller may be used in a dual configuration to provide redundant control. U21 is used to arbitrate between two 3300 Controllers in a dual system. U35 provides buffering and isolation between the two boards. The MYACTIVE and YOURACTIVE signals are cross-coupled on the motherboard. MYACTIVE drives the other board's YOURACTIVE pin, and vice-versa. Likewise, MYSWX/YOURSWX and MYPRESENT/YOURPRESENT are cross-coupled pairs. The MYACTIVE/YOURACTIVE pair are used to indicate the active/standby state of each controller board. The MYSWX/YOURSWX pair identify the state of the active/standby switch on each controller board. The MYPRESENT/YOURPRESENT pair are used to indicate the presence of each card in a dual configuration. The CPUA/B is a signal provided by the motherboard to indicate in which slot the individual controller is installed. In addition to these control lines, a bi-directional serial communications port is connected between the two boards. This port includes the signals MISO, MOSI, SCK, PC0/SS, and PCS1.

## 5.1 Introduction

This section will cover the maintenance, troubleshooting, and repair of the 3300 Controller.

### NOTICE

THIS EQUIPMENT CONTAINS STATIC SENSITIVE DEVICES. IT IS RECOMMENDED THAT A GROUNDED WRIST STRAP AND MAT BE USED WHILE MAKING REPAIRS OR ADJUSTMENTS.

## 5.2 General

There no adjustments on the 3300 Controller Card and the need for regular maintenance is minimal.

## 5.3 Test Equipment

The test equipment recommended for servicing the 3300 Controller is listed below. Equivalent test equipment may be used.

Digital Voltmeter
Digitizing Oscilloscope
Oscilloscope

## 5.4 Maintenance

The 3300 Controller is designed and manufactured to give long, trouble free service with minimum maintenance requirements. If problems do occur, follow the troubleshooting procedure provided in this section. If additional technical assistance is required, refer to the General Assistance and Service information in the front of the manual.



## 5.5 Corrective Maintenance

The following paragraphs provide information to assist the servicing technician in maintenance of the 3300 Controller.

### Factory Repair Service

If desired, equipment or boards may be returned to the factory (transportation prepaid) for repair. Refer to the General Assistance and Service information sheet in the front of this manual. Call the PESA Service Department for a RMA number before shipping an equipment item.

## NOTE

PACK THE EQUIPMENT SECURELY AND LABEL WITH THE CORRECT ADDRESS. PROPER PACKAGING SAVES MONEY. THE SMALL AMOUNT OF EXTRA CARE AND TIME IT TAKES TO CUSHION A PART OR UNIT PROPERLY MAY PREVENT COSTLY DAMAGE WHILE IN TRANSIT. MAKE CERTAIN THAT THE ADDRESS IS BOTH LEGIBLE AND COMPLETE. FAILURE TO DO SO OFTEN RESULTS IN DELAY OR EVEN LOSS.

### Troubleshooting

The best troubleshooting tool is a familiarity with the equipment and a through understanding of its operation. Before troubleshooting the 3300 Controller review Sections 3 and 4 of this manual. Use the functional descriptions and adjustment procedures to quickly locate problems.

- If a problem is suspected with a controller card, first swap out the card and recheck the system for the problem. If the problem can be isolated to the card , and your facility is equipped for component level repair, proceed with repairs.

## NOTE

BEFORE PROCEEDING WITH COMPONENT LEVEL REPAIR MAKE SURE THE EQUIPMENT IS OUT OF WARRANTY. REPAIRING EQUIPMENT COVERED BY A WARRANTY WILL VOID THE WARRANTY.

## 5.5 Corrective Maintenance Continued:

### System Checks

Prior to troubleshooting the 3300 Controller the following basic system checks should be performed.

1. Verify the AC circuit condition. Ensure the unit is receiving the correct voltage from the main AC power source.

2. Check all line fuses and power cords.

3. Ensure that all circuit cards are firmly seated

4. Ensure all interconnecting cables and connectors are plugged in or firmly seated.

5. If applicable, ensure main power switch is turned on.

### Replacement Parts

Only parts of the highest quality have been used in the design and manufacture of the 3300 Controller. If the inherent stability and reliability are to be maintained, replacement parts must be of the same quality. When replacing parts, avoid using excessive solder on the printed circuit card. Always make sure that the solder does not short two circuits together. Be sure the replacement part is identical to the original, and is placed in exactly the same position with same lead lengths (if applicable).


5
MAINTENANCE

## 8.1 Introduction

This document details the message formats and protocol for interfacing to standard PESA Routing Switch Controllers over a CPU link. It covers the protocol used to send commands and status requests to PESA controllers. It details the commands that cause actions to be taken on the routing switcher. It details commands that request that status.

The PESA controllers supporting this protocol (with some limitations) are:

- 6600E/EX Controllers
- 2400E Controller
- PCI Interface for RC5000 Systems
- Bobcat Control System
- Ocelot
- 3300/S/D/EX Controllers
- RC5000 Controller
- RC5500 Controller

This is a protocol that has evolved over a number of generations of PESA controllers. As with all things that evolve, some conventions do not seem intuitive. Some commands listed here will have vestigial leftovers from earlier controllers.

## 8.2 Protocol

The CPU link is an asynchronous serial interface usually implemented using RS-232. Data is transmitted bi-directionally at 9600 baud between the computer and the Controller. The data stream consists of one start bit, eight data bits, and two stop bits. Parity is not used. Data transfer over the CPU Link is controlled by the state of the Ready to Send (RTS) and Clear to Send (CTS) lines.

(All controllers can be configured for these operating parameters. Some controllers allow for other configurations for items such as baud rate and stop bits. Refer to your controller's manual for more information.)

Communications originating from the controller to the external computer are governed by the state of the CTS line. When CTS is high, the controller sends data to the external computer. When CTS is low, the controller ceases transmission to the computer. The external computer controls this line. It must provide for receiving at least three characters after CTS goes low.

## 8.2 Protocol Continued:

The CTS line cannot be allowed to float. It must either be ON (asserted) or OFF (negated).

Communications originating from the external computer to the controller must obey the state of the RTS line. When RTS is high, the controller receives characters on the CPU link from the computer. When RTS is low, the external computer must cease transmission.

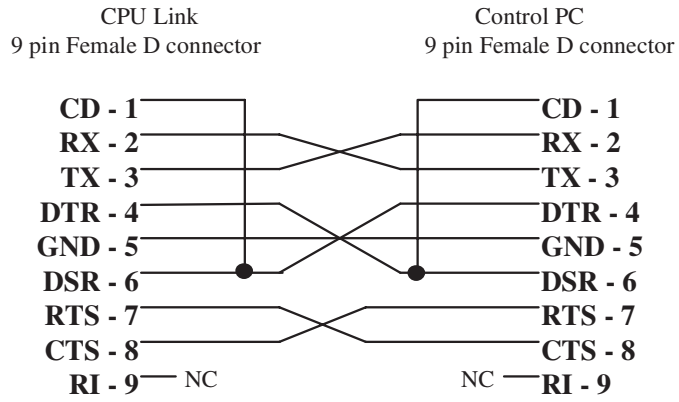
The CTS and RTS lines operate independently of one another.

The 3300 requires an additional connection to the DSR input pin. This signal must be set active to indicate to the controller the presence of an active CPU link connection. Removal of this signal causes the CPU link port mechanism to reset.

(Bobcat Controller does not utilize flow control in its serial port control. It is up to the interfacing machine to accept the output flow of characters from the Bobcat without regulating its flow. )

(The Bobcat Controller and 3300 support RS-422 interface as well as RS-232. Please refer to the respective controller's manual for further information.)

The pin-out of the CPU port may vary from controller to controller. A common pinout configuration from PC to CPU link is as follows:




**NOTE**: CD (pin 1) connection is optional, CD may be left as a no connect on these cables.

Please refer to the controller manual for specific CPU link cabling requirements.

## 8.3 Message Formats

CPU link messages are constructed in ASCII characters. The characters are standard 7 bit ASCII with the eighth bit (most significant bit) set to 0. The communications between the controller and the external computer consist of a variable length buffer of characters containing the desired command (refer to Table A-1), a string of data bytes, a checksum, and a terminator.

**Message Format:** Command, <Data ,> Checksum, Terminator

There are no timing requirements on the transmission of characters into and out of the controller except for the obeyance of the RTS-CTS handshake. The PESA controllers look for the termination characters in a message string and process all information that has been sent since the last terminator was received or since initialization of the CPU link communications port. This information is handled as one communications buffer.

### CPU Link Command Summary

Protocol #1 commands are one letter in length and are the first character encountered in the command string. Some commands have further qualifiers such as the letter “S”. The “S” denotes a command to change or display the status of the Switcher. See the command description for specific information.

This protocol has been extended for the 3300 controller. These command extensions are listed as reserved commands in this document. The description of these extended commands is beyond the scope of this document.

The following discussion briefly describes each command available to the computer via the CPU Link. Refer to Table 8-1 for all of the computer commands.

## 8.3 Message Formats Continued:

### CPU Link Command Summary Continued:

**Table 8-1 CPU Link Command Summary**

| Controller/Command | Bobcat (RS232 & 422)* | 2400 (RS232) | 3300 (RS232) | 6600 (RS232) | PCI-5000 (RS232) | RC5000 (RS232) | RC5000 (RS232) |
|---|---|---|---|---|---|---|---|
| B-Display Salvo | | | · | · | · | | |
| C-Change Salvo Entry | | | · | · | · | | |
| D-Delete Salvo Entry | | | · | · | · | | |
| F-Deallocate Salvo Group | | | · | · | · | | |
| H-Change Switcher | · | · | · | · | · | · | · |
| J-Switcher Status (no error information) | · | · | · | · | · | · | · |
| L-Change Lock Status | · | · | · | · | · | · | · |
| P-Change Protect Status | | · | · | · | · | | |
| R-Restore All Call | | · | · | · | · | | |
| T-All Call | | · | · | · | · | | |
| V-Transmit Salvo Group | | | · | · | · | | |
| W-Display Lock/Protect Status | · | · | · | · | · | · | · |
| Y-Switcher Status (1 dest. w/ error info) | · | · | · | · | · | · | · |
| Z-Switcher Status (entire matrix w/ error info) | | · | · | · | · | | |

* Bobcats may be configured for multi-drop operation when configured for RS-422. See Bobcat manual for details.

## 8.3 Message Formats Continued:

### CPU Link Command Summary Continued:

**Table 8-2 Reply Responses**

| ASCII | REPLY RESPONSES |
|---|---|
| G | Good Transmission |
| E | Error in Transmission |
| L | Locked Destinations |
| N | Requested Function Not Allowed or Equipment Malfunction |

### Checksum Computation

The checksum is a number derived from each data byte for the purpose of verifying data transmission on both sides of the transmission link. A data stream being transmitted computes a checksum which is sent with the data and the termination characters. The receiving equipment generates a checksum from the received data and compares the two checksums. The checksum is calculated as follows:

1. Cumulatively add the bytes received from the CPU Link in an eight (8) bit register. Ignore any overflow (or carry). The result is an eight bit number. Save this number.

2. Create two ASCII characters for the checksum by dividing the saved number into two fields, the upper four bits and the lower four bits. Add 30 Hex to each 4-bit field. The upper four bits become the “TENS” digit; the lower four bits become the “ONES” digit. The checksum and the terminator characters are not included when adding the incoming data to compute a checksum.

The locations now labeled “ONES” and “TENS” contain the ASCII checksum for the received data. When transmitting the checksum, the “TENS” digit is always transmitted first followed by the “ONES” digit.

**e.g. Checksum Calculation**
The command take Source 5 to destination 1 on a 1 level system is:

“H 0 0 1 0 0 5 6 > CR LF” where “6 >” is the checksum.

## 8.3 Message Formats Continued:

**Checksum Computation Continued:**

Checksum Calculation first adds the value of the command characters:

**'H'** 0x48
**'0'** 0x30
**'0'** 0x30
**'1'** 0x31
**'0'** 0x30
**'0'** 0x30
**'5'** 0x35
0x16e

The result has the 8 bit overflow masked out and is divided into upper and lower 4 bits. These values are then placed into the ASCII numeric range.

0x6 + 0x30 = 0x36 '6'
0xE + 0x30 = 0x3e '>'

(Note: 3300 V3.0 and later allows for the use of a more standard hexadecimal checksum as well as for the omission of the checksum. Please refer to the 3300 manual for more information.)

**Terminator**

The terminator is comprised of an ASCII Carriage Return (CR) (Hex 0D) followed by an ASCII Line Feed (LF) (Hex 0A). When these two characters have been received in correct order, the controller initiates processing of the CPU link command.

(6600E/EX V2.30 and later allow the user to drop the Carriage Return from the terminator. A single Line Feed serves its purpose. The 3300 V3.0 and later allows the user to choose between carriage return only, line-feed only, as well the standard terminator. These options are user configurable.)

## 8.4 General

### Inputs/Outputs vs. Source/Destination Groups

Some PESA controllers use the concept of virtual matrix mapping. This allows the system to assign inputs to multiple source devices and to assign inputs and outputs to only those devices that need them. Controllers that use virtual matrix mapping and adhere to this CPU link protocol do not specify inputs and outputs. Instead they specify source and destination groups. Status returned by the PESA controller specifies groups as well.

For example the command:

H001002003

- Switches the input assigned on level 1 of Source group 2 to the corresponding output of Destination group 1

- Switches the input assigned on level 2 of Source group 3 to the corresponding output of Destination group 1

This document uses the terms “source” and “destination” to refer to inputs/source groups and outputs/destinations respectively.

### Virtual Matrix Mapping and Non-Existent Groups

In systems with matrix mapping such as the RC5000, RC5500 and 3300 controllers, there may be times in which a number used in the CPU link does not refer to a valid source or destination. This may pose a problem for applications that coordinate actions with returned status.

The reason gaps are left in the CPU link numbering is that editing of sources and destinations is a dynamic occurrence. If a group is deleted, the controller leaves a gap in the numbering as opposed to renumbering all the groups to insure contiguous numbering.

If a command uses a non-existent source, that source will be ignored and the action will of the command will not be taken for the specified level of control.

## 8.4 General Continued:

**Virtual Matrix Mapping and Non-Existent Groups Continued:**

If a command uses a non-existent destination and that destination's number is less than the highest valid destination number, the command will process the command as being valid but no actions will be taken on the router. Any status returned for a non-existent destination will be '000'. Any command using a destination greater than the highest valid destination number will return an error.

For example, a system has destination groups defined for numbers 1-50 except for group 30 which is not defined. In this case, a switch specified for group 30 will return a good response. No action is taken on the router for this command and any status of the destination 30 will return sources of '000' since it is not defined. This must be accounted for in CPU link applications on controllers using virtual matrix mapping.

**Using Change Commands**

The Controller supports a variety of "Change Switcher" commands on the CPU Link. These commands when received by the Controller are acknowledged with a reply. The replies are "G" (good), "E" (error), "L" (locked), and "N" (not allowed). The acknowledgment replies indicate only that the command was correctly or incorrectly received, NOT whether the actual switch was successful.

When the Controller receives a command to change the switcher, it acknowledges the command received from the computer. The act of the actual switch taking place may not be available until the next vertical interval of the video signal. The Controller cannot interrogate the switcher during the time between loading the preset registers and the next vertical interval. For this reason, the Controller cannot respond immediately with a current status to the external computer.

**NOTE**: On 6600E, RC5000, RC5500 and PCI5000 Switcher status is sent to the external computer only in response to a switcher status request. To determine if a change switcher command has properly executed, the external computer must wait at least 32 milliseconds before requesting status. Switcher status is obtained directly from the crosspoints.
The other control systems send back the desired status instead of actual status of the router. If the desired status differs from the actual status, a readback (where valid) is reported back in the status response.

## 8.5 Command Specifics

### Command Description Conventions

Several abbreviations are used in the following discussions to signify the different portions of the communications buffers. Refer to Table 8-3 for a list of the abbreviations and the length of field for each buffer.

**Table 8-3 Abbreviations and Field Lengths**

| TERM | LENGTH* | DESCRIPTION |
|---|---|---|
| **Lx** | 3 | Level #x Input/Source Number |
| **DST** | 3 | Output/Destination number |
| **SLV** | 2 | Salvo group number |
| **CS** | 2 | Checksum |
| **@** | 2 | Termination character (cr/lf) |
| **S** | 1 | Denotes switcher function |

* Length = number of ASCII characters in buffer.

In the following command examples, the number of levels of control will depend on the configuration of the controller. If the controller is configured for 3 levels, 3 source numbers are included in the buffers; if the controller is configured for 1 level, only 1 source will be included in the buffer.

Many of the commands in the system specify a minimum of two levels in the feedback from the controller.

## 8.5 Command Specifics Continued:

**Command Source/Destination Numbering**

The acceptable numbers for sources and destinations permitted by the controllers are:

0 -255 (All controllers except the RC5000)

For controllers that exceed the 0-255 range (RC5000), the following format is used to identify numbers from 0-1999.

000-999 for numbers 0-999
A00-A99 for numbers 1000-1099
B00-B99 for numbers 1100-1199
C00-C99 for numbers 1200-1299
D00-D99 for numbers 1300-1299
E00-E99 for numbers 1400-1499
F00-F99 for numbers 1500-1599
G00-G99 for numbers 1600-1699
H00-H99 for numbers 1700-1799
I00-I99 for numbers 1800-1899
J00-J99 for numbers 1900-1999

Note: All inputs/sources and outputs/destinations start at number 1. The value 0 is used as a NULL identifier or silent source. NULL identifiers specify no action.

(6600E/EX controller allows configuration of value 0 to be either NULL or silent source. All other controllers use 0 as a NULL source specifier.) On commands that specify destinations in the command string, the destination number used must be within the configuration or an error will be reported. On commands that specify source numbers, a value that is not configured is handled as a NULL and no action is taken with respect to that source.

## 8.5 Command Specifics Continued:

### Command Salvo Group Numbering

Salvo commands use a two character field to specify salvo groups. The field consist of a decimal representation anywhere from '01' to '99.' For controllers that have in excess of 100 salvo groups, the following extension is used to allow access to all configured salvos:

01-99 for salvos 1-99
A0-A9 for salvos 100-109
B0-B9 for salvos 110-119
C0-C9 for salvos 120-129
D0-D9 for salvos 130-139
E0-E9 for salvos 140-149
etc.

For as many salvos as there are configurable in the controller.

### Status Field

The "Y" (Send Switcher Status, single destination) and the "Z" (Send Switcher Status, all) commands contain a STAT field. The STAT field contains the readback/confidence error indicators for each level's crosspoint in the destination group. The STAT field consists of two ASCII characters in the range 30 to 3F Hex inclusive. The ASCII characters must be converted to an 8-bit binary value before use.

The lower four bits of each character represent information for two levels of the system. The more significant two bits are for the lower number level. The possible values for each level are (in binary):

00 = no error
01 = not defined
10 = Readback Error
11= Confidence error

For example:

A STAT field of
"0 0 <"= 0x30 0x30 0x3C

Where the 1st character represent level 1 & 2,
Where the 2nd character represent level 3 & 4,
Where the 3rd character represent level 5 & 6,

## 8.5 Command Specifics Continued:

**Status Field Continued:**

This breaks down into the following bit fields:

| Lev1 | Lev2 | Lev3 | Lev4 | Lev5 | Lev6 |
|---|---|---|---|---|---|
| 00 | 00 | 00 | 00 | 11 | 00 |

All levels except Level 5 are without error. Level 5 shows a Confidence error. The status returned on level 5 is indeterminate.

The 8-bit binary value represents the Readback/Confidence errors for the switcher destination. A Readback error occurs when the Controller switches the matrix but the data read back from the crosspoint is in error. A Confidence error occurs when the Controller detects a missing card in the system.

Restrictions:

All controllers will echo a minimum of four levels of status information at any time.

The 2400E does not support Readback errors.

The Bobcat does not support Readback or Confidence errors.

**Specific Command Descriptions**

Most commands specified in the following sections use four levels in the examples given. This is for illustration purposes only. Level of control restrictions are based on specific controller limitations. Unique command restrictions are listed in the command descriptions.

**Display Salvo**

This command requests a salvo table be forwarded from the Controller.

Command:
**B SLV CS @**

Response:
E - Salvo number out of range or transmission Error
G - command accepted and performed followed by:
**S DST L1 L2 L3 L4 S DST L1 L2 L3 L4 S DST L1 L2 L3 L4 ... S DST L1 L2 L3 L4 CS**

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

The length of the response is determined by the number of entries in the selected salvo.

Restrictions:
Not supported by the RC5000, RC5500, 2400E and Bobcat controllers.

**Change Salvo Entry**

This command is used to add or change an entry in the specified salvo group.

Command:
**C SLV S DST L1 L2 L3 L4 CS @**

Response:
G - command accepted and performed
N - Invalid destination number
E - Transmission error, invalid salvo number or invalid format

Restrictions:
Not supported by the RC5000, RC5500, 2400E and Bobcat controllers.

**Delete Salvo Entry**

This command is used to remove an entry from a salvo group.

Command:
**D SLV S DST CS @**

Response:
G - command accepted and performed
E - Transmission error, invalid salvo number or invalid destination number

Restrictions:
Not supported by the RC5000, RC5500, 2400E and Bobcat controllers.

**De-allocate Salvo Group**

This command removes an entire salvo group from the Controller's memory.

Command:
**F SLV CS @**

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

Response:
G - command accepted and performed
E - Transmission error or invalid salvo number

Restrictions:
Not supported by the RC5000, RC5500, 2400E and Bobcat controllers.

**Change Switcher**

This command is used to make a switch in the switching matrix.

Command:
**H DST L1 L2 L3 L4 CS @**

The length of the buffer is dependent on the number of configured switching levels. All levels configured must be specified in the command buffer. For break-away switching, specify either a NULL source or out of range source on levels on which no switch is needed.

e.g. Using a 2 level 48x40 switch, to switch destination 1 to source 5 only on level 1, the following command can be used:
H 001 005 255

Response:
G - command accepted and performed
N - Invalid Destination Number
L - Destination was locked
E - Transmission error

Restrictions:
6600E/EX switchers do not support break away switching previous to version V2.20.

The RC5000/RC5500 returns back a lock indication if any output in the destination group is locked. The switch request will take the switches on the destination group's unlocked outputs.

**Display Switcher Status (No Error Information)**

This command tells the switcher to send the current source/destination status of the switching matrix.

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

Command:
**J CS @**

Response:
E - Transmission error
N - Configuration is too large to support response
**L1 L2 L3 L4 L1 L2 L3 L4 L1 L2 L3 L4 ... L1 L2 L3 L4 CS @**

The first group of sources correspond to destination 1 of the switcher, the second group to destination 2, etc. The length of each group of level status depends on the number of switching levels configured in the Controller. The length of the buffer depends on the total number of destinations configured in the routing switcher system. It is the responsibility of the requester to count the bytes and determine which bytes represent each switching level source for each destination.

Restrictions:
The 3300 controller will reject requests for systems that are configured with responses greater than 2KB in length. These systems respond back with a 'N' response.

**Change Lock**

This command is used to toggle the lock status of a specified destination. If the specified destination is already locked, receiving this command unlocks it. If the destination is unlocked, receiving this command will lock the destination.

Command:
**L S DST CS @**

Response:
G - Command accepted and performed
N - Invalid Destination Number
L - Destination was locked by an equal or higher priority device (3300, RC5000, RC5500 only)
E - Transmission error
P - Destination was protected by equal or higher priority device

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

Restrictions:
Protect response is used only by 3300 controllers.
The RC5000/RC5500 will unlock any destination in which any of the outputs are locked. It will lock a destination if all the destination's outputs are unlocked.

**Change Protect**

This command is used to toggle the protect status of a specified destination. If the specified destination is already protected by the CPU Link, receiving this command clears the existing protect. If the destination is unprotected, receiving this command will protect the destination.

Command:
**P S DST CS @**

Response:
G - Command accepted and performed
N - Invalid Destination Number
E - Transmission error
L - Destination was locked by equal or higher priority device
P - Destination was protected by equal or higher priority device

Restrictions:
6600E/EX, RC5000, PCI-5000, and Bobcat do not support concept of Protect.

This command is not supported by the RC5500.

Protect response is used only by 3300 controllers.

**Restore System From All Call**

This command is used to restore the switching matrix to the last status prior to receiving the All Call command.

Command:
**R CS @**

Response:
G - command accepted and performed
E - Transmission error

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

Restrictions:
Not supported by the RC5000, RC5500, and Bobcat controllers.

**All Call**

This command is used to switch all destinations on the switching matrix to the sources designated in the command buffer (all level 1 destinations to the specified level 1 source, all level 2 destinations to the specified level 2 source, etc. The switching matrix remains in the All Call condition until either a change switcher or restore command is sent.

If an source is out of range for a given level, no switches will be taken on the level.

Command:
**T L1 L2 L3 L4 CS @**

Response:
G - command accepted and performed
N - Format error
E - Transmission error

Restrictions:
Not supported by the RC5000, RC5500, and Bobcat controllers.

**Transmit Salvo Group**

This command is used to fire a salvo that has been loaded in the Controller's memory.

Command:
**V SLV CS @**

Response:
G - command accepted and performed
E - Transmission error or invalid salvo number

Restrictions:
Not supported by the RC5000, RC5500, 2400E and Bobcat controllers.

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

**Display Lock Status**

This command is used to find out which destinations are locked.

Command:
**W S CS @**

Response:
E - Transmission error
**X X X...X CS @**
Where the lock/unlock/protect status display, "X" denotes:
0 - Destination is unlocked
1 - Destination is Locked
2 - Destination is Protected

The displayed first byte denotes destination 1, the second denotes destination 2, etc.

Restrictions:
The S portion of this command is optional i.e. the command can be sent **W CS @.**

6600E/EX, PCI-5000, RC5000, and Bobcat do not support concept of Protect.

The RC5000/RC5500 returns back a lock indication if any output in the destination group is locked. The switch request will take the switches on the destination group's unlocked outputs.

The 3300 reports destinations that are protected by devices of a different requester code as locked. (See 3300 manual.)

**Send Switcher Status (Single Destination)**

This command allows the computer to interrogate the controller and obtain the status of an individual destination. The format for the command is:

Command:
**Y DST CS @**

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

Response:
E - Transmission error
N - Invalid Destination
**DST STAT L1 L2 L3 L4 CS @**

The STAT field contains error information for each levels crosspoint in the transmission (refer to the section entitled STATUS FIELD for detail of this byte).

Restrictions:
This command always sends a minimum of two levels of information. (One level systems can disregard the second level data.)

A minimum of four levels of status in the STAT field are returned with each command.

**Send Switcher Status (all)**

This command allows the computer to interrogate the Controller to obtain the status of the entire switching matrix. It is similar to the "Display Switcher Status" ("J") command except this command sends destination and status information for each destination. The additional information indicates any readback or confidence errors at each crosspoint.

Command:
**Z CS @**

Response:
E - Transmission error
N - Configuration is too large to support response
**DST1 STAT L1 L2 L3 L4 DST2 STAT L1 L2 L3 L4 DST3 STAT L1 L2 L3 L4 ...**
**DSTn STAT L1 L2 L3 L4 CS @**

The data represents the status of the entire switching matrix. The first group of sources represent the first destination of the switcher. The second group represents the second destination of the switcher, etc. The STAT field contains error information for each VID/AUD crosspoint in the transmission (refer to the discussion of STATUS FIELD, below, for details of this byte).

## 8.5 Command Specifics Continued:

**Specific Command Descriptions Continued:**

Restrictions:
The 3300 controller will reject requests for systems that are configured with responses greater than 2KB in length. These systems respond back with a 'N' response.

This command always sends a minimum of two levels of information. (One level systems can disregard the second level data.)
A minimum of four levels of status in the STAT field are returned with each command.

Not supported by the RC5000, RC5500, 2400E and Bobcat controllers.

## 8.6 RS-422 Multi-Mode Operation

In addition to the standard point to point operation of the CPU link, the Bobcat controller supports a multi-drop mode of operation for use when the serial port is configured for RS-422 operation. This allows for a single device to control the activity on many controllers through a single CPU link connection.

To facilitate the multi-drop connection, the CPU link message format is extended.

**Message Format:** Controller ID, Command, <Data ,> Checksum, Terminator

The bussed mode of operation extends the previous protocol by adding an address field in front of each CPU link command. The address field consists of ASCII numeric characters (0-9). The address field specifies that the command is intended for the controller whose address matches the command. Each controller on the CPU link bus reads the address and only the one with the matching address acts on the command.

The command response from the bussed controller device is the same as for standard mode of operation commands. No address qualifier is added to the response. Only the controller to which the message is directed will respond to a valid command.

## 8.6 RS-422 Multi-Mode Operation Continued:

Bussed mode controllers handle detection of communications errors differently from standard mode controllers. When a bussed CPU link unit detects a communications error, it ignores the message and does not respond. (A communications errors detected by a standard mode unit responds back with an “E” response.)

**Bussed Mode Command Example:**

A command taking Input 3 to output 1 on controller address #2 yields a command of:

Controlling device:
**2H001003003003<4 @**

Controller Unit #2:
**G @**

Note: When the CPU link port is configured for RS-422 operation, the controller RS-422 transmitter is active only during character transmission. At all other times, the RS-422 transmit bus is tri-stated. It is the responsibility of the controlling device to be able to handle the high impedance bus.

During multi-drop operation, flow control is disabled. It is up to the external computer to insure for proper serial port timing.

# ADDENDUM

## Introduction

***CAUTION***

PS130 POWER SUPPLIES CONTAIN ELECTRICAL SHOCK HAZARDS AND SHOULD ONLY BE SERVICED BY QUALIFIED SERVICE PERSONNEL WITH EXPERIENCE IN SERVICING OFF-LINE SWITCHING REGULATORS.

***CAUTION***

There are no user serviceable parts contained in the PS130 Power Supply. All service performed on the PS130 Power Supply should be accomplished by qualified service personnel. **The internal circuits of the PS130 Power Supply contain dangerous voltage and current levels. Prior to servicing any PS130 Power Supply make absolutely sure that the AC line input is disconnected.**

***NOTE***

The PS130 Power Supply replaces the power supply formerly used to power the PESA equipment item referenced in the technical manual to which this addendum is attached. This addendum takes precedence over any mention of the former power supply in the technical manual for any PESA equipment items where the PS130 Power Supply is utilized.

This addendum contains the power connection, front door removal and replacement, power supply removal and installation, and fuse replacement instructions for the PS130 Power Supply. The purpose of this addendum is to provide technical information to the customer concerning the operation and servicing of the PS130 Power Supply.

# ADDENDUM

**General**

## *CAUTION*

## HIGH LEAKAGE CURRENT AT 230 VAC

The PS130 Power Supply leakage current exceeds 3.5mA when used at 230VAC because of leakage through emission filter capacitors.

The PS130 Video Power Supply is responsible for providing a regulated ±8.9VDC @ 5.5A to the switching frame. The PS130 Power Supply is designed to operate within output specifications with AC line voltages ranges from 105 - 240 VAC and with AC line frequencies of 50/60 Hz automatically. 3.15A 250VAC AC line fuses provide over-load protection.

The PS130 Audio Power Supply is responsible for providing a regulated ±24VDC @ 2.35A to the switching frame. The PS130 Power Supply is designed to operate within output specifications with AC line voltages ranges from 105 - 240 VAC and with AC line frequencies of 50/60 Hz automatically. 3.15A 250VAC AC line fuses provide over-load protection.

## *CAUTION*

Disconnect AC Power Cord Before Removing Power Supply.

In the event of a PS130 Power Supply failure, PESA suggets returning the malfunctioning unit to the PESA Service Department for replacement. **PS130 Power Supplies contain lethal voltages when operating and should only be serviced by technicians qualified to service off-line switching regulators.** Please call the PESA Service Department for a RMA number before returning any units for replacement. The service department's phone number is listed on the Service and Ordering Assistance Page.

# ADDENDUM

## Power Connections

***CAUTION***

PS130 POWER SUPPLIES CONTAIN ELECTRICAL SHOCK HAZARDS AND SHOULD ONLY BE SERVICED BY QUALIFIED SERVICE PERSONNEL AND/OR QUALIFIED TECHNICIANS.

***CAUTION***

**THIS POWER SUPPLY USES AN INDIVIDUAL AC POWER CORD. DISCONNECT CORD BEFORE REMOVING SUPPLY.**

### Power Connect

To power-up a PS130 Power Supply and its associated routing switcher frame take the following steps:

1. Insert the power supply into the frame following the instructions in the Power Removal Section of this addendum.

2. Connect the power supply to the AC line.

3. Repeat steps 1 and 2 for a secondary power supply if applicable.

4. If applicable, connect any DC power looped to and from other frames in the routing switcher system to the unit under test.

### Power Disconnect

**To power-down a PS130 Power Supply, disconnect the AC power cord from the power supply's AC line input connector.** To power-down a PS130 Power Supply and its associated routing switcher frame take the following steps:

1. If applicable, disconnect any DC power looped to and from other frames in the routing switcher system from the unit under test.

2. Disconnect the AC line from the primary PS130 Power Supply.

3. If applicable, disconnect the AC line from the secondary PS130 Power Supply.

# ADDENDUM

## Front Door Removal and Replacement

### Front Door Removal (Removable Front Doors Only)

To remove the PESA equipment item's front door (cover) take the following steps:

1. Grasp the both the left and right front cover slide locks and push or pull them towards the center of the equipment item's front.

2. Once both slide locks are slide toward the center of the equipment items front, carefully pull the front door off the equipment item.

### Front Door Installation (Removable Front Doors Only)

To install the PESA equipment item's front door (cover) take the following steps:

1. Align the front door with the front of the PESA equipment item.

2. Once the front door is aligned with the front of the PESA equipment item, slide the front door onto the equipment item until the slide locks snap into the locking provided on the equipment item's chassis.

# ADDENDUM

## Power Supply Removal and Replacement

***CAUTION***

Two AC Power Cords may be connected to this unit.

### Power Supply Removal

To remove the PESA equipment item's power supply or power supplies take the following steps:

1. **Disconnect the AC power cord connected to the power supply to be removed.**

2. Remove or open the equipment item's front door.

3. Grasp the power supply slide lock and pull it toward the center of the supply.

4. Once the slide lock is slid toward the center of the supply, carefully pull the power supply out of the equipment chassis.

5. Repeat step 1 and steps 3 and 4 to remove any additional power supplies from the equipment item.

### Power Supply Installation

To install the PESA equipment item's power supply or power supplies take the following steps:

1. Align the primary power supply with the primary set of power supply circuit card guides in the equipment item's chassis.

2. Carefully push the power supply into the chassis until the power supply connector makes initial contact with the backplane power connector. At this point, firmly but carefully continue pushing the power supply into the equipment chassis while making sure the power connectors are properly aligned. You may have to slide the power supply latch toward the center of the supply in order for the latch to move past the frame's metal work. Continue pushing the power supply until the power supply slide lock clicks into the power supply slide lock hole provided in the equipment chassis and the power connectors are firmly mated.

3. If additional power supplies are to be installed in the equipment chassis, align them with a set of power supply circuit card guides in the equipment item and repeat step 2.

# ADDENDUM

## Fuse Replacement

***CAUTION***

**DOUBLE-POLE/NEUTRAL FUSING**

To replace the PS13O Power Supply line fuses take the following steps:

1. **Disconnect the AC power cord from the power supply being serviced.**

2. Remove or open the front door of the equipment item containing the PS130 Power Supply needing serviced.

3. Remove the power supply from the equipment item. Refer to the Power Supply Removal Section of this addendum for power supply removal instructions.

4. Carefully pull the AC line fuse holder open. The fuse holder is located adjacent to the PS130 Power Supply AC line input connector.

5. **Replace the fuses with fuses of equal current and voltage rating.**

6. Carefully slide the AC line fuse holder closed.

7. Install the power supply back into the equipment chassis. Refer to the Power Supply Installation Section of this addendum for complete power supply installation instructions.

5. Reconnect the associated AC power cord.