PESA

TECHNICAL MANUAL

Cheetah

DISTRIBUTED ROUTING SYSTEM
DRS SERIES
AUDIO ROUTER

Publication: 81-9059-0589-0, Rev. B

September, 2009

www.PESA.com

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

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

Again, thank you for choosing PESA and we look forward to a long-term partnership with you and your facility.

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Original Publication Date: April, 2007

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Chapter 1 Important Safety Instructions

1.1 Documentation and Safety Overview

This manual provides instructions for the installation, operation, and maintenance as well as a top-level functional description of the Cheetah DRS Series Audio Routing Switchers built by PESA.

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

1.2 Warnings, Cautions, and Notes

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

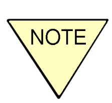
1.2.1 Warning

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

1.2.2 Caution

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

1.2.3 Note



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

1.3 PRECAUTIONS

Avoid exposed circuitry - Dangerous voltage or current may be present - do not touch exposed connections, components or circuitry when power is present.

Remove jewelry - Remove jewelry such as rings, watches, or other metallic objects prior to working around or with power cables or power supply modules.

Use proper power cord - Use only the power cord supplied or specified for this product.

Dual power supplies may be present – If your PESA product is equipped with redundant power supplies, two power cords may be present. If possible, connect each power supply cord to a separate branch circuit. Always disconnect both power supply cords prior to servicing exposed circuitry.

Use correct power source — Do not operate this product from a power source that applies more than the voltage specified for the product.

Provide proper ventilation — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

Use anti-static procedures — Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Ensure mains disconnect — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

Route cable properly — Route power cords and other cables so that they are not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

Use correct power supply cords — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

1.4 LASER SAFETY

In certain DRS installations, fiber optic cable and laser equipped transmitter/receiver modules are used. Laser devices used in this product are classified as Class 1 products which do not present a hazard to skin or eyes for any wavelength or exposure time under normal operating conditions. However, PESA cautions you not to look directly into the fiber optic module or into the end of a fiber optic cable.

Chapter 2 Introduction

2.1 DESCRIPTION

PESA's Cheetah DRS Series Router is a compact, expandable Distributed Routing System for audio and machine time code signals. Cheetah DRS is a true distributed routing system, using high-speed time slice digital data manipulation and multiplexing for signal distribution, rather than a crosspoint matrix array; allowing audio input, output or combination input/output frames to be distributed remotely from one another as needed for a particular installation.

With DRS installations, the time slice data bus is referred to as the Packet Audio Stream (PAS). Input audio or time code signals are sampled and "packetized" into a serial data stream for routing between DRS frames. On the output side, PAS bus data is reconstructed into the original input signals; and these signals are made available for distribution at the desired output channel of the router. Most system interconnections are made using common CAT5E cable and standard RJ-45 connectors. In most system configurations, full redundancy of every link in the router system is possible, including the PAS bus. Figure 2-1 is a front and rear view of a typical DRS rack unit with the front cover in place.

Figure 2-1 Cheetah DRS Router – Typical Rack Unit (Front & Rear View)

DRS router installations are configured using combinations of the following frame types:

- Input (128 input channels for a single signal format)
- Split Input (64 input channels each for AES and analog)
- Output (128 output channels of a single signal format)
- Split Output (64 output channels each of AES and analog)
- Split I/O (64 input and 64 output channels of the same or mixed audio signal type)
- Machine Code Input (64 physical inputs for machine time code)
- Machine Code Output (64 physical outputs of machine time code)
- Data Exchange Engine

NOTE	**DRS input and output frames are available for routing machine time code. Throughout this manual examples or text referring to audio or audio frames are also applicable to time code routing, with the following exceptions:** **1. Time code frames are NOT available with split inputs or outputs** **2. Time code frames support a maximum of 64 physical input or output channels, regardless of backplane connector type; however each time code frame routes 128 actual signal channels** **3. Time code input signals CAN NOT be routed to audio signal output channels, and vice-versa**

Each frame occupies a space of one rack unit (RU) in a standard equipment rack and is configured with the appropriate backplane for the desired signal and connector type, a mid-plane for internal connections, the appropriate circuit card for the frame function and signal type(s), and a single power supply/controller module - two if power supply/controller redundancy is desired.

Audio frames are the input and output point for signals routed through DRS. Key to the versatility of the DRS system is the numerous audio frame variants available to accommodate virtually any audio router requirement. Each audio frame has a signal-handling capacity of 128 channels. Depending on the frame variant, these may be all input channels, all output channels or a split frame – audio signals only – configured as two banks of 64 channels each in various signal type and interface connector combinations. Split frames are available as two banks of input channels, allowing up to 64 inputs each of two different audio signal formats in the same frame. Other split frame variants allow up to 64 outputs each of two different audio signal formats; or 64 input signals and 64 output channels of the same or different signal formats.

Digital signal processing (DSP) functions on every input or output channel allow signals to be delayed by a user-determined time period or phase inverted. Stereo Remedies, available for all adjacent paired input or output audio signals, allow derivation of a summation signal (L+R) or a difference signal (L-R) of the two adjacent audio channels; or channel swapping of the adjacent pair.

Data Exchange Engine (DXE) frames process and distribute data between audio frames. Each DXE interfaces with up to eight audio frames, and processes up to a frame maximum of 512 input channels and 512 output channels. System synchronization and clock timing for the DRS router is derived from a source of facility sync reference and must be supplied to every DXE frame in the system via the loop-thru BNC connectors on the rear panel of each DXE. DRS may be added to in-house sync distribution in a daisy-chain fashion along with other facility equipment.

The distributed architecture of the Cheetah DRS allows for greatly simplified facility wiring schemes and higher quality signal integrity due to shorter cable run requirements. Frame-to-frame cable lengths may be up to 100 meters using CAT5E cable. DRS Routing Systems may be structured in many different input and output (I/O) size, signal format and I/O connector type configurations. Systems are easily expandable from a basic 128X128 configuration in three frames (two Audio Frames and one Data Exchange Engine), to a maximum configuration of 2048X2048 in 36 frames. DRS installations may be easily expanded in the field simply by adding the required number and type of system frames for the desired level of expansion.

For the user/installer who may not be familiar with time-slice signal processing technology or the concept of multiplexing numerous slices of data over serial bus architecture, a brief, top-level tutorial of how this digital signal manipulation and transfer method is applicable to signal routing is provided in Chapter 7 of this manual. PESA recommends that you take the time to read this tutorial and familiarize yourself with your new routing system before proceeding with the installation.

2.2 FEATURES

Features of the DRS Audio Router include:

- Highly Versatile and Flexible Distributed Routing System
- High Speed PAS Bus System Architecture
- Supports Sources of AES/EBU, Analog Audio and Machine Time Code
- Supports Dolby-E Audio
- Setup capabilities for audio delay and phase inversion on every input and output channel.
- Setup capabilities for DRS stereo remedies, allowing the user to derive a summation signal (L+R) or a difference signal (L-R) of two adjacent audio channels; or select adjacent channel swapping of the stereo pair, implemented in input channels and/or output channels
- I/O Configurations Available From 64X64 Up To 2048X2048
- Full Redundancy (Power, Control and PAS Bus) Available as an Option for Most Configurations
- In-Field Expandability: As Your Needs Grow – Your DRS Router Can Grow With You
- Multiple I/O Connector Types Supported: BNC, ELCO, and Weidmuller (6-Pin Detachable)
- Power Supply/Controller Modules are Hot-Swappable (Frames Equipped With Redundant Modules)
- Will Sync To Any Of The Following Sync Source Types: NTSC, PAL, Tri-Level, AES Silent
- Ethernet Based Control System Protocol Using PESA's PERC2000 System Controller

2.3 SPECIFICATIONS

Analog Audio

Connector Type	6 pin detachable, 2 balanced signals per connector ELCO/EDAC 120, 32 balanced signals per connector
Input Level	0 dBFS (full scale digital) = +24 dBu, +18 dBu or +12 dBu, GUI selectable
Input Impedance	20 K Ohms, Balanced
Common Mode Rejection	>74 dB minimum, >90 dB typical (20 Hz - 20 kHz)
Output Levels	0 dBFS=+24dBu, +18 dBu or +12 dBu, GUI selectable A/D, D/A
Output Impedance	130 Ohms; balanced
Resolution	24 bits/sample, 96 kHz sample rate
Frequency Response	+/- 0.1 dB (20 Hz - 20 kHz)
THD+N	<0.02% @ 1 kHz, +20 dBu
Cross Talk	<-95 dB
Dynamic Range	95 dB

AES/EBU Audio Specification

Connector Type	6 pin detachable, one balanced AES stream per connector
ELCO/EDAC 120-16 balanced AES streams per connector	
BNC - one single-ended AES stream per connector	
Input Level	0.5 -7.0 Vp-p balanced, 0.5 - 2.0 Vp-p single ended
Input Impedance	110 Ohms balanced, 75 Ohms single-ended
Input Sample Rate	32 kHz- 96 kHz
Output Level	nominal 2 Vp-p balanced, 1 Vp-p single-ended
Output Impedance	110 Ohms balanced, 75 Ohms single-ended
Output Sample Rate	48 kHz or 96 kHz, GUI selectable
Dolby Support	48 kHz synchronous Dolby/ Dolby E are supported

MADI Audio (Requires Use of Optional MADI Adapter)

Connector Type	BNC
Input Level	200 mV- 2.0 Vp-p
Input Impedance	75 Ohm
Output Level	1 Vp-p
Output Impedance	75 Ohm
MADI Port Mode	Each MADI port may support 28, 32, 56, or 64 synchronous audio streams, GUI selectable

Digital Signal Processing Specifications

Gain Adjustment	Independent +/- 6 dB adjustment in 0.1 dB increments for each input and output, GUI selectable.
Audio Delay	Independent delay elements for inputs and outputs. Unrestricted mode provides 0.341 milliseconds (>10 NTSC frames) for each input and output. Restricted mode provides up to 1.365 seconds (>40 NTSC frames) of delay per input and output for a limited number of channels. All delay parameters are GUI selectable.
Phase/Inversion	Independent Control for each input and output, GUI selectable
Stereo Remedies	Independent Control for each pair of inputs and outputs. The L and R channels of each pair may be individually set to L, R, L+R or L-R. All stereo remedies are GUI selectable.

Time Code Specifications

I/O Connector Type	6 pin detachable, 2 balanced signals per connector, ELCO/EDAC 120, 32 balanced signals per connector; BNC, unbalanced
Input Level	0.7 to 3.3 Vp-p MAX
Input Impedance	110 Ohms balanced, 75 Ohms single-ended
Input Number	64
I/Output Connector Type	BNC
Output Level	1.3 Vp-p +/- 0.3 V MAX
Output Impedance	110 Ohms balanced, 75 Ohms single-ended
Output Number	64
System Distortion	0.2% at 1xTimecode speed; 1.0% at 5xTimecode speed

Environmental & Miscellaneous

AC Input Connectors	IEC 320C6 socket (accepts IEC 320 C5 line cord)Power Requirement 60 VA Max per frame
Input Voltage	90-260 VAC, 47-63 Hz
Operational Temperature	0-40 degrees C
Operational Humidity	90% Non-Condensing
Mechanical Dimensions	1RU 1.75Ó H x 19.00Ó W x 14.75Ó D
Weight	12lbs

Chapter 3 System Architecture

3.1 OVERVIEW OF SYSTEM ARCHITECTURE

There are basically three different types of frames used in the DRS System: Audio, Time Code and Data Exchange Engine (DXE). Figure 3-1 illustrates typical component layout and locations for a DRS frame. A brief overview of each frame type and its components is provided in the following paragraphs. Input and output channel assignments, operating parameters and characteristics of a DRS installation are defined through the system controller graphical user interface (GUI).

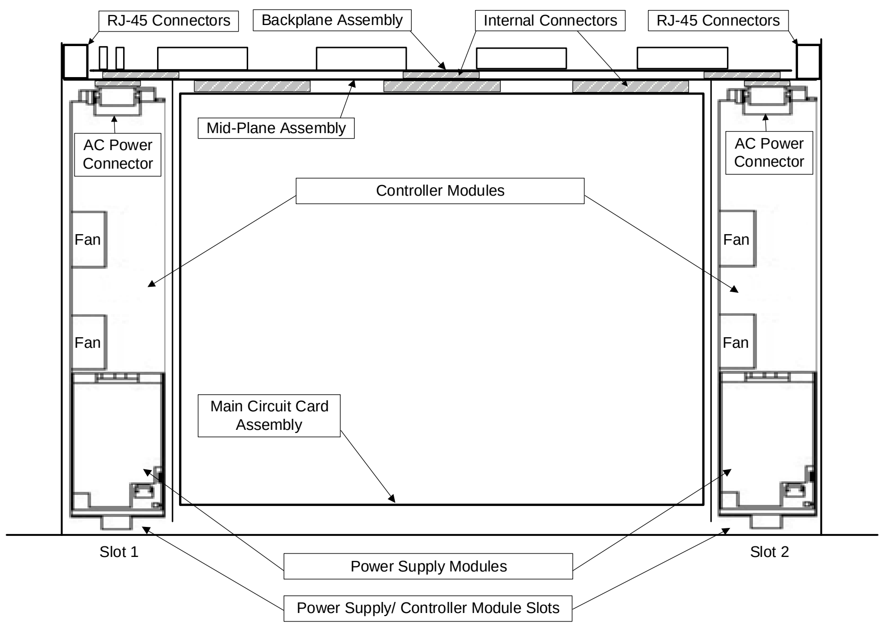


Figure 3-1 Frame Component Layout (Typical)

DRS routing systems are implemented in terms of audio signal blocks. All audio frames process 128 signal channels – either as a single block of 128 channels (dedicated input or output frames), or two 64 channel blocks (split frames). Each audio block supports one signal type (input or output) and one signal format (AES digital or analog). Time code frames support 64 physical input or output channels, but occupy a single block of 128 signals. Signal types and formats can not be mixed within a block.

Dedicated input frames are configured as a single 128 channel block and accept 128 input channels of one signal format – AES or analog. Dedicated output frames are also configured as a single 128 channel block and provide 128 output channels of one signal format – AES or analog.

Split frames process 128 audio channels as two blocks of 64 channels each and may be configured as mixed signal inputs, mixed signal outputs or as one input block and one output block. Figure 3-2 pictorially illustrates the concept of dedicated and split audio frames.

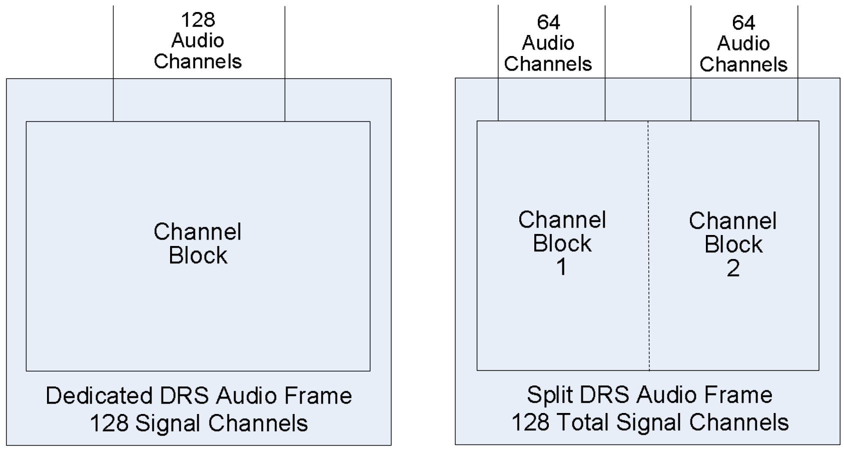


Figure 3-2 Pictorial View of Dedicated and Split Audio Frames

This concept of channel blocks is key to configuring a DRS router and connecting audio frames to DXE frames. Numerous frame variations are possible using channel block architecture – these are introduced in Paragraph 3.2.

3.2 AUDIO FRAMES

Audio frames are the DRS system components that interface with external input or output audio signals. Regardless of the variant, all audio frames have the capacity of processing 128 audio signals. Audio frames are available in the following channel block variants:

- 128 input channels of one signal format - AES or analog
- 128 output channels of one signal format - AES or analog
- 128 total input channels, divided as two 64 channel blocks – AES and analog
- 128 total output channels, divided as two 64 channel blocks – AES and analog
- 64 input channels – AES, 64 output channels - AES
- 64 input channels – analog, 64 output channels - analog
- 64 input channels – AES, 64 output channels - analog
- 64 input channels – analog, 64 output channels – AES

All audio signals are processed by the DRS as digital data. Analog inputs are converted to digital data for routing and AES signal pairs are routed as two adjacent mono channels. Any mono AES signal or any analog input signal may be selected and converted to an analog output. AES outputs are always adjacent paired channels and may be selected from any adjacent channel AES input pair or may be derived from any two mono analog signals selected as adjacent channel outputs. Depending on the choice of frame signal-handling capacity and distribution, it is possible to use the DRS as a format converter. For example, using an analog input block and an AES output block provides not only a router function but also analog to AES conversion capability. In similar manner, using an AES input block and an analog output block provides a router plus AES to analog conversion.

Every audio frame is composed of a Backplane Assembly, Main Circuit Card, Mid-Plane Assembly and up to two Power Supply/Controller Modules, as shown in Figure 3-1. Each audio frame is configured with one of the following backplane types, depending on signal handling requirements and the type of connector(s) used in the installation. Available connector types and signal handling capabilities of each are presented in the chart below. An illustration of each backplane is shown in Figure 3-3.

Connector Type	Signal Type
BNC Connectors	AES Audio 75 Ohm, Unbalanced
ELCO/EDAC Connector	AES Audio 110 Ohm, Balanced or Analog Balanced Audio
6-Pin Connector (Detachable – Weidmuller)	AES Audio 110 Ohm, Balanced or Analog Balanced Audio

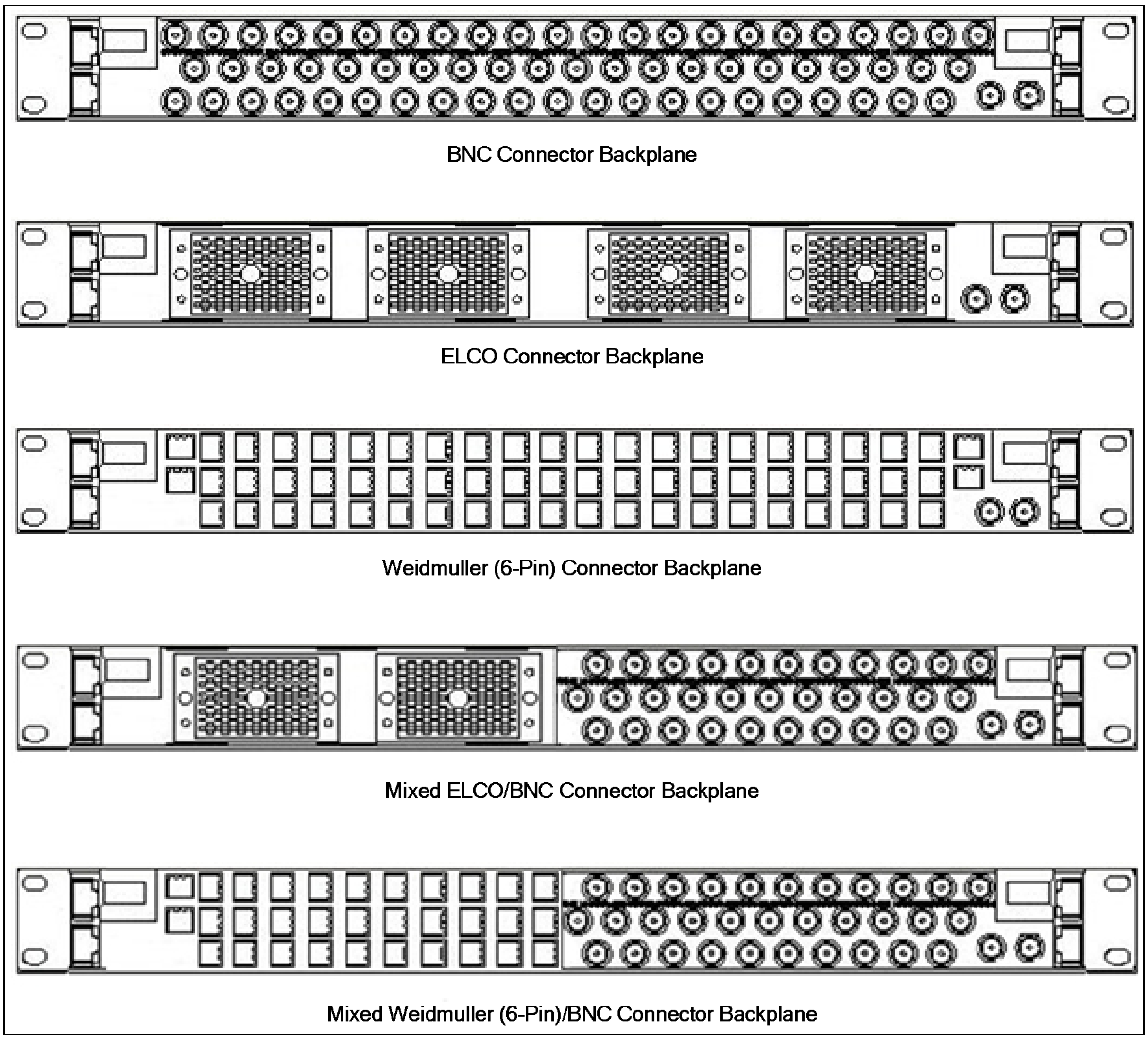


Figure 3-3 Input/Output (I/O) Backplanes

NOTE	**BNC connectors are used only for connection of AES audio sources, and each AES source contains a pair of audio signals. In order to accommodate 128 signals, only 64 connectors are required; and to accommodate 64 signals, only 32 connectors are required.**

There are several variations of main circuit cards, depending on the signal type and I/O mix of the frame. Only one main circuit card is used in any given frame, and the type of card used determines the signal handling characteristics of the frame.

There are two distinct mid-plane assemblies, one of which will be present in a frame, depending on the type of backplane used. Basically, the mid-plane routes signals and voltage sources between the backplane assembly, the power supply/controller module and the main circuit card. There are no active components on the mid-plane board, and the only component of interest to the user is a sixteen position rotary switch mounted to the circuit card side of the assembly. This switch is for possible future product implementations and is not used in DRS applications covered by this manual. Setting position of this switch on an audio frame has no effect on DRS system operation.

3.3 REAR PANEL CONNECTIONS – AUDIO FRAMES

Regardless of the backplane, mid-plane or circuit card used, the intra-system connectors are the same for each audio frame variation. These connections are shown and identified in Figure 3-4 using the ELCO/EDAC Connector Backplane for example only. Connectors identified by Figure 3-4 are identical for all I/O backplanes, and their function is discussed in the following paragraphs.

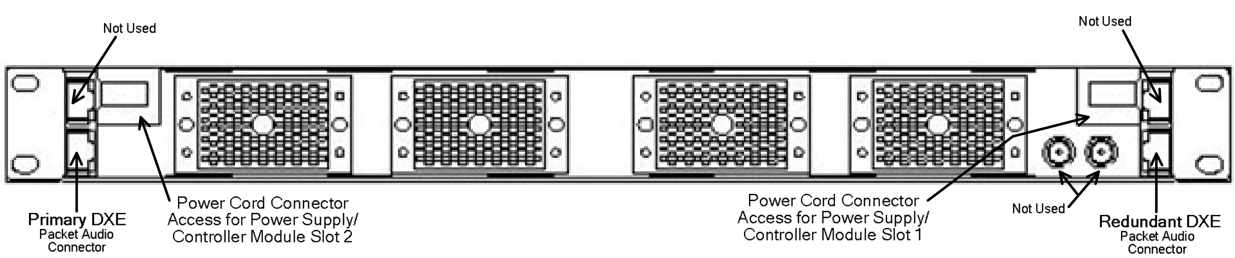


Figure 3-4 I/O Frame Rear Panel Connections (Typical)

Packet Audio Stream (PAS) Connector There are two PAS Connectors (RJ-45) located on the rear panel of each input and output frame. These are the LOWER connectors located on each side of the frame rear panel. When viewed from the rear of the frame the left-hand connector is the **Primary DXE Connector** and the right-hand connector is the **Redundant DXE Connector**. These are interface point(s) for the packet audio stream to the DXE Frame. When only one DXE frame is used, connect a CAT-5E cable between the Primary DXE connector and the DXE. In a redundant system, connect the Redundant DXE connector to the second (redundant) DXE frame.

Power Cord Connector Access Each power supply/controller module is fitted into a chassis slot (either slot 1 or slot 2). When a power supply is installed, its 3-prong input power receptacle is accessible through this opening on the frame rear panel. Each power supply carries its own dedicated power receptacle. Input power is not bussed between modules. When two power supplies are used (for redundancy) a separate power cord must be attached to each receptacle through its access port. Each access port is equipped with a harness device that secures the cord to help prevent accidentally disconnecting the frame from its power source.

There is a second RJ-45 connector located above the PAS connector on each side of the frame rear panel and also a pair of BNC connectors located on the lower right-hand side of the rear panel. These connectors are intended for future product implementations and are not used in DRS applications covered by this manual.

3.4 TIME CODE FRAMES

DRS Time Code frames contain a specially designed circuit card to route 64 channels of machine time code data. For all practical purposes a time code frame may be considered identical to an audio frame with respect to frame component layout and connections between frames. Time code input and output frames are available with BNC, 6-pin detachable or ELCO connectors. Pin-out data for time code is different for ELCO and 6-pin detachable connectors from audio pin-outs for the equivalent connector, and is provided in Chapter 5 of this manual. Time code and audio frames may be mixed within a system, provided input signals of each format are only routed to an output block of the same signal format.

3.5 DATA EXCHANGE ENGINE FRAMES

Data Exchange Engine (DXE) frames process and distribute data on the PAS bus between audio frames. Each DXE frame interfaces with up to eight audio frames through one of the eight I/O Frame Port connectors on the rear panel using CAT5E cable, up to 100 meters in length. Each I/O Frame Port connector interfaces to a single audio frame, and supports the 128 audio channels of the frame – either as a dedicated block of 128 channels, or two 64 channel blocks. A single DXE can interface with up to eight audio frames, for a maximum signal handling capacity of up to 512 audio input signals and 512 audio output signals. In the case of a system expanded beyond 512X512, multiple DXE frames are used; up to a system maximum of four DXE frames, for a total system signal-handling capacity of up to 2048 inputs and 2048 outputs.

Each DXE frame contains at least one frame controller device, co-resident with the power supply on a specialized component called the Power Supply/PERC1000 Controller Module, which communicates with the PESA PERC2000 System Controller. As with any PESA router installation, the system controller communicates with the various router system components and control panels, and orchestrates unified operation of the system through the frame controllers contained in each individual router frame. PERC2000 is available in a stand-alone rack frame with power supply, or the controller circuit card may be mounted in a Cheetah video matrix switcher chassis; in either application, the system controller is connected to DXE frames over a 10/100 Ethernet link. All operational parameters, adjustments and configuration of the DRS system are made through the PC based PERC2000 graphical user interface (GUI) application.

In DRS system architecture, the two power supply/controller slots are identified by the nomenclature primary (slot 1) and redundant (slot 2); and the controller device installed in slot 1 is identified as the "primary" controller, the controller in slot 2 is identified as the "redundant" controller, refer to Figure 3-1 for slot locations. Note that this is a naming convention only and in systems with redundant control capability does not indicate whether a controller is operating as the "active" device or the "standby" device. For systems with only one power supply/controller module, the single module is always installed in the primary controller slot, and is the active controller for the frame. Redundant power and control systems have a module installed in each slot. One of the modules is always active, and the second module is operating as the standby controller – regardless of the slot in which each is physically located. During redundant controller operation, the standby controller maintains contact with the active controller in order to remain current with all current operating status and parameters for the frame, and also to monitor the health of the active controller. Should errors occur with the active controller, or if an operator manually initiates a controller changeover command, the standby controller assumes active control of the frame, and the previously active module becomes the standby controller.

Every DXE frame is composed of a Backplane Assembly, up to two Power Supply/PERC1000 Controller Modules, a Main Circuit Card and a Mid-Plane Assembly, as shown in Figure 3-1. There are no variations of the components comprising a DXE. The Backplane Assembly provides all connectors needed for intra-system connection, and a pair of loop-thru sync reference input BNC connectors. The mid-plane routes signals between the backplane and the circuit card as well as power rails and control signals between the power supply/controller module and the circuit card. There is a rotary switch on the DXE mid-plane used to select configuration parameters for the frame. System configuration and switch settings are discussed in Chapter 6 of this manual.

3.6 REAR PANEL CONNECTIONS – DXE FRAME

Rear panel connections for the DXE are shown and identified in Figure 3-5 and discussed in the following paragraphs.

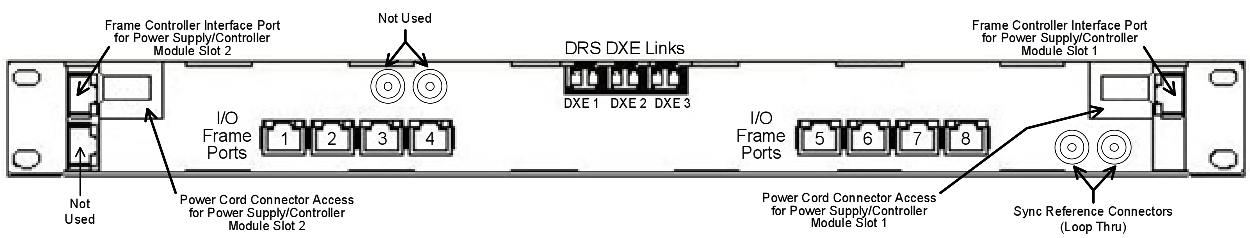


Figure 3-5 DXE Frame Rear Panel Connections

<u>**Frame Controller Interface Port**</u> There are two Frame Controller Interface Port Connectors (RJ-45) located on the rear panel of each DXE frame. These are the UPPER connectors located on each side of the frame rear panel. When viewed from the rear of the frame the right-hand connector is the **Primary Frame Controller Interface Port** and the left-hand connector is the **Secondary Frame Controller Interface Port**. These are interface points between the frame controller circuitry on the Power Supply/PERC1000 Module(s) and the P2K System Controller circuitry. Each frame controller interface port connector is dedicated to a particular power supply/controller module slot: the Primary Port connector associates to module slot 1 (Refer to Figure 3-1 for module slot identification) and the Secondary Port connector associates to module slot 2.

In a system with a non-redundant frame controller, install the Power Supply/PERC1000 module in slot 1 and use the Primary Frame Controller Interface Port connector to connect the DXE to the facility local area network (LAN) or, in some installations, directly to the P2K System Controller. If a second (redundant) frame controller is installed, use the Secondary Frame Controller Interface Port connector to connect it to the LAN or to the P2K through an external Ethernet switch. In a redundant control system installation, two separate cables are used for interface with the system controller. These are Ethernet connections, and do not directly communicate with one another. Each frame controller must have a connection to the system controller through a dedicated system Ethernet switch or the facility local area network (LAN).

I/O Frame Ports There are eight I/O Frame Port Connectors (RJ-45) located on the rear panel of every DXE frame – positioned as two groups of four connectors each. These connector groups are labeled 1 thru 4 and 5 thru 8, and are used to interface the DXE frame with up to eight audio frames through the Packet Audio Stream (PAS). In most installations, audio frames MUST be attached to the DXE I/O frame port connectors in numerical sequence, always beginning with I/O port 1. Connecting audio frames to a DXE is discussed further in Chapters 4 and 5 of this manual.

DRS DXE Links Located along the top edge of the rear panel are three fiber optic cable connectors denoted as DRS DXE Links. These connectors are labeled DXE 1 thru DXE 3 and are used to interconnect DXE frames in expanded DRS systems requiring more than one DXE. All DXE to DXE connections are made using LC to LC duplex fiber optic cable.

Sync Reference Connectors The two Sync Reference Connectors (BNC) located on the rear panel of every DXE frame are the interface point for a source of in-house sync reference. It is imperative that EVERY DXE frame in a DRS system be connected to house sync. All system timing and clocking functions are synchronized between frames using the sync pulse as a reference. The connector pair is a loop-thru arrangement and either may be used for input or output.

Audio Monitor There are two BNC connectors located along the top edge of the DXE frame labeled Audio Monitor 1 and Audio Monitor 2. These connectors are intended for future product implementations and are not used in DRS applications covered by this manual.

Power Cord Connector Access Each power supply/controller module used in a DRS frame is fitted into a chassis slot (either slot 1 or slot 2). When a power supply is installed, its 3-prong input power receptacle is accessible through this opening on the frame rear panel. Each power supply carries its own dedicated power receptacle. Input power is not bussed between modules. When two power supplies are used (for redundancy) a separate power cord must be attached to each receptacle through its access port. Each access port is equipped with a harness device for the input power cord. The harness secures the cord to help prevent accidentally disconnecting the frame from its power source.

3.7 POWER SUPPLY/CONTROLLER MODULES

Two Power Supply/Controller Modules are available in the DRS system architecture. Both supplies are constructed as a modular unit that can slide into either of the two available slots in the chassis frame. In redundant power supply applications, a power supply/controller module is used in both slots of a chassis frame.

A typical power supply/controller module is shown in Figure 3-6. The two modules are distinctly different in *controller* function, even though the power supply portion is identical in function and circuitry with both modules. For purposes of this brief introduction the basic functional difference is discussed in the following paragraphs. The two modules are identified as follows:

Power Supply/Fan Controller Module - This module contains the power supply circuitry, a pair of fans used to circulate cooling air through the chassis frame, and a controller circuit that controls operation and reports status of the on-board cooling fans.

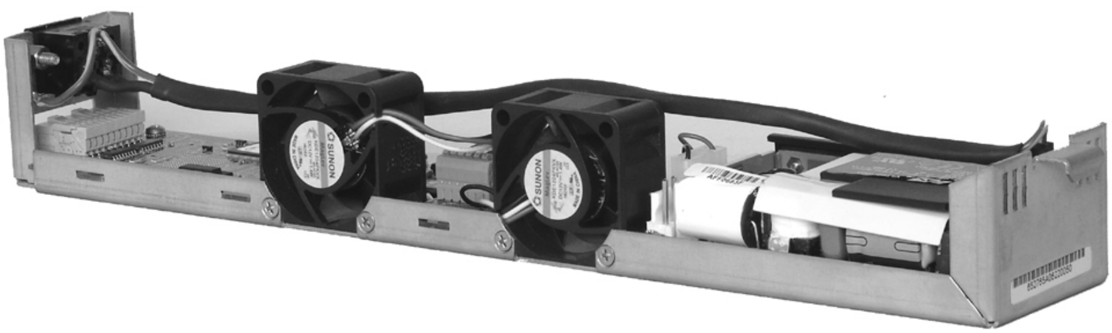


Figure 3-6 Power Supply/Controller Module (Typical)

Power Supply/PERC1000 Controller Module - This module also contains power supply circuitry, a pair of fans used to circulate cooling air through the chassis frame and fan controller functions. In addition it contains the PERC1000 Frame Controller circuitry used to communicate with the external system controller over an Ethernet link.

Chapter 4 Functional Description

4.1 DRS SYSTEM FUNDAMENTALS

In the previous chapter we introduced the various types of frames in the DRS system architecture and provided a brief introduction to the function of each frame. In order to interconnect these various components into a working system we need to introduce a few key principles of system operation.

Unlike a traditional crosspoint matrix router where all signal connectors are contained in a single chassis and input and output cables must terminate at the same hardware unit, the DRS distributes input and output connections over frames configured as signal blocks of various size and type, all interconnected through a data exchange engine (DXE) frame. Each input block contains circuitry necessary to convert audio inputs to digital data, apply any desired DSP functions to each signal and "packetize" the digital data into a serial stream containing high speed samplings of every input signal in the channel block. This data stream is routed to an interface port of the DXE.

The DXE frame performs the actual "routing" function by disassembling incoming data packets to extract audio data for each input channel, constructing outgoing packets containing desired audio signal data for specific output channel blocks, and routing each outgoing data packet to the frame containing the specific channel block. In the output frame, the packetized data is extracted, processed, converted to either analog or AES signal format and routed to output connectors. A single DXE can connect with up to eight audio frames and process a maximum of 512 input and 512 output signal channels. Each audio frame can process up to 128 audio signal channels – either as a single 128 channel block or two 64 channel blocks.

4.1.1 SINGLE DXE SYSTEM CHANNEL ASSIGNMENTS

Audio frames and the signal channel blocks they contain are "assigned" their I/O channel number range by the order they are connected to the DXE I/O frame ports. For example, in a single DXE system, the input **and** output channel range is 1 – 512; and the audio frame connected to I/O port 1 is assigned the first 128 channels. Depending on the type and number of blocks in the frame, the channels may be assigned as inputs 1 – 128, outputs 1 – 128, or inputs 1 – 64 and outputs 1 – 64. If a frame is connected to I/O port 2, it is assigned the next group of 128 channels, etc. The actual channel numbers assigned can vary and depend entirely on the type and number of blocks attached to the previous frame port. For example if port 1 is connected to a block of 128 input signals, and another 128 channel input block is connected to port 2, the frame controller assigns channel numbers 129 – 256 to these inputs; but if a block of 128 output signals is attached to port 2, the frame controller assigns channel numbers 1 thru 128 to these outputs.

Audio frames are always viewed as having a signal capacity of 128 channels. As long as the audio frame supports only input signals or only output signals, it makes no difference whatsoever if the frame is a single block of 128, or is a split frame with 64 analog signals and 64 AES signals, the DXE port still assigns the frame as a range of 128 input or output channels. If a split frame with one input signal block and one output signal block is attached to a port, each block is assigned the next sequential range of 64 channel assignments. For example, assume a frame with 128 input channels is attached to port 1 and a split frame with 64 inputs and 64 outputs is attached to port 2. The frame on port 2 is assigned inputs 129 – 192 and outputs 1 thru 64. Channel assignments continue in numerical sequence by port until the 512 input and 512 output channel maximum of the DXE is reached.

4.1.2 MULTIPLE DXE CHANNEL ASSIGNMENTS

DRS installations expanded beyond a capacity of 512 inputs or 512 outputs require the use of additional DXE frames and their associated audio frames. If we loosely consider a DXE and its audio frames as a “complete” router for 512 inputs and 512 outputs; then with an expanded system, we can consider each DXE as a 512 X 512 “building block” of the total system capacity.

Each DXE frame, and its associated input and output blocks, is called a *channel group* and assumes the identity of the numeric channels it processes. In a single DXE system, the frame is identified as I/O range 1 – 512, since this is the channel range a single DXE would process. In multiple DXE installations, the second DXE is identified as I/O range 513 – 1024, and the third and fourth as I/O range 1025 – 1536 and 1537 – 2048, respectively. The DXE naming scheme may seem like a trivial point, but its importance will become clear when we discuss system hardware configuration.

Consider an example: if we had a system with two DXE frames, the first DXE processes channel group 1 – 512 and is identified by the nomenclature **I/O range 1 – 512**; the second DXE processes channel group 513 – 1024 and is identified as **I/O range 513 – 1024**. The first 128 input and output signals supported by the second DXE would be assigned channel numbers 513 – 640, the second group would be 641 – 768, etc. Just as with the first DXE, channel numbers are assigned to audio blocks connected to the I/O frame ports in sequential order; beginning with port 1.

The channel group a specific DXE processes is assigned to the frame by the setting of the rotary switch on its chassis midplane. This is discussed further in Chapter 6.

4.1.3 REDUNDANT FRAME CONTROLLERS AND REDUNDANT DXE FRAMES

In previous text we discussed that each DXE must contain at least one PERC1000 frame controller, but it may also contain a secondary controller for redundancy. Also, a given DXE processes a specific channel group of 512 input and 512 output signal channels, and a redundant DXE, processing the same channel group and sharing the same audio frames with the primary DXE, may be added for PAS processing redundancy. This means that each I/O channel group must have a minimum of one P1K, but can have as many as four P1K controllers – all configured for the same channel group and frame-type assignments, as shown in the chart below.

P1K Controllers for any I/O Channel Group

- Primary DXE, Primary Controller
- Primary DXE, Secondary Controller
- Redundant DXE, Primary Controller
- Redundant DXE, Secondary Controller

DXE frame status, as to primary or redundant, is also assigned by the setting of the rotary switch on its chassis midplane. This is discussed further in Chapter 6.

4.1.4 BASE IP ADDRESS OF A DRS SYSTEM

Previously, we discussed the interaction between the P1K frame controller contained in a DXE and the system controller, the P2K. We know that the P1K and P2K communicate over an Ethernet TCP/IP communication protocol, and that each component on an Ethernet network must be assigned a unique IP address. The IP address assigned is usually determined by a facility IT administrator or network manager.

With regard to a DRS installation, the assigned address is called the **base IP address,** and becomes the network name for the *entire* DRS system, regardless of how many frames or controllers it contains. Each and every P1K frame controller MUST have a unique IP address – and the address for each individual controller in the system is derived by adding an address offset to the assigned base address. The notion of identifying a complete DRS system by its base IP address is very important and will become much more important as we discuss expanded and redundant systems.

4.1.5 INTRODUCTION TO HARDWARE AND ROUTER CONFIGURATION

From the previous text, we see that every DXE in a system can be uniquely identified by three characteristics – the *base* IP address of the DRS installation, the channel group it processes and whether it is the primary or redundant DXE frame for the channel group. If the frame is equipped with redundant frame controllers, they can further be identified as the primary or secondary controller. DXE and frame controller identification characteristics play a key role in performing system configuration.

Every P1K frame controller in the system is initially programmed with the *base IP address* of the system. On system start-up each frame controller performs a boot-up procedure on its processor circuitry. As part of initialization, it reads the setting position of the rotary switch on the mid-plane of the DXE in which it is installed; and it also determines in which module slot it is installed. Based on these criteria an individual controller can identify whether it is installed and initialized as the primary or secondary controller in the primary or redundant DXE frame, and it determines the channel group it is processing based on the setting of the rotary switch. An individual controller also determines and assumes it own *unique* IP address by adding an offset value, defined by its identity determined in the previous steps, to the programmed base IP address of the system.

On completion of boot-up, every P1K frame controller in the system assumes an individual identity based on the following characteristics:

- Its unique IP address on the network
- Channel group it processes
- Whether it is installed in the primary or redundant DXE frame of the channel group
- Whether it is functioning as the primary or secondary controller in the frame

In Paragraph 4.1.3 we discussed that each channel group must have a minimum of one P1K controller, but can have up to four controllers, if the system is equipped with full control and PAS redundancy. Since a channel group consists of one (or two) DXE frame(s) connected to the primary (or primary and redundant) PAS bus connectors of the audio frames, then any controller in the group is a candidate to potentially assume control of the audio blocks; and therefore all controllers for the channel group must be programmed with the same data as to the type of frames and audio blocks connected to the DXE I/O ports. This is done through the **hardware** configuration file.

During installation of a DRS system there are two configuration operations that must be performed – hardware and router configuration. **Hardware** configuration defines the number and type of audio blocks attached to each DXE frame in the system. It is performed through the DXE Frame Port Configuration Screen of the P2K GUI, and the resulting configuration file is downloaded to the P1K frame controllers. **Router** configuration is where the actual signal switching functions, such as signal input/output assignments, signal names and aliases, switching levels, components and other special router functions are written as a configuration file and downloaded to the P2K System Controller.

These are two very distinct operations with a DRS installation, although both are performed through screens of the P2K GUI application. Hardware configuration is performed from the GUI screen simultaneously for all controllers in a specific channel group, whether there is one controller or four controllers. When you perform hardware configuration the frame type, signal type and signal format attached to each DXE I/O port is entered; and the input/output channel number range for the audio blocks in each frame is calculated and assigned by the configuration application. Once all the audio block and frame parameters for the channel group are entered on the configuration screen, the configuration file is downloaded simultaneously to all frame controllers in the channel group.

The procedure for generating a hardware configuration file is discussed in Chapter 6 of this manual. For purposes of this discussion, you need to be aware that every frame controller in the system assumes a unique personality based on the identity it determines and assumes on boot-up and the hardware configuration file downloaded to it from the GUI application. Hardware configuration data for a specific channel group is written to flash memory on each individual frame controller module in the group, and is retained by the module until it is overwritten by another configuration file.

4.2 SYSTEM CONFIGURATION AND EXPANSION

4.2.1 BASIC SYSTEM CONFIGURATION

NOTE	**Through the remainder of this chapter, the term audio frame, or frames, is used in the configuration examples. Time code frames are interfaced to other system components in the same manner as an audio frame and can be considered as interchangeable in these examples, with the following exceptions: Time code frames support a maximum of 64 physical input or output channels, regardless of backplane connector type; however each time code frame routes 128 signals. Split frames are not available for time code routing.**

Basic System Configuration Using Dedicated 128 Channel Audio Frames

A basic, non-redundant DRS router typically consists of a minimum of two audio blocks and a DXE frame; plus the external P2K control system. Audio signals enter and leave the router system through the audio blocks and the DXE receives, processes and distributes serial data between audio blocks. A simplified block diagram of a basic router configuration is shown in Figure 4-1. In this illustration, frame 1 provides a block of 128 input channels, and frame 2 provides a block of 128 output channels for one specific signal format.

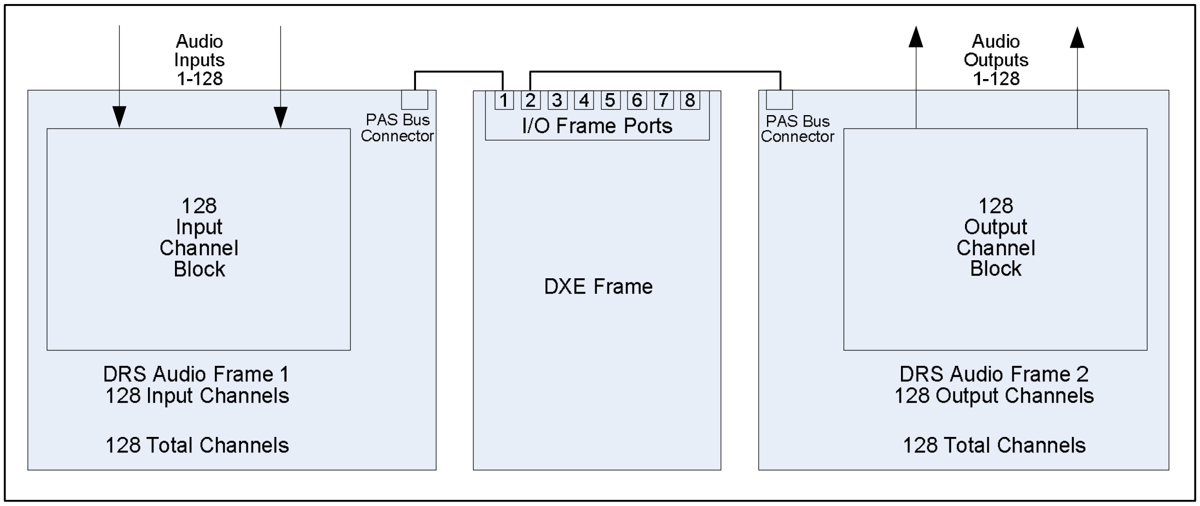


Figure 4-1 Basic DRS Router Configuration

For this example, assume both audio frames contain circuit boards for AES audio signals. Each audio frame must be connected to the DXE I/O frame port connectors in numerical sequence by the range of signal channels we wish to assign to it, beginning with frame port 1. In our example configuration, the frame containing a dedicated input channel block for AES signals we wish to assign as inputs 1 thru 128 is connected to frame port 1. Each frame port can interface with up to 128 channels from a single audio frame, so this frame fills the entire capacity of port 1 with input signals. In similar fashion, the frame containing a dedicated output channel block for AES signals we wish to assign as outputs 1 thru 128 is connected to frame port 2. This frame fills the entire capacity of port 2 with output signals.

When configuring a DRS system, regardless of signal handling capacity, number of audio frames, or number of DXE frames, a hardware configuration file must be generated and downloaded to the P1K Frame Controllers contained in the DXE, as discussed in Paragraph 4.1.5.

Hardware configuration is executed through the DRS Port Configuration Screen of the PERC2000 graphical user interface (GUI); and the procedure for generating a hardware configuration file is presented in Chapter 6 of this manual. However, in order to better understand the concept of assignable frame ports, we need to look at a few of the columns present on this screen. An example screen showing configuration for the basic system we just discussed is shown in Figure 4-2.

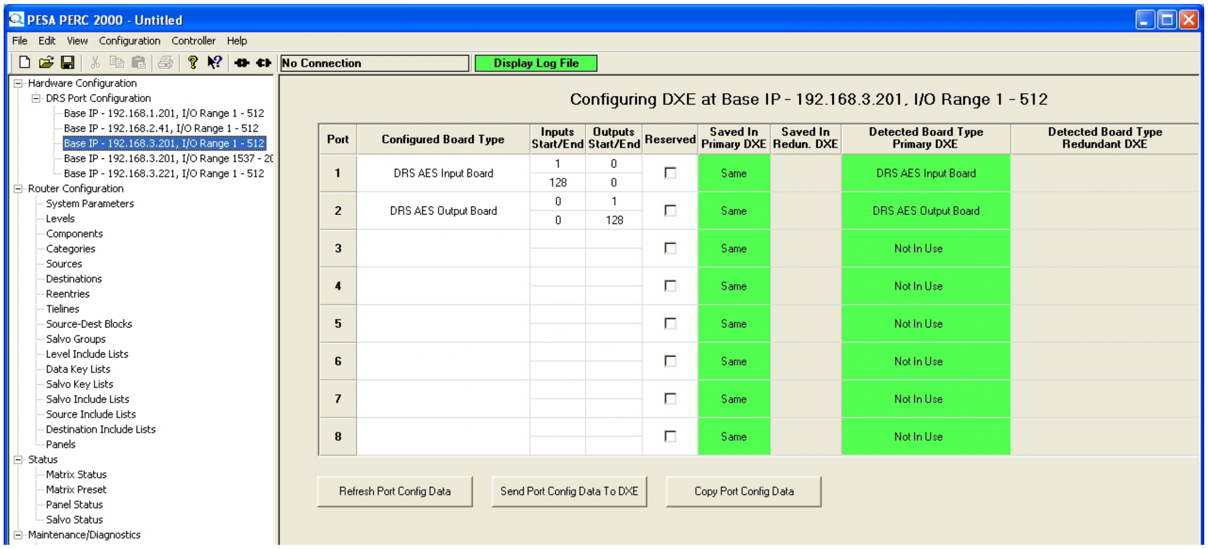


Figure 4-2 Example DRS Port Configuration Screen

The DXE (channel group) we are configuring is identified at the top of the configuration box by the base IP address of the DRS system and the numerical I/O range of the channel group. In this example, we are configuring I/O ports for the system at IP address 192.168.3.201 and the DXE that processes channel group 1 thru 512.

Notice from the figure that DXE frame ports 1 thru 8 are listed vertically on the left side of the configuration box. The next column displays the audio block by signal type and format supported by the circuit board installed in the DXE frame attached to the indicated port. The user may select and enter, or modify, the type of audio block connected to the port. The next two columns indicate the numerical range of input and output signal channels supported by the audio block. The user does not select or enter the channel numbering sequence. The sequence is automatically assigned by the software application beginning with port 1 and increments based on the number of input and output channels supported by the indicated block, until the maximum of 512 input and output channels is reached. Once 512 input channels are assigned, regardless of the frame port number, the GUI software does not allow any more frames with input channels to be configured. Likewise, when 512 output channels are assigned, no more output channels may be configured. The remaining columns are discussed in later text.

Operationally, it would make no difference whatsoever if we connected the output block to frame port 1 and the input block to port 2 – since both are the first numerical blocks of each signal type. An example GUI configuration screen showing this connection is shown by Figure 4-3.

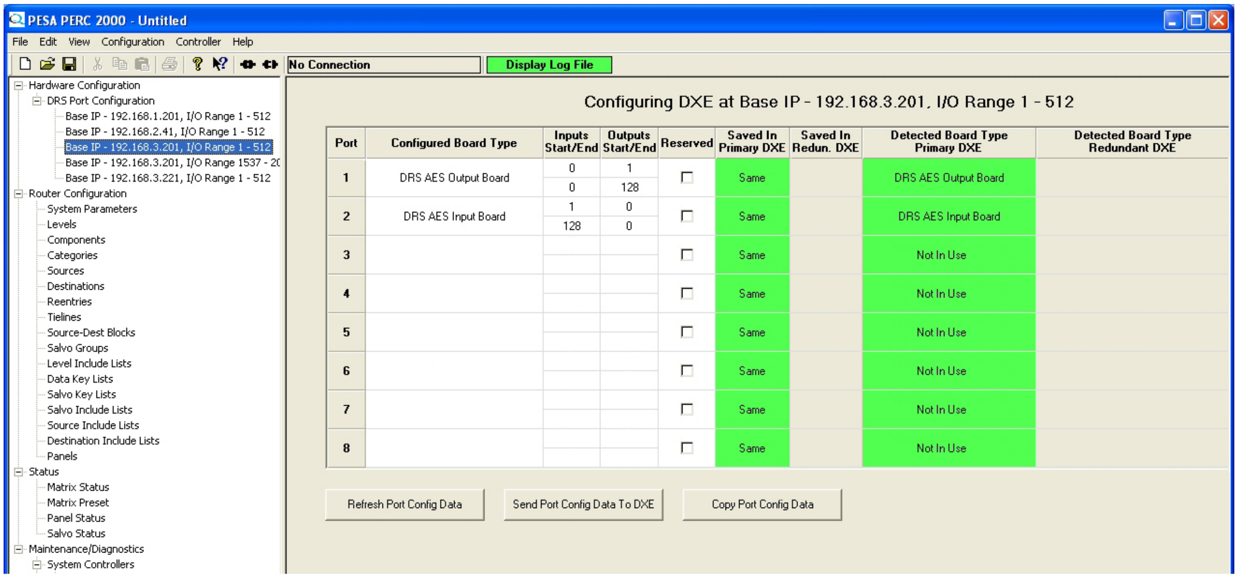


Figure 4-3 Alternative DXE Port Configuration

Expanding on this basic configuration, suppose we wish to add a second input and output block to increase the channel capacity of the system to 256 inputs and 256 outputs, as shown in Figure 4-4. In this application the blocks in frames 1 and 2 are connected to the DXE just as in the previous example, with port 1 processing inputs 1 thru 128 and port 2 processing outputs 1 thru 128. Frames three and four connect to the next two DXE frame ports in numerical sequence. It makes no difference at all whether frame 3 is connected to port 3 or 4, and the same with frame 4. The important thing to remember is that channel blocks and frame ports must be connected in the numerical sequence in which we wish to assign channel numbers to the signals in each block. For this example, we have illustrated frame 3 connected to port 3 and frame 4 to port 4. The GUI menu screen for this example configuration is shown by Figure 4-5

Using this same principle of adding and configuring audio frames and blocks in numerical sequence, we can expand the single DXE system to a maximum configuration of 512 inputs and 512 outputs.

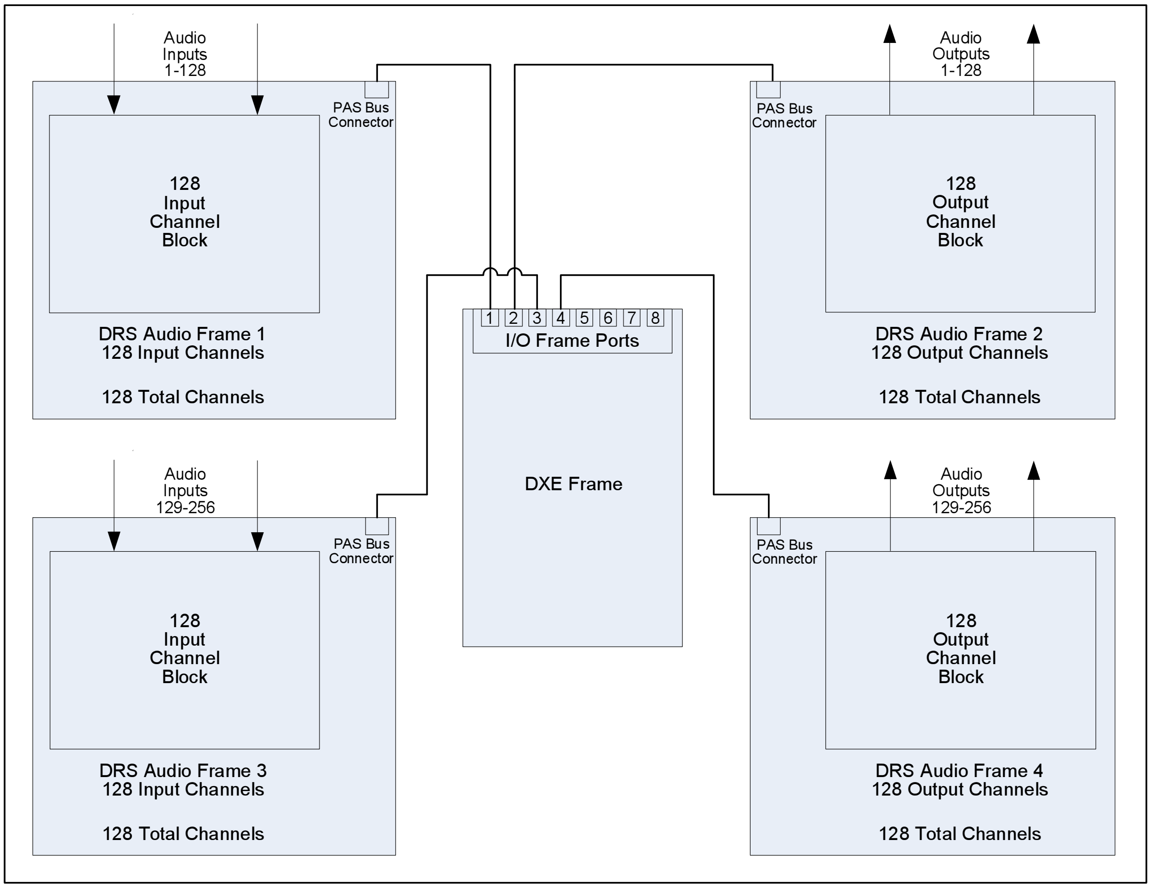


Figure 4-4 256X256 Router Configuration

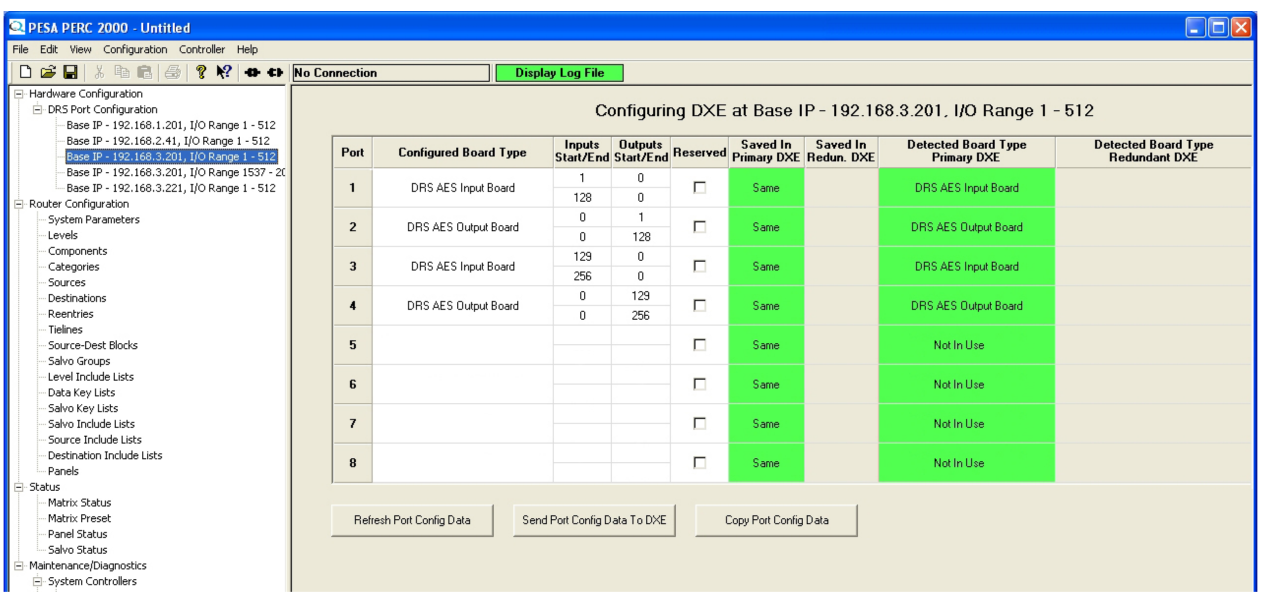


Figure 4-5 Example 256X256 Port Configuration Screen

System Configuration using Split Frames

Split audio frames, just as dedicated frames, process 128 audio channels. In a split frame, however, these channels are split into 2 blocks of 64 channels each.

Figure 4-6 is a simplified block diagram of a system configured using one split input frame, one split output frame and a DXE. This configuration allows routing a mix of analog and AES signals through the same frame. Figure 4-7 shows the GUI configuration screen for this split frame system. Notice that the configured board type entry identifies the audio blocks as being split analog/AES inputs or outputs, but the channel numbering indicates a port capacity of 128 total inputs or 128 total outputs, just as with a dedicated frame. In the case of both frames, the first 64 channel block (1 – 64) processes analog signals and the second block (65 – 128) processes AES digital audio signals.

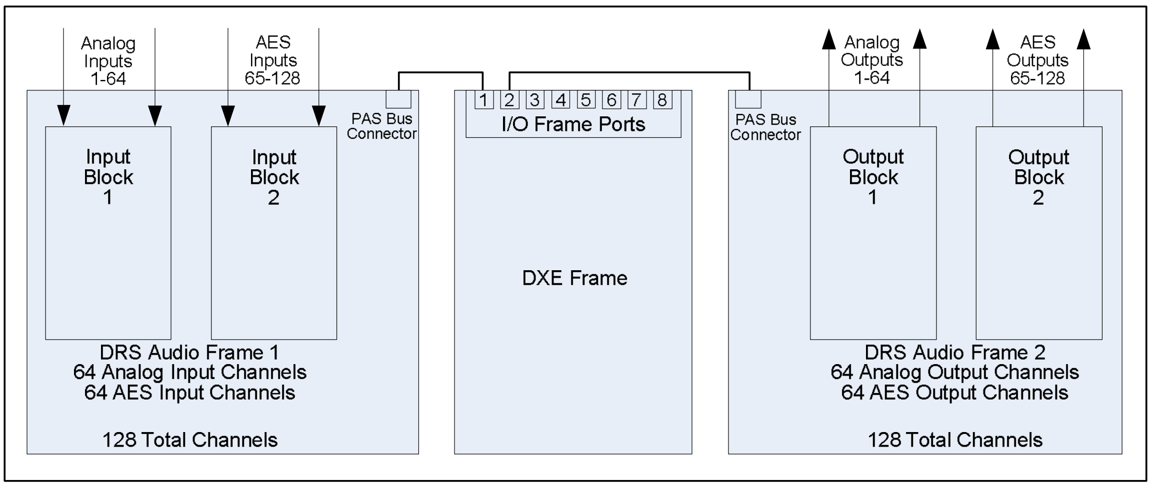


Figure 4-6 Basic Split Frame System

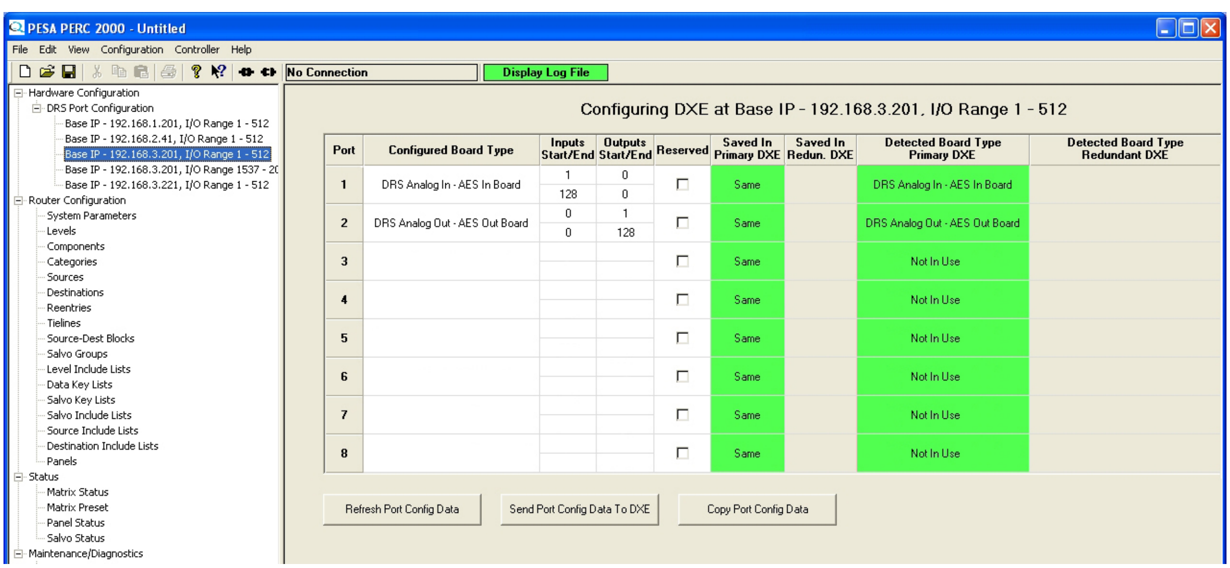


Figure 4-7 Example Split Frame Port Configuration

One of the most versatile applications for split frames allows a single audio frame to support both input and output signal blocks. As an example, we will configure a two audio frame system for AES signals - each frame with a block of 64 input signals and a block of 64 output signals. Referring to Figure 4-8, we see the audio frame identified as frame 1 is assigned audio input channels 1 through 64 and audio output channels 1 through 64. Frame 2 is assigned audio input channels 65 through 128 and audio output channels 65 through 128.

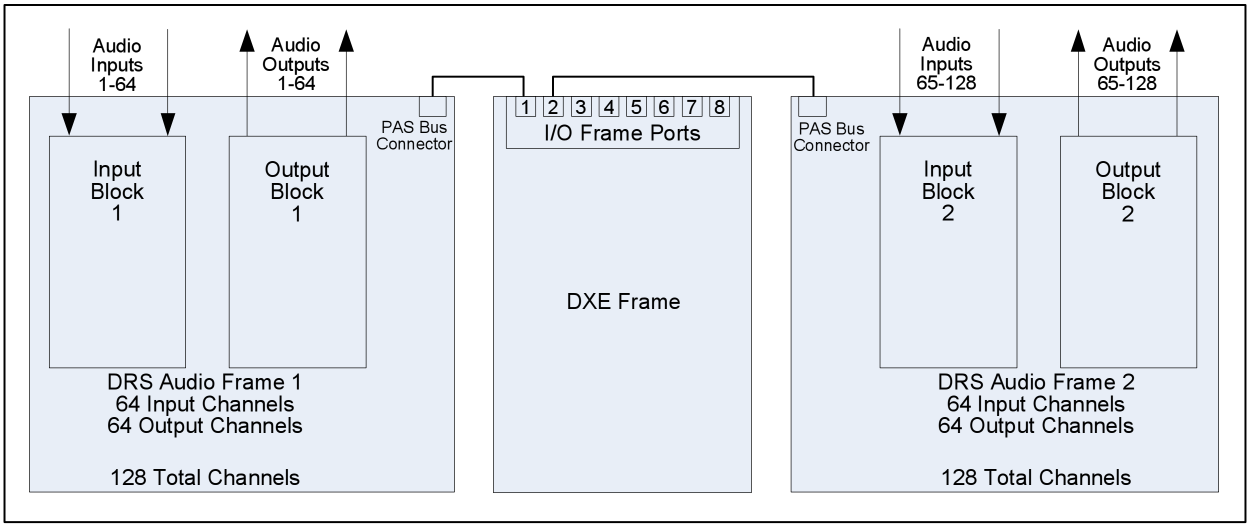


Figure 4-8 Basic Mixed I/O Configuration

The GUI configuration screen for this system is shown in Figure 4-9. Note that each combination input and output board is now configured with 64 input and 64 output channels; with each port still processing 128 total audio channels.

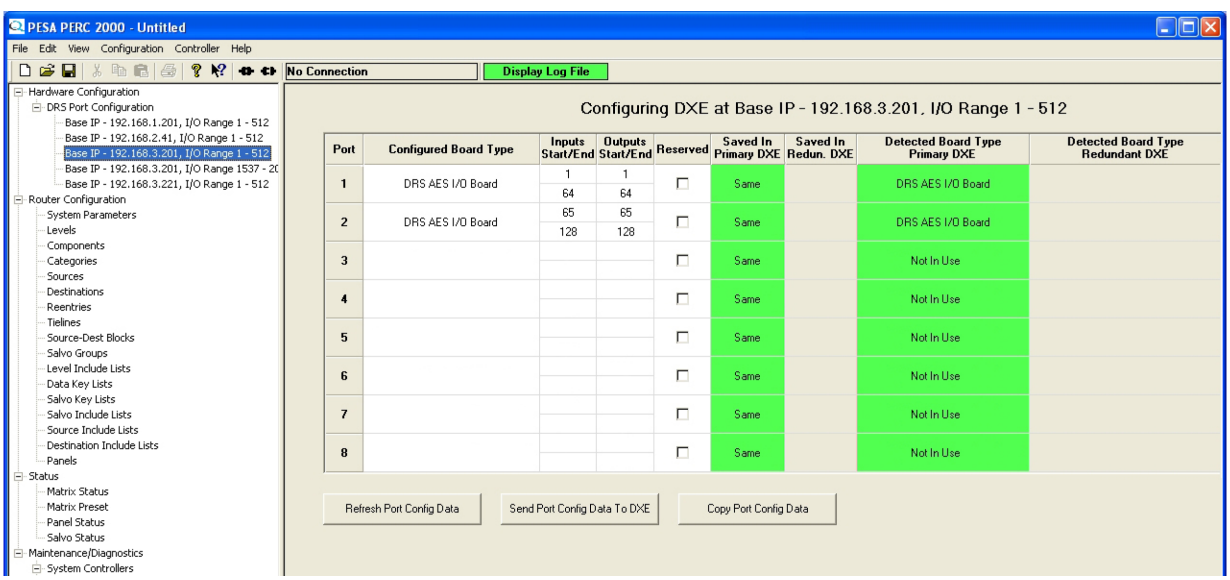


Figure 4-9 Example Mixed I/O Port Configuration

Mixing Dedicated and Split Frames

Dedicated and split audio frames may be intermixed within a system. Figure 4-10 shows a simplified block diagram of a DRS system with one dedicated input frame, one dedicated output frame and two split input/output frames. The GUI configuration screen for this example system is shown in Figure 4-11.

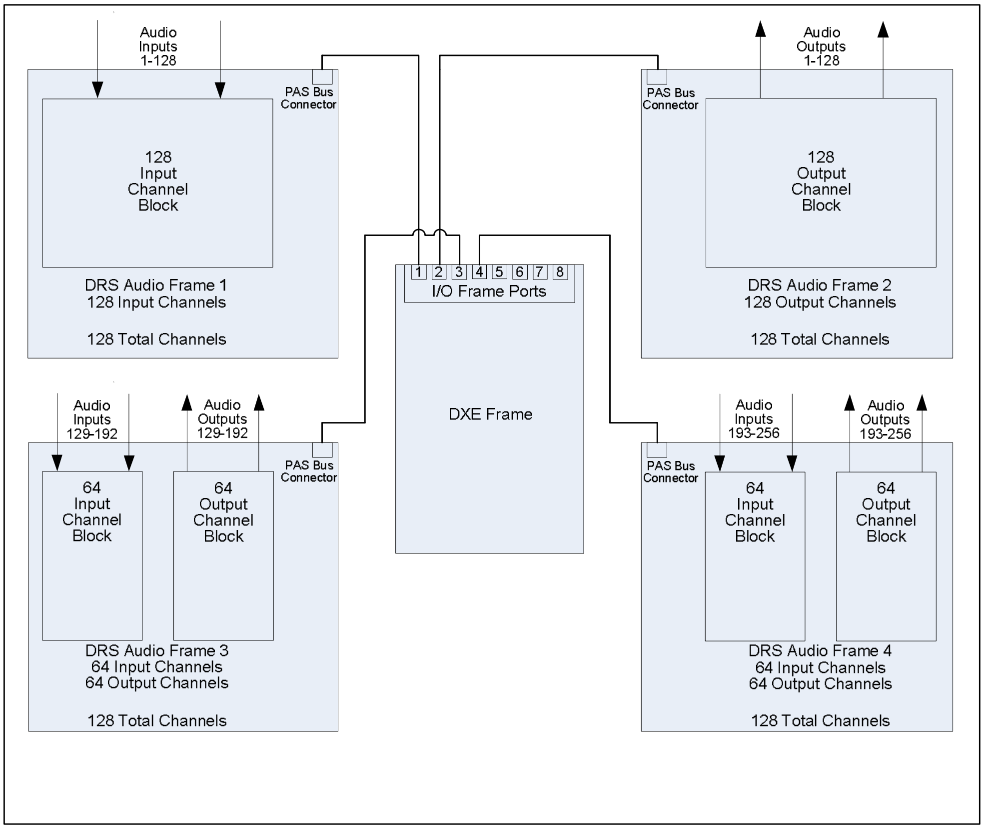


Figure 4-10 Mixed Dedicated and Split Frame Configuration

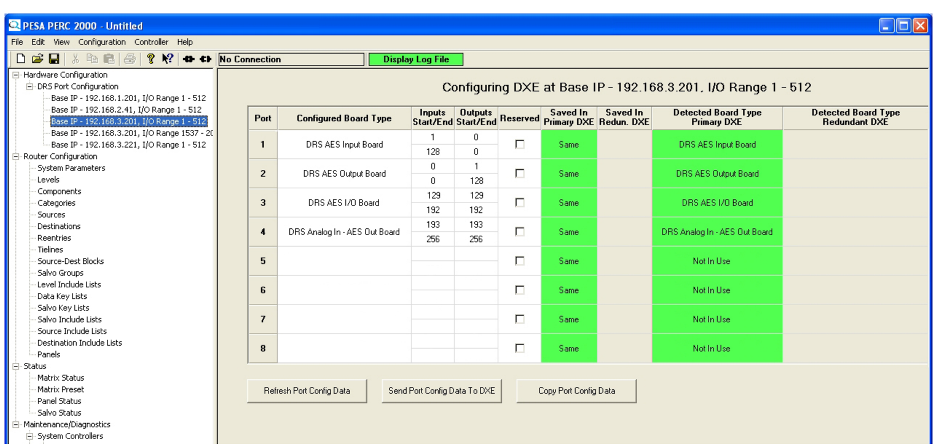


Figure 4-11 Mixed Frame Port Configuration Example

Notice in Figure 4-11 that the numerical sequence of audio channels increments in blocks of 128 or 64 depending on which frame type the port is configured for. As frames are added to the DXE ports, this numbering sequence will continue until a maximum of 512 inputs or 512 outputs is reached.

Unused inputs or outputs in a channel block can not be re-assigned. For example if only 80 of the 128 input channels of frame 1 are used, the next block of input channels on frame 3 still begins with channel number 129. Channels 81 thru 128 are available on frame 1 for future use. Likewise, if only 40 of the 64 input channels of frame 3 are used input signals to frame 4 still begin at 193, etc.

SYSTEM CONTROL AND SYNC CONNECTIONS

Figure 4-12 illustrates system control and sync connections for a single DXE. For simplicity, audio frames are not shown in this illustration.

The single DXE frame must have a Power Supply/PERC1000 Controller Module (Primary Controller) installed in module slot 1. System control communication between the P1K frame controller and the P2K system controller is conducted by an Ethernet connection either directly to the P2K system or over the facility local area network (LAN) using CAT5E cable fitted with an RJ-45 connector. Refer to the PERC2000 documentation for further information on the control system.

Each DXE frame in the DRS Routing System must be connected to an in-house timing synchronization reference signal. Loop-thru BNC connectors for sync reference input and output are provided on the backplane of every DXE. Sync may be routed in a daisy-chain configuration through the DXE to another piece of equipment, or the chain terminated at the second BNC with a 75 Ohm terminator load. Remember, if the DXE frame is the only, or the last, piece of equipment on the chain the open connector on the rear panel pair must be fitted with a 75 Ohm terminator load.

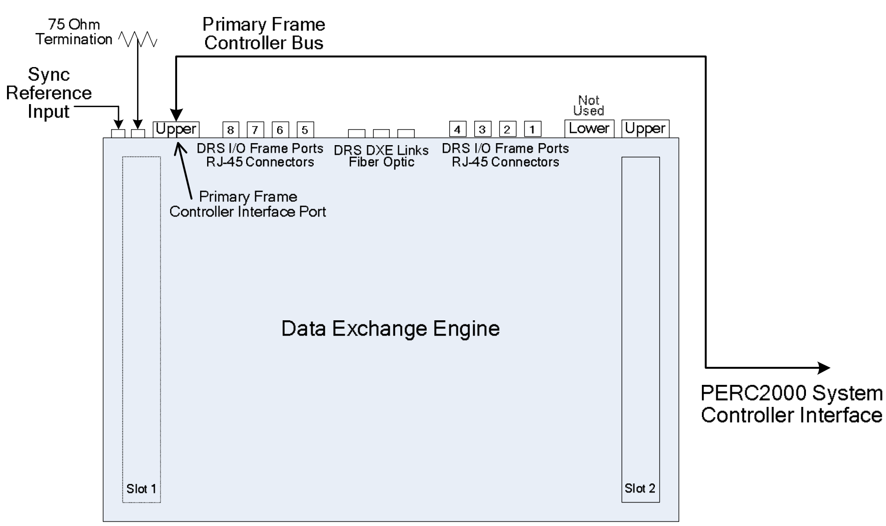


Figure 4-12 128 X 128 Non-Redundant Router System

Even in the most basic configuration, it is possible to have full power supply and controller redundancy simply by installing a second power supply/controller module in the open slot of all system frames. Audio frames should have a second Power Supply/Fan Controller Module installed; and each DXE frame must have a second Power Supply/PERC1000 Module installed in module slot 2, as shown in Figure 4-13. An Ethernet switch is used to provide a direct network connection to each frame controller module. When a second P1K is installed in a DXE, the IP address of the second controller is automatically assigned by the frame controller circuitry as determined by the setting position of the rotary switch.

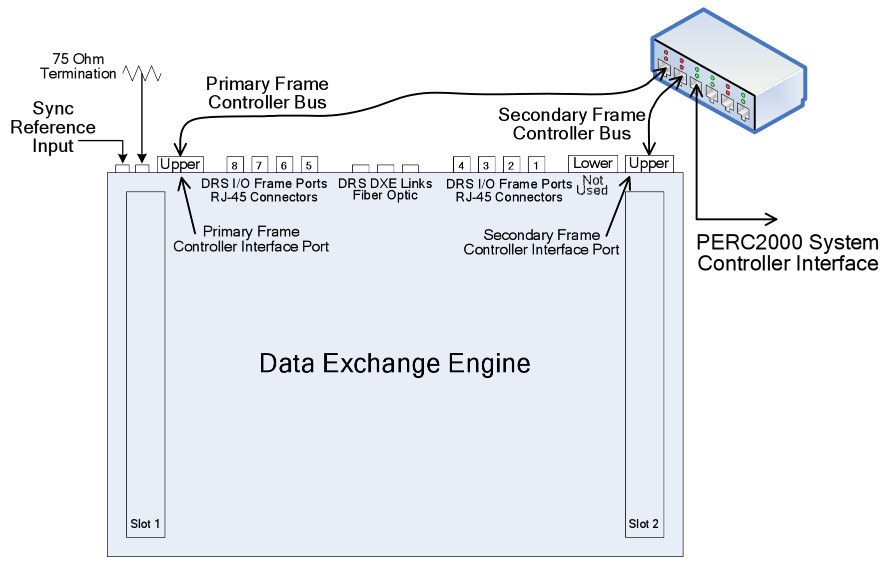


Figure 4-13 128 X 128 Router System With Redundant Power & Controller

With both controller types, several operating parameters of each power supply module in frames with redundant power capability are constantly monitored for status. Should a failure of the active power supply ever occur, the standby supply automatically and seamlessly becomes the active supply for the frame.

In addition to power redundancy, DXE frames equipped with two Power Supply/PERC 1000 modules also operate with redundant frame controller capability whereby one of the modules is always acting as the "active" controller, while the second module assumes the role of "standby" controller. During redundant controller operation, the standby controller maintains contact with the active controller in order to remain current with all current operating status and parameters for the frame, and also to monitor the health of the active controller. Should errors occur with the active controller, or if an operator manually initiates a controller changeover command, the standby controller assumes active control of the frame, and the previously active module becomes the standby controller.

In DRS system architecture, the two power supply/controller slots are identified by the nomenclature primary (slot 1) and redundant (slot 2); and the controller device installed in slot 1 is identified as the "primary" controller, the controller in slot 2 is identified as the "redundant" controller. This is a naming convention only and in systems with redundant control capability does not indicate whether a controller is operating as the "active" device or the "standby" device.

Notice that each controller module has its own Ethernet port for independent communication over the system network or facility LAN. These are denoted as the Primary and Secondary Frame Controller Bus in Figure 4-13. In order for frame controller redundancy to be functional each module must be independently connected as a network device through an Ethernet switch as shown.

By installing a second PAS bus interconnection using the second PAS bus port on each audio frame and an additional DXE frame to perform exchange of the redundant bus data, a second packet audio stream is established. Should either PAS bus connection between frames be broken or data become corrupted, the second (redundant) bus will keep the system fully functional without interruption of audio signals. A block diagram of a fully redundant 128X128 installation with PAS bus, power and frame controller redundancy is shown in Figure 4-14. In this example there are a total of four P1K controllers within the channel group; each of which is assigned a unique IP address derived from the base IP address of the system. All four controllers are provided a direct network connection through an Ethernet switch. Notice also that the sync input is daisy-chained between DXE frames using the loop-thru connector and terminating at the second frame.

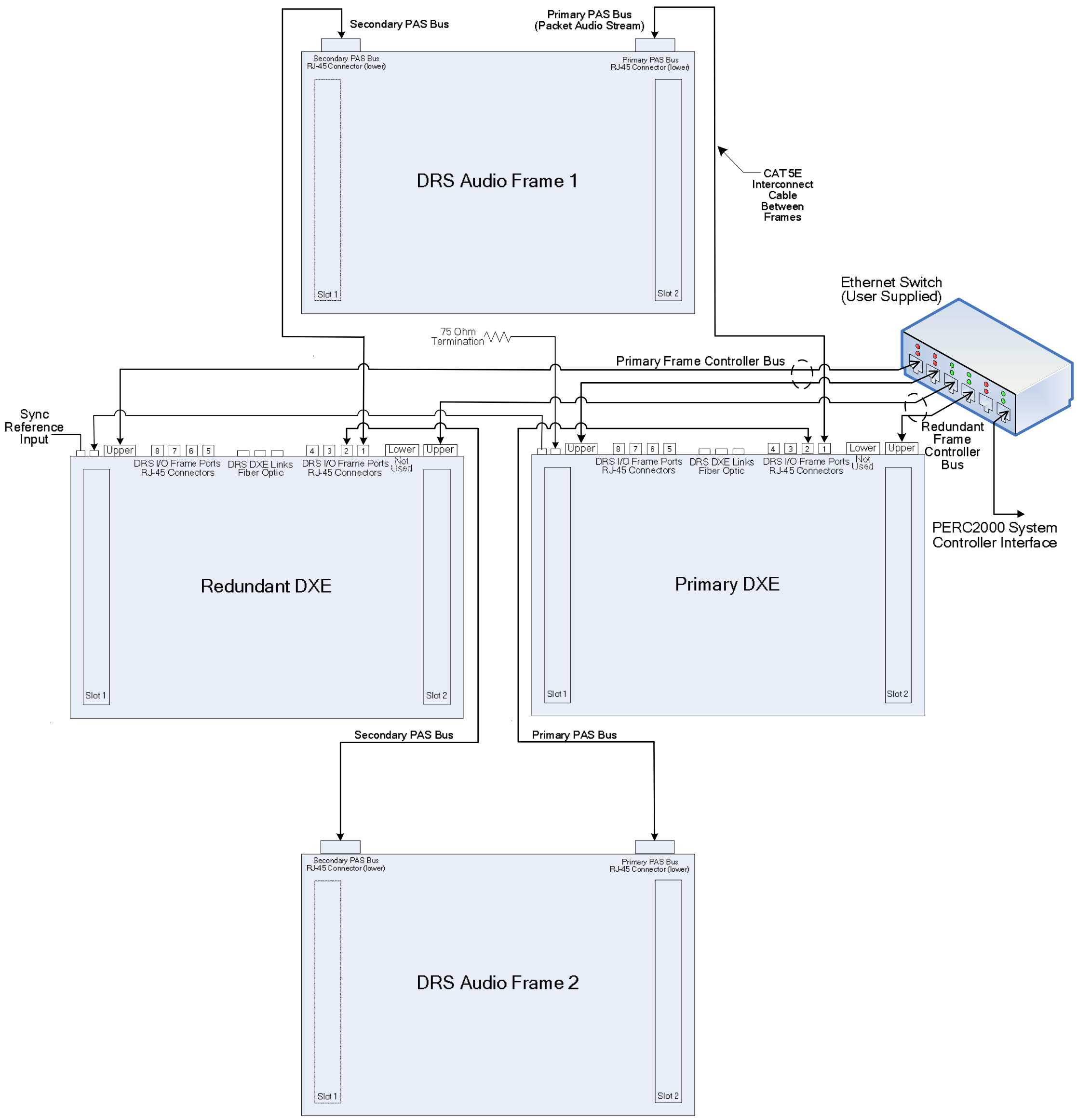


Figure 4-14 128 X 128 Router System with Fully Redundant PAS Bus, Power & Controller

4.2.2 SYSTEM EXPANSION

It is possible to expand either the input or output capacity, or both, of the DRS system, up to a maximum configuration of 2048X2048. Expanded systems use multiple audio frames and one or more data exchange engine (DXE) frames. Any combination of analog and digital channel blocks is allowed in an expanded system.

Single DXE Frame System An example of a 512 input X 512 output expanded system using eight split I/O frames and a single DXE frame is shown in Figure 4-15. Audio frames are identified as frames 1 thru 8, and each provides a block of 64 input channels and a block of 64 output channels. I/O channels are assigned to audio frames in the following numerical sequence:

Frame Number	Input Channels	Output Channels
1	1 thru 64	1 thru 64
2	65 thru 128	65 thru 128
3	129 thru 192	129 thru 192
4	193 thru 256	193 thru 256
5	257 thru 320	257 thru 320
6	321 thru 384	321 thru 384
7	385 thru 448	385 thru 448
8	449 thru 512	449 thru 512

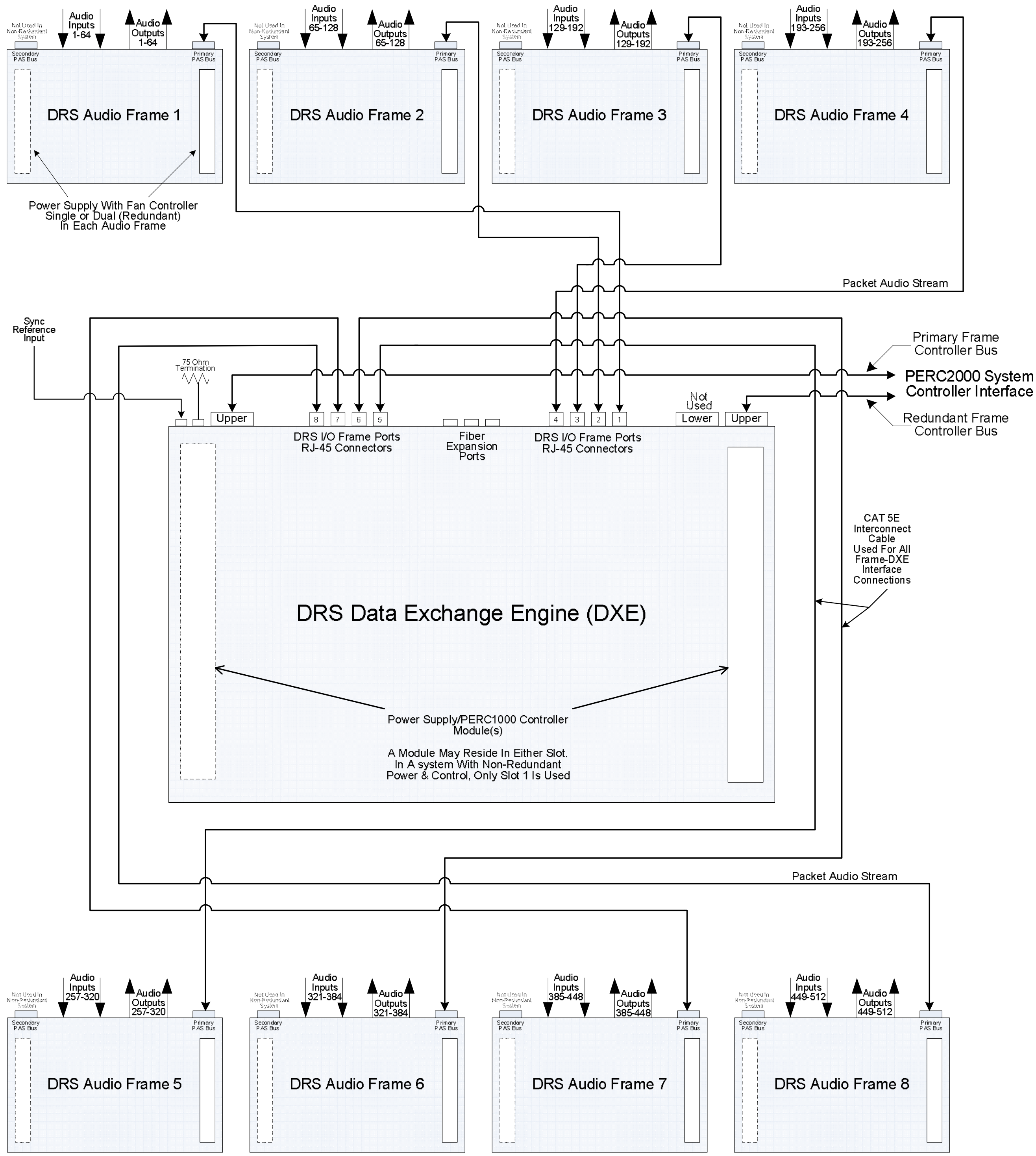


Figure 4-15 512 Input X 512 Output Expanded DRS System

Analog audio and AES digital audio sources may be mixed within an expanded system, and mixed within audio frames using split frames. In our 512 X 512 example, the input channel block of frame 1 may be equipped with an audio board to accept analog sources, while frames 2 thru 4 may be configured to accept AES digital sources. Any combination of analog and digital audio channel blocks is allowed in an expanded system. Remember, however, that all analog sources must be attached to analog input channels and all digital audio sources must be attached to digital input channels.

Multiple DXE System Systems requiring greater than a single channel group of 512 inputs or 512 outputs are configured using two or more DXE frames and the required number of audio frames to provide the desired I/O capacity. Any number of audio frames may be used, up to the system maximum of 32 frames, providing up to 2048 input and 2048 output channels. Since each DXE supports up to eight audio frames - up to four primary DXE and four redundant DXE frames may be used in a system to link the audio frames.

In the previous section we introduced and discussed system expansion for a 512 X 512 router using eight audio frames and a single DXE; and interconnecting the I/O frames to the DXE in an ascending numerical sequence. Building a system greater than 512 X 512 expands the same principle and is accomplished by interconnecting DXE channel groups to one another in an ascending numerical sequence, using fiber optic cable.

Remember that a DXE frame and its associated audio frames together form a channel group, and the channel group assumes the nomenclature of the I/O channel range it contains. We can consider each channel group as a 512 input by 512 output “building block” of the overall expanded system. In an expanded system, the DXE frames process the following input and output channel groups:

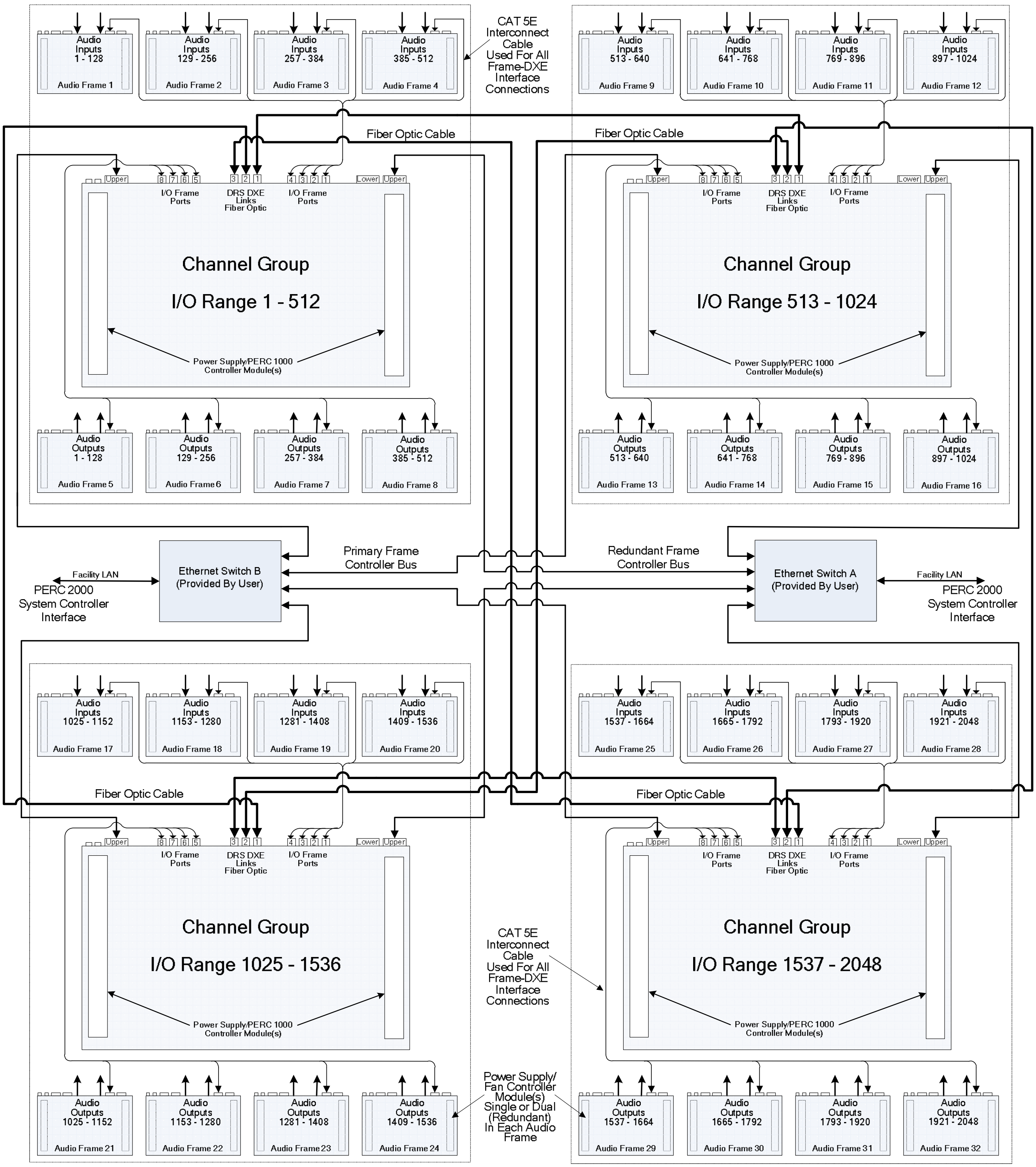
System Channel Groups

DXE	Inputs	Outputs	Group Nomenclature
1	1 - 512	1 - 512	I/O Range 1 - 512
2	513 - 1024	513 - 1024	I/O Range 513 - 1024
3	1025 - 1536	1025 - 1536	I/O Range 1025 - 1536
4	1537 - 2048	1537 - 2048	I/O Range 1537 - 2048

Audio blocks are interconnected to each DXE in the system in exactly the same way as for a single DXE configuration. Each DXE, along with its input blocks and output blocks, is then interconnected as a channel group with all the other DXE frames (channel groups) in the system by fiber optic links.

Just as with audio blocks, unused input or output channels in a channel group can not be re-assigned. For example if only 400 of the 512 input or output channels of group *I/O Range 1 - 512* are used, the next block of audio channels in group *I/O Range 513 - 1024* still begins with channel number 513 for both inputs and outputs. Channels 401 thru 512 are available in group *I/O Range 1 - 512* for future use.

Figure 4-16 illustrates a full capacity 2048 input and 2048 output router configured as four channel groups using 32 audio frames - 16 dedicated input frames, 16 dedicated output frames - and 4 DXE frames. In order to eliminate clutter and make the illustration as clear as possible, sync reference connections are not shown. However, as with any DRS installation, every DXE in the system MUST be connected to a source of in-house synchronization. Multiple DXE systems may be configured using two, three or four DXE frames, depending on the required I/O channel capacity, number of I/O frames, and physical layout of the router system for a particular installation.



NOTE: For Clarity Of Illustration, Sync Reference Connections Are Not Shown. Each DXE MUST Be Connected To A Source Of In-House Sync.

Figure 4-16 2048 Input X 2048 Output Expanded DRS System

DXE frames are interconnected via the DRS DXE Links connectors (fiber optic) labeled DXE 1 thru DXE 3 located along the top edge of each DXE rear panel.

While similar to the numerical hook-up sequence of audio frames, the procedure is not identical. Each DXE frame is interconnected with other DXE frames in the system using a “star” networking arrangement whereby each frame has a direct connection with every other frame. Proper intra-frame cabling for a four DXE system is shown in Figure 4-16. More information on proper cabling of a multiple DXE system, and a hook-up table, is presented in Chapter 5 (Installation) of this manual.

Each frame in the system must contain at least one power supply/controller module. In an expanded system at least one Power Supply/PERC 1000 Module must be installed in every DXE frame. Audio frames must have at least one power supply/controller module installed. Typically Power Supply/Fan Controller modules are used in the audio frames.

The Frame Controller in each DXE in an expanded system must be connected to the P2K System Controller using an external Ethernet switch device. Each DXE must have a direct connection from its active frame controller port to the Ethernet Switch. Daisy-chaining is not acceptable for DXE to DXE interconnection.

Chapter 5 Installation

5.1 MOUNT EACH DRS FRAME IN AN EQUIPMENT RACK

	**Make sure the frame power cords are disconnected from the power source before installing the frame into an equipment rack.**
	**Fans that are mounted inside of this equipment provide forced-air cooling. Do not block airflow around these fans.**

All frames comprising a Cheetah DRS router system are designed for installation in a standard 19" equipment rack. Provide sufficient space behind the equipment racks to allow for control, signal, interconnect and power cables; and around all sides for cooling. Use all chassis mounting holes, and tighten mounting hardware securely by using the rack equipment manufacturer’s suggested torque settings.

Install equipment into racks as follows:

1. Carefully remove equipment from packing container and place each frame near the rack where it will be installed.
2. Loosen two thumbscrews on each end of the chassis front cover and move cover away from chassis. The front cover must be removed from the frame in order to gain access to mounting ears and screw holes.
3. Insert chassis frame into equipment rack and support the bottom of the chassis while mounting hardware is installed.
4. Install the bottom two chassis mounting screws.
5. Install the top two chassis mounting screws.
6. Install Rear Support Rails (Paragraph 5.2)
7. Tighten all chassis mounting screws until they are secure.

5.2 INSTALL REAR SUPPORT RAILS

Every DRS frame is shipped with a Rear Rack Rail Kit. It is essential that this kit be installed as part of the mounting procedure for the frame. Major components included with the kit are shown in Figure 5-1. Each kit consists of two rear rack rails, two rail mounting ears and four screws (not shown) to attach rails to the frame.

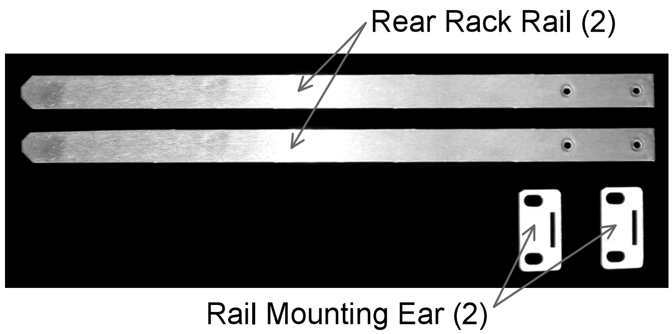


Figure 5-1 Rear Rack Rail Kit

Install the Rear Rack Rails as follows:

1. Mount DRS Chassis in equipment rack at the desired location and secure chassis into rack with four rack mounting screws (not supplied).

2. Install one Rear Rack Rail to DRS Chassis at the two Rack Rail Attachment Points using two Mounting Screws as shown in Figure 5-2.

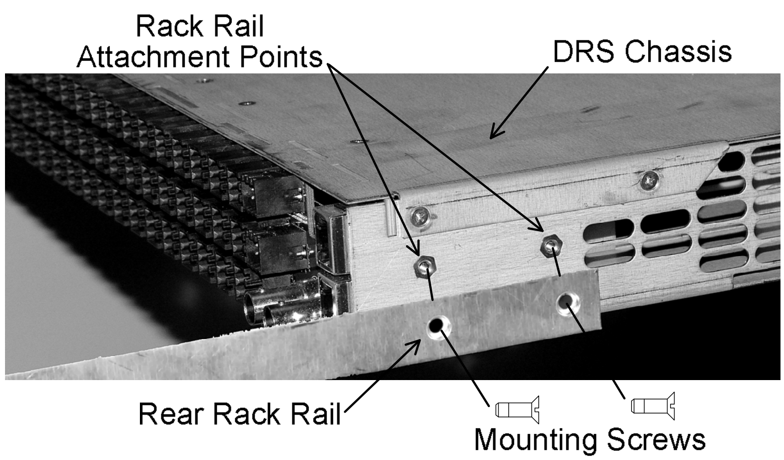


Figure 5-2 Rear Rack Rail Mounting

3. Repeat Step 2 on opposite side of Chassis using second rack rail and remaining two mounting screws.

4. Figure 5-3 shows the rear of the chassis with both rack rails installed.

Figure 5-3 Rear Rack Rails - Installed

5. Install one of the Rack Rail Mounting Ears by aligning the rectangular cutout in the mounting ear with one of the rack support rails previously installed and sliding the mounting ear onto the rail. Ensure that the two screw holes in mounting ear face to outer edge as shown in Figure 5-4

6. Secure mounting ear to rear rail of equipment rack using two rack mounting screws (not supplied) as shown in Figure 5-4. Be sure that the screw holes in the mounting ear align with screw threads in the equipment rack in such a way that the DRS chassis is level in the equipment rack from front to rear as shown in Figure 5-5.

7. Repeat Steps 5 and 6 for the remaining mounting ear and rack rail.

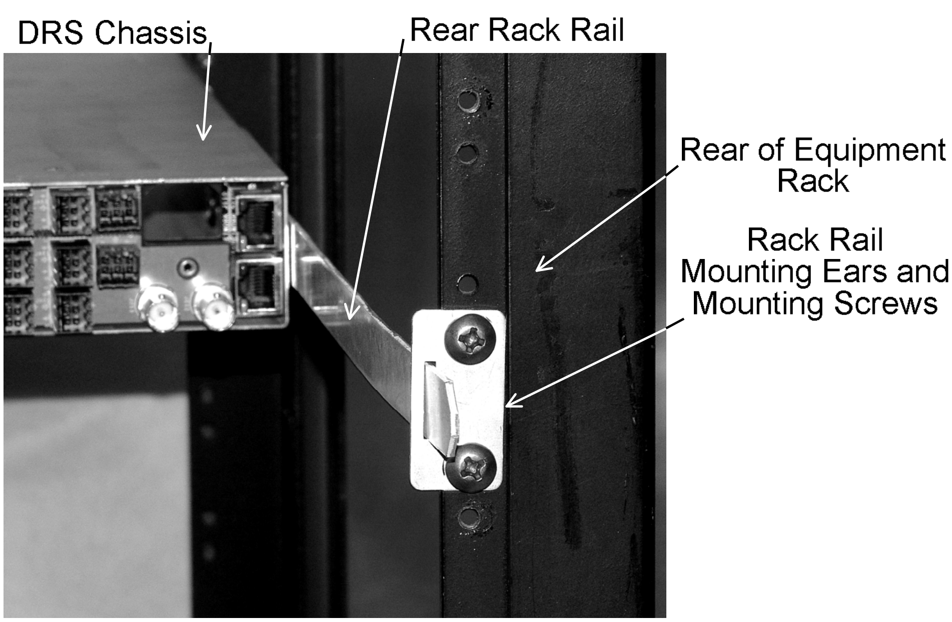


Figure 5-4 Rack Rail Mounting Ear Installation

Figure 5-5 Installed Rear Rack Support System

5.3 CONNECT EQUIPMENT CABLES

Use the following guidelines when connecting equipment cables:

Install equipment in rack before connecting cables.

Relieve strain on all cables to prevent connector separation.

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

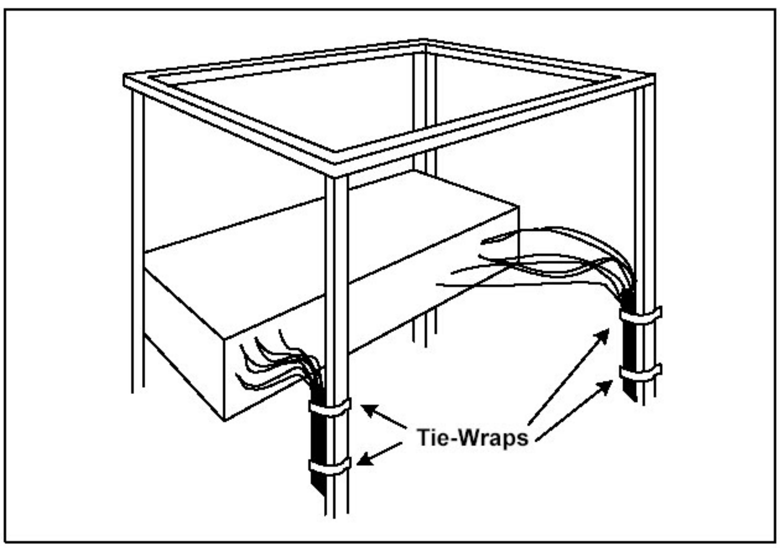


Figure 5-6 Cables Attached To Supports

Use as many cable ties as necessary to secure audio cables and CAT 5E cables to the rack, as shown in Figure 5-6. This will provide cable strain relief and help route cables away from hazardous areas. Do not use cable ties on fiber optic cable. Route cables away from physical traffic areas to avoid creating a safety hazard (trip or shock).

5.4 CONNECTION CHECKLIST

Once each DRS system frame is installed in an equipment rack, associated system connections can be completed. Order of completion of installation steps is not critical, however, DO NOT apply power to a frame until all audio signal, sync, packet audio stream, fiber optic and Ethernet network cables have been installed and their connections verified for proper placement and accuracy.

PESA recommends that you create a chart or list of signals attached to router connectors identifying the source and destination of the signal, cable number (or other identification designation) and router channel number assigned to the signal. When connecting cabling with BNC connectors, it's a good idea to make a sketch of the rear panel of every audio frame equipped with BNC I/O connectors and note cable numbers (or other identifier) attached to each I/O connector. When connecting cabling with ELCO/EDAC or 6-pin detachable connectors, PESA recommends that you make a sketch or a pin layout table for each connector identifying connector number, signal source and destination, cable numbers (or other identifier) attached to each set of I/O pins and the router channel number associated with each cable. Prepare this sketch or table **BEFORE** attaching wires to connector blocks or male mating plugs, and use it as a reference guide when performing connector assembly. **Carefully** follow connector pin-out data provided in this manual when assembling connectors to prevent inadvertent signal swapping. If at all possible, use a continuity measurement device to verify cable connections before attaching mating connectors to DRS rear panel connectors. Retain all of your sketches, cabling diagrams and connection lists, and keep it with your other DRS documentation for future reference.

Use the following guide to insure that all connections are made properly and that power, system interconnect and audio signal cables are correctly installed.

1. Connect an external sync source to the Sync Reference Input (REF) of each DXE Frame using 75 Ohm coaxial cable such as Belden 8281, or equivalent. Be sure to properly terminate external sync sources into a 75Ω load terminator.
2. If using shell connectors such as the ELCO/EDAC or Weidmuller, prepare each connector with its associated input or output audio signals using connector pin-out data provided in the following paragraphs. Installation will be much smoother if all connectors intended to mate with rear panel connectors on DRS I/O frames are pre-wired and tested. If possible, use an Ohmmeter or audible signal tracing device to verify continuity of each connection prior to attaching the external connector to the DRS system.
3. When installing cabling between various frames of the DRS system, use high quality CAT5E cable for interconnecting the packet audio stream between frames. Use high quality LC to LC duplex fiber optic cable for interconnecting DXE frames in an expanded system. Refer to Paragraph 5-8 for further information on interconnecting various frames of a complete DRS routing system.

4. You must configure each DXE frame, using the P2K GUI, for the audio frames attached to its I/O frame ports. For more information on I/O frame ports and configuration, refer to the system configuration discussion presented in Chapter 4 and the port configuration procedure beginning with Paragraph 6-9 of this manual.
5. Before the DRS system can be used to make audio switches, a configuration file must be loaded into the P2K system controller. This file is generated using the P2K GUI and contains I/O signal configuration data, level and component assignments and all operational data for the DRS audio router as well as all other switching components of the installation.

5.5 CONNECTOR PIN-OUT DATA – DEDICATED INPUT OR OUTPUT AUDIO FRAMES

Each input and output frame in a DRS system is configured with a backplane equipped with one of the connector types listed below. The type of backplane used is dependent on the type of signal connected and type of connector used in the installation. In the following paragraphs, each type of connector is illustrated and pin-out data is provided as a guide when wiring mating connectors to interconnect with the DRS frame.

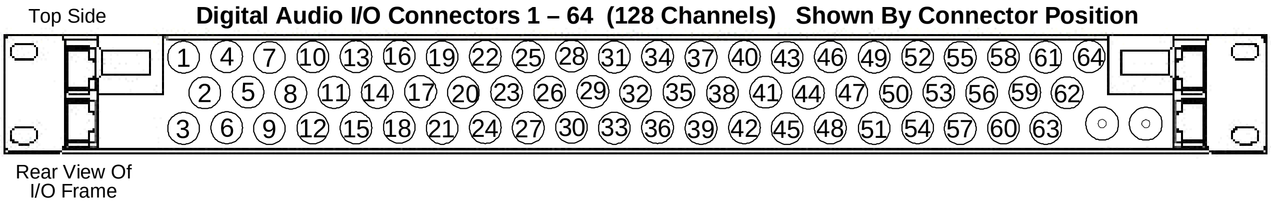
Connector Type	Signal Type
BNC Connectors	AES Unbalanced Audio, 75 Ohm
ELCO/EDAC Connector	AES Balanced Audio, 110 Ohm or Analog Balanced Audio
6-Pin Connector (Detachable - Weidmuller)	AES Balanced Audio, 110 Ohm or Analog Balanced Audio

Each AES input or output channel actually contains a pair of audio signals, therefore the full 128 channel capacity of the DRS frame is realized with 64 AES input sources or output signals. All audio frame backplanes, with the exception of the BNC backplane, provide 128 physical input connections. When connecting AES digital audio sources to the router, this equates to two physical connection points for each audio input signal. One input allows sources to be AC coupled to router inputs and the other allows sources to be DC coupled. In similar manner when connecting interface cabling to AES digital output connectors, there are two physical connection points for each audio output signal. One output allows audio signals to be AC coupled to equipment external to the router and the other output allows the signal to be DC coupled to external equipment. Pin-out charts contained in the following paragraphs identify how to connect an input source or an output signal for AC or DC coupling. In the case of the BNC backplane, all inputs and outputs are AC coupled to router circuitry.

5.5.1 BNC CONNECTOR BACKPLANE

There are 64 BNC I/O connectors on a BNC backplane; each connects to a source of unbalanced AES-compliant digital audio. Figure 5-7 illustrates a BNC backplane and identifies I/O channel layout. Carefully follow the connector layout and channel identification chart when completing connections to the DRS router to prevent inadvertent signal swapping.

NOTE	**There are 64 BNC connectors on the backplane; however, there are 128 data channels used in the configuration. Since the BNC backplane is used for connection of AES Audio sources, each input actually carries a pair of audio signals.**



BNC Connector Number	AES Digital Audio Channels	BNC Connector Number	AES Digital Audio Channels	BNC Connector Number	AES Digital Audio Channels	BNC Connector Number	AES Digital Audio Channels
1	1, 2	17	33, 34	33	65, 66	49	97, 98
2	3, 4	18	35, 36	34	67, 68	50	99, 100
3	5, 6	19	37, 38	35	69, 70	51	101, 102
4	7, 8	20	39, 40	36	71, 72	52	103, 104
5	9, 10	21	41, 42	37	73, 74	53	105, 106
6	11, 12	22	43, 44	38	75, 76	54	107, 108
7	13, 14	23	45, 46	39	77, 78	55	109, 110
8	15, 16	24	47, 48	40	79, 80	56	111, 112
9	17, 18	25	49, 50	41	81, 82	57	113, 114
10	19, 20	26	51, 52	42	83, 84	58	115, 116
11	21, 22	27	53, 54	43	85, 86	59	117, 118
12	23, 24	28	55, 56	44	87, 88	60	119, 120
13	25, 26	29	57, 58	45	89, 90	61	121, 122
14	27, 28	30	59, 60	46	91, 92	62	123, 124
15	29, 30	31	61, 62	47	93, 94	63	125, 126
16	31, 32	32	63, 64	48	95, 96	64	127, 128

Figure 5-7 BNC Backplane – Connector and I/O Channel Identification
(Viewed From Chassis Rear)

5.5.2 ELCO/EDAC CONNECTOR BACKPLANE

There are four ELCO/EDAC 120 pin connectors used on a backplane, each providing 32 input or output connections, for a total of 128 connections. Figure 5-8 illustrates the ELCO/EDAC backplane and identifies I/O connection layout. Notice that I/O connections are numbered consecutively from the left side of frame (looking from rear) to the right side. This same numbering convention holds for each individual connector, with I/O connections provided by each also beginning on the left side of the connector (viewed from the rear) and moving to the right side. Also note that the set of pins associated with the first numerical input of each connector (1, 33, 65 and 97) is located on lower left side of connector.

NOTE	**ELCO/EDAC backplanes are manufactured using EDAC Part Number 516-120-520-202 connectors from the 516 Rack and Panel Connector Series. Choose mating connectors from this series (or equivalent) that best fit your installation. Mating connectors are available in many styles from the manufacturer and may be viewed at their website: www.edac.net**

When connecting AES digital audio inputs and outputs to the router, the 128 input connections equate to two physical connection points for each digital audio signal. One input allows input sources or output signals to be AC coupled to the router and the other allows signals to be DC coupled. When connecting analog input or output signals each of the 128 input connections is used for a separate single-channel, balanced audio input or output. Detailed pin-out diagrams are provided by Figure 5-9 and Figure 5-10; and a pin identification chart is provided by Table 5-1.

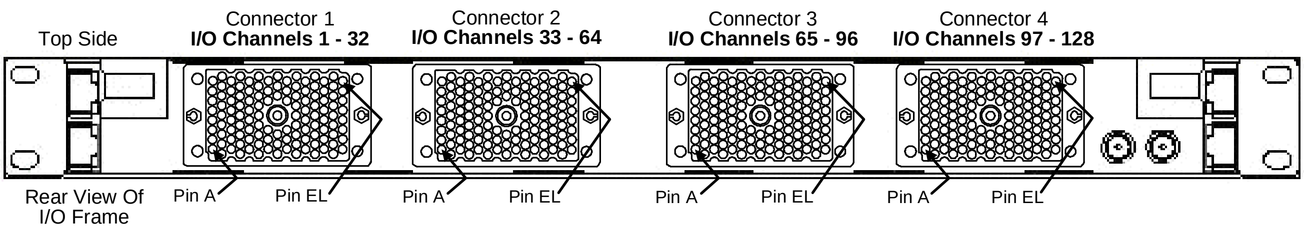


Figure 5-8 ELCO/EDAC Backplane - Connector and I/O Channel Identification
(Viewed From Chassis Rear)

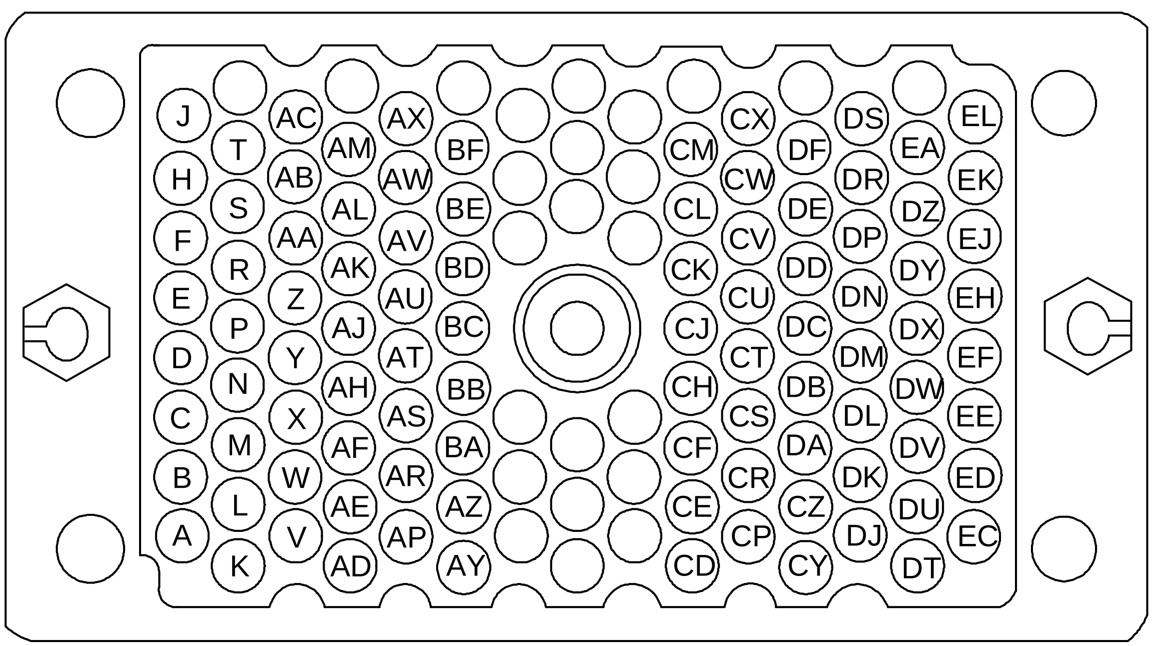


Figure 5-9 ELCO/EDAC Audio Connector Pin-Out Diagram (Refer To Table 5-1)
(Connector As Mounted On I/O Backplane, Viewed From Chassis Rear)

Table 5-1 ELCO/EDAC Audio Connector Pin-Outs

Connection Pin-Outs By Input/Output Number
for ELCO/EDAC Audio Connectors
Refer To Figures 5-8, 5-9 and 5-10 for Proper Connector Orientation
and Channel Assignments

I/O Connections 1 – 32, Rear Panel Connector 1
I/O Connections 33 – 64, Rear Panel Connector 2
I/O Connections 65 – 96, Rear Panel Connector 3
I/O Connections 97 – 128, Rear Panel Connector4

I/O Connection	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		I/O Connection	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
1, 33, 65, 97	1, 17, 33,49 AC CPLD	1, 33, 65, 97	A	K	V		17, 49, 81, 113	9, 25, 41, 57 AC CPLD	17, 49, 81, 113	CD	CP	CY
2, 34, 66, 98	1, 17, 33,49 DC CPLD	2, 34, 66, 98	B	L	W		18, 50, 82, 114	9, 25, 41, 57 DC CPLD	18, 50, 82, 114	CE	CR	CZ
3, 35, 67, 99	2, 18, 34, 50 AC CPLD	3, 35, 67, 99	C	M	X		19, 51, 83, 115	10, 26, 42, 58 AC CPLD	19, 51, 83, 115	CF	CS	DA
4, 36, 68, 100	2, 18, 34, 50 DC CPLD	4, 36, 68, 100	D	N	Y		20, 52, 84, 116	10, 26, 42, 58 DC CPLD	20, 52, 84, 116	CH	CT	DB
5, 37, 69, 101	3, 19, 35, 51 AC CPLD	5, 37, 69, 101	E	P	Z		21, 53, 85, 117	11, 27, 43, 59 AC CPLD	21, 53, 85, 117	CJ	CU	DC
6, 38, 70, 102	3, 19, 35, 51 DC CPLD	6, 38, 70, 102	F	R	AA		22, 54, 86, 118	11, 27, 43, 59 DC CPLD	22, 54, 86, 118	CK	CV	DD
7, 39, 71, 103	4, 20, 36, 52 AC CPLD	7, 39, 71, 103	H	S	AB		23, 55, 87, 119	12, 28, 44, 60 AC CPLD	23, 55, 87, 119	CL	CW	DE
8, 40, 72, 104	4, 20, 36, 52 DC CPLD	8, 40, 72, 104	J	T	AC		24, 56, 88, 120	12, 28, 44, 60 DC CPLD	24, 56, 88, 120	CM	CX	DF
9, 41, 73, 105	5, 21, 37, 53 AC CPLD	9, 41, 73, 105	AD	AP	AY		25, 57, 89, 121	13, 29, 45, 61 AC CPLD	25, 57, 89, 121	DJ	DT	EC
10, 42, 74, 106	5, 21, 37, 53 DC CPLD	10, 42, 74, 106	AE	AR	AZ		26, 58, 90, 122	13, 29, 45, 61 DC CPLD	26, 58, 90, 122	DK	DU	ED
11, 43, 75, 107	6, 22, 38, 54 AC CPLD	11, 43, 75, 107	AF	AS	BA		27, 59, 91, 123	14, 30, 46, 62 AC CPLD	27, 59, 91, 123	DL	DV	EE
12, 44, 76, 108	6, 22, 38, 54 DC CPLD	12, 44, 76, 108	AH	AT	BB		28, 60, 92, 124	14, 30, 46, 62 DC CPLD	28, 60, 92, 124	DM	DW	EF
13, 45, 77, 109	7, 23, 39, 55 AC CPLD	13, 45, 77, 109	AJ	AU	BC		29, 61, 93, 125	15, 31, 47, 63 AC CPLD	29, 61, 93, 125	DN	DX	EH
14, 46, 78, 110	7, 23, 39, 55 DC CPLD	14, 46, 78, 110	AK	AV	BD		30, 62, 94, 126	15, 31, 47, 63 DC CPLD	30, 62, 94, 126	DP	DY	EJ
15, 47, 79, 111	8, 24, 40, 56 AC CPLD	15, 47, 79, 111	AL	AW	BE		31, 63, 95, 127	16, 32, 48, 64 AC CPLD	31, 63, 95, 127	DR	DZ	EK
16, 48, 80, 112	8, 24, 40, 56 DC CPLD	16, 48, 80, 112	AM	AX	BF		32, 64, 96, 128	16, 32, 48, 64 DC CPLD	32, 64, 96, 128	DS	EA	EL

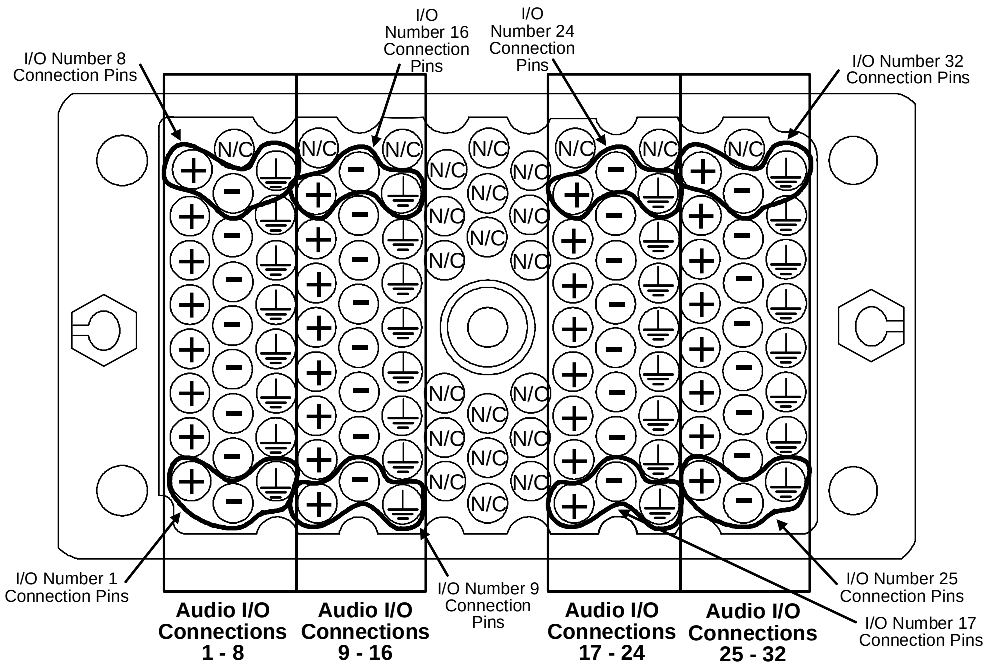


Figure 5-10 ELCO/EDAC Audio Connector I/O Channel Grouping

Wiring errors within connectors can be both frustrating and time consuming. Carefully check pin-out and I/O channel data provided here and verify proper cabling and connector hook-up BEFORE completing connection to the DRS frame.

5.5.3 6-PIN (WEIDMULLER) CONNECTOR BACKPLANE

There are 64 6-Pin I/O connectors on a 6-pin connector backplane, each connector provides 2 physical input or output connections for a total of 128 I/O connections on a backplane. Figure 5-11 illustrates the 6-pin connector backplane and identifies connector layout by "J" number. You will note from the illustration that I/O connectors are arranged in rows and columns and numbered from the left side of frame (looking from the rear) to the right side. Also note the connector column on the left hand side of the backplane (first column) and the connector column on the right hand side (last column) contain only two connectors, while all other columns contain three connectors. These connectors are labeled J1 and J2 (left side) and J63 and J64 (right side) in Figure 5-11, and are oriented 90 degrees counter-clockwise from the remaining 60 connectors on backplane. This orientation difference does not affect pin-outs or signal connections in any way, other than to note that respective mating plugs for these connectors must be rotated to proper orientation. Figure 5-11 shows in detail the orientation of backplane connectors and pin-out connections of mating plugs.

The mating plug used with the on-board connectors is a solder-less type and uses a spring clamp to securely hold input or output cable wires. Connections are made by inserting the wire end into the round receptacle on the plug. The small square hole beside each wire receptacle contains a spring release that loosens the clamp and allows the wire to be removed from its associated receptacle. To remove a wire, simply insert the blade of a small flat tip screwdriver into the release hole adjacent to the receptacle containing the wire you wish to remove, and gently pull the wire from the receptacle.

When connecting AES digital audio inputs and outputs to the router, the 128 input connections equate to two physical connection points for each digital audio signal. One input allows input sources or output signals to be AC coupled to the router and the other allows signals to be DC coupled. When connecting analog input or output signals each of the 128 input connections is used for a separate single-channel, balanced audio input or output.

Connector orientation and pin identification diagrams are provided by Figure 5-11. Figure 5-12 provides a detailed view of I/O connector numbering layout and Figure 5-13 illustrates channel I/O pin arrangement for a typical 6-pin connector. Table 5-2 is a detailed I/O channel pin-out chart.

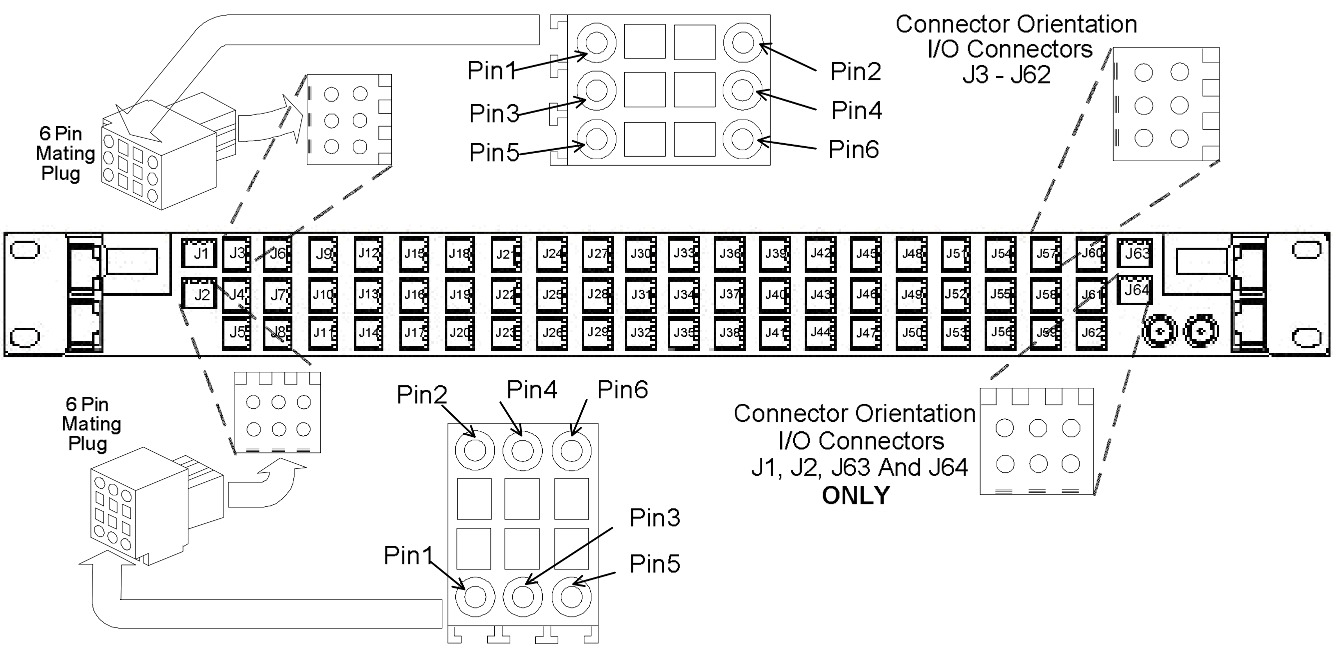


Figure 5-11 6-Pin Connector Backplane Orientation and Pin-Out Diagram

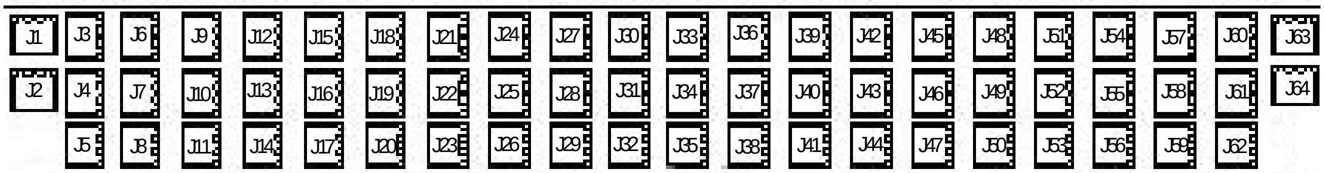


Figure 5-12 6-Pin Connector Backplane – Connector Numbering Layout

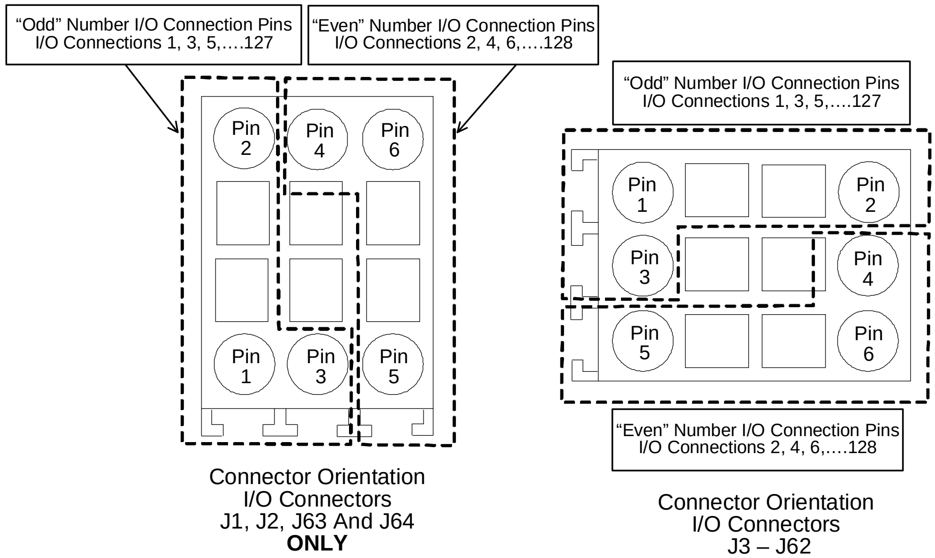


Figure 5-13 6-Pin Detachable Connector – I/O Channel Pin Grouping

Table 5-2 6-Pin Audio Connector Backplane – Channel Pin-Out Chart

Connection Pin-Outs By Input/Output Channel
for 6-Pin Detachable Audio Connectors
Refer To Figures 5-11, 5-12 and 5-13 for Proper Connector
Orientation and Channel Assignments

Backplane Connector Number	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J1	1 DC CPLD	1	1	2	3		J17	17 DC CPLD	33	1	2	3
J1	1 AC CPLD	2	5	6	4		J17	17 AC CPLD	34	5	6	4
J2	2 DC CPLD	3	1	2	3		J18	18 DC CPLD	35	1	2	3
J2	2 AC CPLD	4	5	6	4		J18	18 AC CPLD	36	5	6	4
J3	3 DC CPLD	5	1	2	3		J19	19 DC CPLD	37	1	2	3
J3	3 AC CPLD	6	5	6	4		J19	19 AC CPLD	38	5	6	4
J4	4 DC CPLD	7	1	2	3		J20	20 DC CPLD	39	1	2	3
J4	4 AC CPLD	8	5	6	4		J20	20 AC CPLD	40	5	6	4
J5	5 DC CPLD	9	1	2	3		J21	21 DC CPLD	41	1	2	3
J5	5 AC CPLD	10	5	6	4		J21	21 AC CPLD	42	5	6	4
J6	6 DC CPLD	11	1	2	3		J22	22 DC CPLD	43	1	2	3
J6	6 AC CPLD	12	5	6	4		J22	22 AC CPLD	44	5	6	4

Table 5-2 6-Pin Audio Connector Backplane – Channel Pin-Out Chart (Cont.)

Backplane Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J7	7 DC CPLD	13	1	2	3		J23	23 DC CPLD	45	1	2	3
J7	7 AC CPLD	14	5	6	4		J23	23 AC CPLD	46	5	6	4
J8	8 DC CPLD	15	1	2	3		J24	24 DC CPLD	47	1	2	3
J8	8 AC CPLD	16	5	6	4		J24	24 AC CPLD	48	5	6	4
J9	9 DC CPLD	17	1	2	3		J25	25 DC CPLD	49	1	2	3
J9	9 AC CPLD	18	5	6	4		J25	25 AC CPLD	50	5	6	4
J10	10 DC CPLD	19	1	2	3		J26	26 DC CPLD	51	1	2	3
J10	10 AC CPLD	20	5	6	4		J26	26 AC CPLD	52	5	6	4
J11	11 DC CPLD	21	1	2	3		J27	27 DC CPLD	53	1	2	3
J11	11 AC CPLD	22	5	6	4		J27	27 AC CPLD	54	5	6	4
J12	12 DC CPLD	23	1	2	3		J28	28 DC CPLD	55	1	2	3
J12	12 AC CPLD	24	5	6	4		J28	28 AC CPLD	56	5	6	4
J13	13 DC CPLD	25	1	2	3		J29	29 DC CPLD	57	1	2	3
J13	13 AC CPLD	26	5	6	4		J29	29 AC CPLD	58	5	6	4
J14	14 DC CPLD	27	1	2	3		J30	30 DC CPLD	59	1	2	3
J14	14 AC CPLD	28	5	6	4		J30	30 AC CPLD	60	5	6	4
J15	15 DC CPLD	29	1	2	3		J31	31 DC CPLD	61	1	2	3
J15	15 AC CPLD	30	5	6	4		J31	31 AC CPLD	62	5	6	4
J16	16 DC CPLD	31	1	2	3		J32	32 DC CPLD	63	1	2	3
J16	16 AC CPLD	32	5	6	4		J32	32 AC CPLD	64	5	6	4

Table 5-2 Continued on Page 5-14 for Connectors J33 – J64

Table 5-2 6-Pin Audio Connector Backplane – Channel Pin-Out Chart (Cont.)

Backplane Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J33	33 DC CPLD	65	1	2	3		J49	49 DC CPLD	97	1	2	3
J33	33 AC CPLD	66	5	6	4		J49	49 AC CPLD	98	5	6	4
J34	34 DC CPLD	67	1	2	3		J50	50 DC CPLD	99	1	2	3
J34	34 AC CPLD	68	5	6	4		J50	50 AC CPLD	100	5	6	4
J35	35 DC CPLD	69	1	2	3		J51	51 DC CPLD	101	1	2	3
J35	35 AC CPLD	70	5	6	4		J51	51 AC CPLD	102	5	6	4
J36	36 DC CPLD	71	1	2	3		J52	52 DC CPLD	103	1	2	3
J36	36 AC CPLD	72	5	6	4		J52	52 AC CPLD	104	5	6	4
J37	37 DC CPLD	73	1	2	3		J53	53 DC CPLD	105	1	2	3
J37	37 AC CPLD	74	5	6	4		J53	53 AC CPLD	106	5	6	4
J38	38 DC CPLD	75	1	2	3		J54	54 DC CPLD	107	1	2	3
J38	38 AC CPLD	76	5	6	4		J54	54 AC CPLD	108	5	6	4
J39	39 DC CPLD	77	1	2	3		J55	55 DC CPLD	109	1	2	3
J39	39 AC CPLD	78	5	6	4		J55	55 AC CPLD	110	5	6	4
J40	40 DC CPLD	79	1	2	3		J56	56 DC CPLD	111	1	2	3
J40	40 AC CPLD	80	5	6	4		J56	56 AC CPLD	112	5	6	4
J41	41 DC CPLD	81	1	2	3		J57	57 DC CPLD	113	1	2	3
J41	41 AC CPLD	82	5	6	4		J57	57 AC CPLD	114	5	6	4
J42	42 DC CPLD	83	1	2	3		J58	58 DC CPLD	115	1	2	3
J42	42 AC CPLD	84	5	6	4		J58	58 AC CPLD	116	5	6	4
J43	43 DC CPLD	85	1	2	3		J59	59 DC CPLD	117	1	2	3
J43	43 AC CPLD	86	5	6	4		J59	59 AC CPLD	118	5	6	4
J44	44 DC CPLD	87	1	2	3		J60	60 DC CPLD	119	1	2	3
J44	44 AC CPLD	88	5	6	4		J60	60 AC CPLD	120	5	6	4

Table 5-2 6-Pin Audio Connector Backplane – Channel Pin-Out Chart (Cont.)

Backplane Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J45	45 DC CPLD	89	1	2	3		J61	61 DC CPLD	121	1	2	3
J45	45 AC CPLD	90	5	6	4		J61	61 AC CPLD	122	5	6	4
J46	46 DC CPLD	91	1	2	3		J62	62 DC CPLD	123	1	2	3
J46	46 AC CPLD	92	5	6	4		J62	62 AC CPLD	124	5	6	4
J47	47 DC CPLD	93	1	2	3		J63	63 DC CPLD	125	1	2	3
J47	47 AC CPLD	94	5	6	4		J63	63 AC CPLD	126	5	6	4
J48	48 DC CPLD	95	1	2	3		J64	64 DC CPLD	127	1	2	3
J48	48 AC CPLD	96	5	6	4		J64	64 AC CPLD	128	5	6	4

5.6 CONNECTOR PIN-OUT DATA – SPLIT INPUT OR OUTPUT AUDIO FRAMES

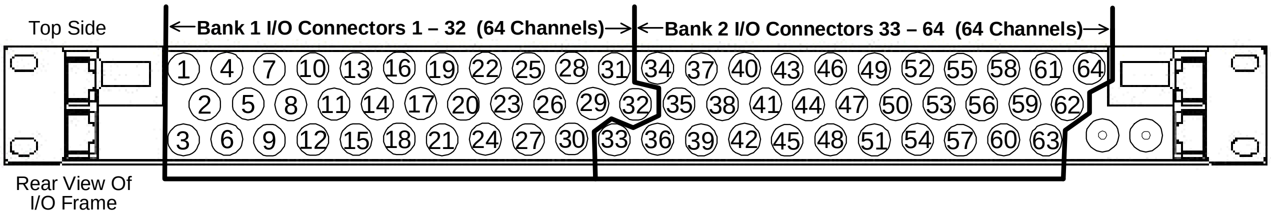
Split frames, regardless of connector mix, are configured as two blocks of 64 input or output channels, with connectors for each channel block, referred to as a connector bank. Connectors may be all of the same type, such as two banks of BNCs, or may be a mix of BNC and either ELCO/EDAC or 6-pin detachable. Connectors available for split frames are the same as those used with dedicated frames and are compatible with the signal types identified in paragraph 3.2.

Connector population for a split frame backplane is dependent on the type of signals connected and type of connectors used in the installation. In the following paragraphs, each backplane variant is illustrated and pin-out data is provided as a guide when wiring mating connectors to interconnect with the DRS frame. Split frames are available where both connector banks are inputs or outputs; or where one bank is for input signals and the other is for output signals. Each split frame backplane is shipped from the factory with a rear panel label identifying each connector bank as input connections or output connections. Regardless of whether the connector bank is used for input signals or output signals, the connector pin-outs and channel number assignments presented in the following paragraphs are the same.

5.6.1 SPLIT FRAME BNC CONNECTOR BACKPLANE

There are 64 BNC I/O connectors on the split frame BNC backplane, divided into two banks of 32 connectors, each of which connects to a source of unbalanced AES-compliant digital audio. Figure 5-14 illustrates a split frame BNC backplane and identifies I/O channel layout. Carefully follow the connector layout and channel identification chart when completing connections to the DRS router to prevent inadvertent signal swapping.

NOTE	There are 32 BNC connectors for each connector bank on the backplane; however, there are 64 data channels used in the configuration. Since BNC connectors are used for connection of AES Audio sources, each input actually carries a pair of audio signals.



Split Frame BNC Connectors 1 – 64, Shown By Channel Bank And Connector Position

Bank 1 BNC Connector Number	AES I/O Channels		Bank 1 BNC Connector Number	AES I/O Channels
1	1, 2		17	33, 34
2	3, 4		18	35, 36
3	5, 6		19	37, 38
4	7, 8		20	39, 40
5	9, 10		21	41, 42
6	11, 12		22	43, 44
7	13, 14		23	45, 46
8	15, 16		24	47, 48
9	17, 18		25	49, 50
10	19, 20		26	51, 52
11	21, 22		27	53, 54
12	23, 24		28	55, 56
13	25, 26		29	57, 58
14	27, 28		30	59, 60
15	29, 30		31	61, 62
16	31, 32		32	63, 64

Bank 2 BNC Connector Number	AES I/O Channels		Bank 2 BNC Connector Number	AES I/O Channels
33	1, 2		49	33, 34
34	3, 4		50	35, 36
35	5, 6		51	37, 38
36	7, 8		52	39, 40
37	9, 10		53	41, 42
38	11, 12		54	43, 44
39	13, 14		55	45, 46
40	15, 16		56	47, 48
41	17, 18		57	49, 50
42	19, 20		58	51, 52
43	21, 22		59	53, 54
44	23, 24		60	55, 56
45	25, 26		61	57, 58
46	27, 28		62	59, 60
47	29, 30		63	61, 62
48	31, 32		64	63, 64

Figure 5-14 BNC Backplane – Connector and I/O Channel Identification
(Viewed From Chassis Rear)

5.6.2 SPLIT FRAME ELCO/EDAC CONNECTOR BACKPLANE

There are four ELCO/EDAC 120 pin connectors on the split frame backplane, divided into two banks of two connectors, each providing 32 input or output connections, for a total of 64 connections per bank. Figure 5-15 illustrates the split frame ELCO/EDAC backplane and identifies I/O connection layout. I/O connections are numbered consecutively from the left side of each connector (looking from rear) to the right side. Connector pins associated with the first numerical input of each connector (1 or 33) are located on lower left side of connector.

NOTE	**ELCO/EDAC backplanes are manufactured using EDAC Part Number 516-120-520-202 connectors from the 516 Rack and Panel Connector Series. Choose mating connectors from this series (or equivalent) that best fit your installation. Mating connectors are available in many styles from the manufacturer and may be viewed at their website: www.edac.net**

When connecting AES digital audio inputs and outputs to the router, the 64 input connections of each bank equate to two physical connection points for each digital audio signal. One input allows input sources or output signals to be AC coupled to the router and the other allows signals to be DC coupled. When connecting analog input or output signals each of the 64 input connections is used for a separate single-channel, balanced audio input or output. Detailed pin-out diagrams are provided by Figure 5-9 and Figure 5-10; and a pin identification chart is provided by Table 5-3.

Carefully follow connector pin-out data provided by Table 5-3 when assembling connector blocks to prevent inadvertent signal swapping. If at all possible, use a continuity measurement device to verify cable connections before attaching mating connectors to DRS rear panel connectors.

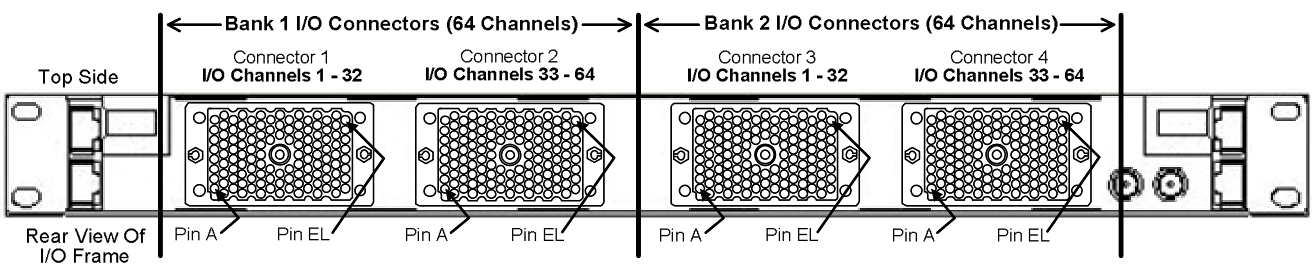


Figure 5-15 Split Frame ELCO/EDAC Backplane - Connector and I/O Channel Identification
(Viewed From Chassis Rear)

TABLE 5-3 ELCO/EDAC Split Frame Audio Connector Pin-Outs

Connection Pin-Outs By Connector Bank and Input/Output Number
for ELCO/EDAC Audio Connectors
Refer To Figures 5-9, 5-10 and 5-15 for Proper Connector Orientation
and Channel Assignments

Bank 1 I/O Connections 1 – 32, Rear Panel Connector 1
Bank 1 I/O Connections 33 – 64, Rear Panel Connector 2

Bank 2 I/O Connections 1 – 32, Rear Panel Connector 3
Bank 2 I/O Connections 33 – 64, Rear Panel Connector 4

I/O Connection	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		I/O Connection	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
1, 33	1, 17 AC CPLD	1, 33	A	K	V		17, 49	9, 25 AC CPLD	17, 49	CD	CP	CY
2, 34	1, 17 DC CPLD	2, 34	B	L	W		18, 50	9, 25 DC CPLD	18, 50	CE	CR	CZ
3, 35	2, 18 AC CPLD	3, 35	C	M	X		19, 51	10, 26 AC CPLD	19, 51	CF	CS	DA
4, 36	2, 18 DC CPLD	4, 36	D	N	Y		20, 52	10, 26 DC CPLD	20, 52	CH	CT	DB
5, 37	3, 19 AC CPLD	5, 37	E	P	Z		21, 53	11, 27 AC CPLD	21, 53	CJ	CU	DC
6, 38	3, 19 DC CPLD	6, 38	F	R	AA		22, 54	11, 27 DC CPLD	22, 54	CK	CV	DD
7, 39	4, 20 AC CPLD	7, 39	H	S	AB		23, 55	12, 28 AC CPLD	23, 55	CL	CW	DE
8, 40	4, 20 DC CPLD	8, 40	J	T	AC		24, 56	12, 28 DC CPLD	24, 56	CM	CX	DF
9, 41	5, 21 AC CPLD	9, 41	AD	AP	AY		25, 57	13, 29 AC CPLD	25, 57	DJ	DT	EC
10, 42	5, 21 DC CPLD	10, 42	AE	AR	AZ		26, 58	13, 29 DC CPLD	26, 58	DK	DU	ED
11, 43	6, 22 AC CPLD	11, 43	AF	AS	BA		27, 59	14, 30 AC CPLD	27, 59	DL	DV	EE
12, 44	6, 22 DC CPLD	12, 44	AH	AT	BB		28, 60	14, 30 DC CPLD	28, 60	DM	DW	EF
13, 45	7, 23 AC CPLD	13, 45	AJ	AU	BC		29, 61	15, 31 AC CPLD	29, 61	DN	DX	EH
14, 46	7, 23 DC CPLD	14, 46	AK	AV	BD		30, 62	15, 31 DC CPLD	30, 62	DP	DY	EJ
15, 47	8, 24 AC CPLD	15, 47	AL	AW	BE		31, 63	16, 32 AC CPLD	31, 63	DR	DZ	EK
16, 48	8, 24 DC CPLD	16, 48	AM	AX	BF		32, 64	16, 32 DC CPLD	32, 64	DS	EA	EL

Wiring errors within connectors can be both frustrating and time consuming. Carefully check pin-out and I/O channel data provided here and verify proper cabling and connector hook-up BEFORE completing connection to the DRS frame.

5.6.3 SPLIT FRAME 6-PIN (WEIDMULLER) CONNECTOR BACKPLANE

There are 64 6-Pin I/O connectors on a backplane, divided into two banks of 32 connectors per bank, each of which provides 2 physical input or output connections for a total of 64 I/O connections per bank. Figure 5-16 illustrates the split frame 6-pin connector backplane and identifies connector layout by "J" number.

The mating plug used with the on-board connectors is a solder-less type and uses a spring clamp to securely hold input or output cable wires. Connections are made by inserting the wire end into the round receptacle on the plug. The small square hole beside each wire receptacle contains a spring release that loosens the clamp and allows the wire to be removed from its associated receptacle. To remove a wire, simply insert the blade of a small flat tip screwdriver into the release hole adjacent to the receptacle containing the wire you wish to remove, and gently pull the wire from the receptacle.

When connecting AES digital audio inputs and outputs to the router, the 64 input connections of each bank equate to two physical connection points for each digital audio signal. One input allows input sources or output signals to be AC coupled to the router and the other allows signals to be DC coupled. When connecting analog input or output signals each of the 64 input connections is used for a separate single-channel, balanced audio input or output.

Carefully follow connector pin-out data provided in this text when assembling male mating plug connectors to prevent inadvertent signal swapping. If at all possible, use a continuity measurement device to verify cable connections before attaching mating connectors to DRS rear panel connectors.

Connector orientation and pin identification diagrams are provided by Figure 5-11. Figure 5-16 provides a detailed view of I/O connector numbering layout for the split backplane and Figure 5-13 illustrates channel I/O pin arrangement for a typical 6-pin connector. Table 5-4 is a detailed I/O channel pin-out chart.

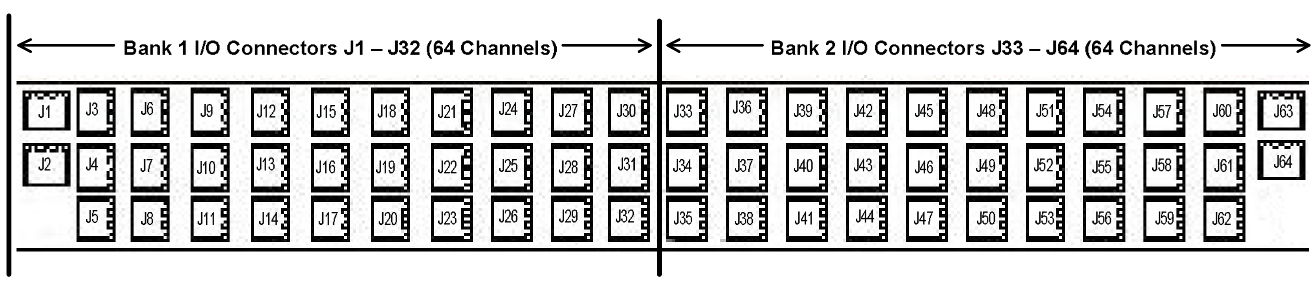


Figure 5-16 6-Pin Connector Split Backplane – Connector Numbering Layout

Table 5-4 6-Pin Detachable Split Frame Backplane – Connector Pin-Out Chart

Pin-Outs By Connector Bank and Input/Output Channel
Refer To Figures 5-11, 5-13 for Connector Pin Diagrams
and Figure 5-16 for Backplane Layout and Channel Assignments

Backplane Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J1 / J33	1 DC CPLD	1	1	2	3		J17 / J49	17 DC CPLD	33	1	2	3
J1 / J33	1 AC CPLD	2	5	6	4		J17 / J49	17 AC CPLD	34	5	6	4
J2 / J34	2 DC CPLD	3	1	2	3		J18 / J50	18 DC CPLD	35	1	2	3
J2 / J34	2 AC CPLD	4	5	6	4		J18 / J50	18 AC CPLD	36	5	6	4
J3 / J35	3 DC CPLD	5	1	2	3		J19 / J51	19 DC CPLD	37	1	2	3
J3 / J35	3 AC CPLD	6	5	6	4		J19 / J51	19 AC CPLD	38	5	6	4
J4 / J36	4 DC CPLD	7	1	2	3		J20 / J52	20 DC CPLD	39	1	2	3
J4 / J36	4 AC CPLD	8	5	6	4		J20 / J52	20 AC CPLD	40	5	6	4
J5 / J37	5 DC CPLD	9	1	2	3		J21 / J53	21 DC CPLD	41	1	2	3
J5 / J37	5 AC CPLD	10	5	6	4		J21 / J53	21 AC CPLD	42	5	6	4
J6 / J38	6 DC CPLD	11	1	2	3		J22 / J54	22 DC CPLD	43	1	2	3
J6 / J38	6 AC CPLD	12	5	6	4		J22 / J54	22 AC CPLD	44	5	6	4
J7 / J39	7 DC CPLD	13	1	2	3		J23 / J55	23 DC CPLD	45	1	2	3
J7 / J39	7 AC CPLD	14	5	6	4		J23 / J55	23 AC CPLD	46	5	6	4
J8 / J40	8 DC CPLD	15	1	2	3		J24 / J56	24 DC CPLD	47	1	2	3
J8 / J40	8 AC CPLD	16	5	6	4		J24 / J56	24 AC CPLD	48	5	6	4
J9 / J41	9 DC CPLD	17	1	2	3		J25 / J57	25 DC CPLD	49	1	2	3
J9 / J41	9 AC CPLD	18	5	6	4		J25 / J57	25 AC CPLD	50	5	6	4
J10 / J42	10 DC CPLD	19	1	2	3		J26 / J58	26 DC CPLD	51	1	2	3
J10 / J42	10 AC CPLD	20	5	6	4		J26 / J58	26 AC CPLD	52	5	6	4
J11 / J43	11 DC CPLD	21	1	2	3		J27 / J59	27 DC CPLD	53	1	2	3
J11 / J43	11 AC CPLD	22	5	6	4		J27 / J59	27 AC CPLD	54	5	6	4

Table 5-4 6-Pin Detachable Split Frame Backplane – Connector Pin-Out Chart (Cont.)

Backplane Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J12 / J44	12 DC CPLD	23	1	2	3		J28 / J60	28 DC CPLD	55	1	2	3
J12 / J44	12 AC CPLD	24	5	6	4		J28 / J60	28 AC CPLD	56	5	6	4
J13 / J45	13 DC CPLD	25	1	2	3		J29 / J61	29 DC CPLD	57	1	2	3
J13 / J45	13 AC CPLD	26	5	6	4		J29 / J61	29 AC CPLD	58	5	6	4
J14 / J46	14 DC CPLD	27	1	2	3		J30 / J62	30 DC CPLD	59	1	2	3
J14 / J46	14 AC CPLD	28	5	6	4		J30 / J62	30 AC CPLD	60	5	6	4
J15 / J47	15 DC CPLD	29	1	2	3		J31 / J63	31 DC CPLD	61	1	2	3
J15 / J47	15 AC CPLD	30	5	6	4		J31 / J63	31 AC CPLD	62	5	6	4
J16 / J48	16 DC CPLD	31	1	2	3		J32 / J64	32 DC CPLD	63	1	2	3
J16 / J48	16 AC CPLD	32	5	6	4		J32 / J64	32 AC CPLD	64	5	6	4

5.6.4 SPLIT FRAME MIXED ELCO/EDAC AND BNC CONNECTOR BACKPLANE

There are two ELCO/EDAC I/O connectors and 32 BNC I/O connectors on the mixed backplane, divided into two banks of 64 channels. Figure 5-17 illustrates the mixed backplane and identifies I/O connector layout. Carefully follow the connector layout and channel identification when completing connections to the DRS router to prevent inadvertent signal swapping.

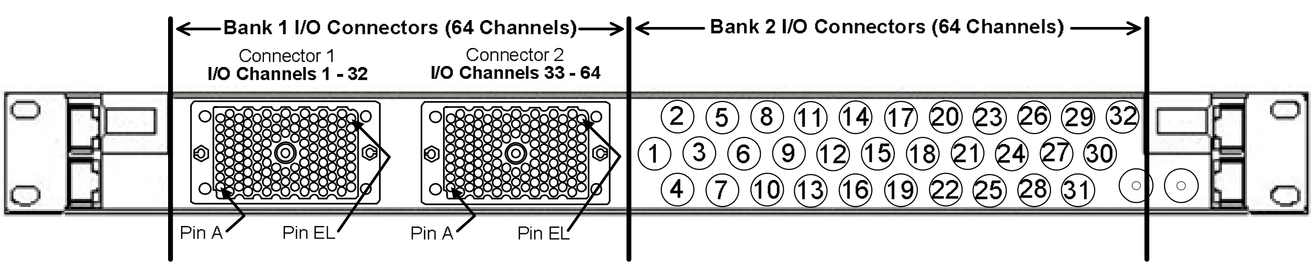


Figure 5-17 Split Frame Mixed ELCO/EDAC and BNC Connectors Shown By Channel Bank and Connector Position

ELCO/EDAC Connector Wiring

Figure 5-17 illustrates the mixed backplane and identifies I/O connection layout. The bank 1 ELCO/EDAC connectors follow the same pin-outs and channel numbering as bank 1 connectors 1 and 2 provided in Table 5-3.

NOTE	**ELCO/EDAC backplanes are manufactured using EDAC Part Number 516-120-520-202 connectors from the 516 Rack and Panel Connector Series. Choose mating connectors from this series (or equivalent) that best fit your installation. Mating connectors are available in many styles from the manufacturer and may be viewed at their website: www.edac.net**

When connecting AES digital audio inputs and outputs to the router, the 64 input connections of each bank equate to two physical connection points for each digital audio signal. One input allows input sources or output signals to be AC coupled to the router and the other allows signals to be DC coupled. When connecting analog input or output signals each of the 64 input connections is used for a separate single-channel, balanced audio input or output. Detailed pin-out diagrams are provided by Figure 5-9 and Figure 5-10.

Carefully follow connector pin-out data provided by Table 5-3 when assembling connector blocks to prevent inadvertent signal swapping. If at all possible, use a continuity measurement device to verify cable connections before attaching mating connectors to DRS rear panel connectors.

BNC Connector Cabling

Follow the connector layout diagram, Figure 5-17, and the channel assignment chart, Table 5-5, when attaching cables to the BNC connectors on the mixed backplane.

NOTE	**There are 32 BNC connectors for connector bank 2 on the mixed backplane, however, there are 64 data channels used in the configuration. Since BNC connectors are used for connection of AES Audio sources, each input actually carries a pair of audio signals.**

Table 5-5 Bank 2 BNC Connector Channel Assignments

Bank 2 BNC Connector Number	**AES Digital** Audio Channels		**Bank 2 BNC Connector Number**	**AES Digital** Audio Channels
1	1, 2		17	33, 34
2	3, 4		18	35, 36
3	5, 6		19	37, 38
4	7, 8		20	39, 40
5	9, 10		21	41, 42
6	11, 12		22	43, 44
7	13, 14		23	45, 46
8	15, 16		24	47, 48
9	17, 18		25	49, 50
10	19, 20		26	51, 52
11	21, 22		27	53, 54
12	23, 24		28	55, 56
13	25, 26		29	57, 58
14	27, 28		30	59, 60
15	29, 30		31	61, 62
16	31, 32		32	63, 64

5.6.5 SPLIT FRAME MIXED 6-PIN DETACHABLE AND BNC CONNECTOR BACKPLANE

There are 32 6-pin detachable I/O connectors and 32 BNC I/O connectors on the mixed backplane, divided into two banks of 64 channels. Figure 5-18 illustrates the mixed backplane and identifies I/O channel layout. Carefully follow the connector layout and channel identification when completing connections to the DRS router to prevent inadvertent signal swapping.

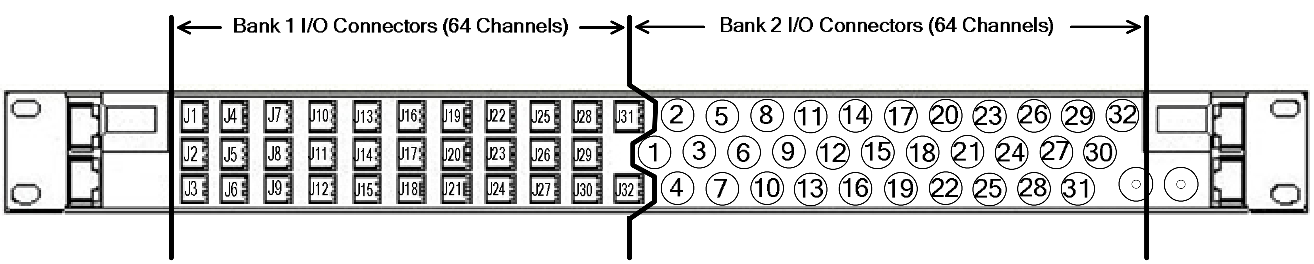


Figure 5-18 Split Frame Mixed 6-Pin and BNC Connectors Shown By Channel Bank and Connector Position

6-Pin Detachable Connector Wiring

Figure 5-18 illustrates the mixed backplane and identifies connector layout by “J” number. The bank 1 6-pin detachable connectors follow the same pin-outs and channel numbering as bank 1 connectors J1 thru J32 provided in Table 5-4.

The mating plug used with the on-board connectors is a solder-less type and uses a spring clamp to securely hold input or output cable wires. Connections are made by inserting the wire end into the round receptacle on the plug. The small square hole beside each wire receptacle contains a spring release that loosens the clamp and allows the wire to be removed from its associated receptacle. To remove a wire, simply insert the blade of a small flat tip screwdriver into the release hole adjacent to the receptacle containing the wire you wish to remove, and gently pull the wire from the receptacle.

When connecting AES digital audio inputs and outputs to the router, the 64 input connections equate to two physical connection points for each digital audio signal. One input allows input sources or output signals to be AC coupled to the router and the other allows signals to be DC coupled. When connecting analog input or output signals each of the 64 input connections is used for a separate single-channel, balanced audio input or output.

Carefully follow connector pin-out data provided in this text when assembling male mating plug connectors to prevent inadvertent signal swapping. If at all possible, use a continuity measurement device to verify cable connections before attaching mating connectors to DRS rear panel connectors.

Connector orientation and pin identification diagrams are provided by Figure 5-11. Figure 5-18 provides a detailed view of I/O connector numbering layout for the mixed backplane and Figure 5-13 illustrates channel I/O pin arrangement for a typical 6-pin connector. Table 5-4 is a detailed I/O channel pin-out chart.

BNC Connector Cabling

Follow the connector layout diagram, Figure 5-18, and the channel assignment chart, Table 5-5, when attaching cables to the BNC connectors on the mixed backplane.

NOTE	**There are 32 BNC connectors for connector bank 2 on the mixed backplane, however, there are 64 data channels used in the configuration. Since BNC connectors are used for connection of AES Audio sources, each input actually carries a pair of audio signals.**

5.7 CONNECTOR PIN-OUT DATA – TIME CODE FRAMES

Time code frames, regardless of connector type, are configured as a single, dedicated input or output block of 64 physical input or output channels. Each time code channel is routed as two signals, so 64 physical inputs equate to 128 routing signals; and therefore the single, dedicated block fills the capacity of the frame and the DXE port to which it is attached. Time code frames may be fitted with any of the connector-type backplanes used for dedicated audio frames; however, connection pin-outs for the ELCO/EDAC and 6-pin detachable connector backplanes are different than with audio signals.

DRS backplanes, with the exception of the BNC backplane, provide 128 physical input connections, only 64 of which are used with a time code input or output frame. Both single-ended and differential time code sources may be connected to a router with ELCCO/EDAC or 6-pin detachable connector backplanes. Pin-out charts contained in the following paragraphs identify how to connect input sources and output channels for single-ended or differential hook-up schemes. In the case of a BNC backplane, all inputs and outputs are connected as single-ended sources.

5.7.1 BNC Connector Backplane for Time Code

There are 64 BNC I/O connectors on a BNC backplane; each connects to a source of single-ended time code. BNC backplane I/O channel layout for time code is identical to the audio layout as shown in Figure 5-7. Carefully follow the connector layout and channel identification chart when completing time code connections to the DRS router to prevent inadvertent signal swapping.

5.7.2 ELCO/EDAC Connector Backplane for Time Code

There are four ELCO/EDAC 120 pin connectors used on a backplane, each providing 16 input or output time code connections, for a total of 64 connections. Figure 5-19 illustrates the ELCO/EDAC backplane for time code signals and identifies I/O connection layout. Notice that I/O connections are numbered consecutively from the left side of frame (looking from rear) to the right side. This same numbering convention holds for each individual connector, with I/O connections provided by each also beginning on the left side of the connector (viewed from the rear) and moving to the right side. Also note that the set of pins associated with the first numerical input of each connector (1, 33, 65 and 97) is located on lower left side of connector.

NOTE	**ELCO/EDAC backplanes are manufactured using EDAC Part Number 516-120-520-202 connectors from the 516 Rack and Panel Connector Series. Choose mating connectors from this series (or equivalent) that best fit your installation. Mating connectors are available in many styles from the manufacturer and may be viewed at their website: www.edac.net**

When connecting time code inputs and outputs to the router, the 64 connections may be single-ended or differential. Detailed pin-out diagrams are provided by Figure 5-9 and Figure 5-10; and a pin identification chart is provided by Table 5-6.

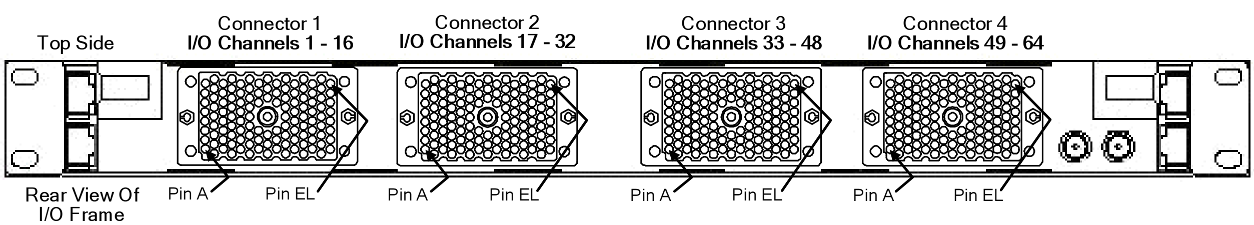


Figure 5-19 ELCO/EDAC Time Code Backplane - Connector and I/O Channel Identification
(Viewed From Chassis Rear)

Table 5-6 ELCO/EDAC Time Code Connector Pin-Outs

Connection Pin-Outs By Input/Output Number
for ELCO/EDAC Time Code Connectors
Refer To Figures 5-19, 5-9 and 5-10 for Proper Connector Orientation
and Channel Assignments

Time Code I/O Connections 1 – 16, Rear Panel Connector 1
Time Code I/O Connections 17 – 32, Rear Panel Connector 2
Time Code I/O Connections 33 – 48, Rear Panel Connector 3
Time Code I/O Connections 49 – 64, Rear Panel Connector 4

I/O Connection	Time Code Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		I/O Connection	Time Code Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
1, 17, 33, 49	1, 17, 33,49 SINGLE-ENDED	A		V		9, 25, 41, 57	9, 25, 41, 57 SINGLE-ENDED	CD		CY
1,17, 33, 49	1, 17, 33,49 DIFFERENTIAL	A	K	V		9, 25, 41, 57	9, 25, 41, 57 DIFFERENTIAL	CD	CP	CY
2, 18, 34, 50	2, 18, 34, 50 SINGLE-ENDED	C		X		10, 26, 42, 58	10, 26, 42, 58 SINGLE-ENDED	CF		DA
2, 18, 34, 50	2, 18, 34, 50 DIFFERENTIAL	C	M	X		10, 26, 42, 58	10, 26, 42, 58 DIFFERENTIAL	CF	CS	DA
3, 19, 35, 51	3, 19, 35, 51 SINGLE-ENDED	E		Z		11, 27, 43, 59	11, 27, 43, 59 SINGLE-ENDED	CJ		DC
3, 19, 35, 51	3, 19, 35, 51 DIFFERENTIAL	E	P	Z		11, 27, 43, 59	11, 27, 43, 59 DIFFERENTIAL	CJ	CU	DC
4, 20, 36, 52	4, 20, 36, 52 SINGLE-ENDED	H		AB		12, 28, 44, 60	12, 28, 44, 60 SINGLE-ENDED	CL		DE
4, 20, 36, 52	4, 20, 36, 52 DIFFERENTIAL	H	S	AB		12, 28, 44, 60	12, 28, 44, 60 DIFFERENTIAL	CL	CW	DE
5, 21, 37, 53	5, 21, 37, 53 SINGLE-ENDED	AD		AY		13, 29, 45, 61	13, 29, 45, 61 SINGLE-ENDED	DJ		EC
5, 21, 37, 53	5, 21, 37, 53 DIFFERENTIAL	AD	AP	AY		13, 29, 45, 61	13, 29, 45, 61 DIFFERENTIAL	DJ	DT	EC
6, 22, 38, 54	6, 22, 38, 54 SINGLE-ENDED	AF		BA		14, 30, 46, 62	14, 30, 46, 62 SINGLE-ENDED	DL		EE
6, 22, 38, 54	6, 22, 38, 54 DIFFERENTIAL	AF	AS	BA		14, 30, 46, 62	14, 30, 46, 62 DIFFERENTIAL	DL	DV	EE
7, 23, 39, 55	7, 23, 39, 55 SINGLE-ENDED	AJ		BC		15, 31, 47, 63	15, 31, 47, 63 SINGLE-ENDED	DN		EH
7, 23, 39, 55	7, 23, 39, 55 DIFFERENTIAL	AJ	AU	BC		15, 31, 47, 63	15, 31, 47, 63 DIFFERENTIAL	DN	DX	EH
8, 24, 40, 56	8, 24, 40, 56 SINGLE-ENDED	AL		BE		16, 32, 48, 64	16, 32, 48, 64 SINGLE-ENDED	DR		EK
8, 24, 40, 56	8, 24, 40, 56 DIFFERENTIAL	AL	AW	BE		16, 32, 48, 64	16, 32, 48, 64 DIFFERENTIAL	DR	DZ	EK

5.7.3 6-PIN (WEIDMULLER) CONNECTOR BACKPLANE FOR TIME CODE

There are 64 6-Pin I/O connectors on a 6-pin connector backplane, each connector provides both single-ended or differential connections for a single time code signal for a total of 64 time code I/O connections on a backplane. Figure 5-11 illustrates a typical 6-pin connector backplane and identifies connector layout by "J" number. You will note from the illustration that I/O connectors are arranged in rows and columns and numbered from the left side of frame (looking from the rear) to the right side. Also note the connector column on the left hand side of the backplane (first column) and the connector column on the right hand side (last column) contain only two connectors, while all other columns contain three connectors. These connectors are labeled J1 and J2 (left side) and J63 and J64 (right side) in Figure 5-11, and are oriented 90 degrees counter-clockwise from the remaining 60 connectors on backplane. This orientation difference does not affect pin-outs or signal connections in any way, other than to note that respective mating plugs for these connectors must be rotated to proper orientation. Figure 5-11 shows in detail the orientation of backplane connectors and pin-out connections of mating plugs.

The mating plug used with the on-board connectors is a solder-less type and uses a spring clamp to securely hold input or output cable wires. Connections are made by inserting the wire end into the round receptacle on the plug. The small square hole beside each wire receptacle contains a spring release that loosens the clamp and allows the wire to be removed from its associated receptacle. To remove a wire, simply insert the blade of a small flat tip screwdriver into the release hole adjacent to the receptacle containing the wire you wish to remove, and gently pull the wire from the receptacle.

When connecting time code inputs and outputs to the router, the 64 connections may be single-ended or differential. Connector orientation and pin identification diagrams are provided by Figure 5-11. Figure 5-12 provides a detailed view of I/O connector numbering layout and Figure 5-13 illustrates channel I/O pin arrangement for a typical 6-pin connector. Table 5-7 is a detailed I/O channel pin-out chart for time code signal connection.

Table 5-7 6-Pin Connector Backplane for Time Code – Channel Pin-Out Chart

Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J1	1 SINGLE-ENDED	5		3		J17	17 SINGLE-ENDED	5		3
J1	1 DIFFERENTIAL	5	6	3		J17	17 DIFFERENTIAL	5	6	3
J2	2 SINGLE-ENDED	5		3		J18	18 SINGLE-ENDED	5		3
J2	2 DIFFERENTIAL	5	6	3		J18	18 DIFFERENTIAL	5	6	3
J3	3 SINGLE-ENDED	5		3		J19	19 SINGLE-ENDED	5		3
J3	3 DIFFERENTIAL	5	6	3		J19	19 DIFFERENTIAL	5	6	3
J4	4 SINGLE-ENDED	5		3		J20	20 SINGLE-ENDED	5		3
J4	4 DIFFERENTIAL	5	6	3		J20	20 DIFFERENTIAL	5	6	3

Table 5-7 6-Pin Connector Backplane for Time Code – Channel Pin-Out Chart (Cont.)

Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J5	5 SINGLE-ENDED	5		3		J21	21 SINGLE-ENDED	5		3
J5	5 DIFFERENTIAL	5	6	3		J21	21 DIFFERENTIAL	5	6	3
J6	6 SINGLE-ENDED	5		3		J22	22 SINGLE-ENDED	5		3
J6	6 DIFFERENTIAL	5	6	3		J22	22 DIFFERENTIAL	5	6	3
J7	7 SINGLE-ENDED	5		3		J23	23 SINGLE-ENDED	5		3
J7	7 DIFFERENTIAL	5	6	3		J23	23 DIFFERENTIAL	5	6	3
J8	8 SINGLE-ENDED	5		3		J24	24 SINGLE-ENDED	5		3
J8	8 DIFFERENTIAL	5	6	3		J24	24 DIFFERENTIAL	5	6	3
J9	9 SINGLE-ENDED	5		3		J25	25 SINGLE-ENDED	5		3
J9	9 DIFFERENTIAL	5	6	3		J25	25 DIFFERENTIAL	5	6	3
J10	10 SINGLE-ENDED	5		3		J26	26 SINGLE-ENDED	5		3
J10	10 DIFFERENTIAL	5	6	3		J26	26 DIFFERENTIAL	5	6	3
J11	11 SINGLE-ENDED	5		3		J27	27 SINGLE-ENDED	5		3
J11	11 DIFFERENTIAL	5	6	3		J27	27 DIFFERENTIAL	5	6	3
J12	12 SINGLE-ENDED	5		3		J28	28 SINGLE-ENDED	5		3
J12	12 DIFFERENTIAL	5	6	3		J28	28 DIFFERENTIAL	5	6	3
J13	13 SINGLE-ENDED	5		3		J29	29 SINGLE-ENDED	5		3
J13	13 DIFFERENTIAL	5	6	3		J29	29 DIFFERENTIAL	5	6	3
J14	14 SINGLE-ENDED	5		3		J30	30 SINGLE-ENDED	5		3
J14	14 DIFFERENTIAL	5	6	3		J30	30 DIFFERENTIAL	5	6	3
J15	15 SINGLE-ENDED	5		3		J31	31 SINGLE-ENDED	5		3
J15	15 DIFFERENTIAL	5	6	3		J31	31 DIFFERENTIAL	5	6	3
J16	16 SINGLE-ENDED	5		3		J32	32 SINGLE-ENDED	5		3
J16	16 DIFFERENTIAL	5	6	3		J32	32 DIFFERENTIAL	5	6	3

Table 5-8 Continued on Page 5-29 for Connectors J33 – J64

Table 5-7 6-Pin Connector Backplane for Time Code – Channel Pin-Out Chart (Cont.)

Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J33	33 SINGLE-ENDED	5		3		J49	49 SINGLE-ENDED	5		3
J33	33 DIFFERENTIAL	5	6	3		J49	49 DIFFERENTIAL	5	6	3
J34	34 SINGLE-ENDED	5		3		J50	50 SINGLE-ENDED	5		3
J34	34 DIFFERENTIAL	5	6	3		J50	50 DIFFERENTIAL	5	6	3
J35	35 SINGLE-ENDED	5		3		J51	51 SINGLE-ENDED	5		3
J35	35 DIFFERENTIAL	5	6	3		J51	51 DIFFERENTIAL	5	6	3
J36	36 SINGLE-ENDED	5		3		J52	52 SINGLE-ENDED	5		3
J36	36 DIFFERENTIAL	5	6	3		J52	52 DIFFERENTIAL	5	6	3
J37	37 SINGLE-ENDED	5		3		J53	53 SINGLE-ENDED	5		3
J37	37 DIFFERENTIAL	5	6	3		J53	53 DIFFERENTIAL	5	6	3
J38	38 SINGLE-ENDED	5		3		J54	54 SINGLE-ENDED	5		3
J38	38 DIFFERENTIAL	5	6	3		J54	54 DIFFERENTIAL	5	6	3
J39	39 SINGLE-ENDED	5		3		J55	55 SINGLE-ENDED	5		3
J39	39 DIFFERENTIAL	5	6	3		J55	55 DIFFERENTIAL	5	6	3
J40	40 SINGLE-ENDED	5		3		J56	56 SINGLE-ENDED	5		3
J40	40 DIFFERENTIAL	5	6	3		J56	56 DIFFERENTIAL	5	6	3
J41	41 SINGLE-ENDED	5		3		J57	57 SINGLE-ENDED	5		3
J41	41 DIFFERENTIAL	5	6	3		J57	57 DIFFERENTIAL	5	6	3
J42	42 SINGLE-ENDED	5		3		J58	58 SINGLE-ENDED	5		3
J42	42 DIFFERENTIAL	5	6	3		J58	58 DIFFERENTIAL	5	6	3
J43	43 SINGLE-ENDED	5		3		J59	59 SINGLE-ENDED	5		3
J43	43 DIFFERENTIAL	5	6	3		J59	59 DIFFERENTIAL	5	6	3
J44	44 SINGLE-ENDED	5		3		J60	60 SINGLE-ENDED	5		3
J44	44 DIFFERENTIAL	5	6	3		J60	60 DIFFERENTIAL	5	6	3
J45	45 SINGLE-ENDED	5		3		J61	61 SINGLE-ENDED	5		3
J45	45 DIFFERENTIAL	5	6	3		J61	61 DIFFERENTIAL	5	6	3

Table 5-7 6-Pin Connector Backplane for Time Code – Channel Pin-Out Chart (Cont.)

Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Backplane Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J46	46 SINGLE-ENDED	5		3		J62	62 SINGLE-ENDED	5		3
J46	46 DIFFERENTIAL	5	6	3		J62	62 DIFFERENTIAL	5	6	3
J47	47 SINGLE-ENDED	5		3		J63	63 SINGLE-ENDED	5		3
J47	47 DIFFERENTIAL	5	6	3		J63	63 DIFFERENTIAL	5	6	3
J48	48 SINGLE-ENDED	5		3		J64	64 SINGLE-ENDED	5		3
J48	48 DIFFERENTIAL	5	6	3		J64	64 DIFFERENTIAL	5	6	3

5.8 DRS INTERCONNECT CABLES

System interconnects for Packet Audio Stream (PAS) Bus connections between frames and Ethernet connections for system control are made using common CAT5E cable and RJ-45 connectors. Two types of Ethernet cables are commonly available: those that are “straight-thru” pin-for-pin and “crossover” cables that have transmit leads (TX+ and TX-) and receive leads (RX+ and RX-) exchanged between the two connector ends according to a specified pin-out standard. All DRS connections, both PAS and Ethernet, can use either type of cable. Auto-detect circuitry determines the type of cable used and makes proper internal connections accordingly. This operation is totally transparent and requires no operator input or action.

Pre-assembled Ethernet cables, in various lengths, with connectors attached are readily available from a number of sources. In some installations it may be necessary, due to routing requirements or other constraints, to run bulk cable and attach connectors once the cable is in place. PESA recommends that, unless you have training in proper crimping techniques and the necessary equipment, you purchase pre-assembled cables if at all possible for your installation

If you do choose to make your own interconnect cables, always use the very best quality cable and connectors available, use a good crimping tool and follow proper technique when installing connector ends to the cable run. **AN IMPROPERLY INSTALLED CONNECTOR END CAN SERIOUSLY DEGRADE PERFORMANCE OF THE DRS SYSTEM.** The installer should be aware that there is no real “standard” color-coding convention for wiring an Ethernet cable; in fact as of this writing, several coding schemes exist. For the sake of consistency, PESA recommends that you wire all cables as pin-for-pin “straight-thru” (no TX/RX crossover) using the EIA/TIA 568B "standard" color code scheme shown in Figure 5-20. Pin numbering for a standard RJ-45 connector is also provided in Figure 5-20 for reference.

RJ-45 Connector Pin Number	Wire Color
1	White/Orange
2	Orange
3	White/Green
4	Blue
5	White/Blue
6	Green
7	White/Brown
8	Brown

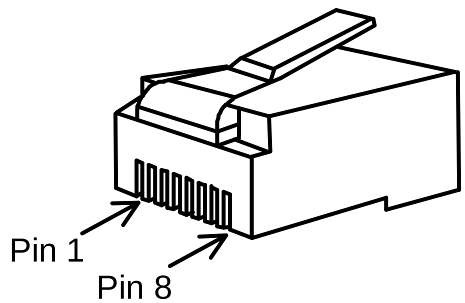


Figure 5-20 EIA 568B Color Code for Ethernet Cable and RJ-45 Pin-Out Diagram

5.9 INTRA-SYSTEM CABLING AND CONNECTIONS

Chapter 4 of this manual took a rather in-depth look at various DRS system installations; from a simple three box 128X128 system using two audio frames and one DXE frame to a fully expanded 2048X2048 system using four DXE frames and their associated audio frames. From the simplest to the most complex system, each installation requires some degree of intra-system cabling between the various frames comprising the DRS router. The number and type of intra-system cables will vary by system and depends on the number of audio frames, number of DXE frames and whether or not system redundancy is incorporated. Regardless of the number and length of cables ultimately used for configuration, there are three types of intra-system connections possible for a DRS installation: Packet Audio Stream, DXE Fiber Optic Links (if used) and P2K System Controller Interface. Each connection type is identified and discussed in the following paragraphs.

5.9.1 PACKET AUDIO STREAM

Data “packets” are routed between frames over the Packet Audio Stream connections. When installing packet audio stream cable, there are really very few constraints on routing and placement. You will obtain best performance and highest signal integrity by using a high quality CAT5E cable for interconnection. Plan your installation by determining the location of audio frames and use the shortest, most direct path possible for running cables between frames. Be sure that the RJ-45 connector on each cable end is properly wired per pin-out or wire color code and that the connector is securely attached to the cable wires. If possible use an Ohmmeter or other signal tracing device to verify continuity of interconnecting cables before installing them to DRS frames.

NOTE	**DO NOT CONNECT THE PACKET AUDIO STREAM CONNECTORS TO AN ETHERNET NETWORK!!** **Even though the Packet Audio Stream connections are made using RJ-45 connectors and CAT5E cable, they SHOULD NOT be made through the facility LAN. The packet audio bus operating parameters require dedicated, point-to-point connections, and WILL NOT function over a network!!**

128X128 Systems To configure a basic 128X128 router, install the Packet Audio Stream cable between audio frames and the DXE as shown in Figure 5-21. Packet Audio Stream connectors are located on the left and right side of the audio frame chassis rear panel, and are the lower of the pair of RJ-45 connectors. When connecting a single DXE (non-redundant) system, connect the Primary PAS Bus Connector on both the input and output frames to the DXE Frame Port connectors.

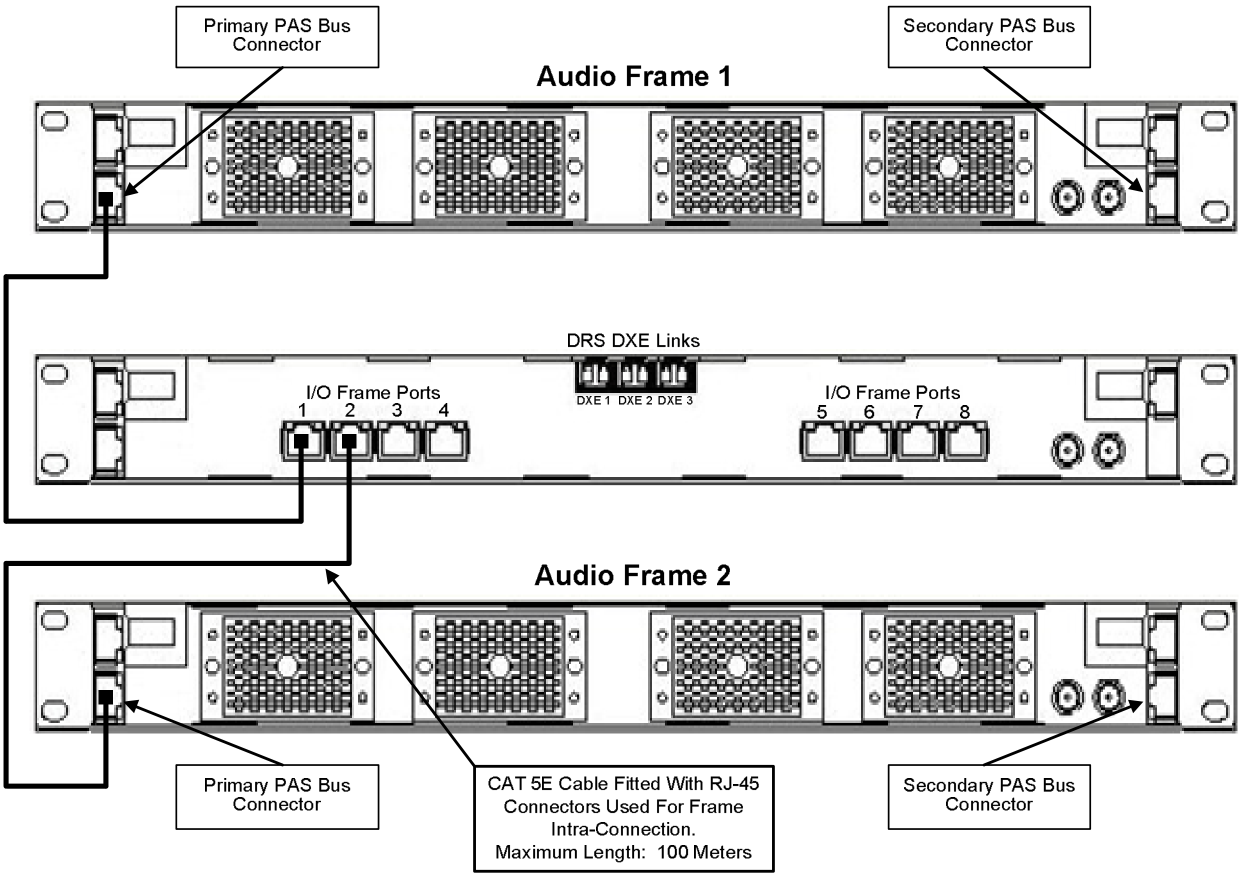


Figure 5-21 Packet Audio Stream Connection (Non-Redundant PAS Bus)

In addition to completing installation of the PAS bus cables between audio frames and the DXE, we must also configure the DXE I/O frame ports for the type of audio frame connected to each. In the hook-up scenario of Figure 5-20, audio frames 1 and 2 could be dedicated input or output, or split frames with various combinations of I/O capability possible. We use the GUI application of the P2K System Controller to configure each I/O port. A discussion of the port configuration procedure is provided in Chapter 6, beginning with Paragraph 6-9. Remember, all active I/O ports on all DXE frames must be configured through the GUI.

If PAS bus redundancy is desired, the installation requires a second DXE frame. In this installation use the PAS Bus connectors identified as Primary DXE to interconnect packet audio stream cables from input and output frames to the Primary DXE frame as shown in Figure 5-22, and the Secondary DXE connectors to form the second PAS bus with the Redundant DXE frame. This installation provides full packet audio bus redundancy. Should cables from either the input or output frame to the primary DXE become disconnected or data become unavailable or unusable for whatever reason, the redundant DXE, and the secondary bus, will immediately become the primary bus and keep the packet audio stream intact between the input and output frame, with no signal interruption. Figure 5-22 illustrates a redundant PAS bus system. Use this figure as a guide for installation of cables.

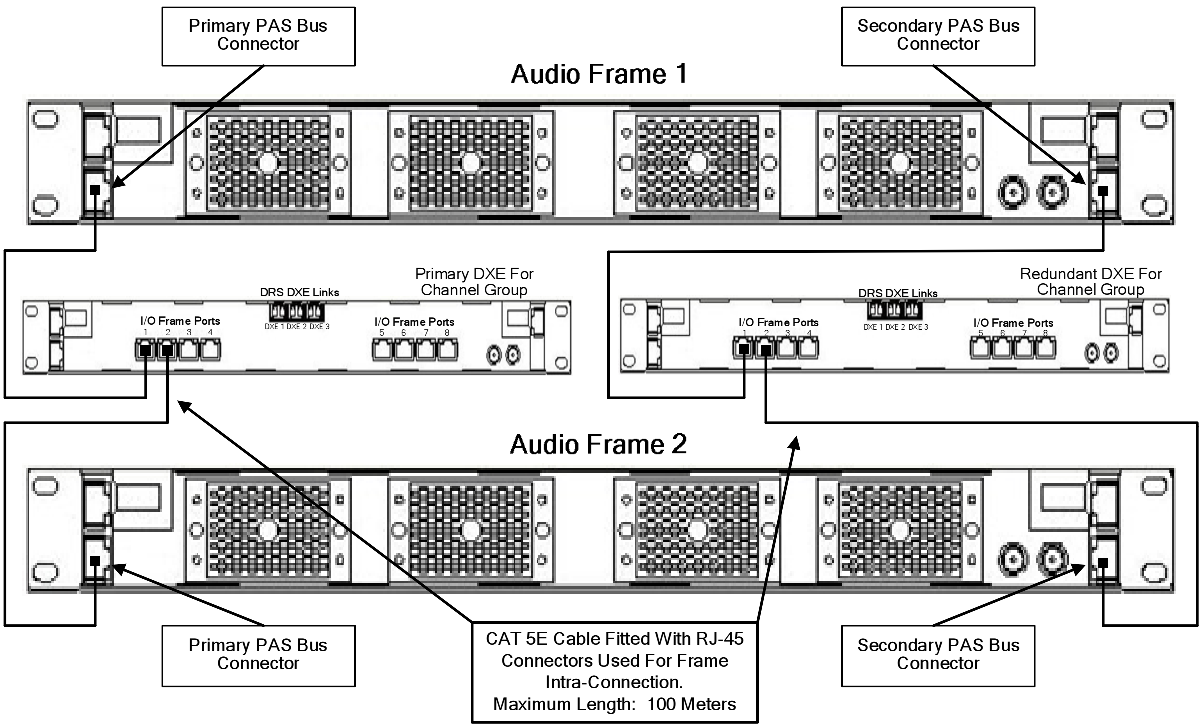


Figure 5-22 Packet Audio Stream Connection (Redundant PAS Bus)

<u>**Expanded Systems**</u> To configure an expanded system using one or more DXE frames, each audio frame must be connected to a DXE. Figure 5-23 illustrates cabling for an expanded system using eight audio frames and a single DXE. Just as in a 128X128 installation, the packet audio stream from each audio frame must be interconnected with the DXE in numerical sequence with its audio channel blocks.

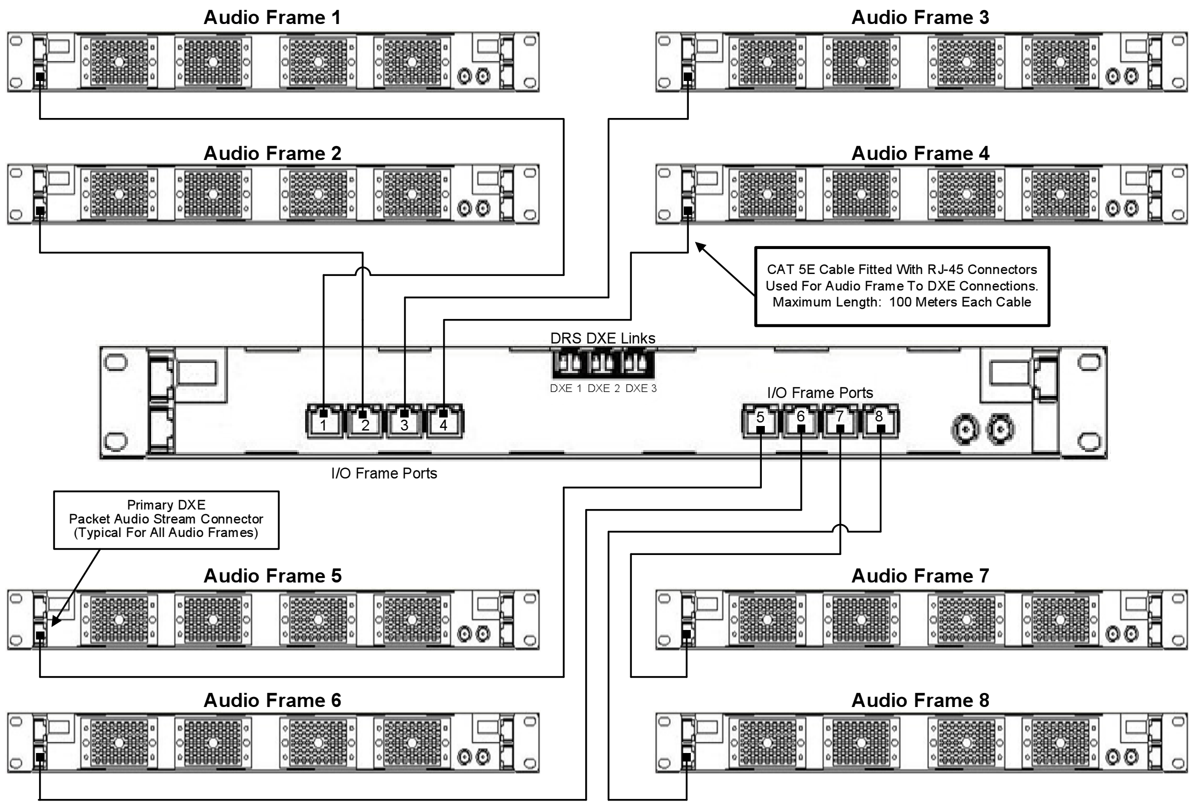


Figure 5-23 Packet Audio Stream Connections - Audio Frames To DXE Frame

5.9.2 DXE FIBER OPTIC LINKS

When multiple DXE frames are used in an expanded system, all of the frames must be interconnected using an optical cabling method analogous to the “star” networking topology. There are a few constraints on connecting and routing the optical cables. You will obtain best performance and highest signal integrity by using high quality fiber optic cable for interconnection. Plan your installation by determining the location of the DXE frames and use the shortest, most direct path possible for running optical cables between frames.

You will find it very helpful in installing and working with any fiber optic system to take time to familiarize yourself with some basic knowledge of optical data transmission principles and fiber optic cable characteristics. It is not the intent of this manual to provide a tutorial on optical data systems; however, to insure the best DRS router installation possible there are a few points in dealing with optical cable that should be discussed:

1. Duplex fiber optic cable with a type LC connector on each end is required for connection of DXE frames. Duplex cable actually consists of two separate optical conductors in each run of cable. Since light is not bi-directional, two conductors are required for a two-way communication system: one conductor is the transmit cable, the other is the receive cable. The two conductors attach to DXE rear panel receptacle connectors.

NOTE	**The Transmit Port from one DXE MUST connect to the receive Port of another DXE. In order to accomplish this, each duplex cable MUST be configured as "Cross-Over."**

2. Fiber optic cable, like any other cable, is available in bulk spools of varying lengths without connectors attached. Be aware that some degree of specialized training, skill and equipment is required when installing connectors on the ends of fiber optic cable or splicing two cable ends together. In some installations it may be necessary, due to routing requirements or other constraints, to run bulk cable and attach connectors once the cable is in place. For easier and quicker installation, pre-assembled fiber optic cables, in various lengths, with connectors attached are readily available from a number of sources. PESA highly recommends that, unless you have training in working with optical cable and the necessary equipment, you purchase pre-assembled cables if at all possible for your installation. If using pre-assembled cabling is not feasible for your installation, consider procuring the services of a trained fiber technician, certified for fiber terminations, to install connectors and verify cable continuity before proceeding with DXE interconnection.

3. One final point on dealing with optical cable - be sure that the optical connectors are clean and dust free. Each end of a fiber cable connection is fitted with a small lens to direct the light source. Dust, even small amounts, can greatly degrade performance of an optical data transmission system. Always keep dust caps on cable connector ends and optical receptacle connectors when cables are not attached. NEVER touch the end of the optical connector or receptacle with your bare skin. Grease and dirt, even minute amounts, can seriously degrade performance of the optics.

The dual conductors of fiber optic cable are usually attached to a connector equipped with two fiber-end lenses, one for each conductor. This assembly mates to rear panel DXE Link receptacles on the DXE simply by inserting the connector end into its mating receptacle with very slight pressure. A snap latch secures the end into the receptacle. To remove cable-end connector from a rear panel receptacle, gently press the latch tab and pull cable from receptacle. Immediately replace dust caps on the end of each fiber cable conductor and the DXE connector receptacle.

Multiple DXE frames must be interconnected to one another in a numerical sequence through the DRS DXE Links connectors, labeled DXE 1 thru DXE 3, located along the top edge of each DXE rear panel. DXE frames are interconnected with one another in a manner whereby each frame has a direct connection with every other frame. Proper interconnection of a full capacity system is illustrated in Figure 5-24. Table 5-8 is a hook-up chart providing quick reference for determining proper DXE to DXE frame connection.

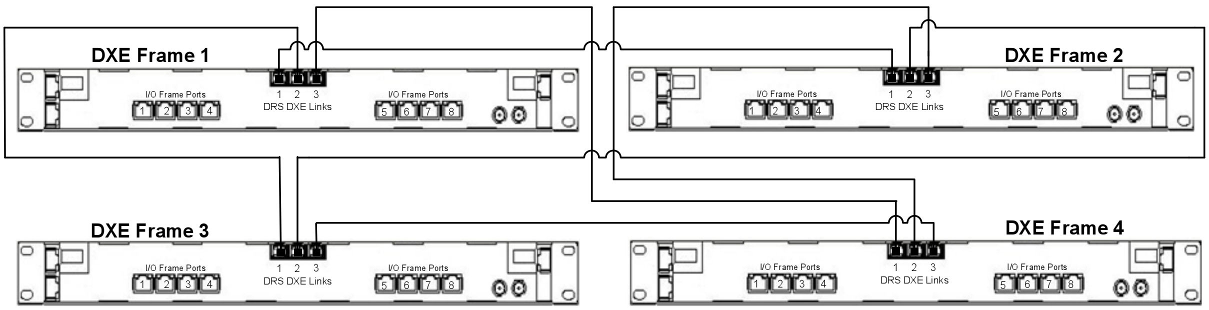


Figure 5-24 Multiple DXE Fiber Optic Links - Cable Interconnect Diagram

Table 5-8 DXE Frame Interconnection Chart

System Frame	Rear Panel DRS DXE Link 1 Connects To -	Rear Panel DRS DXE Link 2 Connects To -	Rear Panel DRS DXE Link 3 Connects To -
DXE Frame 1	DXE Frame 2 – DXE Link 1	DXE Frame 3 – DXE Link 1	DXE Frame 4 – DXE Link 1
DXE Frame 2	DXE Frame 1 – DXE Link 1	DXE Frame 3 – DXE Link 2	DXE Frame 4 – DXE Link 2
DXE Frame 3	DXE Frame 1 – DXE Link 2	DXE Frame 2 – DXE Link 2	DXE Frame 4 – DXE Link 3
DXE Frame 4	DXE Frame 1 – DXE Link 3	DXE Frame 2 – DXE Link 3	DXE Frame 3 – DXE Link 3

Interconnecting between the proper DXE Link Connectors on each frame is critical for proper system operation. Use the references discussed above when installing fiber interconnect cables to insure that all cables are attached to the proper connectors. The system will not function properly and troubleshooting could be a tedious task if these connections are not made correctly.

In planning your installation, consider carefully the placement of DXE frames and how to route and dress optical cabling between all frames. As with any wiring effort, using a chart or sketch greatly simplifies final hook-up once all optical cables are in place. Make notes of cable numbers (or other identifiers) and the name and number of the rear panel connector to which each cable is attached. Always retain any installation data for future use should system troubleshooting ever be necessary.

NOTE	**Dust, even small amounts, can greatly degrade performance of an optical data transmission system. Always keep the dust caps on the cable connector ends and the optical receptacle connectors when the cables are not attached. NEVER touch the end of the optical connector or receptacle with your bare skin. Grease and dirt, even minute amounts, can seriously degrade performance of the optics.**

5.9.3 PERC2000 SYSTEM CONTROLLER INTERFACE

As discussed in previous chapters and sections of this manual, the control system for a DRS router consists of the P1K Controller circuitry co-resident on a Power Supply/PERC1000 Controller Module, and the P2K System Controller located external to the DRS router. It is not the intent of this manual to provide a detailed tutorial of the P2K circuit card assembly (CCA) or software. The P2K has its own technical manual and other documentation, and the user of this equipment is referred to that documentation for additional information. However, for purposes of installing the DRS router the user needs to have a good basic understanding of the controller system components, their function and possible physical locations. There are also some cabling considerations to the controller interface that must be addressed. These topics are briefly introduced and discussed in the following paragraphs.

P2K is the name given collectively to the system controller CCA, its associated board-resident firmware and a graphical user interface (GUI) application that resides and runs on a Microsoft Windows™ based PC platform. Consider the System Controller to be the master overseer of the entire router system. This master overseer can not only control the DRS system but can also simultaneously control other PESA routers or switchers, such as a Cheetah Video Matrix Switcher, which may be attached to it. The system controller CCA circuitry communicates bi-directionally with the Frame Controller circuitry over a standard 10/100 Ethernet link, and issues control and operating commands to each frame controller in the system. The Frame Controller circuitry orchestrates system commands for the router under its control. In terms of a router/switcher installation, where, for example, audio is routed by a Cheetah DRS System and video is routed by a Cheetah Video Matrix Switcher, the Frame Controller for the DRS system (P1K) receives commands from the System Controller (P2K) and is responsible for executing these commands on the system it is controlling – in this example the audio router. Likewise, a separate frame controller is contained in the Video Matrix Switcher. It receives commands from the same P2K System Controller, but it is responsible for executing the commands of the system controller on the video matrix and has nothing whatsoever to do with controlling the audio router. It is the job of the System Controller to keep the entire system running as it is programmed to do. The system controller provides programming functions and interface functions to various types of control panels which may be used by facility operators to control operation of the entire switching system.

From the previous discussion, we see that every DRS system must have the components of the P2K System Controller interfacing with the components of the P1K Frame Controller for operation of the router. There are two very distinct ways that the P2K circuitry can be accessed for the DRS router:

1. In some installations, the P2K CCA(s) will be mounted in a stand-alone rack frame with a power supply and the necessary external connectors. Only one P2K CCA is required for any system, however, a second CCA may be installed in the rack frame to provide full system redundancy in the event one of the CCAs should have a failure.

2. Cheetah Video Matrix Switcher frames are designed to house the P2K System Controller CCA(s) internal to the switcher. Slots are provided in the matrix frame for up to two P2K CCAs. Only one is required for system operation, but two may be used for system redundancy, if desired. A 10/100 Ethernet connector on the video switcher rear panel allows the P2K to connect to the facility LAN.

For true redundant system operation, not only are two System Controller CCAs required, but two Frame Controllers (P1K) are also required. If two P2K CCAs are used for system redundancy, there are actually two totally separate 10/100 Ethernet Links for system control. One link interfaces to each of the Frame Controllers. One of the links becomes the “primary” data link and the second becomes the “secondary” data link. Should either one have a failure – the remaining functional link becomes the “primary” regardless of its previous status.

P1K frame controller circuitry interfaces to P2K system controller circuitry over a 10/100 Ethernet link. If the stand-alone rack frame P2K is used, the Ethernet cable from the DRS Frame Controller Module connects to one of the RJ-45 connectors on the rear of the P2K rack unit. If the facility is also using a Cheetah Video Matrix Switcher and chooses to mount the System Controller CCA(s) in the matrix frame, then the Ethernet cable from the DRS Frame Controller Module connects to one of the “System Controller” RJ-45 connectors on the rear panel of the matrix switcher. If two P2K CCAs are used for redundancy, at least two P1K Frame Controller modules will be used in the DRS system. One will function as the “primary” controller and the other as the “secondary.” Should either one fail, the remaining functional bus continues to control the system.

Control Cabling for 128X128 Systems In a basic 128X128 router the P1K frame controller circuitry is contained in the DXE frame of the system. One module or two may be used in the chassis frame. If one module is used, the router contains only a “primary” control bus and the Ethernet cable from the frame controller connects to the facility LAN through an external Ethernet switch. This configuration is illustrated in Figure 5-25.

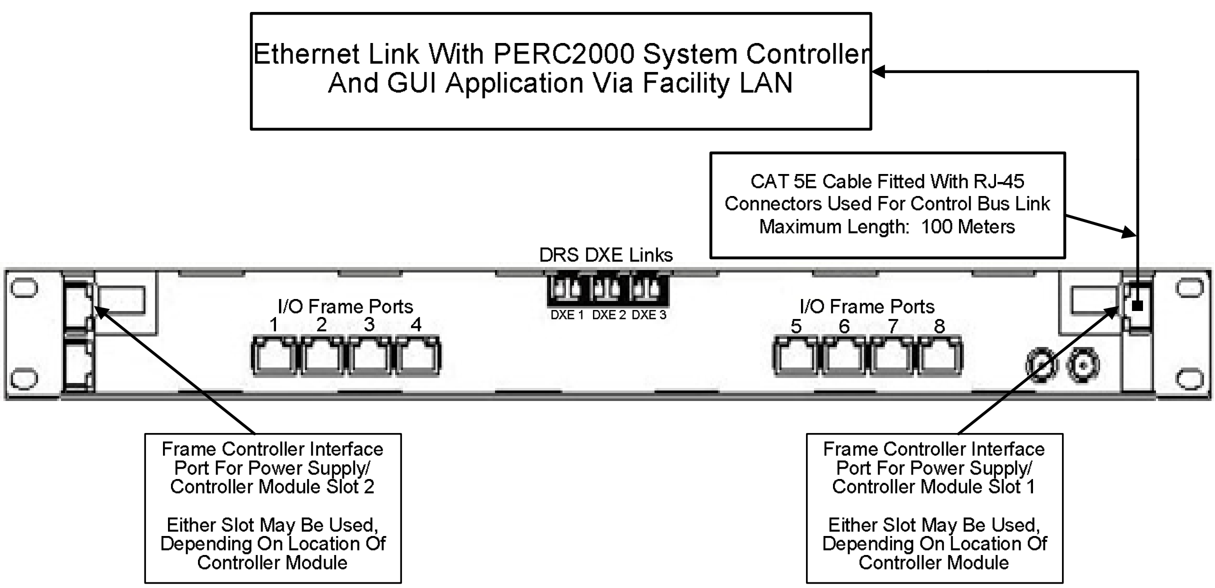


Figure 5-25 Control Cabling for Single Controller Module Installation

If two Power Supply/PERC1000 Controller modules are used in the DXE, two hook-up configurations are possible, one of which will be used depending on the System Controller configuration. First, if there are two P2K System Controller CCAs then each one will have its own control bus. In this application, Ethernet cables from the DRS frame connect to system controller Ethernet ports through an external Ethernet Switch. This arrangement now contains a "primary" bus and a "secondary" bus for full redundancy, and is illustrated in Figure 5-26.

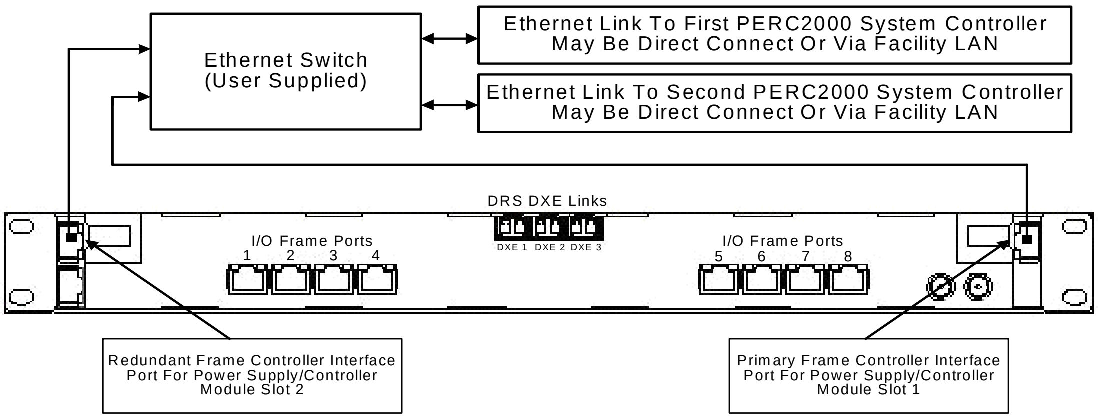


Figure 5-26 Control Cabling for Fully Redundant Dual Controller Module Installation

If there is only one P2K system controller CCA and two P1K modules, the installer must use an Ethernet switch to connect the two buses to the single port of the P2K. While this option does not provide full redundancy, it still offers a redundant frame controller should one of the modules ever fail. This configuration is illustrated in Figure 5-27.

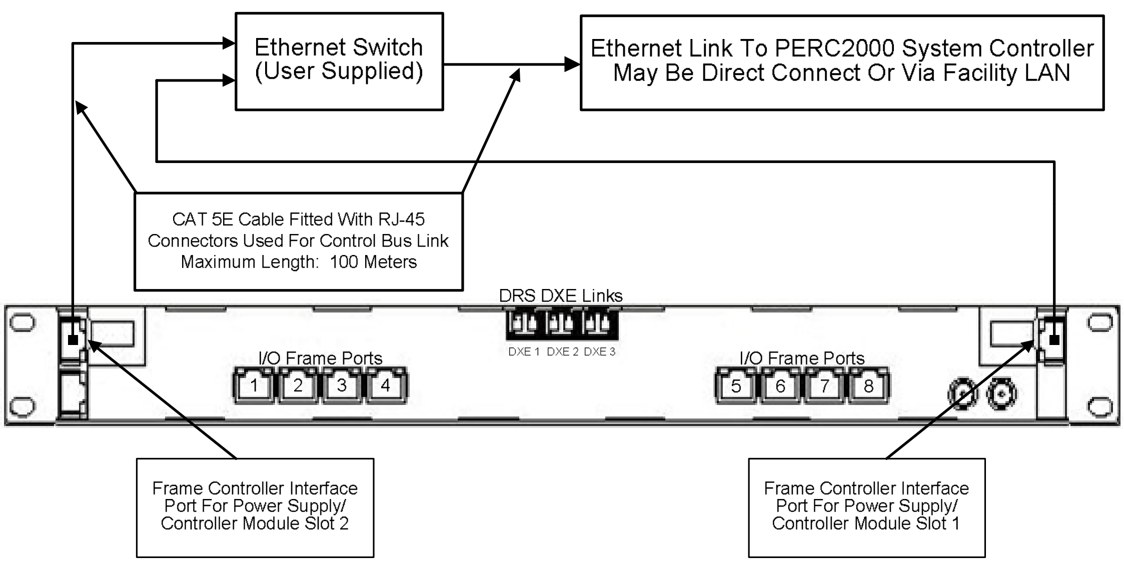


Figure 5-27 Control Cabling for Redundant Frame Controller Module Installation

Installations providing PAS bus redundancy require two DXE frames with each requiring an Ethernet connection with the P2K System Controller. Any of the control cabling schemes discussed above may be used with a dual DXE system, the difference being that like frame controller interface ports of each DXE must be connected to the system controller through a high-speed Ethernet switch. Figures 5-28 through 5-30 illustrate the cabling schemes shown in Figures 5-25 through 5-27 using dual DXE frames. When configuring a PAS bus redundant installation use these figures as a guide for installing control cabling.

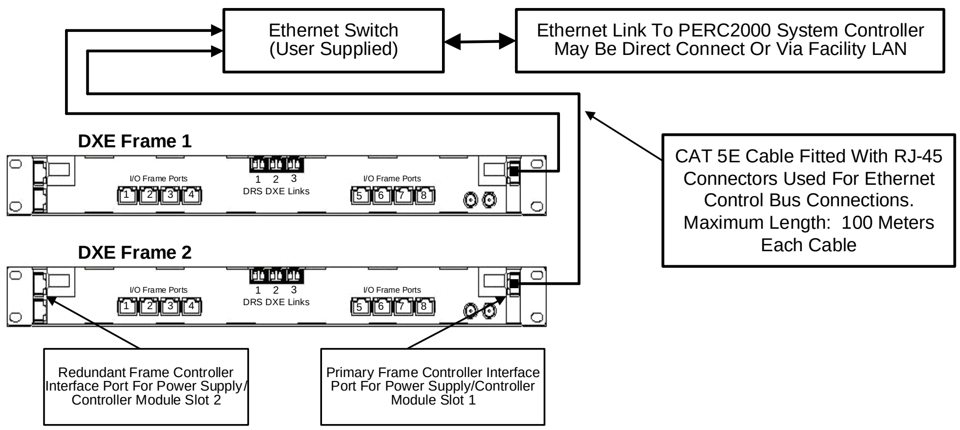


Figure 5-28 Control Cabling for Dual DXE, Single Controller Module Installation

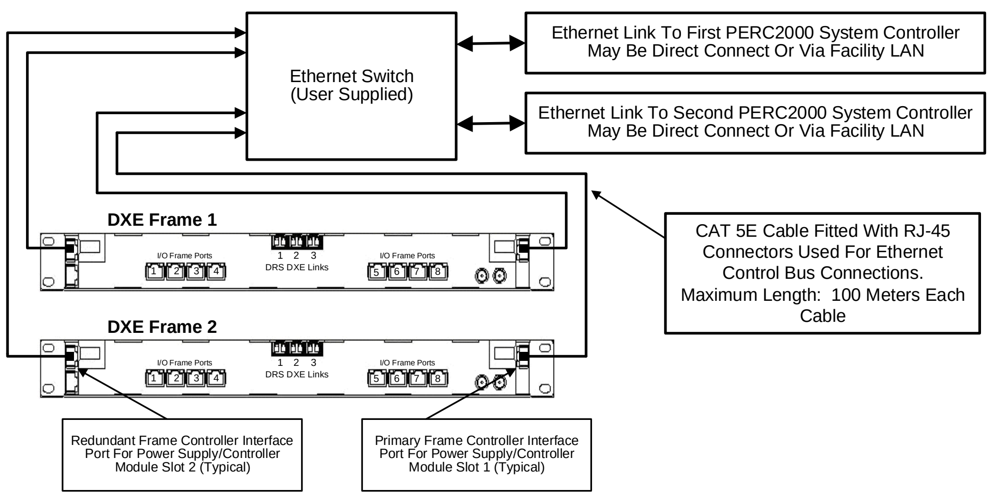


Figure 5-29 Control Cabling for Dual DXE, Fully Redundant Dual Controller Module Installation

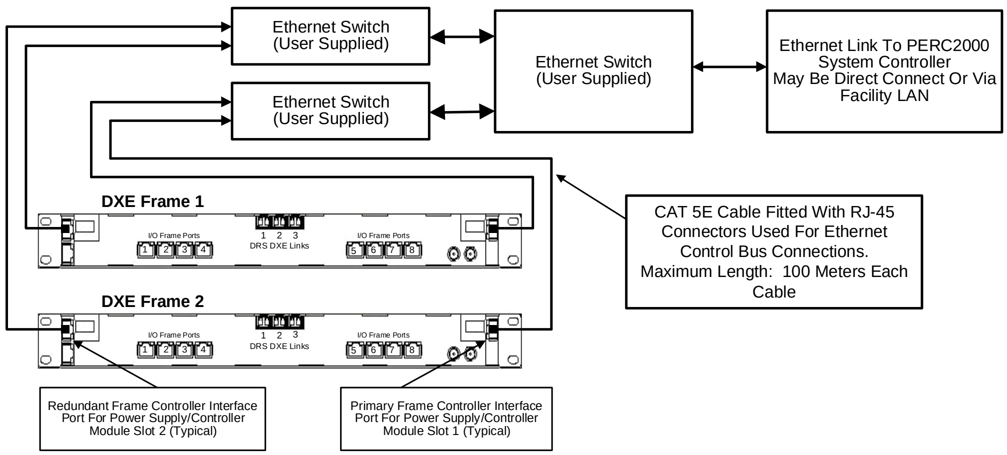


Figure 5-30 Control Cabling for Dual DXE, Redundant Frame Controller Module Installation

<u>Control Cabling for Expanded System Installations</u> Control bus cables for installations using a single DXE frame connect exactly as described in previous paragraphs for a single DXE (non-redundant PAS bus) 128X128 system. Refer to Figure 5-25, 5-26 and 5-27.

When multiple DXE frames are used, the installation principle is still the same as for a single DXE. Either one frame controller module or two may be used in each DXE chassis frame. If one module is used the router contains only a "primary" control bus. Control cables from every DXE frame in the system connect to the system controller through an Ethernet switch. Just as with a single frame installation, the system controller connection is either on the stand-alone rack frame or the rear panel of a video matrix switcher. This configuration is illustrated in Figure 5-31.

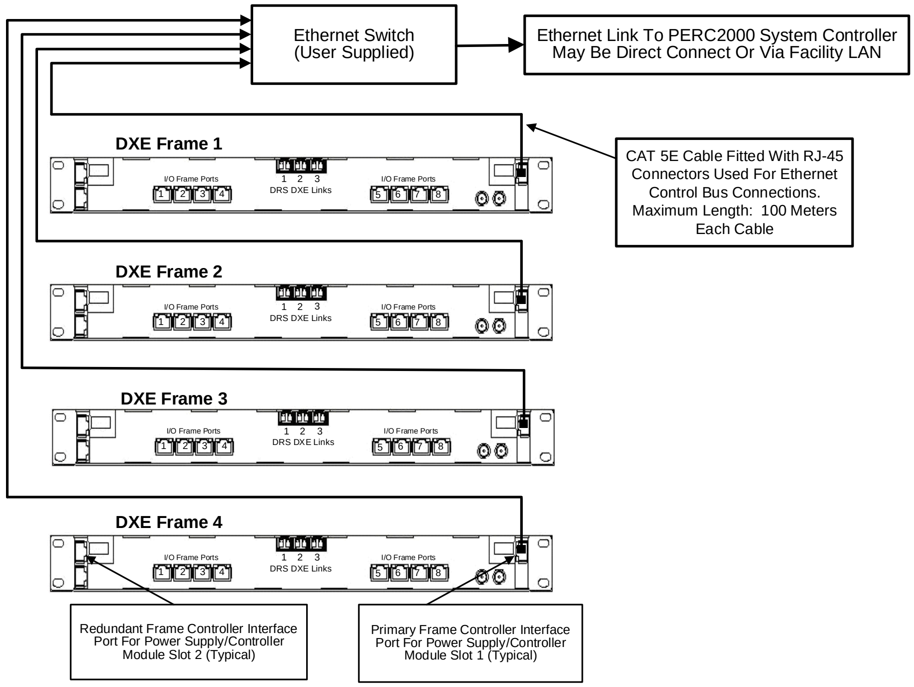


Figure 5-31 Control Cabling for Multiple DXE, Single Controller Module Installation

If two Power Supply/PERC1000 Controller modules are used in each DXE frame, the same two hook-up configurations as with a single frame installation are possible, one of which will be used depending on the System Controller configuration used. If there are two P2K System Controller CCAs in the system then each one will have its own control bus. In this application, Ethernet cables from both module slot connectors on every DXE frame connect through an Ethernet switch to the system controller Ethernet ports. This arrangement now contains a “primary” bus and a “secondary” bus for each DXE frame, providing full control system redundancy. This configuration is illustrated in Figure 5-32.

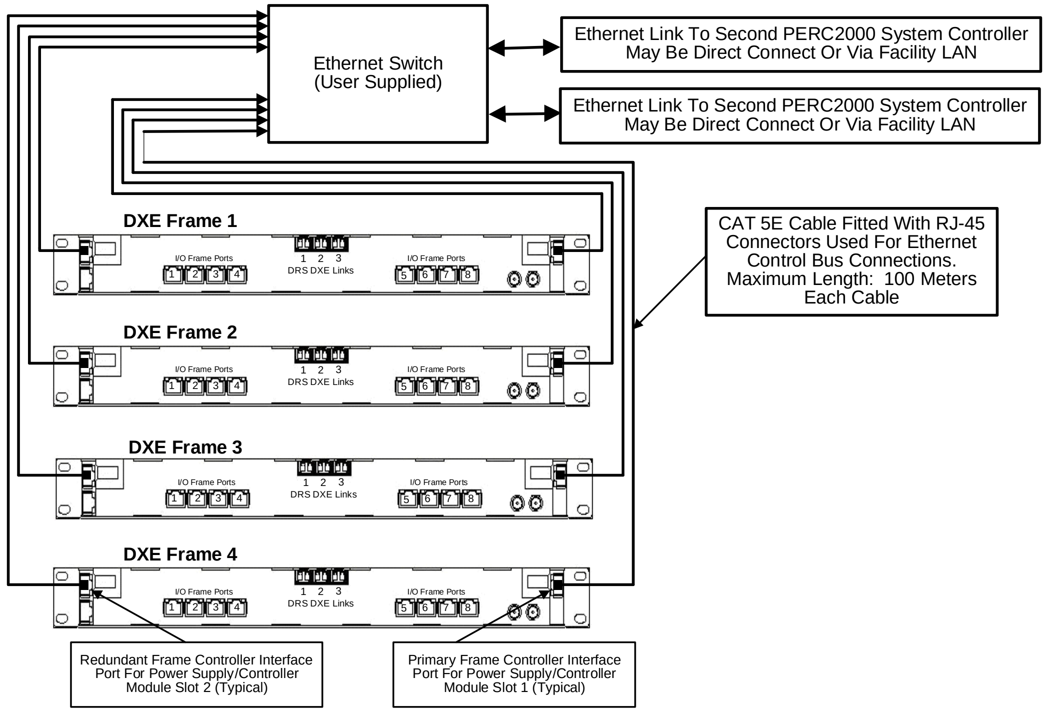


Figure 5-32 Control Cabling for Multiple DXE Fully Redundant, Dual Controller Module Installation

If there is only one P2K system controller CCA and two P1K modules in each DXE, the Ethernet cable from the Primary module slot connector on every DXE frame connects through an Ethernet switch to one link of another Ethernet switch. The cable from each Redundant module slot connector also attaches through an Ethernet switch to a second link on this additional Ethernet switch. This additional switch connects the two DRS control system buses to the single port of the P2K. While this option does not provide full redundancy, it still offers a redundant frame controller should one of the modules ever fail. This configuration is illustrated in Figure 5-33.

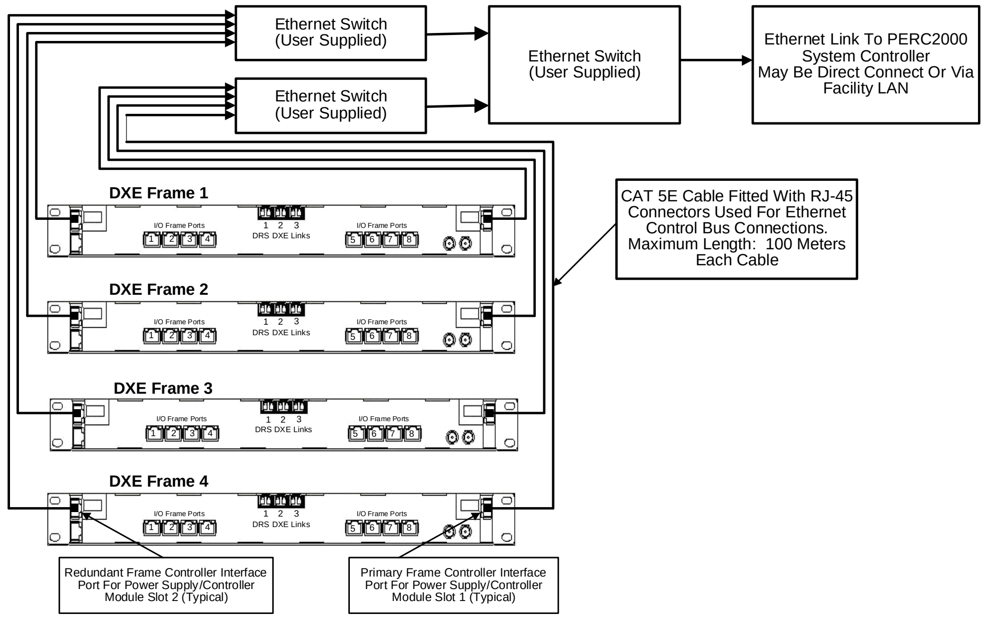


Figure 5-33 Control Cabling for Multiple DXE Redundant Frame Controller Module Installation

5.10 POWER CONNECTIONS

Power for all DRS system frames is derived from wall receptacles. No special direct wiring or heavy gauge wire is required for this equipment. There are two power connector access ports, one located on the upper left-hand side and the other on the upper right-hand side of the rear panel of each DRS frame, regardless of frame type. These ports allow access to the power receptacle on the power supply/controller module located in the slot associated with each. In a non-redundant power or control system, only one of the slots will have a power supply module installed. Attach the power cord through the proper access port to the receptacle on the power supply module. Each power supply carries its own dedicated power receptacle. Input power is not bussed between modules. When two power supplies are used (for redundancy) a separate power cord must be attached to each receptacle through its access port.

Each access port is equipped with a harness device for the input power cord that secures the cord to prevent accidentally disconnecting the frame from its power source. To use the harness, slip the groove on the power cord connector end horizontally into the opening of the harness. In planning your installation, consider the location of each DRS system frame and how to route and dress power cords from the power source to each frame.

Connecting the power cord to a source of power immediately applies power to the DRS frame. Do not apply power for the first time until all signal, intra-system, sync and control connections have been made and verified.

5.11 INITIAL POWER-UP

Before applying power to the DRS system for the first time, please take time to go back over your installation:

- Check for electrically sound connections, proper connector placement and possible wiring errors.
- Ensure that each DXE frame has a connection with a source of in-house sync reference and that each loop-through connector is either daisy-chained to the next unit in the chain, or is properly terminated into a 75Ohm load.
- Check that all logic cards and power supply/controller modules are securely installed in each system frame.
- Ensure that all RJ-45 connectors between frames and system controllers are in the proper mating receptacle and are securely snapped in place.
- Verify settings of the rotary configuration switches on each DXE mid-plane.

There are no power switches on the DRS frames and each frame is powered-up simply by connecting the main power cord to a source of primary power. Systems with redundant power supply/controller modules have two main power cords per frame, each of which must be connected to source of primary power.

- Apply power to all frames in the system.
- Wait a few seconds for each frame to perform processor boot-up, and observe status of the ERROR LED located on front edge of each logic card as shown by Figure 5-34.
- This LED will initially light upon application of power, but should extinguish after the on-board processor has completed start-up.
- Verify that the LED is off on all DRS frames.

Figure 5-34 ERROR LED Location

- Once the initial power-up procedure is completed on all frames, replace front panels on each frame by aligning front panel and tightening two thumbscrews, Figure 5-35.

Figure 5-35 Front Panel Replacement

Chapter 6 Operation

6.1 AN INTRODUCTION TO THE PESA CHEETAH CONTROL SYSTEM

Every Cheetah router installation – video matrix and DRS – has two control system components: frame controllers and a system controller that interface through a communication protocol. A frame controller card is located in every video routing chassis and every DRS DXE frame; and, as the name implies, is the control component for functions within the particular frame in which it is installed. In a typical Cheetah installation, there is only one system controller (two for redundancy) and it may be contained in a video matrix frame or in a stand-alone chassis. The system controller interfaces with all frame controllers, remote control panels and a host computer. Its function is to oversee operation of the entire router installation through commands and communication with the individual frame controllers.

With DRS systems, PERC1000 (P1K) identifies the frame controller circuitry installed in each DXE frame. P1K uses a 10/100 Ethernet protocol for communication and must be paired with the PESA PERC2000 System Controller to complete the DRS control system requirements.

PERC2000 (P2K) is the name given collectively to the system controller circuit card assembly (CCA), its associated board-resident firmware and a GUI application that resides and runs on a Microsoft Windows™ based PC platform. P2K provides routing control functions to the DRS router through the P1K components; but can also be the master controller for other PESA routing and switching components, such as a Cheetah Video Matrix Router. This is shown pictorially by Figure 6-1.

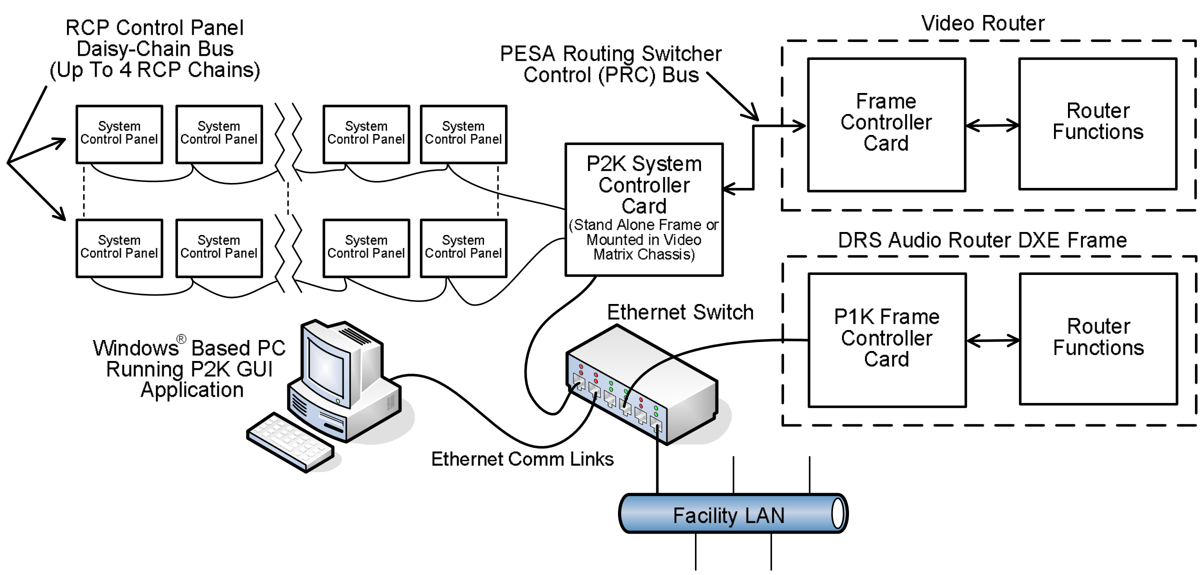


Figure 6-1 Example PESA Cheetah Control System

6.2 PERC2000 GRAPHICAL USER INTERFACE

A major component of the P2K System Controller is the graphical user interface (GUI) software application. This application must be installed on a Windows™ based PC that serves as a "host" computer for the router installation. Complete instructions for installing the GUI application are provided in the PERC2000 Technical Manual. All control and set-up operations for a DRS system are done through the P2K GUI in conjunction with the P1K Frame Controller located in each DXE frame, and the P2K System Controller hardware located external to the DRS router. System configuration data is entered on the GUI screens to generate a configuration file, and may be immediately downloaded to the frame and system controllers or may be saved as a data file for future use.

When the P2K GUI application is started on the host PC there are no configuration files loaded. The user has three options from which to choose when the GUI application is first started:

1. Treat the screens as a "clean slate" and generate a new configuration file by entering hardware and router configuration data for download to the controllers, or save the "new" file to a storage media such as a hard drive of the host PC or other memory device

2. Load an existing configuration file from a previously saved and stored file

3. Upload the currently active configuration file stored in flash memory on the system controller card

Either of the last two options allows the user to view or modify an existing configuration file.

Regardless of which option is chosen, as configuration data is entered or modified on the GUI screen, it is stored by the GUI application on the host PC – and only on the host PC. Changes entered do not get saved to a file, written to either the frame or system controller, or become active, until the operator issues a command from the GUI to either save or download the configuration data.

In order to prepare a DRS system for operation, there are two distinct configuration procedures that must be performed – hardware configuration and router configuration. Both types of configuration procedures are accomplished by generating config files through screens of the P2K GUI and downloading them to the controllers. Note that when a configuration file written using the P2K GUI is saved to storage media, both DRS hardware and router configuration data is stored with the file; and can be retrieved to the host PC for future modification or use. The act of saving a file does not download the config data to either the frame controller or the system controller.

Designing and configuring a routing switcher system requires a thorough working knowledge of the hardware components and the operational modes and functions available to the user. This discussion of the P2K software application assumes the user has the knowledge of switching functions and terminologies required to configure a system using the various commands and screens introduced in the following paragraphs. The user will need clear understanding of the concepts of switching levels, components, a reentry path, tie-lines, salvos, hardware strobes, etc. in order to make use of the following discussions.

Be aware that system changes you can make through the commands and screens discussed in the following paragraphs configure virtually all operational aspects of the system. Mistakes or erroneous entries made in many of the following programming steps can cause serious problems ranging from incorrect sources being switched to total shutdown of the entire system. Be sure you know exactly what you want to do before you make changes to the system configuration.

6.3 HARDWARE AND ROUTER CONFIGURATION FILES

Hardware configuration is where the PERC1000 (P1K) Frame Controller in each DXE frame is configured for the number and type of audio blocks under its control and a numerical input/output channel range is assigned to each block. Although hardware configuration functions are performed through the P2K GUI application, and the data is stored as part of a saved system configuration file, the system controller has no real intervention in this procedure.

In order for the system controller to operate, we must write a Router configuration file and load it into controller memory. This file contains programming data for individual sources and destinations such as where (frame and physical connector) each signal connects to the system, the type of signal and names we wish to associate with each; as well as switching levels, components, source groups, destination groups, and other system functions. It is through router configuration that audio signals available through DRS can be paired with video signals in a video matrix frame for AFV or breakaway switching as a group. In many installations, remote control panels are located at operator stations or consoles; these are programmed through the router configuration file and allow an operator to control designated functions of the router from a remote station. Virtually any routing function available through the P2K control system can be applied to DRS audio signals.

A system configuration file containing both hardware and router configuration data may be named and saved allowing it to be retrieved to the host PC for future modification or use. Multiple configuration files may be written, stored and loaded as needed to allow quick access of different operational set-ups for the routing system. Remember, however, that the act of generating or saving a file does not download the configuration data to either the frame controller or the system controller.

NOTE	**Anytime a configuration file of *either* type is written or modified using the P2K GUI and saved to storage media, *both* hardware and router configuration data is always stored with the file. Therefore you must always either upload from the system controller or retrieve a stored config file with valid hardware and router config data entries on which to make desired modifications. If you start with "clean slate" configuration screens and only make entries for a hardware or router configuration and save the file, it *will not* contain a full set of configuration data; and, if downloaded to the controllers, *will not* allow the DRS to function properly.**

Also as part of DRS configuration it is possible to set several audio characteristics for individual input and output channels, such as gain, balance, phase inversion and stereo remedies. This configuration data is not saved as a part of the P2K configuration file, however, it may be saved as a separate file on the storage media for future modification or use. Audio characteristics are discussed in Paragraph 6.13 of this manual.

6.4 NAVIGATING THE PERC2000 SYSTEM SCREEN

With respect to the DRS router, all control system components: P2K system controller, host PC running P2K GUI, and up to 16 P1K frame controllers communicate over a standard 10/100 Ethernet link. Any DRS system must have the components of the P2K interfacing with the components of the P1K to control operation of the router. Hardware and router configuration, operation and monitoring functions of the DRS are all accomplished using tools available through the P2K GUI application. If the control system components are not set-up for either network or direct Ethernet communication, establish this connection before continuing. Refer to the PERC2000 Technical Manual for further information.

When the P2K GUI application is launched, the System Parameters Screen, Figure 6-2, appears on the host PC display device. Note from the figure that the screen is displayed in a familiar Windows format, divided into five major functional areas: Menu Bar, Tool Bar, Status Bar, Command Tree Window and Main Display Screen.

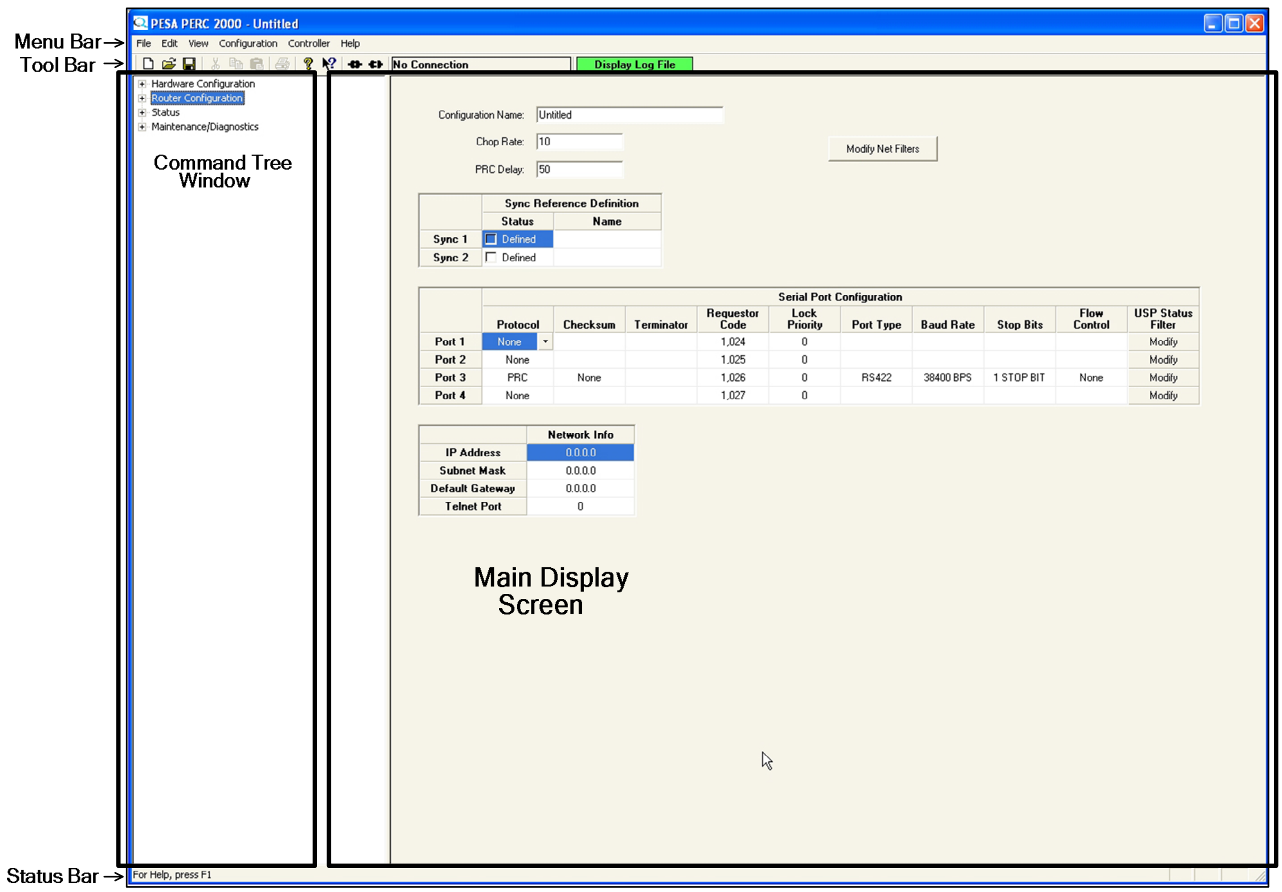


Figure 6-2 PERC2000 System Parameters Screen

The Menu Bar, Tool Bar and Status Bar all function in a similar manner to other Windows® based software applications. Some of the pull-down menus in the menu bar contain application specific commands and these will be discussed in detail where appropriate in the operating guide paragraphs.

All commands for hardware and router configuration, monitoring and diagnostics are contained in the command tree located on the left side of the screen in the Command Tree Window. Notice there are four top-level (parent) command headers: Hardware Configuration, Router Configuration, Status and Maintenance/Diagnostics. As in most Windows® applications each parent header may be expanded to reveal sub-headers and commands by clicking the + box next to the item.

When a command is selected from the command tree, the data entry or status screen associated with the command appears in the Main Display Screen window.

6.5 ESTABLISH COMMUNICATION WITH THE SYSTEM CONTROLLER CARD

In order to upload or download a router configuration file, modify operational parameters or perform monitoring/diagnostic functions to the DRS system, the GUI must have an established link with the P2K CCA. Once the GUI application is launched you may establish a communication connection between the GUI and the P2K Hardware System Controller Card as follows:

- Click on the "Connect to Controller Symbol," Figure 6-3, to bring up a box with all P2K controllers listed by IP address. In most applications there will only be one controller listed.
- Select the P2K controlling the DRS system from the list, by IP address, and click to activate the connection between the GUI and the controller.
- Once activated, and communication is established, the IP address of the P2K appears in the box to the right of the connection symbols and the box is highlighted green to indicate the connection is functional.
- In order to disconnect the GUI from the P2K, click on the "Disconnect from Controller Symbol" as shown in Figure 6-3. The display box will return to a non-highlighted background and the message "No Connection" is displayed.

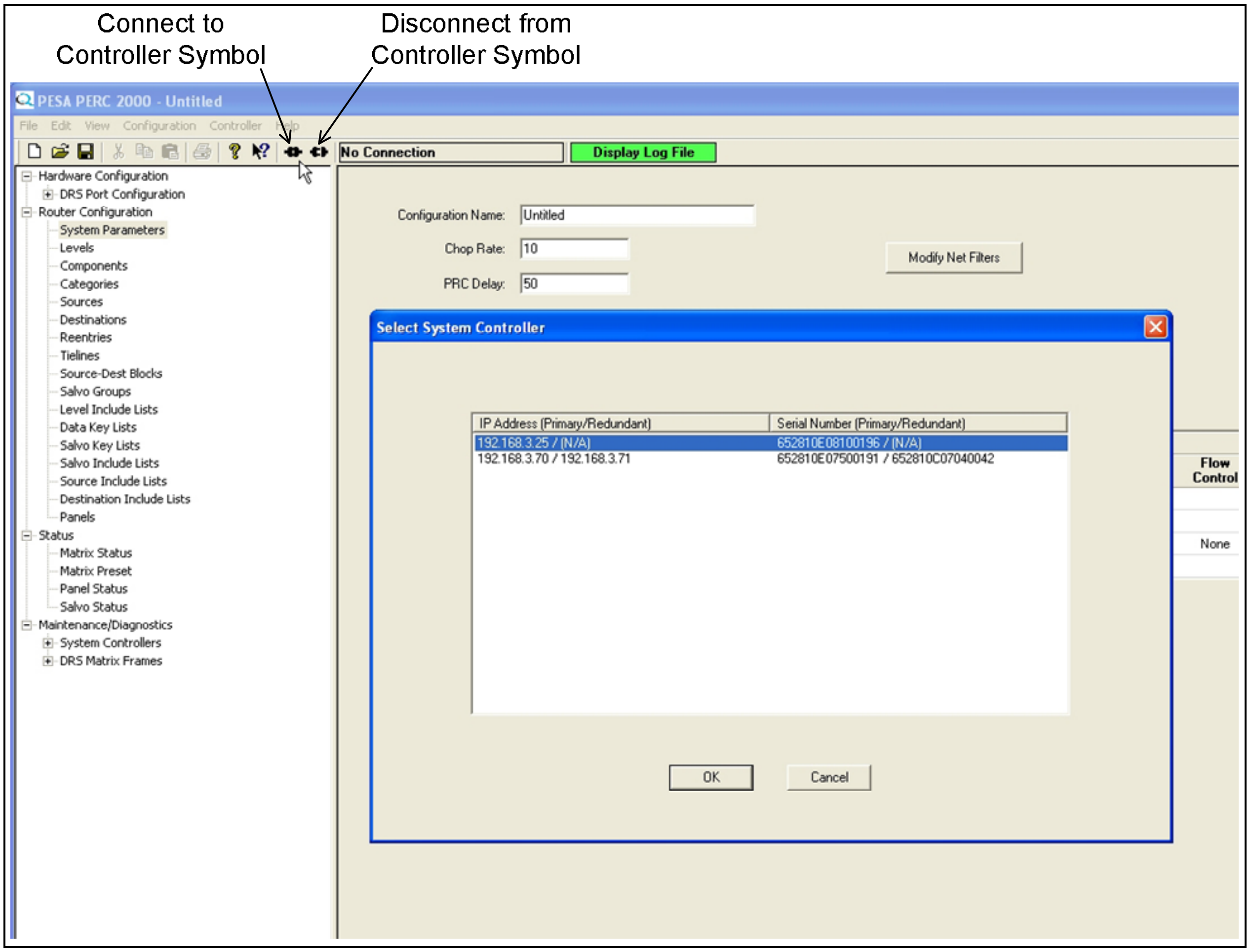


Figure 6-3. System Controller Selection

6.6 SETTING FRAME CONTROLLER IP ADDRESS AND DXE FRAME CONFIGURATION

Each DXE frame in a DRS system must be configured for the control system to communicate with its frame controller(s) and properly access its input and output channel assignments. This is done by setting the rotary switch located on the frame mid-plane. Figure 6-4 illustrates the location of the rotary switch on the DXE mid-plane.

In previous text we introduced the rotary switch present on the midplane of each DXE frame, and stated that the setting position of this switch assigned the IP address offset from the base address to both the primary and secondary controller slots in an individual frame; and also, based on the setting and address offset assigned, determined whether the controller(s) is functioning in the primary or redundant DXE frame for the channel group.

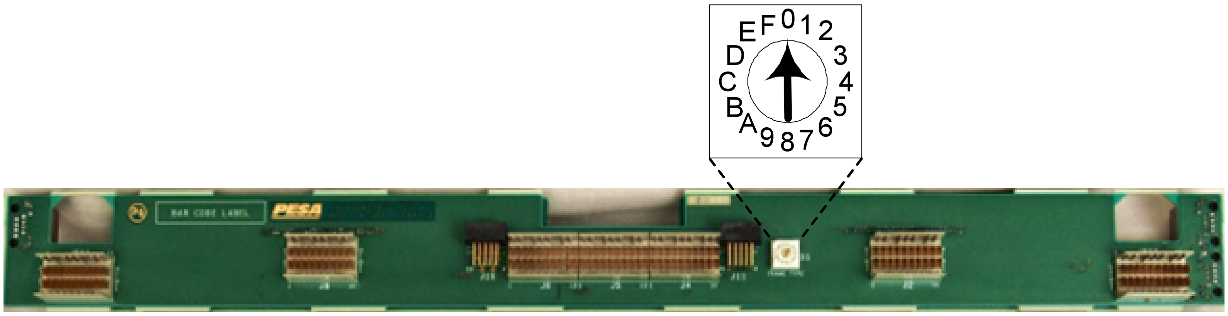


Figure 6-4 Rotary Switch Location – DXE Mid-Plane (Internal to Frame)

Three operational parameters for an individual DXE frame are determined by the setting of this switch:

DXE I/O Range - Assigns the input and output channel group processed by the DXE.

Primary/Redundant DXE - Assigns Primary or Redundant status to the DXE.

IP Address - Increments the IP Address of the P1K Frame Controller Module(s) installed in each DXE. Notice from Table 6-1 the IP address determined by each switch position to the various frame controller(s) is the Base IP Address incremented sequentially by a value of one in the fourth octet of the address.

Each P1K Module is factory configured to a Base IP Address of 192.168.1.201 and a Subnet Mask of 255.255.0.0. The actual IP Address used by an individual P1K module is determined by the Base IP Address, the position of the rotary switch in the DXE frame and the module slot within the DXE frame the P1K module occupies.

Table 6-1 identifies switch settings and the associated parameters.

Table 6-1 DXE Frame Configuration Settings

DXE Rotary Switch Setting	Primary/Redundant DXE	DXE I/O Range	IP Address Controller in Slot 1	IP Address Controller in Slot 2
0	Primary	1 – 512	Base IP Address	Base IP Address + 1
1	Primary	513 – 1024	Base IP Address + 2	Base IP Address + 3
2	Primary	1025 – 1536	Base IP Address + 4	Base IP Address + 5
3	Primary	1537 - 2048	Base IP Address + 6	Base IP Address + 7
4	Redundant	1 – 512	Base IP Address + 8	Base IP Address + 9
5	Redundant	513 – 1024	Base IP Address + 10	Base IP Address + 11
6	Redundant	1025 – 1536	Base IP Address + 12	Base IP Address + 13
7	Redundant	1537 - 2048	Base IP Address + 14	Base IP Address + 15

- If you are configuring a 128X128, non-redundant system, the switch setting on the single DXE required for the configuration is Zero (0). This setting identifies the DXE as Primary with I/O channels 1-512. A single Power Supply/Frame Controller Module is installed in Slot 1 (Primary Controller). Assuming a base IP Address of 192.168.1.200, the IP Address for the frame controller is 192.168.1.200.

- If we add a redundant Frame Controller to slot 2 (Secondary Controller) of this frame, the IP Address assigned to this controller is 192.168.1.201.

- As a final example if we add a second DXE frame to this configuration for system redundancy, the rotary switch setting for this second frame is Four (4) – Redundant DXE for I/O Channels 1 – 512. The IP Address of the primary controller is 192.168.1.208 and if a second controller (redundant slot) is added to this frame its IP Address is 192.168.1.209.

The rotary switches are set at the factory to order specifications, and should not require resetting. If, however, the switch settings are accidentally changed, or if you should wish to reconfigure the system, follow these examples and Table 6-1 to determine the proper switch setting for DXE frames in the system.

Before applying power to the system for the first time, PESA recommends that you verify the setting of the rotary switch on every DXE frame used in the configuration.

6.7 CHANGING THE DEFAULT IP ADDRESS OF A FRAME CONTROLLER MODULE

Remember the base IP address is the address initially programmed into all of the P1K frame controllers in the entire DRS system, and it becomes the nomenclature used to identify the entire DRS system on the network. On power-up of the DXE frames in the system, the frame controllers determine and assume a unique IP address as discussed in Paragraph 4.1.5.

In some applications it may be necessary to set the base IP address of the DRS system to a value other than the factory assigned address to accommodate your particular installation; this is easily accomplished through the P2K GUI. Changing the IP address may be required for a number of reasons; for example, in new DRS installations the IP addresses of the frame controllers occasionally need to be set differently from the factory ship configuration to avoid addressing conflicts with other network hardware.

Assume you are installing a new DRS system and wish to use the IP addresses 192.168.5.101 through 192.168.5.116 for the P1K frame controllers, rather than the default values set by the factory. Using the P2K GUI you would change the base address of the system to 192.168.5.101. When the “new” address is saved to the controllers, it is simultaneously written to all frame controllers in the system. Saving the new address will cause the frame controllers to re-boot and thereby assume their “new” unique addresses derived from the changed base address.

The base IP address of the P1K frame controllers may be set to virtually any value that best suits your network, with a few caveats:

- You may set the first three octets of the IP address to any values needed for your installation.
- You may assign any valid value (1 thru 254) to the fourth octet, keeping in mind that the number you assign will be incremented when assigning IP addresses to each of the frame controllers in the system. The numbers 0 (zero) and 255 are not valid for use in the fourth octet.
- When determining the number for the fourth octet you must dedicate a block of 16 numbers with the number you assign being the starting point.

The following steps guide you through the procedure to enter a new base IP address value to your P1K frame controllers:

- Launch the P2K GUI application from the desktop icon or browse to the PERC2000.exe file and double click to open the application.
- Click on the Help menu in the Windows™ menu bar and select the "IP Config Utility" option from the menu as shown in Figure 6-5.

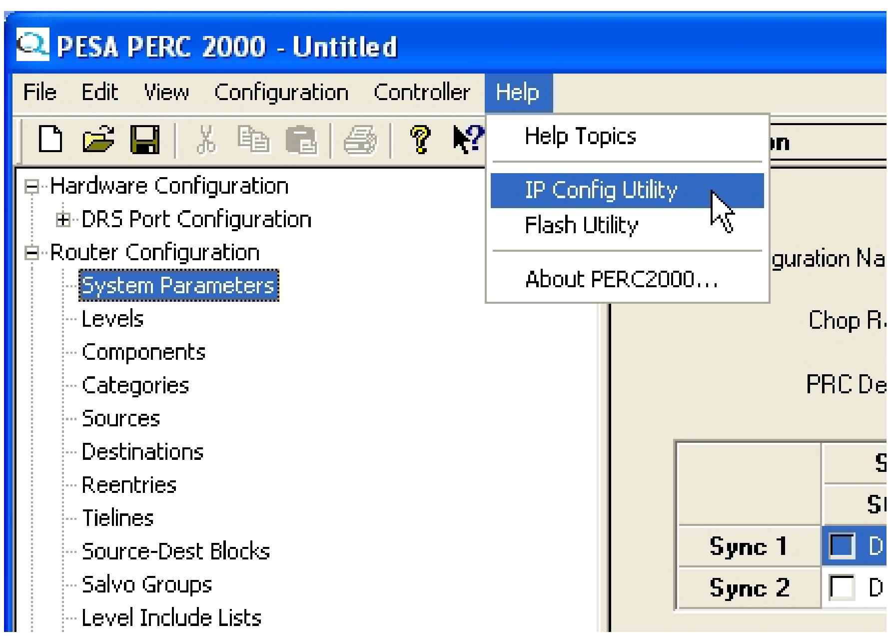


Figure 6-5. "IP Config" Utility Command Location

- This will bring up the Select Device window as shown in Figure 6-6. Select the DRS system you wish to re-address, by its current base IP address shown in the listing and click the entry to select the system. Note that in the listing DRS systems are referred to as a DRS MATRIX. With the entry highlighted, click the **OK** button to continue.

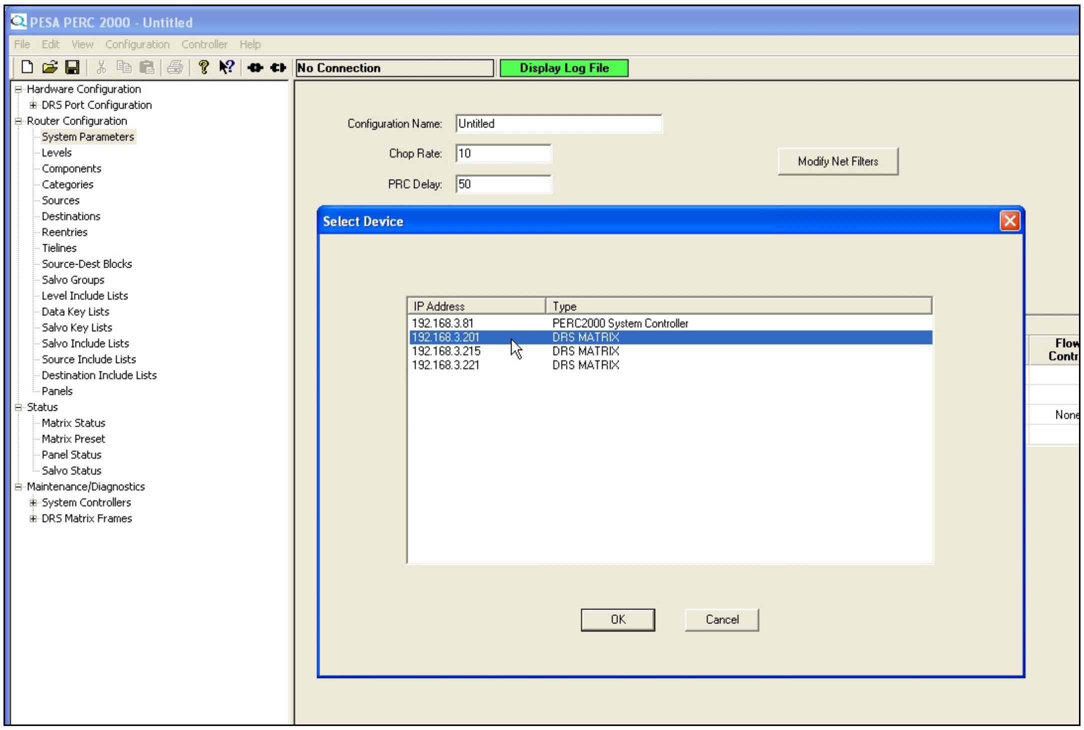


Figure 6-6. Select Device Window

- The Select Device box will clear and the IP Parameters Config box, Figure 6-7, is displayed. Note when the box initially appears, the IP address listed is the current base IP address of the system. Click in the IP Address block, remove the currently listed IP address and enter the "new" IP address you have selected as the base IP address for the DRS system. Remember that the numbers 0 (zero) and 255 are not valid for the fourth octet of the IP address. If, based on your network requirements, you also need to assign a "new" subnet mask or default gateway setting, enter the desired values in the Netmask and Default Gateway boxes. Default values for these settings are:

    - Netmask: 255.255.255.0
    - Gateway: 0.0.0.0

- In our example screen the "new" IP address is chosen as 192.168.3.210, netmask as 255.255.0.0 and gateway as the default value of 0.0.0.0. Click **Save Changes** to write the new address data simultaneously to all P1K frame controllers in the system.

- If you wish to change the address on other PESA systems on the network, click the **Select New Device** button to return to the Select Device box and select the address you wish to change from the list.

- Clicking **OK**, saves any changes you made to the controllers and closes the IP Parameters Config box.

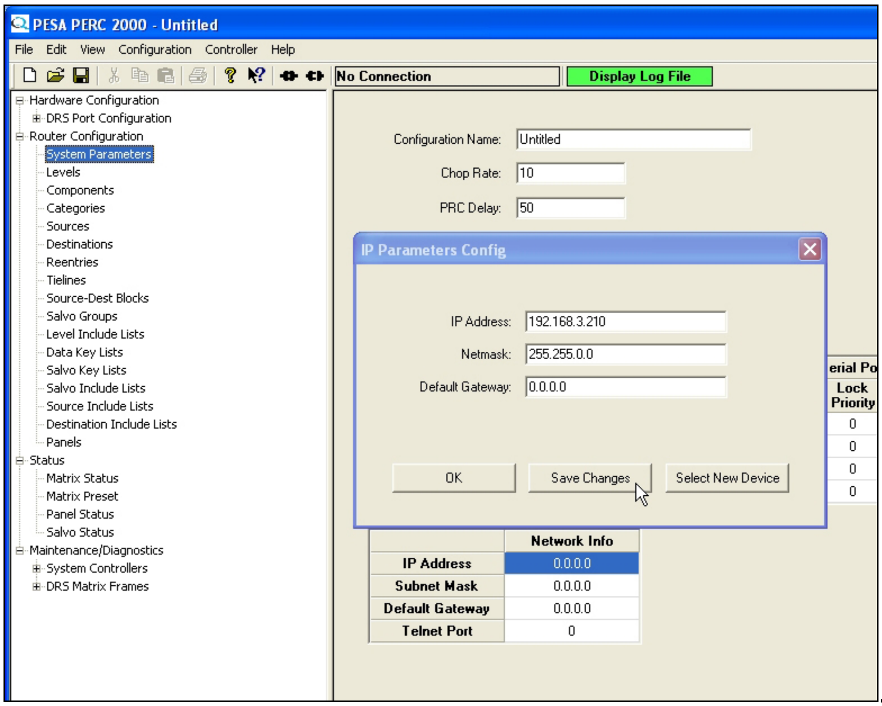


Figure 6-7. IP Address Data Entry Box

- Once the new address is assigned, allow a few seconds for the frame controllers to reboot. Click on the IP Config command and verify that the base IP address listed for the system reflects the desired change.

6.8 DUAL (REDUNDANT) P1K FRAME CONTROLLERS

When a DXE frame is equipped with dual P1K controllers, one is always functioning as the active controller and the other is the standby controller. Installation position in the frame is not an indicator of which is the active controller. During operation, the standby controller monitors the health of the active controller and will automatically become active and take over control of the DXE frame if it detects a problem. A standby controller can become active for any of the following reasons:

- User presses the “Active” button on the front edge of the circuit board in the frame.
- User requests the standby P1K become active by a command from the P2K GUI.
- Standby P1K loses serial communication with the active P1K.

- Active P1K cannot make an Ethernet connection.
- Active P1K experiences communication failure with the DXE.
- Active P1K controller is removed from its frame slot.

6.9 DXE FRAME PORT CONFIGURATION SCREEN

As we discussed in Chapter 4, a channel group consists of at least one DXE frame and its associated audio frames, and is identified by the numerical range of I/O signals it can process. Audio frames and blocks are connected to DXE frames through the I/O Frame Port connectors on the DXE rear panel in a numerical sequence, and the order of connection assigns the numerical range of input or output channels handled by each block. Every I/O port must be configured through the DXE Frame Port Configuration menu screen to identify the type of audio block(s) connected to the port and assign the numerical bank of channels to the block. Figure 6-8 shows a typical DXE port configuration menu screen.

The main display portion of this window contains a table with a row entry for each of the 8 frame ports on the DXE. Each row is composed of columns that identify certain operational and configuration parameters about the frame port. Before we continue to the procedure for entering hardware configuration data, we need to closely look at each of the columns. Refer to the example DXE Frame Port Configuration Screen shown by Figure 6-8. You might also find it useful to have a “live” screen open on the host PC. Access the DXE Frame Port Configuration Screen as follows:

- Launch the P2K GUI application from the desktop icon or browse to the PERC2000.exe file and double click to open the application.

- Expand the Hardware Configuration tree in the left pane of the GUI display, as shown in Figure 6-8; then expand the DRS Port Configuration tree.

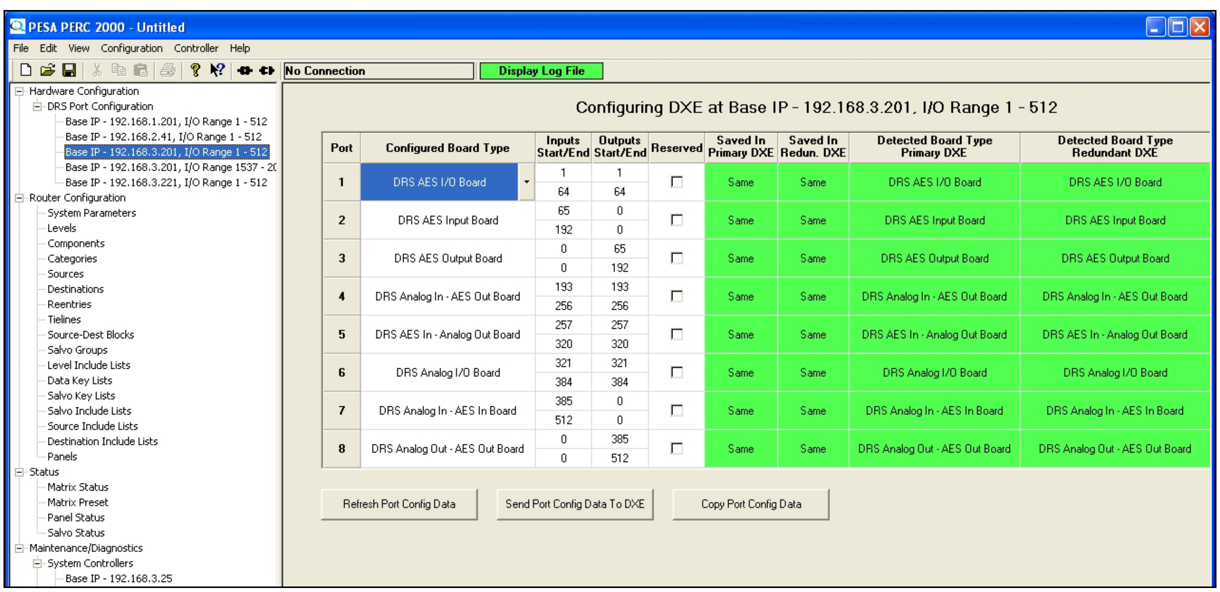


Figure 6-8 Example Frame Port Configuration Screen

- The DRS Port Configuration tree opens to a listing of all channel groups in the system, identified by the base IP address of the system and the I/O range nomenclature of each group.

- Highlight the tree entry for the desired channel group to open on the port configuration screen. In our example we have selected the channel group named I/O Range 1 - 512, residing in the DRS system assigned the base address 192.168.3.201.

When a channel group is selected from the tree listing, data for that group is refreshed as follows prior to display:

- The DXE, primary and redundant, if used, polls its frame I/O ports to determine the type of audio block(s) currently attached to each port.

- The hardware configuration data loaded into the frame controller(s) of each DXE is read to determine the type of audio block(s) programmed in the configuration file as being attached to each I/O port.

At the top of the main window screen the channel group shown for configuration is identified as the DXE, with the base IP address and its I/O range nomenclature displayed. The table in the main display area contains 9 columns, and displays configuration data for the primary DXE and, if equipped, the redundant DXE for the channel group. A brief explanation of the data displayed in each column follows:

- **PORT** - The left-most column labeled PORT, is a listing by port number of the eight physical DXE input/output ports.

- **Configured Board Type** – This entry displays for each of the I/O ports the type of audio frame for which the currently open GUI configuration file is programmed.

- If an existing configuration file has not been either uploaded from the P2K or retrieved from storage media the currently open GUI file will contain no hardware config data for the ports and the cells in this column will be grayed-out, and remain grayed-out until the operator manually enters frame type data for the indicated I/O port using the pull-down menu in each cell. If data is present in any of the cells, the entry displays the frame type **currently defined in the configuration file open on the host PC for the indicated port**. Regardless of whether frame type data is displayed or not, this column allows the user to enter or modify hardware data using the pull-down menu.

- **Inputs Start/End** – Indicates the numeric range of input channels assigned to the port. This entry is determined by the frame type specified in the previous column and is automatically assigned by the GUI application. If no Configured Board Type entry is listed for the port, this column will also be grayed-out.

- **Outputs Start/End** – Same as the previous column, except it displays the numerical range of output channels assigned to the port. If no Configured Board Type entry is listed for the port, this column will also be grayed-out.

- **Reserved** – A check in the box indicates that the range of input/output channel numbers and frame type have been reserved for future implementation.

- **Saved In Primary DXE** – Compares the actual frame hardware type detected on the physical port to the frame type expected on the port, as **determined by the configuration file loaded into the primary P1K** frame controller. If the actual and expected frame types are the same, the message SAME is displayed on a green background. Should the frame type for which the P1K controller is programmed to expect on the port and the frame type actually detected on the port not be the same, the message DIFFERENT is displayed on a red background.

- **Saved In Redun. DXE** – Compares the actual frame hardware type detected on the physical port to the frame type expected on the port, as **determined by the configuration file loaded into the redundant P1K** frame controller, if a redundant DXE is present. If the actual and expected frame types are the same, the message SAME is displayed on a green background. Should the frame type for which the P1K controller is programmed to expect on the port and the frame type actually detected on the port not be the same, the message DIFFERENT is displayed on a red background. If a redundant DXE is not used in the installation, the column will be grayed-out.

- **Detected Board Type, Primary DXE** – When the port configuration screen is selected the Primary DXE frame for the channel group polls the audio block(s) attached to each of its I/O ports. This column displays the results – and indicates the frame type of the actual hardware connected to the indicated port. A comparison is then made between the actual detected hardware and the frame type **indicated in the Configured Board Type column**. If the actual and indicated frame types are the same, the cell is displayed with a green background. Should the GUI application file not yet contain hardware config data, or should it indicate a different frame type from what is actually detected, the cell is displayed with a red background.

- **Detected Board Type, Redundant DXE** – When the port configuration screen is selected the Redundant DXE frame, if present, for the channel group polls the audio block(s) attached to each of its I/O ports. This column displays the results – and indicates the frame type of the actual hardware connected to the indicated port. A comparison is then made between the actual detected hardware and the frame type **indicated in the Configured Board Type column**. If the actual and indicated frame types are the same, the cell is displayed with a green background. Should the GUI application file not yet contain any hardware config data, or should it indicate a different frame type from what is actually detected, the cell is displayed with a red background. If a redundant DXE is not used in the installation, the column will be grayed-out.

To summarize the Frame Port Configuration Screen:

- When the screen is open from the GUI, the frame type for each frame attached to each I/O port of the indicated DXE is detected.
- A comparison is made between the actual frame type connected and the frame type programmed into the P1K controller configuration file for each I/O port
- A comparison is made between the actual frame type connected to each port and the frame type indicated by the currently open GUI file.
- Any comparisons not resulting in a positive match are indicated by a red background in the display cell.

6.10 DXE FRAME PORT CONFIGURATION

In most installations, once the initial hardware configuration data is downloaded to the P1K controllers it will rarely, if ever, change. The only reason to alter hardware configuration would be if I/O frames should be added to or removed from an installed system, if signal handling capacity of an installed system is expanded by adding additional DXE frames, or if an additional DXE frame is added to an existing channel group for redundancy.

Use the following procedure to configure the I/O frame ports:

- Launch the P2K GUI application from the desktop icon or browse to the PERC2000.exe file and double click to open the application.

- Expand the Hardware Configuration tree in the left pane of the GUI display, as shown in Figure 6-9; then expand the DRS Port Configuration tree.

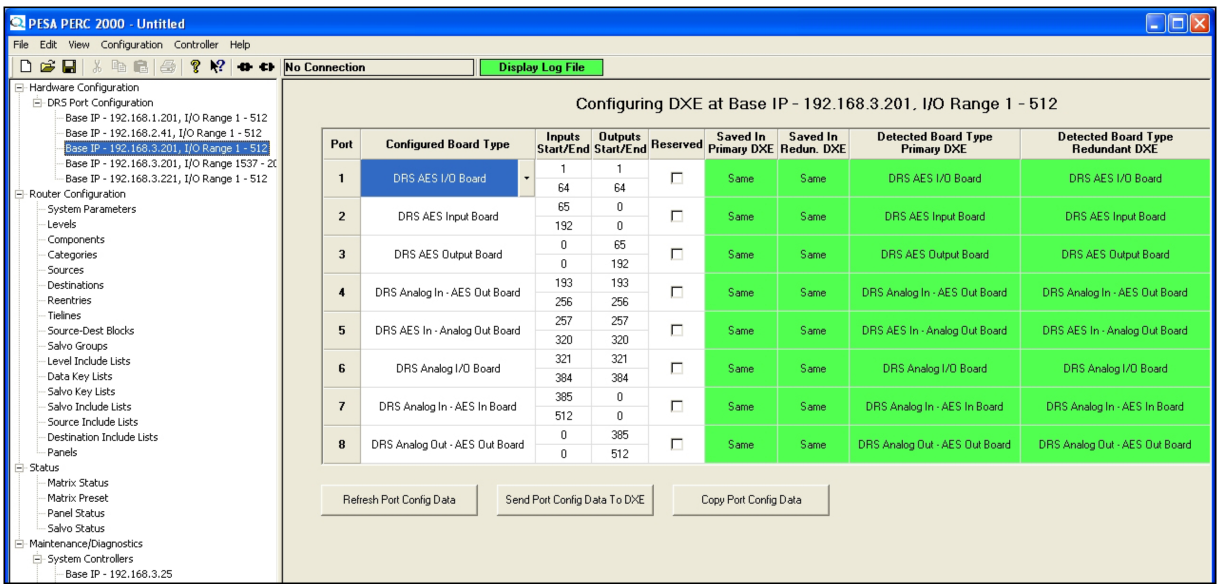


Figure 6-9 Example Frame Port Configuration Screen

- The DRS Port Configuration tree opens to a listing of all DXE frames in the system, identified by the base IP address and the I/O range of each. Remember in previous text we said that we can identify the DXE(s) for a given channel group by the system base IP address and the I/O range of the group. Select the channel group on which you wish to perform hardware configuration.

- The port configuration screen is displayed as shown. The DXE being configured is identified at the top of the configuration box by the IP address of the DXE and the numerical I/O range of the frame. In this example, the DXE at IP address 192.168.3.201 processes data for numerical input channels 1 thru 512 and numerical output channels 1 thru 512.

- When the port configuration screen is initialized the frame type detected on each interface port on each DXE, primary and redundant – if equipped, is displayed in the two right-most columns.

- If you are generating a "new" hardware configuration, or doing an initial install of the system, and no configuration file has been uploaded from the system controller, the "Configured Board Type" column will be grayed-out. It is from this column that you identify to the frame controller what type of audio frame is connected to each I/O port. If a configuration file has been uploaded from the controller, the detected board type and the configured board type SHOULD agree. If they do not, it means that hardware cabling has been swapped between ports or for some reason the audio frames at the ports have been changed since the loaded configuration file was written.

- If you wish to enter or modify the board type in the configured column, you may use the drop-down menu to assign the board type to each I/O port. Optionally, you may click the "Copy Port Config Data" button below the table and the detected board types at each port will automatically be entered in the configured board type column.

- Input and output channel range is automatically assigned based on the frame type and port order. If you have used the "Copy Port Config Data" option to enter board types, the input and output channel numbers are assigned to all ports.

- If you wish to "reserve" a block of channels for future implementation, select the type of frame you will add in the port number slot for the channel range desired, and check the "Reserved" box next to the board type assignment. The I/O channel range will be assigned to the port based on the entered "future" frame type.

- Once data for each frame type has been entered to the ports, click on the "Send Port Config Data to DXE" button to download the hardware configuration to all P1K frame controllers in the channel group.

- Repeat this procedure for each channel group and its associated DXE frames.

- Clicking the "Refresh Port Config Data" button causes the DXE to perform board detection at each I/O port and update the data shown in the Detected Board Type columns.

6.11 CHANNEL GROUP STATUS AND SET-UP SCREENS

Setup parameters and status monitoring screens for channel groups are accessed through the P2K GUI. Launch the GUI application from the desktop icon or browse to the PERC2000.exe file and double click to open the application.

Locate and expand the Maintenance/Diagnostics tree in the left pane of the GUI display, as shown in Figure 6-10. Then expand the DRS Matrix Frames tree; this action expands the tree to a listing of all channel groups in the system. Each entry in the listing identifies a channel group of the total system by the base IP address of the system and the numerical *output* channel range of the specified group. Click on any list entry to select and highlight that channel group. The main display screen shows real-time status and setup information for system components specific to the selected channel group. For our example screen, we have selected channel group I/O Range 1 – 512 within the DRS system residing at base IP address 192.168.3.201.

Let's take a closer look at the screen and data provided. The base IP address of the system and I/O range of the selected channel group is displayed at the top of the pane, along with a notation that the GUI is **connected** to and communicating with the frame controllers in that channel group. The upper data displays indicate the Component and Strobe values assigned to the channel group within the overall router installation by the router configuration file.

The main display area is a larger pane with tabs at the top; there is a tab for each hardware device (DXE frame(s), frame controller(s), audio blocks) within the channel group. Note in our example screen from left to right there are tabs for the Primary DXE frame and the Primary and Redundant PERC1000 frame controllers contained in it; the Redundant DXE and the Primary PERC1000 frame controller in it; followed by tabs for the audio frames, identified as boards, within the channel group. The display presented when a tab is highlighted provides operating parameters for the selected device. When any audio board tab is selected, monitoring data is displayed for various attributes of the frame containing the board, as well as the circuit board itself.

6.11.1 DXE FRAME STATUS SCREEN

Looking at Figure 6-10, the Primary DXE tab is selected. The displayed data identifies the board by type and serial number, its current operational status and its sync reference source. The next lines provide monitoring data for the frame power supply voltages, status of the power supply and its cooling fan and the surface temperature of the circuit board. The Link box displays status of the fiber optic links interconnecting the DXE frames, if any are present.

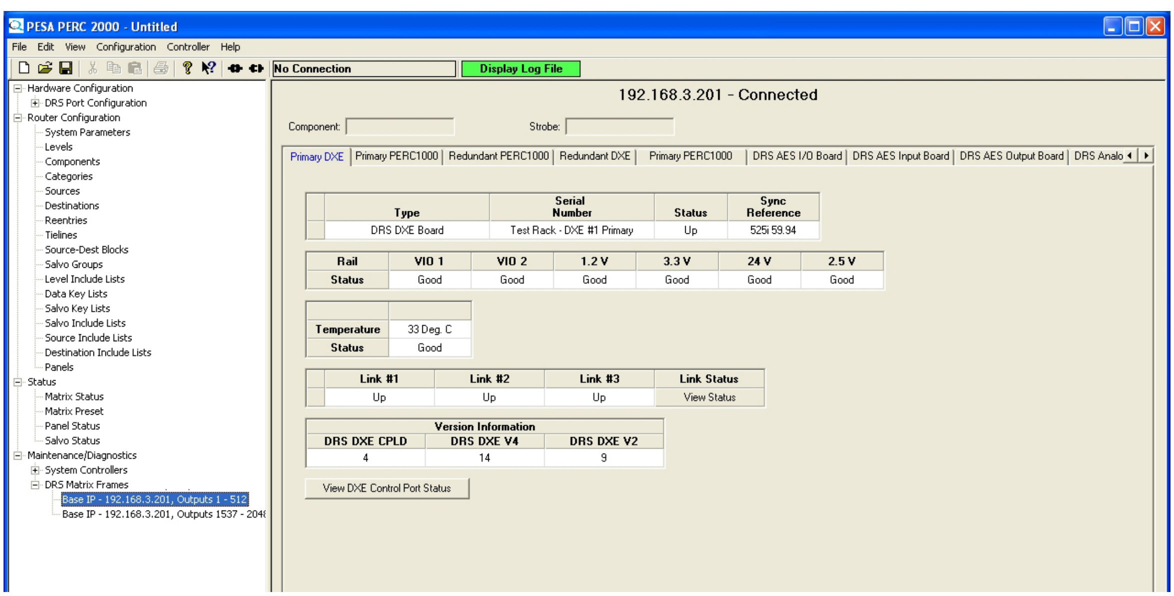


Figure 6-10. Channel Group DXE Status Screen

6.11.2 DXE LINK STATUS SCREEN

The DXE Link or SFP Status Screen provides a status display for the DXE Link monitor, as shown in Figure 6-11. To access this display, click the View Status button, as shown, to open the status display box. This box identifies, for each active link, the receive (Rx Power) and transmit (Tx Power) power of the fiber optic laser module, the module temperature and the current operating wavelength of the laser. Click **OK** to close this box.

NOTE	**Use this display as a diagnostic and monitoring tool only when needed. Polling the data for this display ties up a number of resources and can slow operation of the GUI. Close the display when not needed.**

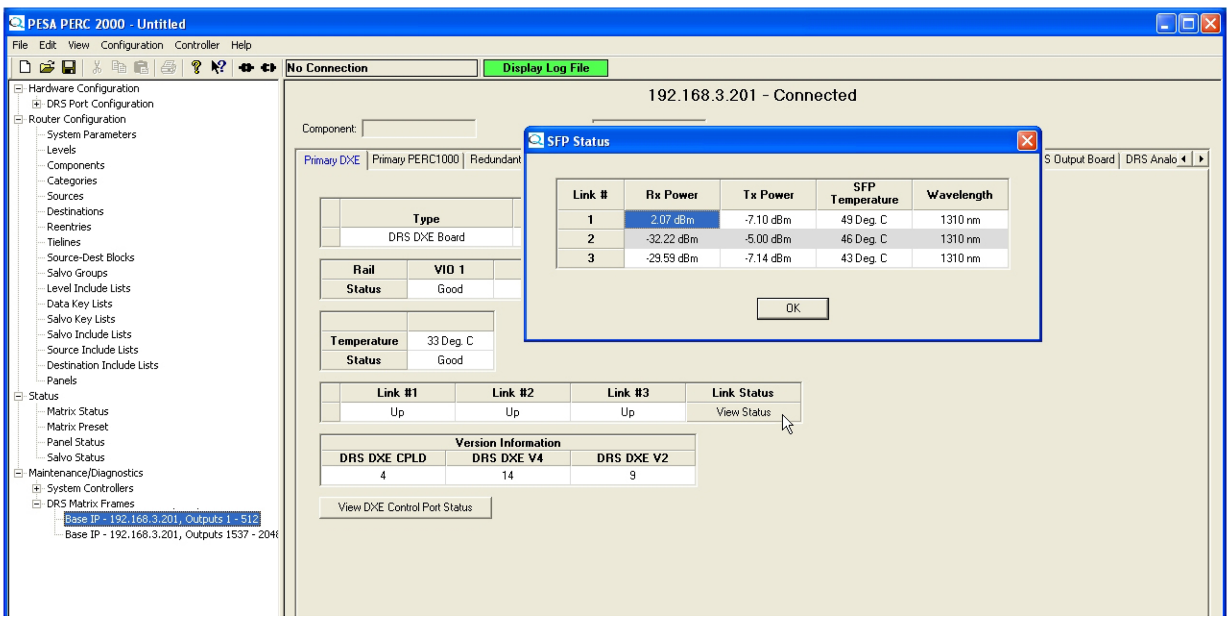


Figure 6-11. DXE Link Status Monitor Display

6.11.3 FRAME CONTROLLER STATUS SCREEN

There is a tab for every frame controller in the channel group located immediately following the tab for the DXE frame containing the controller. As an example we have highlighted the tab for the Primary PERC1000 controller located in the Redundant DXE frame, Figure 6-12.

Looking at Figure 6-12, the displayed data identifies the frame controller circuitry by its *unique* IP address, serial number and MAC address. Just beneath the serial number and MAC address display is a box labeled "Status" which identifies the location and operational status of the selected controller. In our example screen, status identifies the selected controller as the P1K installed in the Primary Controller slot of the frame and shows it is currently the ***active*** frame controller.

The next lines indicate status of the power supply portion of the selected power supply/PERC1000 module, and its cooling fan. The Version Information box displays the revision numbers of the currently loaded firmware modules for the selected frame controller.

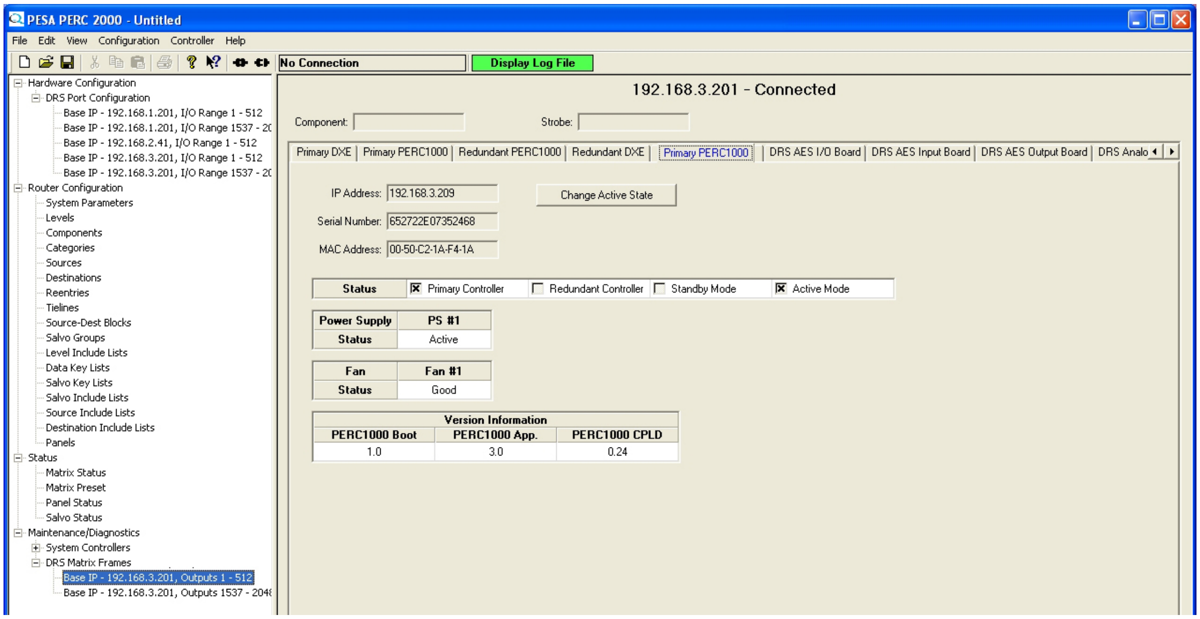


Figure 6-12. Frame Controller Status Screen

6.11.4 AUDIO BOARD STATUS SCREEN

If one of the audio board tabs is selected, the display provides data and status for the selected board and frame. An example audio board display is shown in Figure 6-13 using the DRS AES I/O Board tab. This audio board contains one input block and one output block of 64 channels each for AES audio signals.

The displayed data identifies the board by type and serial number, its current operational status, the range of I/O signals it is processing and its sync reference source. The next lines provide monitoring data for the primary and redundant power supply modules contained in the audio frame, status of the cooling fans and the surface temperature of the circuit board. The Version Information box displays the revision numbers of the currently loaded firmware modules for the selected audio circuit board.

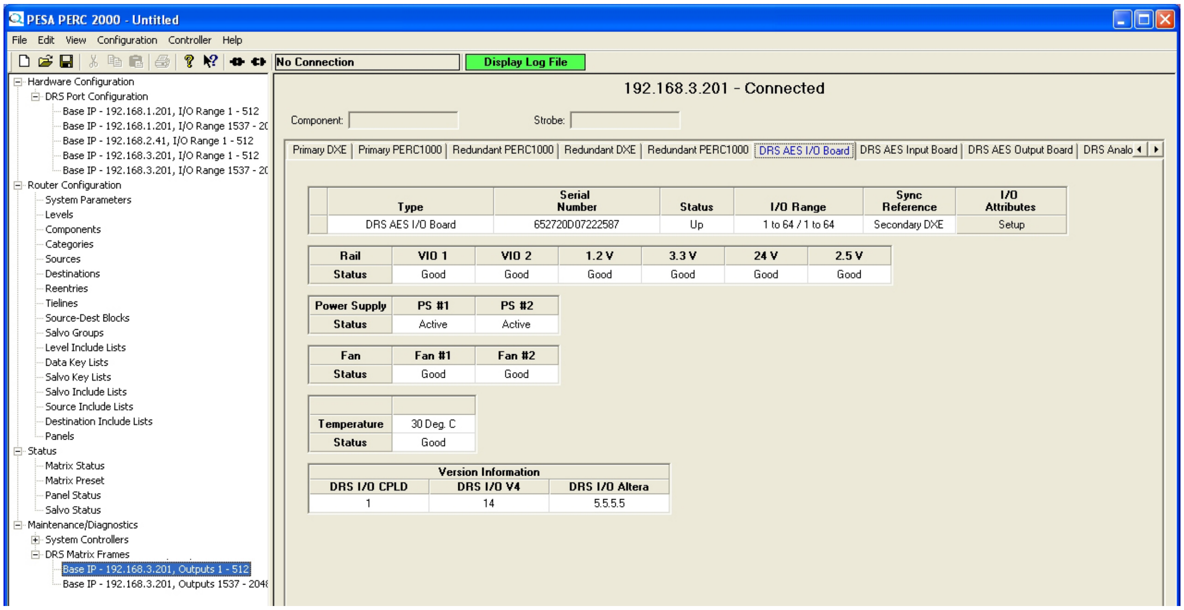


Figure 6-13. Audio Board Display

6.12 ACCESSING AND NAVIGATING AUDIO SETUP SCREENS

Setup screens for DRS audio boards are accessed through the I/O Attributes screen, and are set on one board at a time. The following steps guide you through the procedure to access the setup screen for a particular audio board. Instructions for modifying or selecting a specific audio attribute are covered in a separate paragraph for that function. Once you have accessed the setup screen for the audio board containing the signal(s) or channel(s) you wish to modify, proceed to the paragraph addressing the particular function you wish to use. You may set attributes and parameters on input signals, output signals, or both.

From the list of channel groups under the DRS Matrix Frames directory tree, select the ***base IP address*** of the DRS system and the channel group containing the audio board you wish to configure. The status and monitoring screen as shown in Figure 6-13 is displayed for the selected channel group.

All components associated with the channel group appear as tabs across the top of the system monitor display screen – primary and redundant DXE frames, primary and secondary PERC1000 frame controllers and tabs for all audio boards comprising the channel group. Select the tab for the board you wish to setup. Figure 6-14 shows an example screen using the DRS AES Output Board tab. The upper line of the status display identifies the Board Type, Serial Number, Status, I/O Range, and the Sync Reference source. The final button on this row selects the Setup screen for I/O Attributes. Click on the **Setup** button to bring up the attributes screen for the desired board. An example attributes screen, showing a dedicated AES Output Board as an example, is shown in Figure 6-15.

The setup screens are different for each board type – input or output, analog or AES, split frame or dedicated frame; however, setup screens are accessed identically for all boards. The following paragraphs present detailed configuration procedures for each board type.

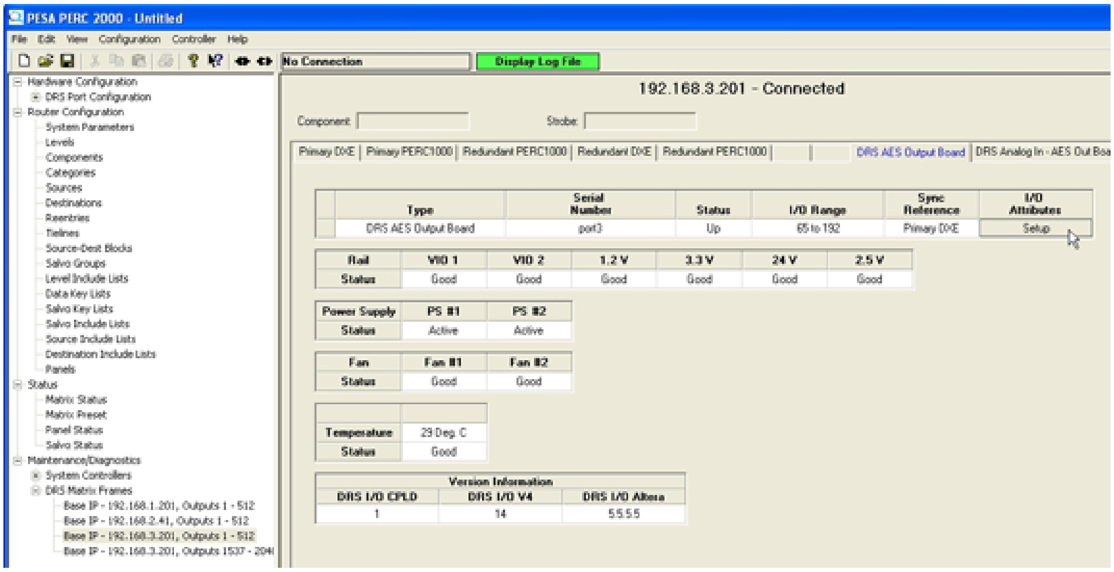


Figure 6-14. Location of I/O Attributes Setup Button

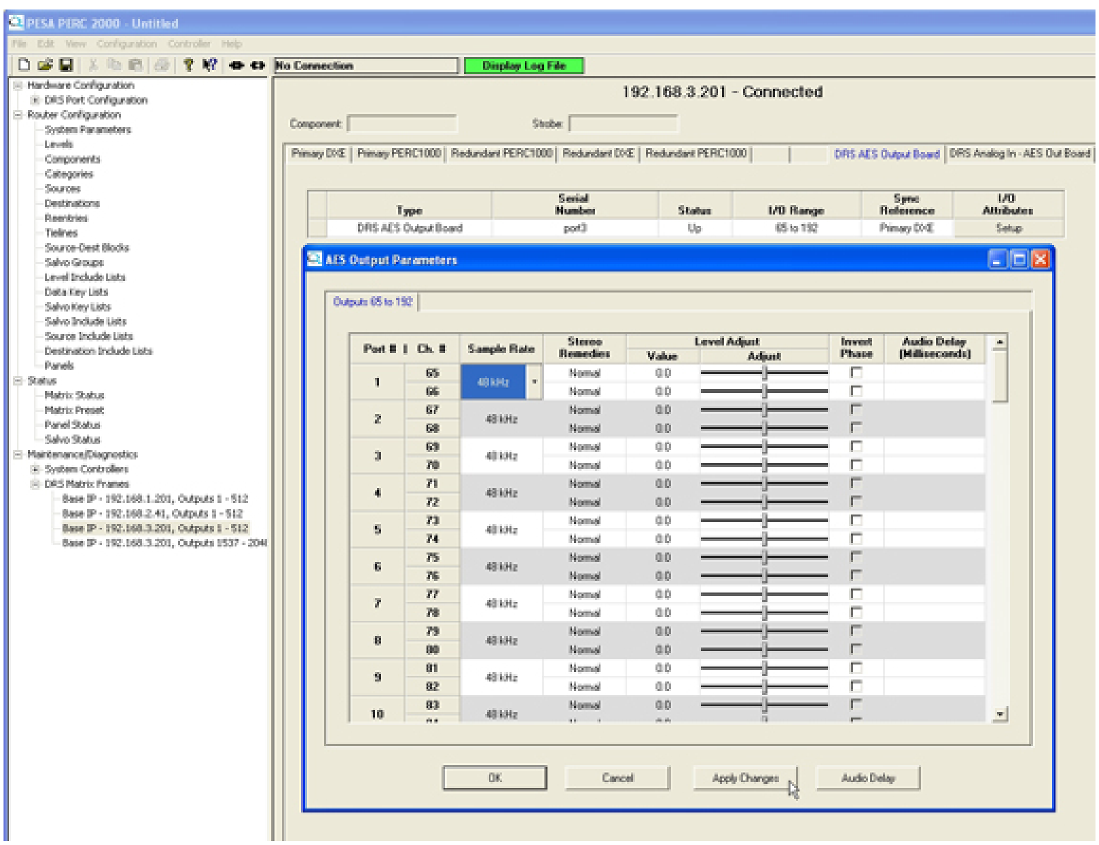


Figure 6-15. Audio Attributes Screen

6.12.1 AES INPUT OR OUTPUT PARAMETERS SCREENS

An example AES Input Parameters Screen for a dedicated 128 channel block is shown in Figure 6-16 and an example AES Output Parameters Screen is shown in Figure 6-17. At the top of the display window there is a tab identifying the numerical input or output range of the board, and the board type is identified in the title bar of the window. These screens are very similar, but notice that columns for each audio adjustment are placed in different locations on the input and output screens. Placement follows a logical pattern of signal flow through the board. Controls on the screen function identically whether setting up an input board or an output board.

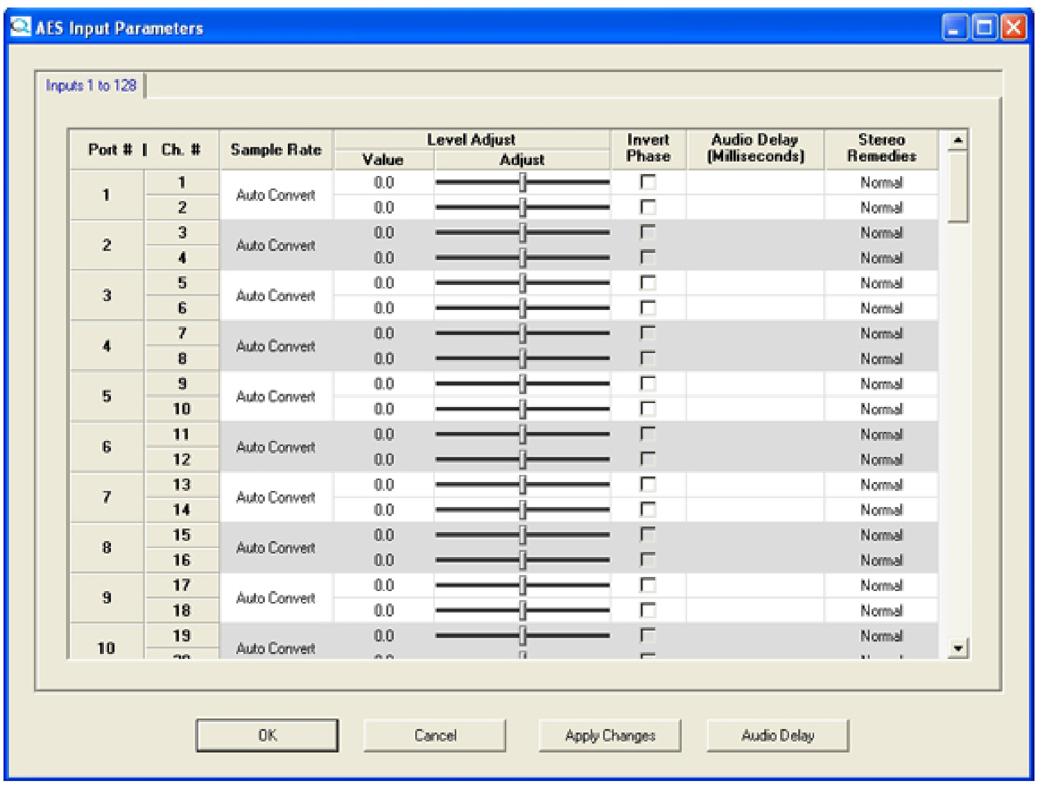


Figure 6-16. Example AES Input Parameters Screen

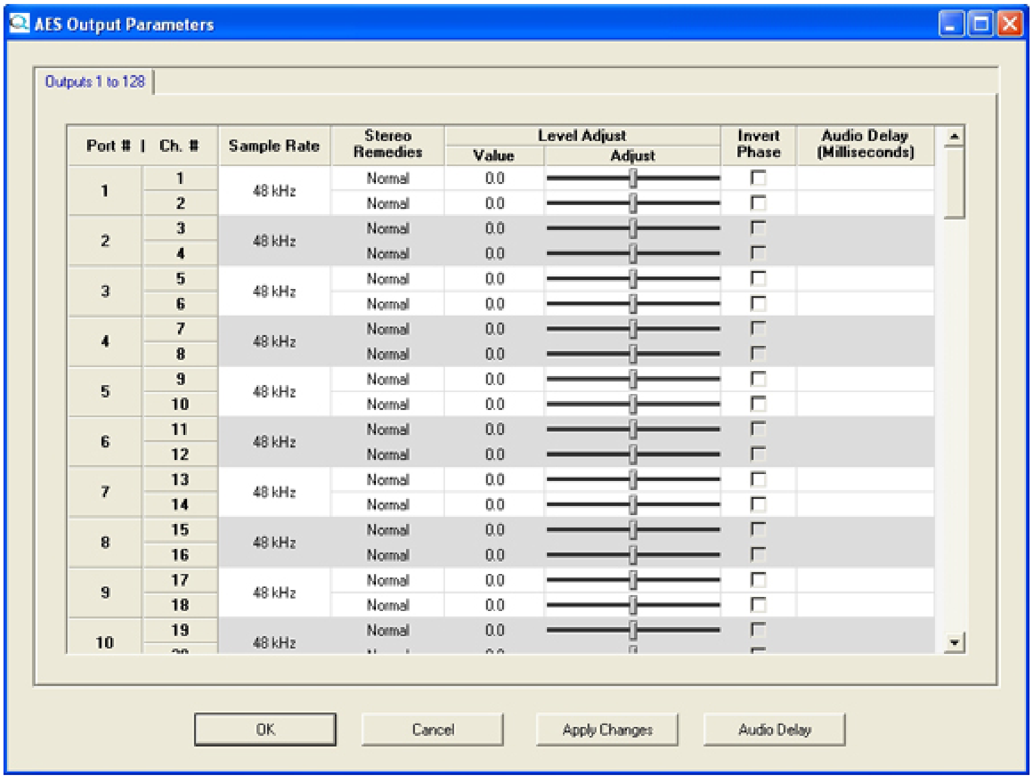


Figure 6-17. Example AES Output Parameters Screen

The left-most column of each screen is labeled Port Number (Port #), the next column to the right is labeled Channel Number (Ch. #). Remember that in AES digital audio, each audio signal actually carries two channels of audio data. On AES input and output screens the port number entry identifies the physical input or output number of AES signals to the router rear panel, and the channel number entry identifies the DRS routing channel number of each monaural audio signal carried by the AES input.

On both the input and output parameters screens there is a column labeled **Sample Rate**. On an input parameter screen the entry in this box reads AutoConvert, as shown in Figure 6-16, and is a fixed parameter with no operator input required. AutoConvert indicates that the sample rate of incoming data is determined by on-board circuitry and is automatically set accordingly. On an output parameter screen, the displayed value indicates the sampling rate of audio signals leaving the router. There is a pull-down box in each cell that allows the user to set the output sampling rate for each AES output pair at either 48kHz or 96kHz, as shown by Figure 6-18. To enter a sample rate setting, open the pull-down box for the desired output pair and click on the value.

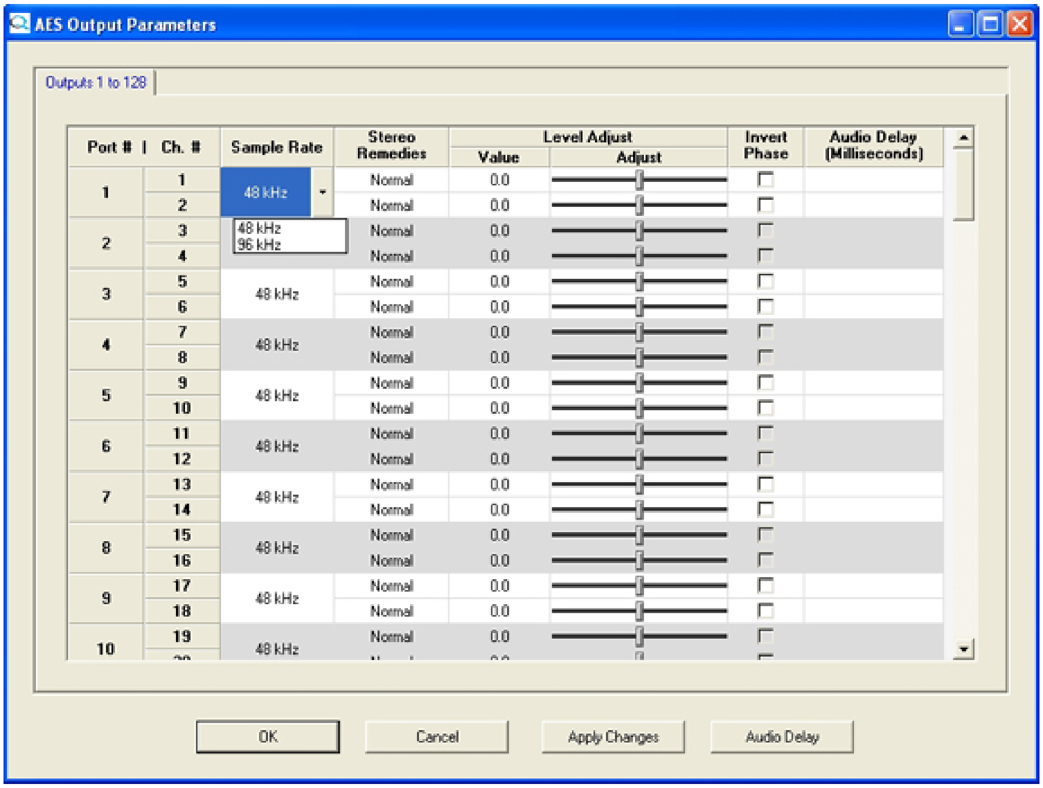


Figure 6-18 Output Sample Rate Selection

Individual signals on each audio routing channel can be independently set for level, phase inversion and delay. Stereo remedies may be applied to paired adjacent signals. Paragraph 6.13 contains procedures for performing audio channel adjustments.

NOTE	**It is important to remember that source and destination configuration, as well as switching, occurs on a routing channel basis, not a port basis.**

Signal pairing and channel adjacency are very important considerations in certain of the audio attribute adjustments – such as stereo remedies. Looking at either example screen, *channels* 1 and 2 are *adjacent* channels, 3 and 4 are adjacent channels, 5 and 6 are adjacent channels and so on. But, channels 2 and 3 are NOT considered adjacent channels, neither are channels 4 and 5, 6 and 7, etc. The importance of this is covered in the paragraph on stereo remedies, but for now just grasp the concept of which channels are adjacent – and which are not. Notice that the screen shows adjacent channels paired by an alternating color.

Remember that input signals may be routed to any output destination. An input signal retains modifications you make, regardless to which output it is routed. Adjustments to an output signal are made on audio routed to the output channel as final processing before leaving the router, regardless of which input it came from. Whether to make adjustments to input signals or output signals is going to be driven by your particular application requirements.

6.12.2 ANALOG AUDIO INPUT OR OUTPUT PARAMETERS SCREENS

An example Analog Input Parameters Screen for a dedicated 128 channel block is shown in Figure 6-19 and an example Analog Output Parameters Screen is shown in Figure 6-20. At the top of the display window there is a tab identifying the numerical input or output range of the board, and the board type is identified in the title bar of the window. Columns for each audio adjustment are placed in different locations on the input and output screen and follow a logical pattern of signal flow through the board. Controls on the screen function identically when setting up an input board or an output board.

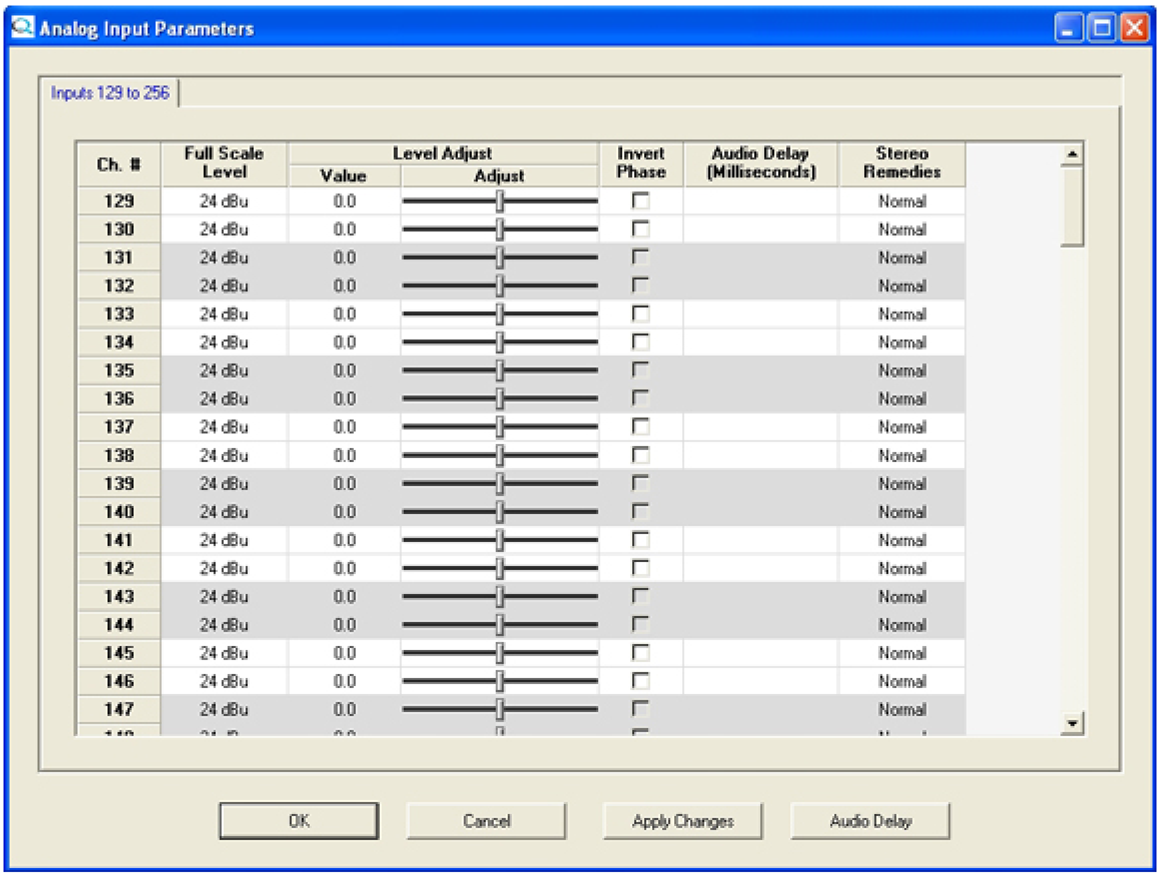


Figure 6-19 Example Analog Input Parameters Screen

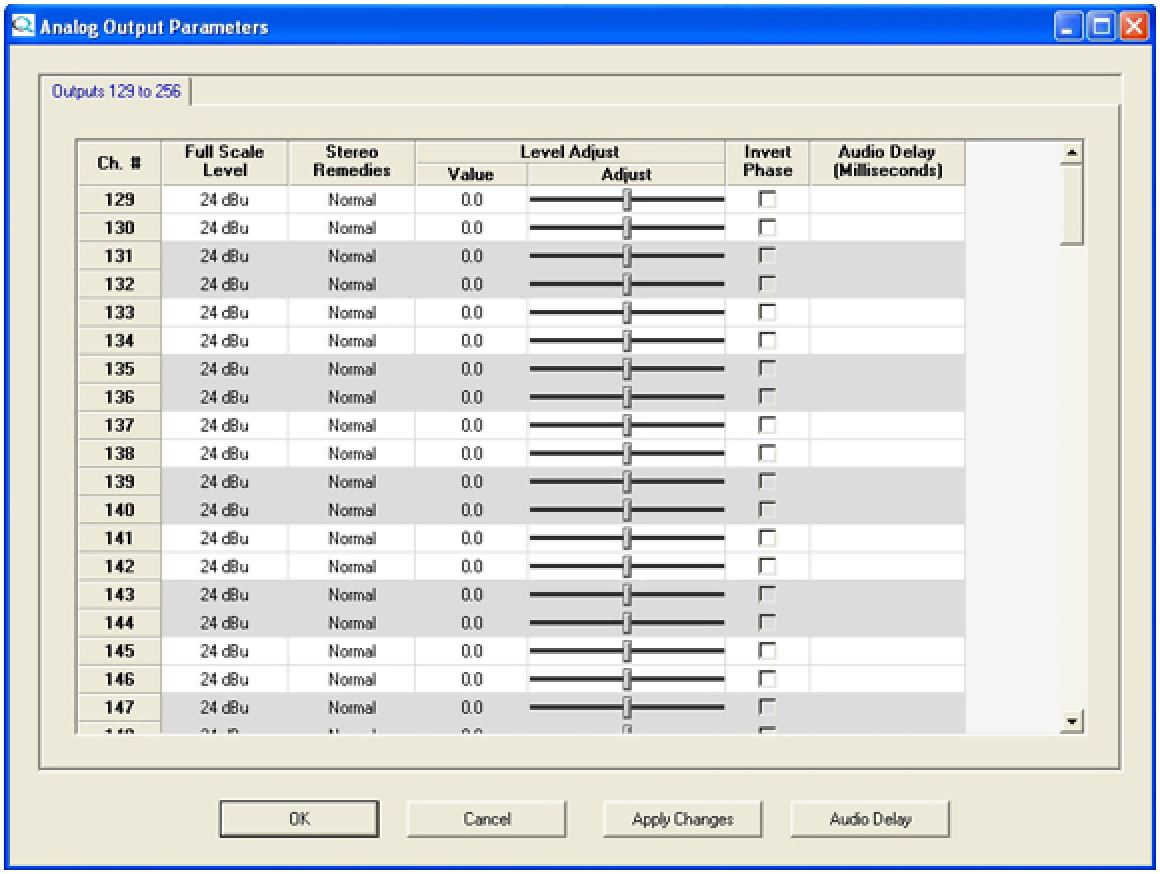


Figure 6-20. Example Analog Output Parameters Screen

The left most column of each screen is labeled Channel Number (Ch. #). Remember that in analog audio, each audio signal is exactly that - a single, independent signal. The channel number displayed in the column identifies the physical input or output number of the router. Each signal can be independently modified.

On both the input and output parameters screens there is a column labeled **Full Scale Level**, as shown in Figure 6-21. The value displayed in each row indicates the analog signal level that correlates to a digital audio signal with a full scale value of 0dB. There is a pull-down box in each cell that allows you to individually select the desired level for each analog audio signal, from the choices of 12, 18 or 24dBu. To enter a full scale level value, open the pull-down box for the desired output signal and click on the value.

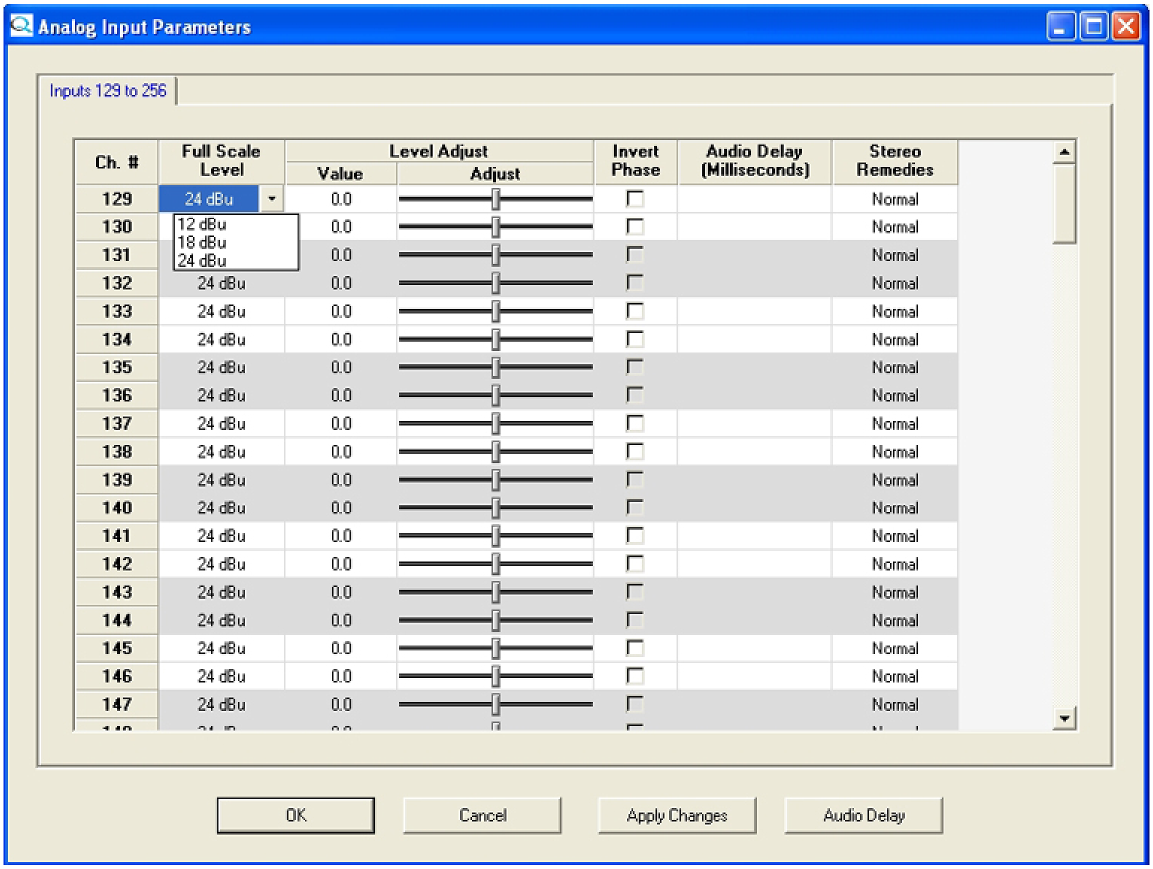


Figure 6-21 Full Scale Level Value Selection

Individual signals on each audio routing channel can be independently set for level, phase inversion and delay. Stereo remedies may be applied to paired adjacent signals. Paragraph 6.13 contains procedures for performing audio channel adjustments.

Notice that two channels are always paired, as indicated by alternating row colors. On our example input screen, channels 129 and 130 are paired, as are channels 131 and 132, etc. However, with analog boards, the concept of pairing is different than with AES. Remember that each channel of the pair represents a separate, independent physical input to the router, and often the paired inputs are related, such as with stereo audio. In many installations the DRS is user-configured to where two consecutive channels are treated as a single audio source for routing related signals. The left channel of a stereo signal, in our example screen, may be attached to input 129 and the right channel of the pair would be attached to input 130. The router is easily configured to where it switches both of these channels as a single source.

Even though it is the most common application, it is not necessary that the pairs be used for stereo audio – each may carry totally unrelated signals. However, the two channels indicated as paired by the colored rows are always adjacent channels; and just as with AES audio this is an important consideration in certain of the audio attribute adjustments – such as stereo remedies. In our example input screen channels 129 and 130 are adjacent channels, 131 and 132 are adjacent channels, etc. But, channels 130 and 131 are NOT adjacent channels, neither are channels 132 and 133, 134 and 135 and so on. The importance of this is covered in the paragraph on stereo remedies, but for now just grasp the concept of which channels are adjacent – and which are not. Adjacent channels are always shown as paired by the alternating row color.

Remember that input signals may be routed to any output destination. An input signal retains modifications you make, regardless to which output it is routed. Adjustments to an output signal are made on audio routed to the output channel as final processing before leaving the router, regardless of which input it came from. Whether to make adjustments to input signals or output signals is going to be driven by your particular installation.

6.12.3 SPLIT FRAME INPUT OR OUTPUT PARAMETERS SCREENS

Split audio frames contain two blocks of 64 channels each, in various combinations of input or output signals and AES or analog signal types. When you select the tab for a split frame board from the channel group status and set-up screen, a parameters screen opens identifying the two block contained in the frame, as shown in Figure 6-22 using an AES Input/Analog Output screen as an example. At the top of the display window there is a tab identifying the type and numerical input or output range of each block, and the board type is identified in the title bar of the window. Parameter screens for each signal type and format are functionally identical to screens for dedicated 128 channel blocks, as discussed in Paragraphs 6.12.1 and 6.12.2.

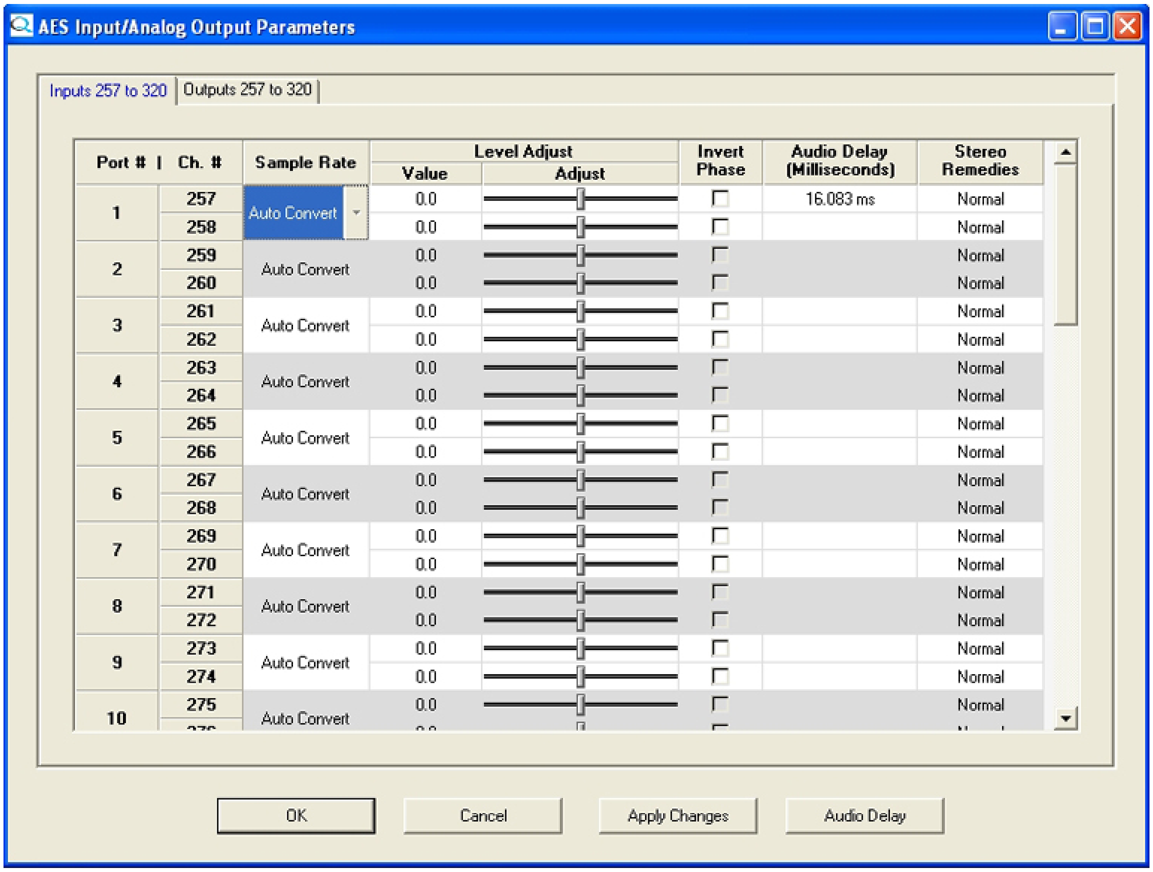


Figure 6-22 Typical Split Frame Parameters Screen

6.13 Audio Adjustment and Digital Signal Processing Functions

Each individual DRS input or output signal may be adjusted for signal level, phase inversion and delay; and stereo remedies may be applied to any pair of adjacent channels. Controls on the screen function identically whether setting up an input board or an output board, refer to Figures 6-16, 6-17, 6-19 and 6-20.

6.13.1 Channel Level Adjustment

Level Adjust allows you to set the gain level of an individual audio signal, with an adjustment range of ±6dB. Use your mouse to move the level adjust slider to the desired output level. The box next to the slider labeled Value displays the amount of gain adjustment applied to the signal in dB. You may also click at each end of the slider bar to move the value up or down in 0.1 dB increments. Click the **Apply Changes** button to immediately apply the change and leave the attributes screen open for further changes, if desired. Click the **OK** button to apply the changes and exit the screen. **Cancel** exits the screen without applying any changes.

6.13.2 PHASE INVERSION OPTION

Phase Inversion allows you to apply a 180 degree phase shift to the audio channel. To apply phase inversion, simply click in the Invert Phase click box for the channel you wish to invert. A check in the box indicates that phase inversion is active for that channel. Click the **Apply Changes** button to immediately apply the change and leave the attributes screen open for further changes, if desired. Click the **OK** button to apply the changes and exit the screen. **Cancel** exits the screen without applying any changes.

6.13.3 AUDIO DELAY OPTION

Audio Delay allows you to apply a delay factor to an audio signal channel. Audio channels to delay and delay values are selected through the Delay Setup Screen. To access the Delay Setup Screen, click on the “Audio Delay” button at the bottom of the input or output parameters screen, as shown in Figure 6-23. A DRS AES audio input board is used for this example screen, however, the audio adjustment columns are identical between all DRS audio boards. Clicking the button will bring up the Delay Setup Screen, Figure 6-24. The delay setup screen is identical in appearance and function for all DRS audio board types.

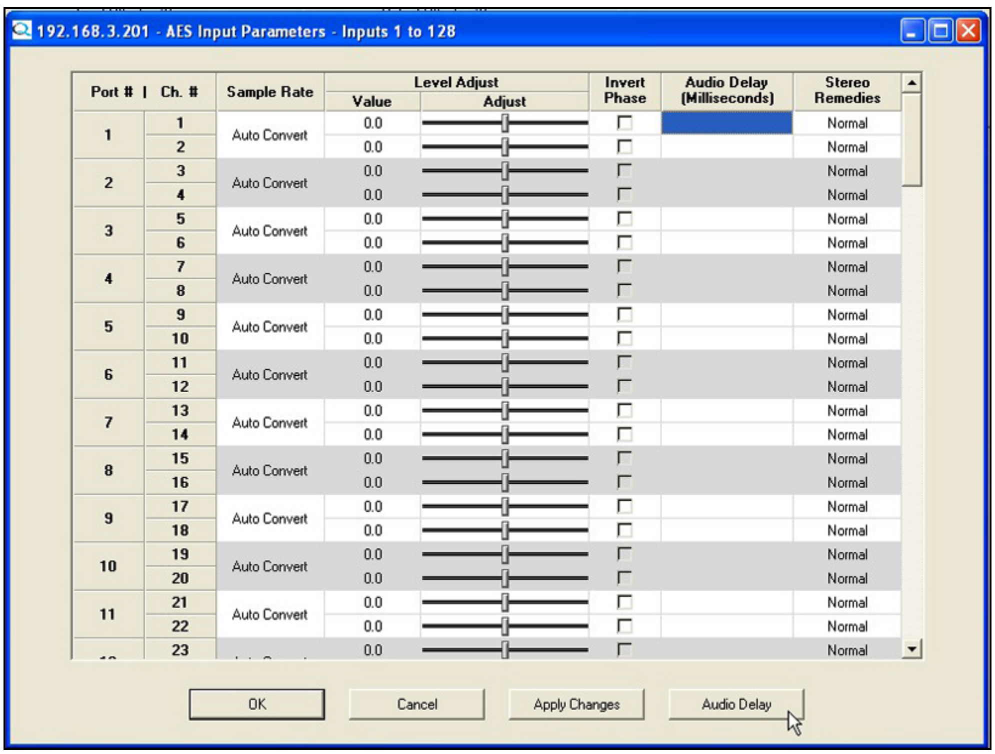


Figure 6-23 Location of Audio Delay Button

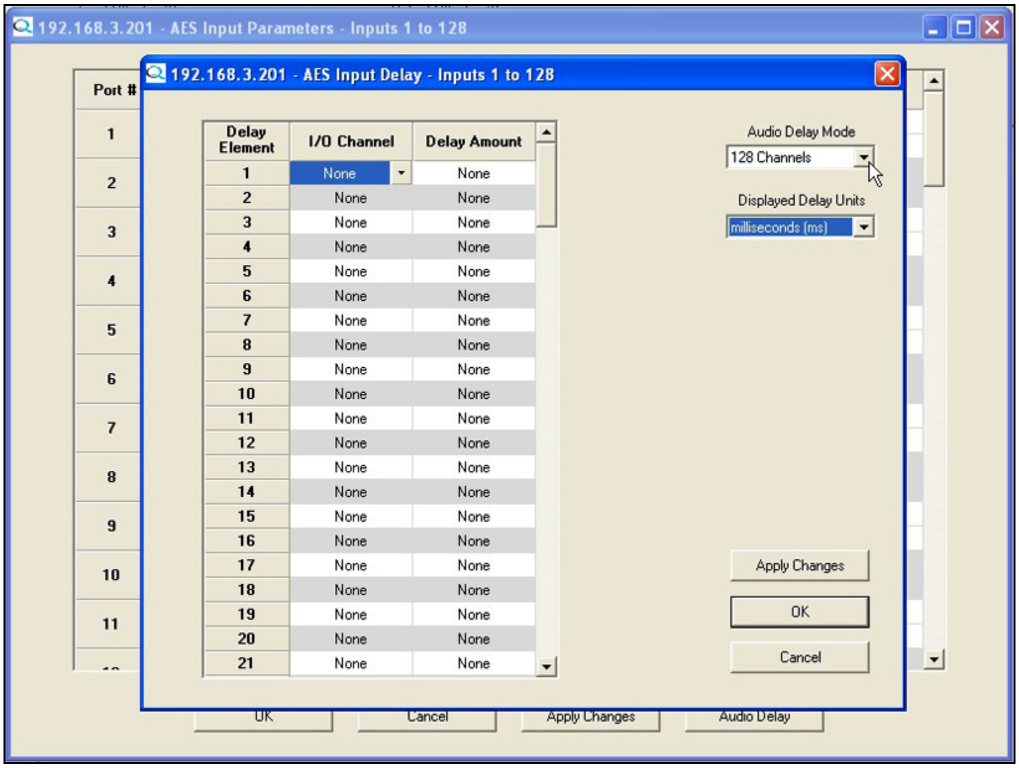


Figure 6-24. Delay Setup Screen

Refer to Figure 6-24 as we discuss the Delay Setup Screen. The leftmost column is labeled Delay Element, the next column is labeled I/O Channel and the third column is labeled Delay Amount. Two drop-down menus are located on the right side of the screen – these are the Audio Delay Mode menu and the Displayed Delay Units menu.

The selection you make from the Audio Delay Mode menu determines how many Delay Elements are available for assignment and also determines the length of delay available to a channel. Figure 6-25 shows the expanded Delay Mode Menu. Options available from the drop-down menu are 128 channels, 64 channels and 32 channels.

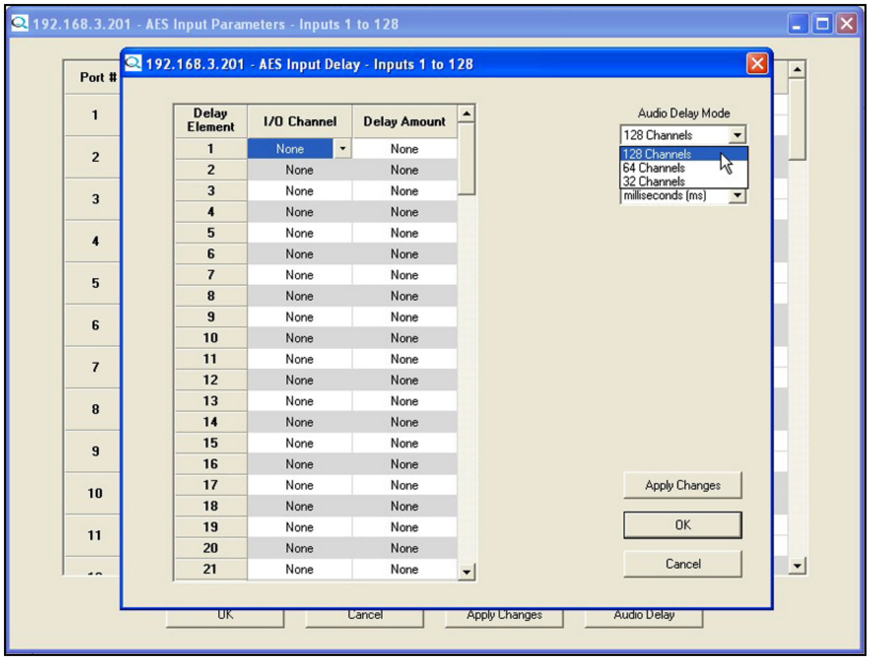


Figure 6-25. Delay Mode Menu

In order to understand the available options we need to briefly discuss the method used to delay audio. Every channel to which you wish to apply a delay must be assigned through one of the available delay elements. Think of a delay element as a discrete delay line, and the number of channels you assign through the delay mode drop-down as the number of available delay lines. The algorithm used to implement the delay is not important to this discussion, but you do need to realize that every available delay element requires a block of system memory. The available memory is divided among all of the delay element allocations. Therefore, the fewer delay elements you allocate, the more memory available for performing the delay algorithm. In simpler terms, this means the fewer channels you allocate from the Audio Delay Mode drop-down menu, a greater amount of delay time can be allocated to each delay element.

More on this, but for now let's look at the next drop-down menu – the Displayed Delay Units menu, Figure 6-26. The selection you make in this menu determines by what unit of measure the delay time is displayed. You may display the delay in terms of NTSC video frames, PAL video frames or in milliseconds. Simply click the unit you wish to use. The selection will be highlighted.

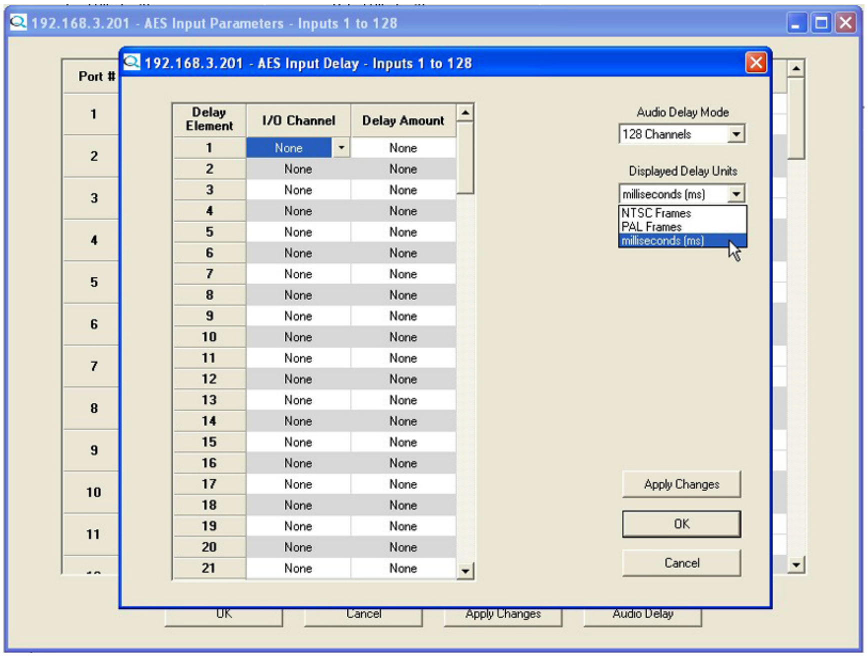


Figure 6-26. Displayed Delay Units Menu

From the previous paragraph we see there is a direct correlation to the number of delay elements we allocate and the amount of delay available to each. Table 6-2 shows the range of delay time that can be selected for each delay element for each of the Audio Delay Mode options. The table also lists the delay times in all three of the available display units.

Table 6-2 Delay Times for Available Channel Options

	NTSC Frames	PAL Frames	Milliseconds
128 Channels	0.160 – 10.230	0.133 – 8.533	5.333 – 341.333
64 Channels	0.160 – 20-460	0.133 – 17.067	5.333 – 682.667
32 Channels	0.160 – 40.919	0.133 – 34.133	5.333 – 1365.333

When setting up the delay option for your system, consider how many audio signals or channels you will need to delay and use the Audio Delay Mode drop-down menu to allocate the delay elements. Remember, the more delay elements you allocate, the less the amount of delay time available to each one. Use the Displayed Delay Units drop-down menu to select the units for delay display. With those selections made, we are ready to begin assigning channels and delay time values.

We used the analogy of a delay element to a discrete delay line. The Delay Element column on the setup screen provides a data entry row for each element. If you selected 128 channels from the delay mode menu – there will be 128 rows, numbered 1 thru 128, in the Delay Element column. Each element is a delay line you can assign to any of the audio signals associated with the particular audio board you are configuring.

To apply delay to an audio channel choose a delay element (delay line) and open the I/O Channel drop-down list on the row of the desired element by clicking in the box as shown in Figure 6-27. The menu listing allows you to select the physical input or output of the audio frame, depending on frame type, you wish to delay. Use the scroll bar to locate the channel number and click the entry to select it. The channel number assigned is displayed in the box.

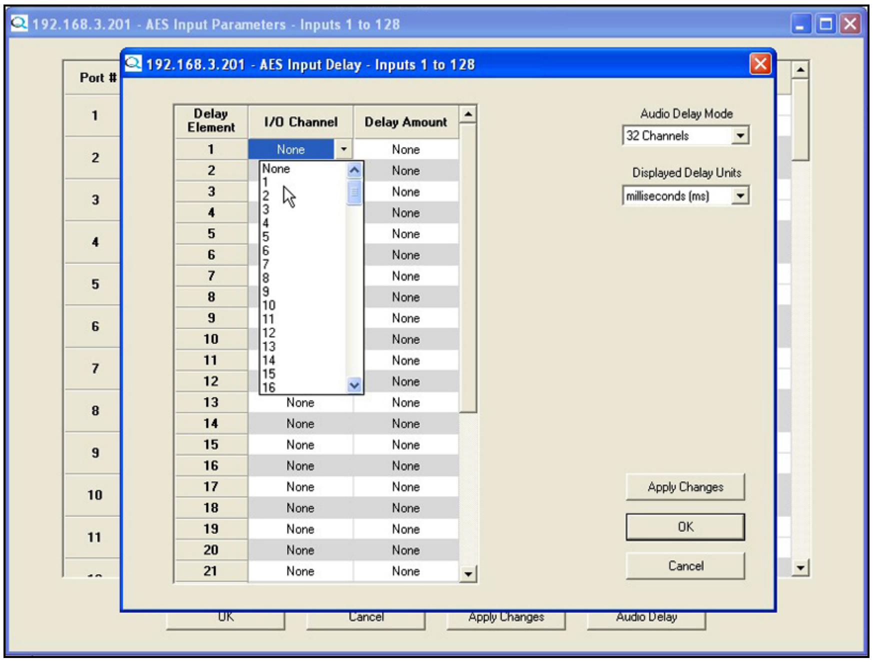


Figure 6-27. I/O Channel Listing

Use the Delay Amount drop-down menu to select the amount of delay you wish to apply to the audio channel as shown in Figure 6-28. The values shown in the menu are displayed in the units you chose in the Displayed Delay Units menu. Use the scroll bar to select the value and click the entry to select it. The delay time is displayed in the box.

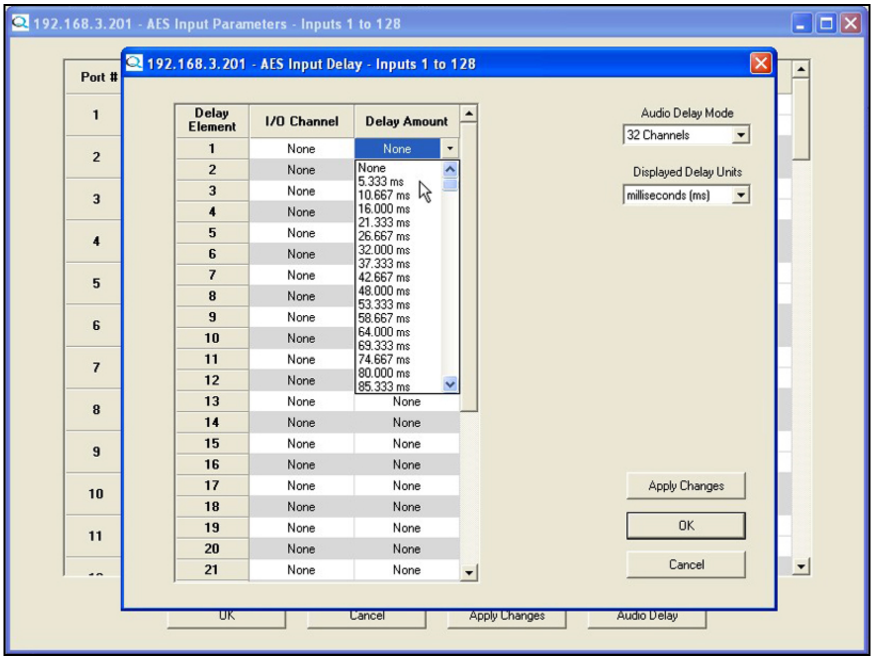


Figure 6-28. Delay Amount Menu

Repeat this process for all channels to which you wish to apply a delay. Once all delay assignments are made, click on the **Apply Changes** button, Figure 6-29, to apply the delay times to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the settings. Figure 6-29 illustrates a delay setup screen with delay assigned to various channels.

Once entered and activated, audio delay values are displayed on the parameters screen in the Audio Delay column using the selected unit of time measure.

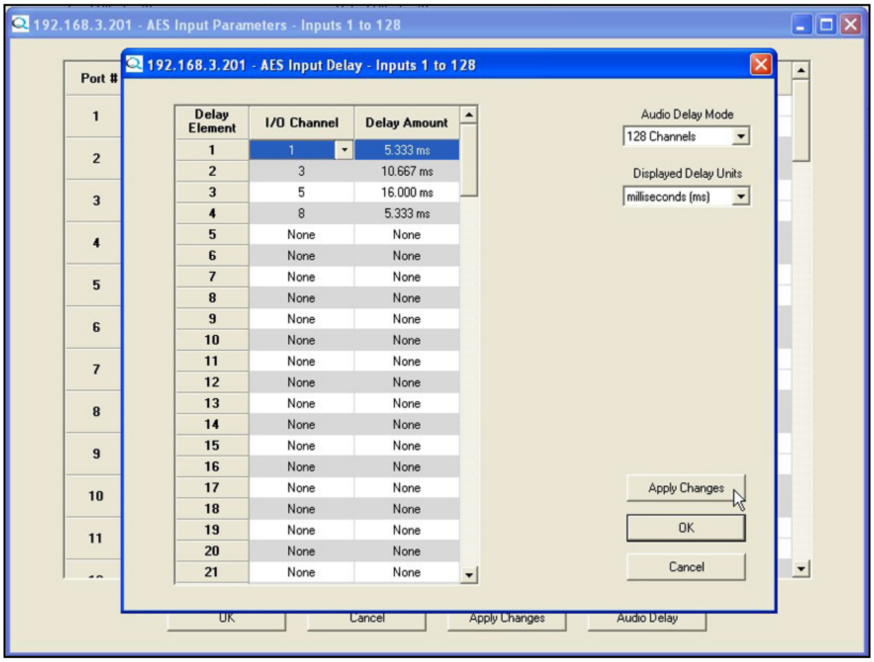


Figure 6-29. Example Delay Setup Screen

Both the I/O Channel box and the Delay Amount box have associated right-click menus. These are shown in Figures 6-30 and 6-31. Each menu function is discussed in the following chart:

<u>I/O Channel Box Right-Click Menu Item</u>	**<u>Function</u>**
Clear All I/O Channel Selections	Clears all channel assignments from all the Delay Elements
Auto Increment I/O Channel Selections	Allows you to enter a value in a cell, click and drag the cursor to cover the desired number of cells. The block will be filled beginning with the value you entered in the first cell and incrementing the value by one for each cell in the block.
<u>Delay Amount Box Right-Click Menu Item</u>	
Clear All Delay Values	Clears all delay time assignments from all the Delay Elements

Set All Delay Values To (cell entry)	This function allows you to right click in any Delay Amount cell and the value entered in that cell will be applied to all cells in the Delay Amount column.
Fill Down	Allows you to enter a value in a cell, click and drag the cursor in a downward direction to cover the desired number of cells. The block will be filled in the downward direction beginning with the value you entered in the first cell and incrementing the value by one for each cell in the block.
Fill Up	Allows you to enter a value in a cell, click and drag the cursor in an upward direction to cover the desired number of cells. The block will be filled in the upward direction beginning with the value you entered in the first cell and incrementing the value by one for each cell in the block.

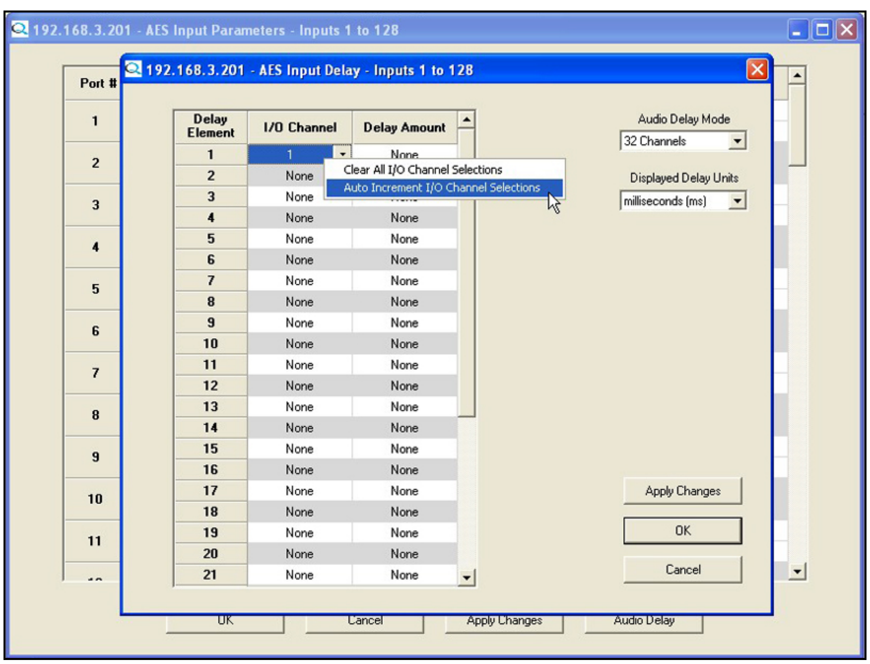


Figure 6-30. I/O Channel Right-Click Menu

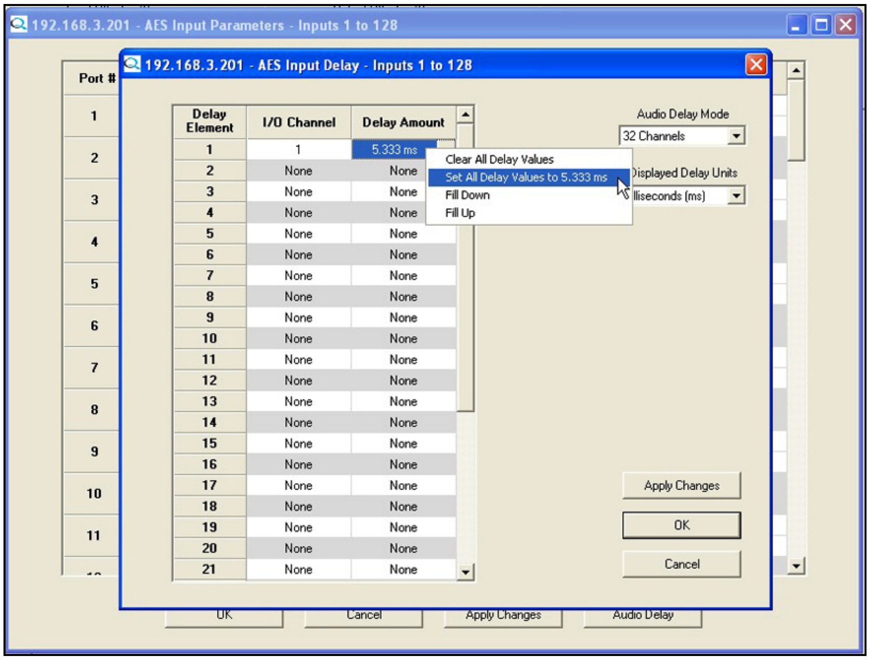


Figure 6-31. Delay Amount Right-Click Menu

6.13.4 STEREO REMEDIES OPTIONS

Stereo Remedies describes a group of commands that allow you to select operational parameters for paired audio channels. In previous text we discussed the pairing concept for two audio channels. In that discussion we see that paired audio channels are displayed on the parameters setup screen by alternating color rows, and are said to be adjacent to one another. We also said that in many installations pairs are the left and right channels of a stereo audio source.

Some installation situations may require that the left and right channels of a stereo source be summed into a monaural signal containing both channels, or subtracted to derive the L-R stereo difference signal. Other situations may require that the channel pairs be swapped left for right and vice-versa. The Stereo Remedies functions allow you to easily perform these tasks from the parameters setup screen. Remember, however, that stereo remedies functions can only be applied to channels that are adjacent to one another. In all stereo remedies functions, the first signal of an adjacent pair is processed as the left channel audio and the second signal is processed as the right channel audio.

To access Stereo Remedies, click in the cell of the Stereo Remedies column on the row of the audio channel you wish to modify. Our example screen, Figure 6-32, shows the remedies menu selected for physical router input 641 on an analog input board. The menu choices are the same for all input and output boards. Each selection option is discussed below.

- **Normal** applies no change to the paired channels.

- **Swap** replaces the input signal for the selected channel with the audio signal from the adjacent channel. In the example screen, clicking Swap would cause the signal on physical input 641 to not be routed through channel 641 to the matrix. Instead the audio from input 642 would become the audio routed through channel 641. The audio from input 642 is also routed through channel 642 as normal – provided the remedies selection for channel 642 is Normal. If we select the Swap function in both channels of the pair, the inputs are totally swapped, meaning that the input signal on physical input 641 is routed through channel 642 and vice-versa.

- **L+R** adds the adjacent channel to the selected channel. Again in our example screen, if we select the L+R option for channel 641, audio from physical input 642 is summed with audio from physical input 641 and routed through the matrix as a mixed signal. The signal on channel 642 is not altered and is still available for routing through the matrix. If we select the L+R function for both channels of the pair, we will derive two identical signals, both of which are a summation of physical inputs 641 and 642.

- **L-R** subtracts the second signal of an adjacent pair from the first signal of the pair and routes the stereo difference signal as the output of the selected channel. Remember that the first signal of an adjacent pair is processed as the left channel audio and the second signal is processed as the right channel audio. For example, if we select the L-R option for channel 641, audio from physical input 642 is subtracted from audio of physical input 641 and the difference signal is routed through the matrix on channel 641. If we select the L-R option for channel 642, the algorithm performs exactly the same function - audio from physical input 642 is subtracted from audio of physical input 641 (right audio is subtracted from left audio) and the difference signal is routed through the matrix on channel 642. In this instance, the signal on channel 641 is not altered and is still available for routing through the matrix. If we select the L-R function for both channels of the pair, we will derive two identical difference signals, both of which are the audio from input signal 642 subtracted from audio input signal 641.

When you have entered stereo remedies for all desired channels, click on the **Apply Changes** button, Figure 6-32, to apply the functions to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

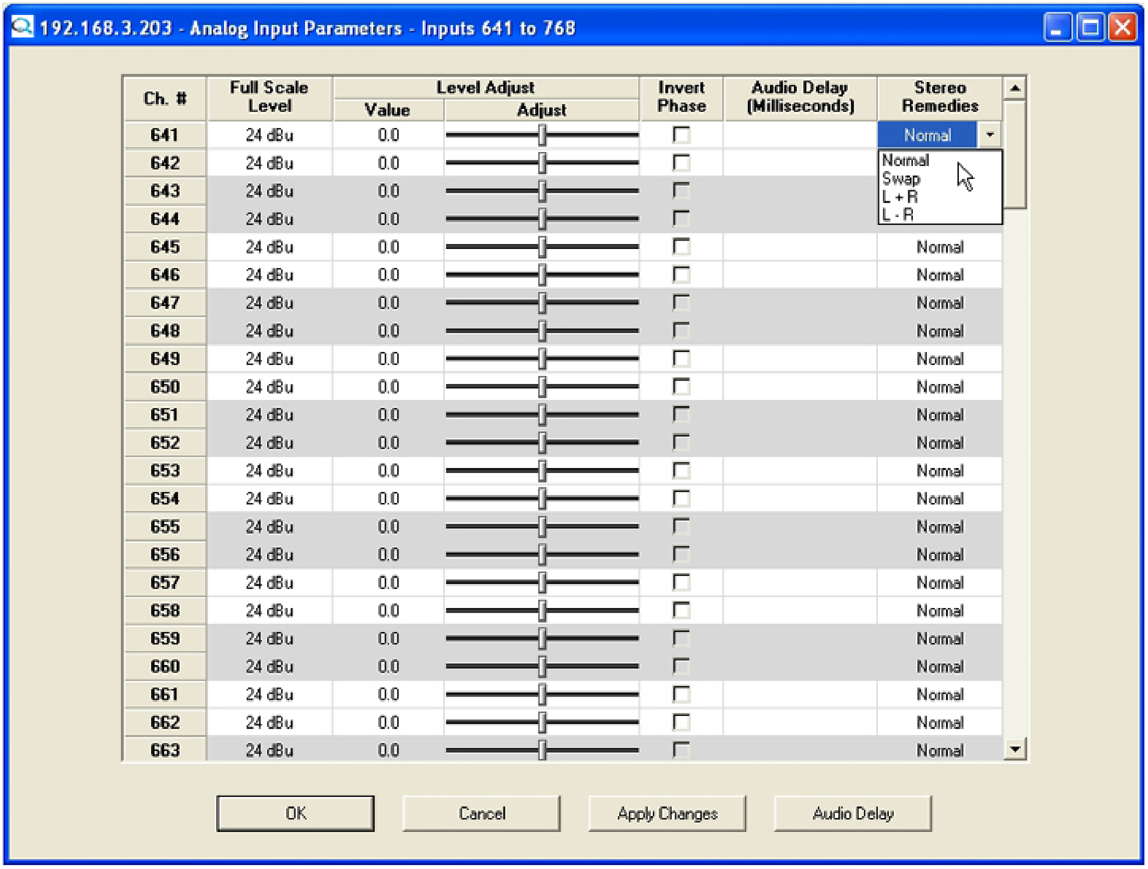


Figure 6-32. Stereo Remedies Menu

6.13.5 SAVE AND LOAD AUDIO BOARD PARAMETERS

Audio parameters and settings - such as levels, stereo remedies, delay, etc. – for all audio boards in a channel group may be saved as a data file. You may create data files of audio settings for particular applications or productions and quickly reload these as needed. Audio data files are always saved in, and retrieved from, the directory containing the PERC2000.exe file you use to launch the GUI application. Audio data files are always generated with the base IP address of the DRS system and the range of numerical output channels contained in the channel group as the filename, and adding the .dat extension.

The following steps guide you through the procedure to generate an audio data file:

- From the list of channel groups under the DRS Matrix Frames directory tree, select the channel group for which you wish to create an audio data file. Only one file is generated, regardless of the number of DXE frames or frame controllers in the group, but this single file contains audio setting data for all audio boards associated with the channel group.

- This will bring up the DRS Home Screen for the channel group.
- Right click on the highlighted channel group entry in the DRS Matrix Frames directory tree. The menu shown in Figure 6-33 is displayed.
- Select the “Save I/O Board Data” option from the menu.
- You will not be prompted to enter any file data. The audio data file is saved to the directory on the host PC containing the executable file for the P2K GUI. The file is saved with a filename derived from the channel group nomenclature, followed by a .dat extension. Our example screen, Figure 6-33, shows the audio data file we just created saved in the directory named P2K GUI with the filename IP-192.168.3.201.dat. This naming convention is always used when saving audio data files.
- Repeat this procedure for all channel groups in the system by selecting the channel group from the DRS Matrix Frames directory tree.
- Each audio data file is saved into the directory with a filename that allows easy identification of the channel group used to generate it as shown in Figure 6-34.

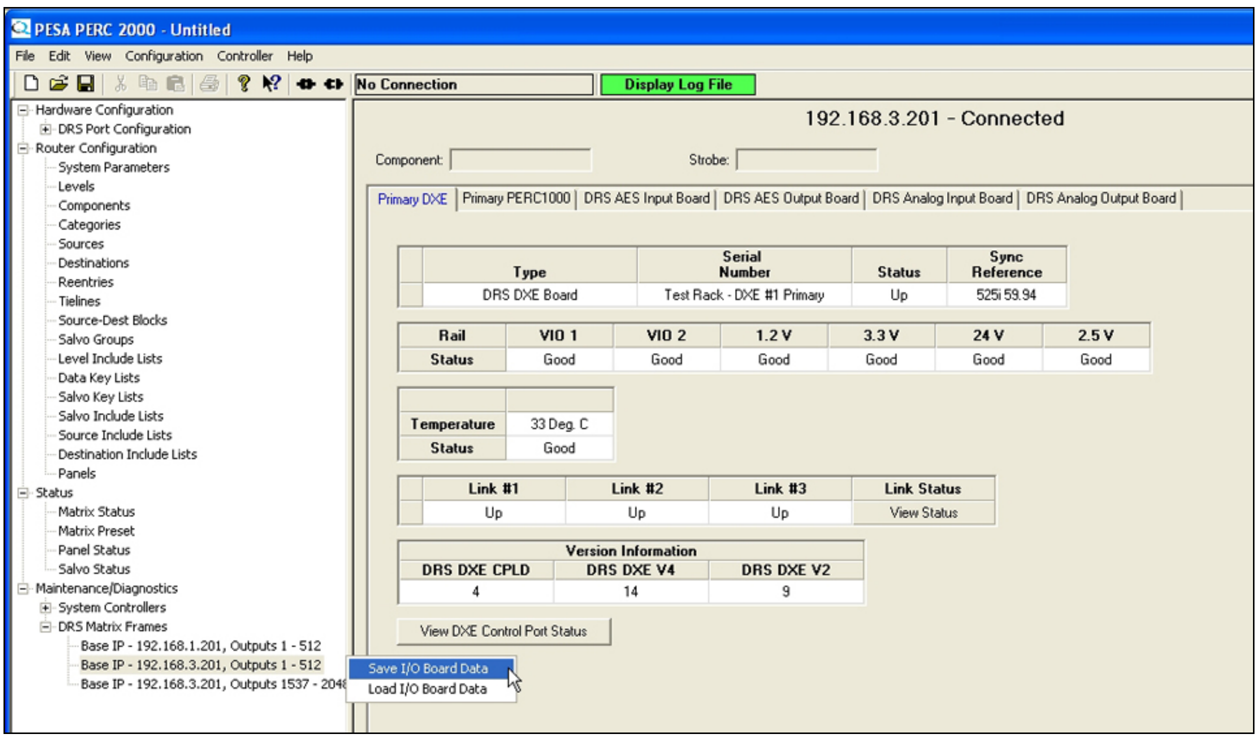


Figure 6-33 Audio Data Save and Load Commands

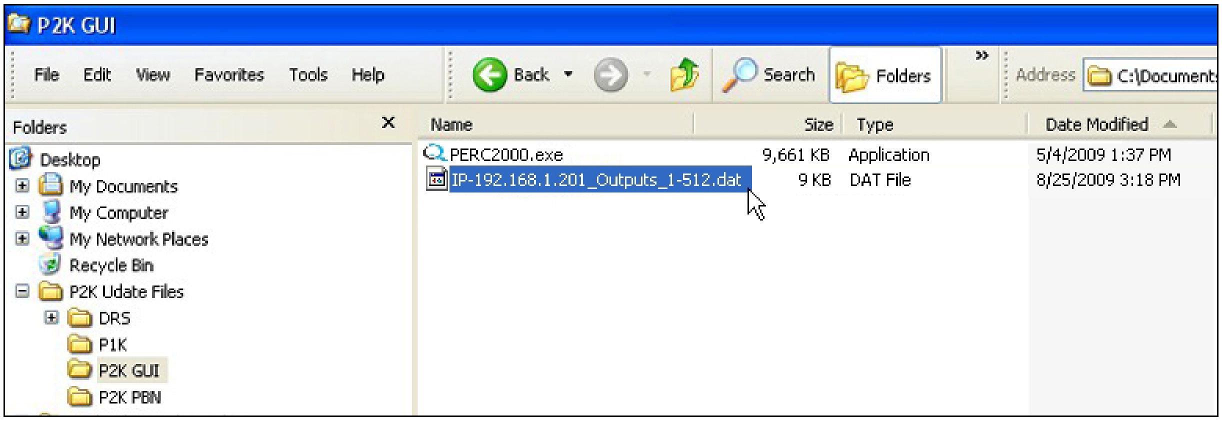


Figure 6-34 Audio Data Filename Location and Structure

In a practical application of this feature you would typically create a folder named to specify a certain application or date. Generate the audio data files for all DXE frames in the system - they will be stored in the folder with the GUI application. Once all needed data files are generated, move the files to the folder you just created.

In order to load audio data to the frame controllers from a saved file, the file must be located in the folder containing the executable file for the P2K GUI. If you have moved these files into another folder, they must be copied into the P2K GUI folder in order to be loaded. You will not have the option to browse to the files, they must be available in the application folder.

The following steps guide you through the procedure to load an audio data file:

- From the list of channel groups under the DRS Matrix Frames directory tree, select the channel group for the DXE frame on which you wish to load an audio data file.
- This will bring up the DRS Home Screen for the channel group.
- Ensure that the audio data file with the filename of the channel group you selected in the directory tree is available in the P2K GUI application folder.
- Right click on the highlighted channel group entry in the DRS Matrix Frames directory tree. The menu shown in Figure 6-33 is displayed.
- Select the “Load I/O Board Data” option from the menu.
- You will not be prompted to enter any file data. The audio data file is read from the directory on the host PC containing the executable file for the P2K GUI.
- Audio data will load and can be verified by checking the setting and parameters on the audio setup screens.
- You may repeat this procedure for all channel groups in the system, selecting the desired group from the DRS Matrix Frames directory tree.

6.14 ACCESSING INTERNALLY GENERATED SIGNALS

Every DRS system contains an internal signal generator. Signals from the generator are accessed by inserting the source number for the desired tone into system configuration files, just as you would with any other audio source channel number; and may be selected for embedding into an output embed group, if desired. The following chart identifies the signals that are available using the source number indicated in the source definition configuration lists.

DRS Generated Signal	Source Number
Audio Silence	4097
Sweep	4098
Tone 100 Hz	4099
Tone 1 kHz	4100
Tone 10 kHz	4101
Tone 1 kHz w/Dip	4102
White Noise 1	4103
White Noise 2	4104
Pink Noise 1	4105
Pink Noise 2	4106

Chapter 7 Functional Description

7.1 AN INTRODUCTION TO MULTIPLEX DATA SYSTEMS

PESA's Cheetah DRS Series Audio Router uses a time slice/multiplex serial data bus signal processing scheme. Very simplistically stated, in this processing method multiple signals from various sources are sampled and the data obtained from each is stored as a packet and formatted into a serial output stream (multiplex data bus). At the receiving end this "packetized" stream of data is read at the same clock rate as it was packaged, using a synchronized clock strobe, and the individual digital signals are reconstructed as they were at the source. For purposes of this text the data bus generation circuitry is referred to as the Bus Transmitter (XMTR), and the receiving circuitry is referred to as the Bus Receiver (RCVR). Multiplexed data bus systems are used in many applications requiring efficient transfer of large amounts of data.

Let's take a closer look at how multiplexing technology is applied to the Cheetah DRS Router. For a simplified explanation consider the most basic configuration as it would apply to a distributed routing system: a multiplex data system with two input channels and two output channels, 2x2, with the Bus XMTR circuitry located remotely from the Bus RCVR circuitry. For this example assume that both input signals are analog audio and that we wish to have the input point and output point separated by a distance of 30 meters. A top-level, simplified block diagram of this system is shown in Figure 7-1.

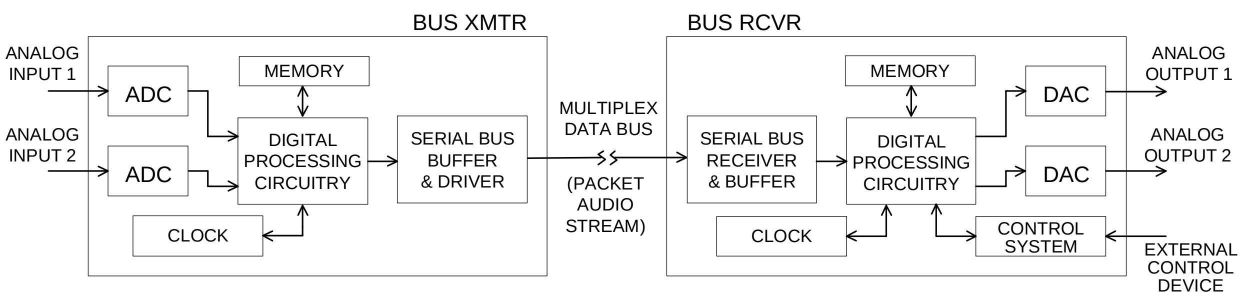


Figure 7-1 Simplified Block Diagram – 2x2 Multiplex Bus Router

Analog Inputs 1 and 2 are connected to the Bus XMTR circuitry, where the multiplex data bus is generated, and each is routed to an Analog-to-Digital Converter (ADC) device. The output of each ADC is a digital translation of the analog input that is routed to the Digital Processing Circuitry. This circuitry sequentially "reads" or samples the data of each input at a rate determined by the system Clock. Real-time instances of the data sample words are stored in Memory. Additional processing circuitry takes the data words stored in memory and sequentially writes these words, as data packets, into a serial data stream containing all the samples of inputs 1 and 2, plus necessary control data for clock synchronization and other housekeeping operations. This data stream (Multiplex Data Bus) is routed to the Serial Bus Buffer and Driver circuitry where it is level shifted and fed through a driver to the outside world.

A low-loss cable (In our example a 30 meter cable) routes the multiplex data bus from the Bus XMTR to the Bus RCVR. At the receiver, bus data enters the Serial Bus Receiver and Buffer circuitry where it is level shifted, buffered and conditioned for use by the Digital Processing Circuitry. Using control data packets embedded in the multiplex data stream for clock synchronization and other functions, the processing circuitry "disassembles" the data stream, extracts the data words (samples) for inputs 1 and 2, and stores each sample in Memory. For purposes of this simple example consider that data for each input is stored in a memory location dedicated to that input, in this example, of course, input 1 and 2.

In order for our simple 2X2 router to be of any use, we have to be able to access either input signal (1 or 2) at either output connector (1 or 2) and be able to specify which input signal we want on each output connection by some External Control Device. To do this it is necessary to "build," as directed by commands from the control system, a data stream for each output channel containing only the data words, in the exact order, as the original input signal selected as the channel output. This is done by a portion of the processing circuitry that "reads" the memory location corresponding to a particular input channel and processes the data bits into a serial stream containing only the sampled data for that input channel.

In our example, suppose we want to route input 1 to output 1. The external control device allows us to assign input signals to specific output paths, in this case input 1 to output 1, and it in turn issues the command to Control System circuitry within the Bus RCVR. On receipt of our command, processing circuitry for output 1 reads the sample data in the memory location associated with input 1 at the proper refresh rate and reconstructs the digital data translation of analog input 1. The digital data stream is routed through a Digital-to-Analog Converter (DAC) device and an exact reproduction of analog input 1 is available at output channel 1. If we want input 1 available simultaneously at outputs 1 and 2, processing circuitry for both output channels (1 and 2) read sample data from the memory location associated with input channel 1. Both data streams are converted to analog outputs by the DAC device for the respective output channel, and analog input 1 is available at both router output channels. By this same method, in order to route input 2 to output 1, the processing circuitry associated with output 1 would read the data for input 2 from its memory location. This data would be converted by the output channel 1 DAC and be available for use at the channel 1output connector.

This is a greatly simplified tutorial to the basic idea behind a multiplex data transfer system. In reality, the multiplex data stream is usually bidirectional and there are many other communication and control activities occurring between the processing devices per the transmission protocol. However, this explanation provides the user who may not be familiar with a multiplex system a basic understanding of how a multiplex router gets signals from one place to another. You can easily see how this system can be expanded beyond two inputs and two outputs. Since the "packetized" multiplex data bus from the input circuitry (Bus XMTR) contains data samples for all input channels, any output channel on the Bus RCVR may provide a reconstruction of any input signal by reading the appropriate memory location and processing the data back to a usable audio signal. Expanding the number of input channels and output channels allows a very efficient and flexible signal routing system to be implemented.

7.2 THE CHEETAH DRS ROUTER

Relating this routing concept to the Cheetah DRS Router, think of the Bus XMTR as an Input Frame, the Bus RCVR as an Output Frame, the System Control function as the P1K Frame Controller located in the DXE Frame and the External Control Device as the P2K System Controller. Instead of two input channels and two output channels, each frame can process up to 128 channels. In the DRS application, the multiplex data bus is referred to as the Packet Audio Stream Bus, or simply PAS Bus. A simplified, top-level block diagram of a 128 X 128 router is shown in Figure 7-2.

Think of a DXE simplistically as a data router. In the configuration of a basic 128X128 system the DXE receives the “packetized” audio stream from the input frame through a Serial Bus Receiver and Buffer which level shifts and conditions incoming data for use by the processing circuitry. Data from the input frame is read by the Digital Processing Circuitry where it is “disassembled” and the data packets (samples) for all 128 inputs are extracted and stored in Memory.

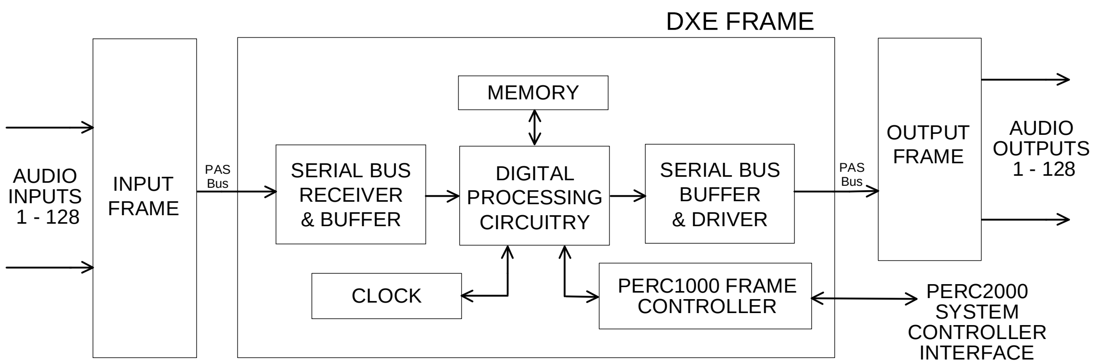


Figure 7-2 Simplified Block Diagram – 128X128 DRS System

For a useable router, we have to be able to access any input signal (1 thru 128) at any output frame connector (1 thru 128) and be able to specify which input signal we want on each output connection by some control scheme. In the case of the DRS, this is the P1K Frame Controller and the P2K System Controller. Under software control, the DXE processing circuitry generates the packet audio stream received by the Output Frame. This data stream contains the data packets necessary to reconstruct the input signals which are assigned to be available at the output connectors of the output frame. PAS bus data to the output frame is “built” as directed by commands from the Control System. Prior to leaving the DXE the data stream (Packet Audio Stream) is routed to the Serial Bus Buffer and Driver circuitry where it is level shifted and fed through a driver to the system output frame.

When PAS data is received by the output frame the signal is buffered and processed in a manner similar to our simple 2 X 2 example. Under software control, the data packets received from the DXE are disassembled and the data stored in memory. Processing circuitry within the output frame retrieves the data specified for a given output channel and reconstructs the original input signal.

A simplified block diagram of a 512 X 512 single DXE expanded system is shown in Figure 7-3. Each of the four Input Frames generates a "packetized" audio stream of the inputs connected to it. In other words, the data stream from frame 1 contains data for inputs 1 – 128, the stream from frame 2 contains data for input 129 – 256, etc. All of the input streams are received by the DXE. In a manner similar to a 128 X 128 system, incoming data from all four input frames is read by DXE processing circuitry where the data is "disassembled" and data packets (samples) for all 512 input signals are extracted and stored in Memory.

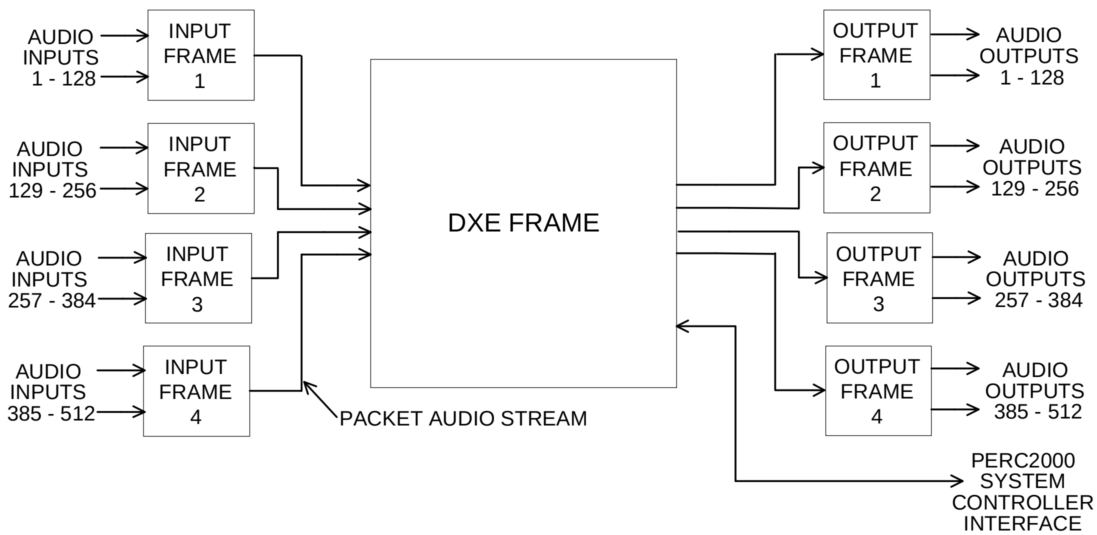


Figure 7-3 Simplified Block Diagram – Expanded DRS System

In an expanded system, we have to be able to access any input signal (1 thru 512) at any output connector (1 thru 512) and be able to specify which input signal we want on each output connection. Under software control, the DXE processing circuitry generates four packet audio stream outputs – one dedicated for each Output Frame in the system. Each data stream contains the data packets necessary to reconstruct the input signals which are assigned to be available at the output connectors of the respective output frame. Each output PAS is "built" as directed by commands from the System Controller, in the same manner as discussed for a single output frame – only on a much larger scale. Each data stream (Packet Audio Stream) is routed to its respective output frame where the data stream is reconstructed into individual output signals.

When multiple DXE frames are used (up to four), the operational theory is the same as just presented for a single DXE system, again – just on a larger scale. In operation, each DXE makes its 512 input signals available to all other DXE frames in the system by fiber optic links. Under software control, data streams are constructed by each DXE with the data packets required by the other DXE frames to service the output channels supported by each.

Again, the DRS user should be aware that the text just presented is a simplified, basic level tutorial of what occurs in a DRS installation, and is presented only as an overview of the system to acquaint the user with the concepts of multiplex routing and how it is implemented by the Cheetah DRS Router.

Chapter 8 Maintenance and Repair

8.1 PERIODIC MAINTENANCE

No periodic maintenance is required.

8.2 PESA CUSTOMER SERVICE

If you are experiencing any difficulty with your DRS router, please contact the PESA Customer Service Department. Skilled technicians are available to assist you 24 hours a day, seven days a week.

8.3 REPAIR

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

PC boards in this equipment contain Surface Mount Technology (SMT) components. Special tools are required to replace these components without causing damage to adjacent areas.

Failure to consult with Customer Service before attempting to repair these boards may void your warranty.

8.4 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. Please consult our Customer Service Department before installing any parts not purchased from PESA.

8.5 FACTORY SERVICE

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

PESA