PRELIMINARY USER GUIDE

ENTERPRISE DRS ROUTER

HIGH CAPACITY
DISTRIBUTED ROUTING SYSTEM FOR AUDIO AND TIME CODE SIGNALS

Supplement to PESA publication 81905905890,
Technical Manual , DRS Distributed Routing System

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1.1 DOCUMENTATION AND SAFETY OVERVIEW

This manual provides instructions for the installation and operation of the DRS Series Distributed Audio Routers 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

STOP	**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	**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

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 to not take unnecessary chances when working with lasers or laser optics.

NEVER LOOK DIRECTLY INTO A FIBER OPTIC MODULE OR INTO THE END OF A FIBER OPTIC CABLE

Chapter 2 Introduction

2.1 DESCRIPTION

PESA's Enterprise DRS (EDRS) Audio Router is a high channel capacity implementation of the traditional DRS Distributed Routing System for audio and time code signals. Using modular system integration, EDRS systems may be configured up to a system maximum of 7680 inputs x 7680 outputs.

Functionally, Enterprise DRS is virtually identical in hardware interface, set-up, configuration and operation to the traditional DRS router. This **Preliminary** EDRS User Guide is intended as a supplement to PESA publication 81905905890, *Technical Manual , DRS Distributed Routing System*, covering the traditional DRS router. If you are not familiar with the traditional DRS system, PESA recommends that you take the time to read the aforementioned manual and establish a solid understanding of the DRS system before proceeding with this guide. Configuration, set-up and operation are all done through user interface screens of PESA's Cattrax software control application.

The key difference in the two systems lies in the Data Exchange Engine frame. Enterprise DXE (EDXE) frames offer a much higher signal handling capacity and can interface with up to 24 DRS I/O signal frames to support a maximum of 1536 input signals and 1536 output signals; whereas traditional DXE frames can interface with up to 8 signal frames and support a maximum of 512 input signals and 512 output signals.

When expanding a system beyond the 1536 x 1536 signal handling capacity offered by a single EDXE frame, each Enterprise DXE frame can interface with up to 4 additional EDXE frames for a system total of 5 data exchange frames and a total signal handling capacity of 7680 x 7680.

Both EDXE and traditional DXE frames interface to the same input and output signal frames. All information, pin-outs and hook-up data for signal frames presented in the traditional DRS Technical Manual is applicable when interfacing a signal frame to an EDXE frame.

Both traditional DRS and EDRS incorporate high-speed time division multiplex (TDM) technology for signal distribution, rather than a crosspoint matrix array; allowing input signal, output signal or combination input/output signal frames to be distributed remotely from one another as needed for a particular installation. Figure 2-1 is a front view of a typical DRS rack frame with the front cover in place.

Figure 2-1 DRS Router – Typical Rack Unit

Traditional DRS and EDRS 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)
- Time Code Input (64 physical inputs for time code)
- Time Code Output (64 physical outputs of time code)
- Data Exchange Engine

This User Guide is divided into the same Chapter headings as the Technical Manual for the traditional DRS router. Each chapter contained in this guide introduces and discusses differences between the two systems that pertain to the topic of the chapter. It will be most helpful for you to have a copy of the traditional DRS Technical Manual available as you proceed with familiarizing yourself with the EDRS system. The DRS Technical Manual file is available on the Product Documentation CD included with the router, or you may contact PESA Customer Service and we will gladly E-Mail you a copy of the file.

2.2 FEATURES

Features of the DRS Audio Router include:

- Highly versatile and flexible distributed routing system
- High speed TDM bus system architecture
- Supports sources of AES/EBU, analog audio and 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 up to 7680 x 7680
- Full redundancy (power, control and TDM 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 6-Pin Detachable (Weidmeuller)
- 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 an external system controller, such as PESA's PERC2000

2.3 SPECIFICATIONS

Analog Audio

I/O 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

I/O Connector Type	
6 pin detachable	1 balanced AES stream per connector
ELCO/EDAC 120	16 balanced AES streams per connector
BNC	1 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)

I/O 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	1 signal per connector, installer choice of single-ended or differential
ELCO/EDAC 120	16 signals per connector, installer choice of single-ended or differential
BNC	1 single-ended signal per connector
Input Level	0.7 to 3.3 Vp-p MAX
Input Impedance	110 Ohms balanced, 75 Ohms single-ended
Input Number	64
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

Just as with a traditional DRS router, there are basically three different types of chassis frames used in an EDRS system: audio signal frames, time code signal frames and Enterprise Data Exchange Engine (EDXE) frames. Figure 3-1 illustrates component layout for a typical signal frame (top illustration) and EDXE frame (bottom illustration).

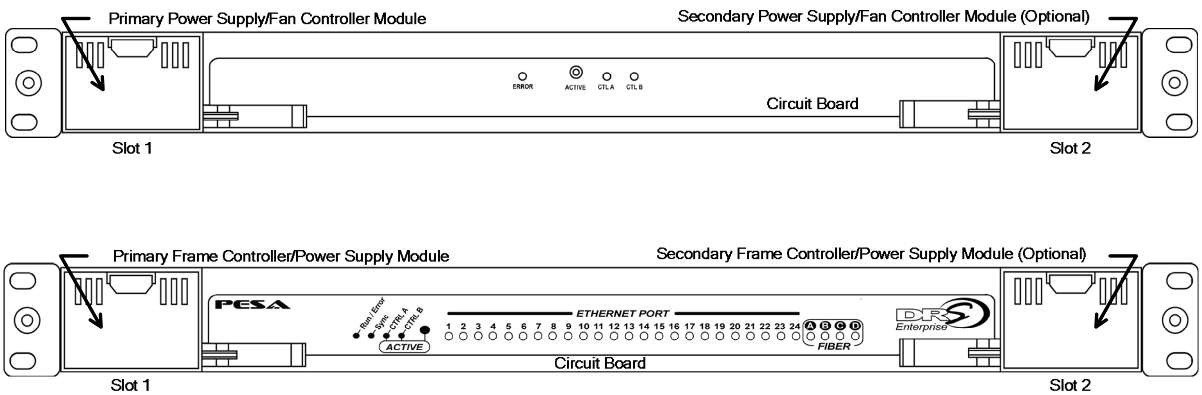


Figure 3-1 Frame Component Layout (Typical)

EDRS routing systems are implemented in terms of signal blocks. All audio signal frames process 128 audio 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.

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

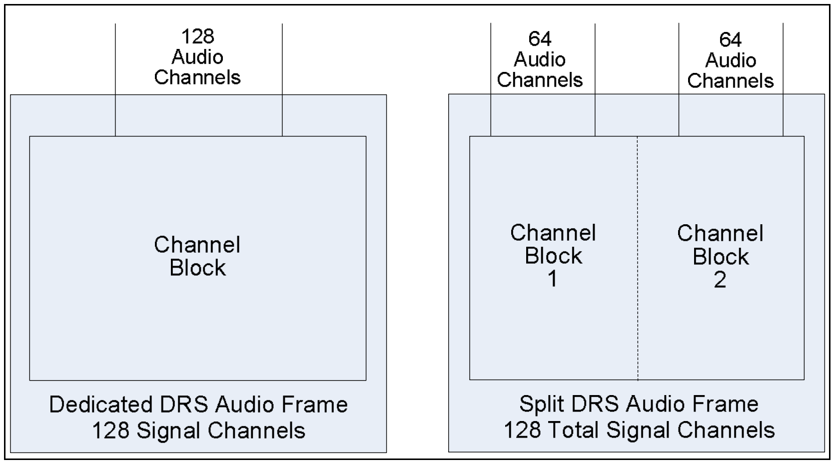


Figure 3-2 Pictorial View of Dedicated and Split Audio Frames

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 decoded and routed as two independent mono channels. Any audio input signal to DRS, whether derived from an AES or analog input block, may be routed to an analog output block channel where DAC circuitry converts the digital signal to an analog output. AES outputs are always paired channels and each signal of the pair may be individually selected from any decoded AES input signal or from any mono analog signal. Depending on the choice of frame signal-handling capacity and distribution, it is possible to use the DRS as a format converter. For example, routing an analog input to an AES output channel provides not only a router function but also analog to AES conversion capability. In similar manner, routing an AES input to an analog output channel provides AES to analog conversion.

Every audio frame is composed of a rear panel, circuit board, and up to two power supply/controller modules. Each audio frame is configured with one of the following rear panel 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 rear panel 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)	AES Audio 110 Ohm, Balanced or Analog Balanced Audio

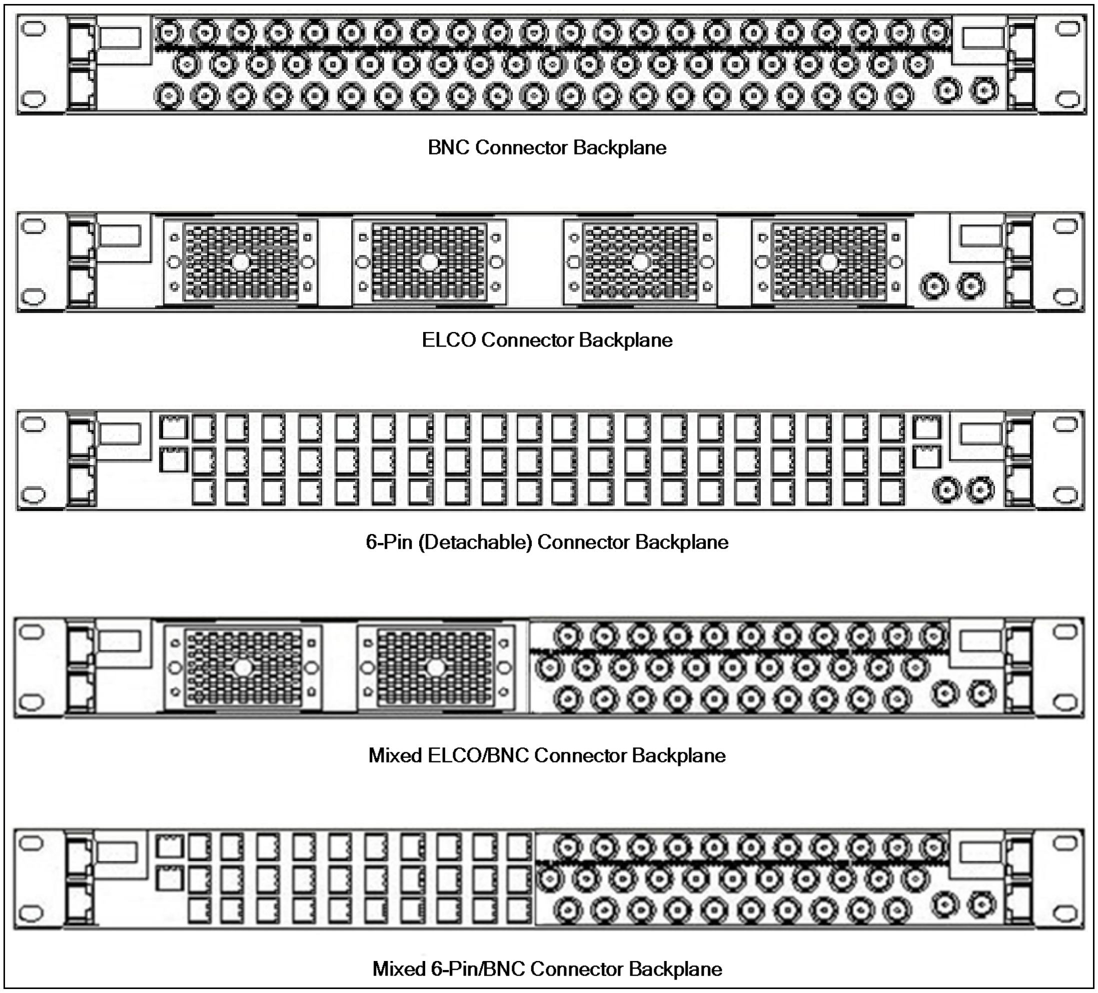


Figure 3-3 Input/Output (I/O) Rear Panels

NOTE	**BNC connectors are used only for connection of AES audio signals, each of which contains a pair of audio channels. 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 circuit boards, depending on the signal type and I/O mix of the frame. Only one circuit board is used in any given frame, and the type of card used determines the signal handling characteristics of the frame.

Each frame also contains a mid-plane assembly which routes signals and voltage sources between the rear panel, the power supply/controller module and the 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 rear panel 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 rear panel for example only. Connectors identified by Figure 3-4 are identical for all rear panel styles.

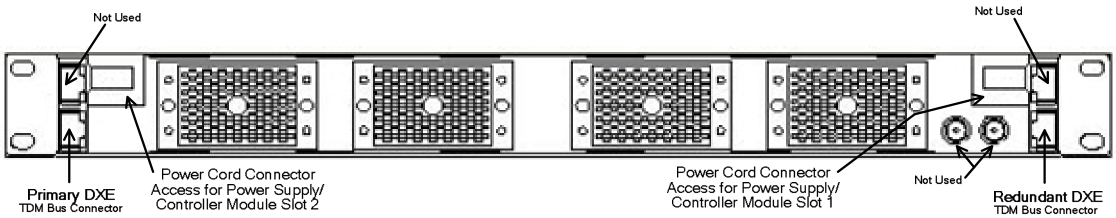


Figure 3-4 I/O Frame Rear Panel Connections (Typical)

TDM Bus Connector There are two TDM bus connectors (RJ-45) located on the rear panel of each signal 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 signal frame TDM bus 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 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 TDM bus 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 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 signal 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 ENTERPRISE DATA EXCHANGE ENGINE FRAMES

Enterprise Data Exchange Engine (EDXE) frames process and distribute data on the TDM bus between signal frames. Each DXE frame interfaces with up to 24 signal frames through one of the 24 I/O Frame Port connectors on the rear panel using CAT5x cable. A signal frame and EDXE may be separated by up to 100 meters in length when CAT5E cable is used. Each I/O Frame Port connector interfaces to a single signal frame, and supports the 128 channels of the frame – either as a dedicated block of 128 channels, or two 64 channel blocks. A single EDXE can interface with up to 24 frames, for a maximum signal handling capacity of up to 1536 input signals and 1536 output signals. In the case of a system expanded beyond 1536X1536, multiple EDXE frames are used; up to a system maximum of five EDXE frames, for a total system signal-handling capacity of up to 7680 inputs and 7680 outputs.

Each EDXE frame contains at least one frame controller device, co-resident with the power supply on a specialized component called the Power Supply/PERC1500 Controller Module, which communicates with the router system controller, such as a PERC2000. 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. PESA's PERC2000 is available in a stand-alone rack frame with power supply, or the system controller circuit card may be mounted in a Cheetah video matrix switcher chassis. In either application, the system controller is connected to EDXE frames over a 10/100 Ethernet link. All operational parameters, adjustments and configuration of the Enterprise DRS system are made through PESA's Cattrax control software 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 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 EDXE frame is composed of a rear panel assembly, up to two power supply/PERC1500 controller modules, and an EDXE circuit board. There are no variations of the components comprising an EDXE. The rear panel assembly provides all connectors needed for intra-system connection, and a pair of loop-thru sync reference input BNC connectors. A mid-plane routes signals between the rear panel and the circuit board as well as power rails and control signals between the power supply/controller module and the circuit board. A rotary switch on the EDXE rear panel selects configuration parameters for the frame, as discussed in Chapter 6 of this manual.

3.6 REAR PANEL CONNECTIONS – EDXE FRAME

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

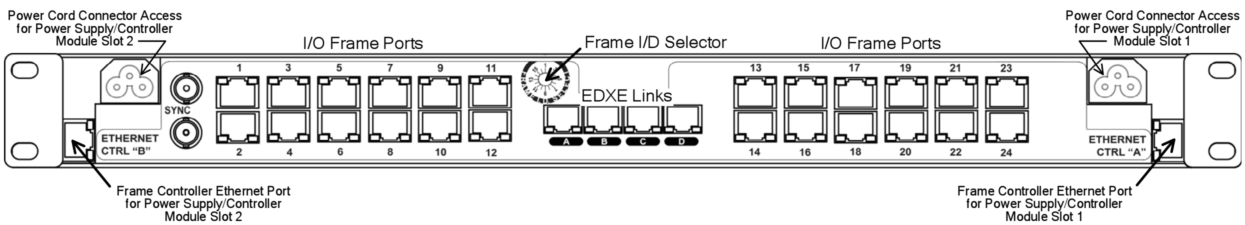


Figure 3-5 DXE Frame Rear Panel Connections

Frame Controller Ethernet Port There are two Frame Controller Ethernet Port Connectors (RJ-45) located on the rear panel of each DXE frame. These are located on the lower edge of each side of the frame rear panel. When viewed from the rear of the frame the right-hand connector, labeled **ETHERNET CTRL “A,”** is the primary frame controller Ethernet port and the left-hand connector, labeled **ETHERNET CTRL “B,”** is the secondary frame controller Ethernet port. Each frame controller Ethernet port connector is dedicated to a particular power supply/controller module slot: the Primary Port connector associates to module slot 1 (Refer to Figure 3-5) and the Secondary Port connector associates to module slot 2.

In a non-redundant system with a single frame controller, install the power supply/PERC1500 module in slot 1 and use the Ethernet Ctrl “A” port connector to connect the DXE to the facility local area network (LAN) or closed-loop Ethernet interface for the router system. If a second (redundant) frame controller is installed, use the Ethernet Ctrl “B” port connector to connect it to the LAN or to the closed communication loop through an external Ethernet switch. In a redundant control system installation each frame controller must have a direct connection to an Ethernet hub.

I/O Frame Ports There are 24 I/O Frame Port Connectors (RJ-45) located on the rear panel of every EDXE frame – positioned as two groups of 12 connectors each. These connector groups are labeled 1 thru 12 and 13 thru 24, and are used to interface the EDXE frame with up to 24 signal frames through the TDM bus. In most installations, signal frames will be attached to the EDXE I/O frame port connectors in numerical sequence, beginning with I/O port 1. Connecting signal frames to an EDXE is discussed further in Chapters 4 and 5 of this guide.

EDXE Links Located in the center of the rear panel are four fiber optic cable connectors denoted as EDXE Links. These connectors are labeled A thru D and are used to interconnect EDXE frames in expanded Enterprise DRS systems requiring more than one EDXE. All EDXE to EDXE connections are made using LC to LC duplex fiber optic cable.

Sync Reference Connectors The EDXE rear panel contains a pair of BNC connectors, labeled SYNC, for attaching a sync reference signal source to the audio router. Either connector may be used for signal input, and the remaining connector used as a looping output for the signal if you wish to daisy-chain the signal source to other equipment. If the EDXE is the last, or only, piece of equipment in the chain, a terminator must be installed on the unused BNC connector.

Power Cord Connector Access Access port for attaching power cord directly to power supply portion of controller 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. The harness secures the cord to help prevent accidentally disconnecting the frame from its power source.

3.7 POWER SUPPLY/CONTROLLER MODULES

Two variations of Power Supply/Controller Modules are used in DRS system architecture. Both supplies are constructed as a modular unit that slides 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. They are identified as follows:

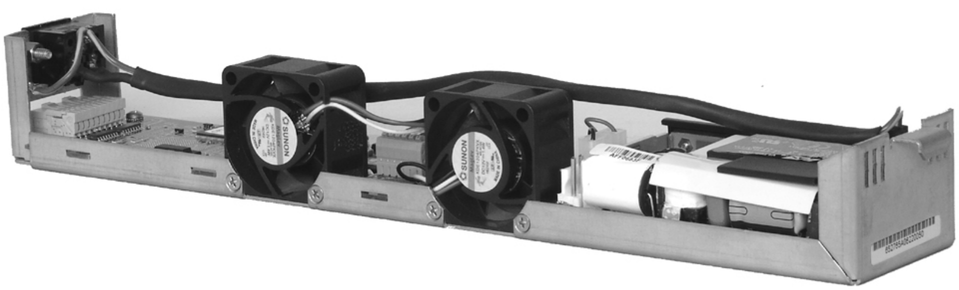


Figure 3-6 Power Supply/Controller Module (Typical)

Power Supply/PERC1500 Controller Module - This module contains power supply circuitry that provides power to all frame components, a pair of fans used to circulate cooling air through the chassis frame and control circuitry that monitors operation and reports status of the on-board cooling fans. In addition it contains the PERC1500 Frame Controller circuitry used to communicate with the external system controller over an Ethernet link. At least one module of this type is required in every EDXE frame.

Power Supply/Fan Controller Module - This module contains power supply circuitry, a pair of fans used to circulate cooling air through the chassis frame, and control circuitry that monitors operation and reports status of the on-board cooling fans. This module is typically used in signal frames.

Chapter 4 Functional Description

4.1 DRS System Fundamentals

Chapter 3 introduced the various types of frames in Enterprise 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 a few key principles of system operation need to be discussed.

Unlike a traditional crosspoint matrix router where 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 (EDXE) frame. Each input block contains circuitry necessary to convert input signals to digital data, apply any desired DSP functions to audio signals and "packetize" the digital data into a serial stream, the TDM bus, containing high speed samplings of every input signal in the channel block. This data stream is routed to an interface port of the EDXE.

The EDXE frame performs the actual "routing" function by disassembling incoming data packets to extract signal data for each input channel, constructing outgoing packets containing desired signal data for specific output channels, and routing each outgoing data packet to the frame and channel block containing the specific output channel. In the output frame, the TDM bus data is extracted, processed, converted to the native signal format of the output block and routed to output connectors.

4.1.1 Single EDXE System Channel Assignments

Signal frames and the signal channel blocks they contain are "assigned" their I/O channel number range by the order they are connected to the EDXE I/O frame ports. For example, in a single EDXE system, the input **and** output channel range is 1 – 1536; and the signal 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. The frame connected to I/O port 2 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 input channel numbers 129 – 256 to these inputs; but if a block of 128 output signals is attached to port 2, the frame controller assigns output channel numbers 1 thru 128 to these signals.

Signal frames always have a capacity of 128 channels. As long as the 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 EDXE 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 1536 input and 1536 output channel maximum of the EDXE is reached.

4.1.2 MULTIPLE EDXE CHANNEL ASSIGNMENTS

DRS installations expanded beyond a capacity of 1536 inputs or 1536 outputs require the use of additional EDXE frames and their associated signal frames. If an EDXE and its signal frames is loosely considered as a “complete” router for 1536 inputs and 1536 outputs; then with an expanded system, each EDXE may be considered as a 1536 X 1536 “building block” of the total system capacity.

Each EDXE 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 EDXE system, the frame is identified as I/O range 1 – 1536, since this is the channel range a single EDXE would process. In multiple EDXE installations, the second EDXE is identified as I/O range 1537 – 3072, and the third, fourth and fifth as I/O range 3073 – 4608, 4609 - 6144 and 6145 – 7680, respectively. The EDXE naming scheme may seem like a trivial point, but its importance will become clear during the discussion of system hardware configuration.

Consider an example of a system with two EDXE frames where the first EDXE processes channel group 1 – 1536 and is identified by the nomenclature **I/O range 1 – 1536** and the second EDXE processes channel group 1537 – 3072 and is identified as **I/O range 1537 – 3072**. The first 128 input and output signals supported by the second EDXE are assigned channel numbers 1537 – 1664, the second group would be 1665 – 1792, etc. Just as with the first EDXE, 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 EDXE processes is assigned to the frame by the setting of the rotary switch on its rear panel. This is discussed further in Chapter 6.

4.1.3 REDUNDANT FRAME CONTROLLERS AND REDUNDANT EDXE FRAMES

Previous text discussed that each EDXE must contain at least one PERC1500 frame controller, but it may also contain a secondary controller for redundancy. Also, a given EDXE processes a specific channel group of 1536 input and 1536 output signal channels, and a redundant EDXE, processing the same channel group and sharing the same signal frames with the primary EDXE, may be added for TDM bus processing redundancy. This means that each I/O channel group must have a minimum of one frame controller, but can have as many as four frame controllers – all configured for the same channel group and frame-type assignments, as shown in the chart below.

Possible Frame Controller Assignments 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 rear panel. This is discussed further in Chapter 6.

4.1.4 BASE IP ADDRESS OF A DRS SYSTEM

Previously, we discussed the interaction between the frame controller(s) contained in an EDXE and the router system controller, such as a PERC2000. We know that the frame and system controllers communicate over Ethernet, and that each component on any Ethernet network must be assigned a unique IP address. IP addresses for all network devices are usually assigned by a facility IT administrator or network manager.

Each PERC1500 frame controller in an Enterprise DRS system must have a unique IP address; therefore, a sequential group of IP addresses should be dedicated to DRS frame controllers on the network. A fully expanded DRS with total TDM bus and frame controller redundancy would require a block of 16 sequential IP addresses dedicated to the DRS router system. The numbers in the first three octets of the address are always identical, such as 192.168.1.xxx; and the number in the fourth octet determines the unique address for each controller device, such as 192.168.1.001 to 192.168.1.016. With regard to a DRS installation, the IP address with the *sequentially lowest number in the fourth octet* assigned to the router is called the ***base IP address,*** and becomes the network name for the *entire* Enterprise DRS system, regardless of how many frames or controllers it contains. A unique IP address for each individual controller in the system is derived at system boot-up by adding a defined address offset to the assigned base address. The notion of the base IP as the network identity for the entire DRS system 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 previous text, we see that every EDXE frame in a DRS router can be uniquely identified by three characteristics – the *base* IP address assigned to the DRS system, the channel group it processes and whether it is the primary or redundant EDXE 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. EDXE and frame controller identification characteristics play a key role in performing system configuration.

Every PERC1500 frame controller in the system is programmed with the assigned *base IP address* in its' flash memory. On system start-up each frame controller performs a boot-up procedure on its processor circuitry. As part of initialization, each frame controller reads the setting position of the rotary switch on the rear panel of the EDXE 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 EDXE 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* operating 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 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 EDXE 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 frame controller, but can have as many as four, if the system is equipped with full control and TDM bus redundancy. Since a channel group consists of one (or two) EDXE frame(s) connected to the primary (or primary and redundant) TDM bus connectors of the signal frames, then any controller in the group is a candidate to potentially assume control of the channel blocks; and therefore all controllers for the channel group must be programmed with the same data as to the type of frames and channel blocks connected to the EDXE I/O ports. This is done through the **hardware** configuration file.

During installation of an Enterprise DRS system there are two configuration operations that must be performed – hardware and router configuration. **Hardware** configuration defines the number and type of channel blocks attached to each EDXE frame in the system. It is performed through the EDXE Frame Port Configuration Screen of Cattrax, and the resulting configuration file is downloaded to the 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 system controller.

These are two very distinct operations with an Enterprise DRS installation, although both are performed through screens of the Cattrax system control application. Hardware configuration is performed from Cattrax simultaneously for all frame 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 EDXE 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 presented in Chapter 7 of this guide. 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 Cattrax. 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 rear panel connector type. Split frames are not available for time code routing.**

Basic System Configuration Using Dedicated 128 Channel Audio Frames

Audio signals enter and leave the router system through signal blocks and the EDXE 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.

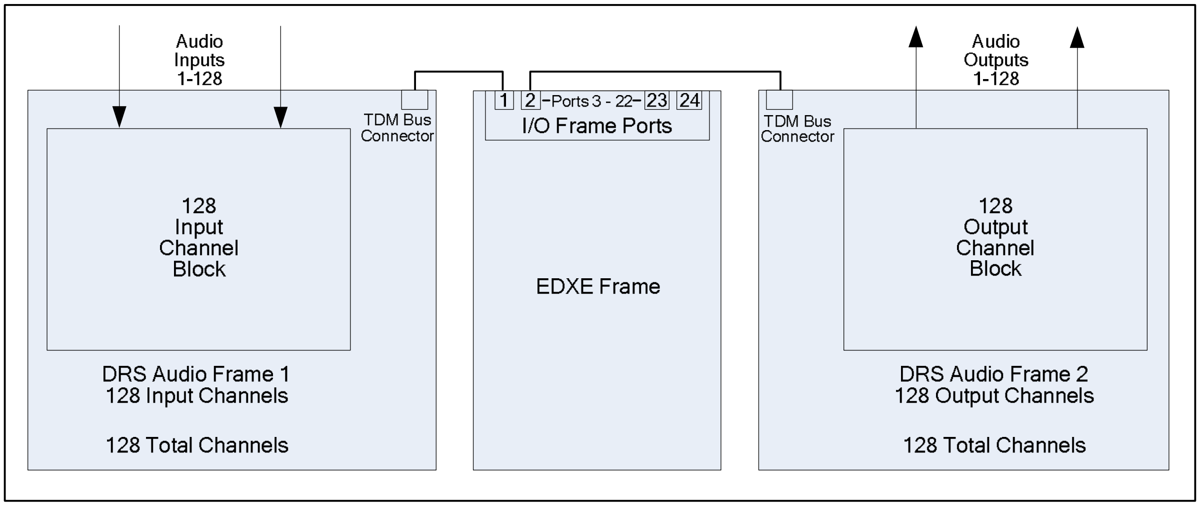


Figure 4-1 Basic DRS Router Configuration

For this example, assume both signal frames contain circuit boards for AES audio signals. Each frame must be connected to the EDXE I/O frame port connectors in numerical sequence by the range of signal channels you 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 assigned 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 assigned 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 an Enterprise DRS system, regardless of signal handling capacity, number of signal frames, or number of EDXE frames, a hardware configuration file must be generated and downloaded to the frame controller(s) contained in the EDXE, as discussed in Paragraph 4.1.5.

Hardware configuration is executed through the DRS Port Configuration Screen of Cattrax; and the procedure for generating a hardware configuration file is presented in Chapter 7 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 just discussed is shown in Figure 4-2.

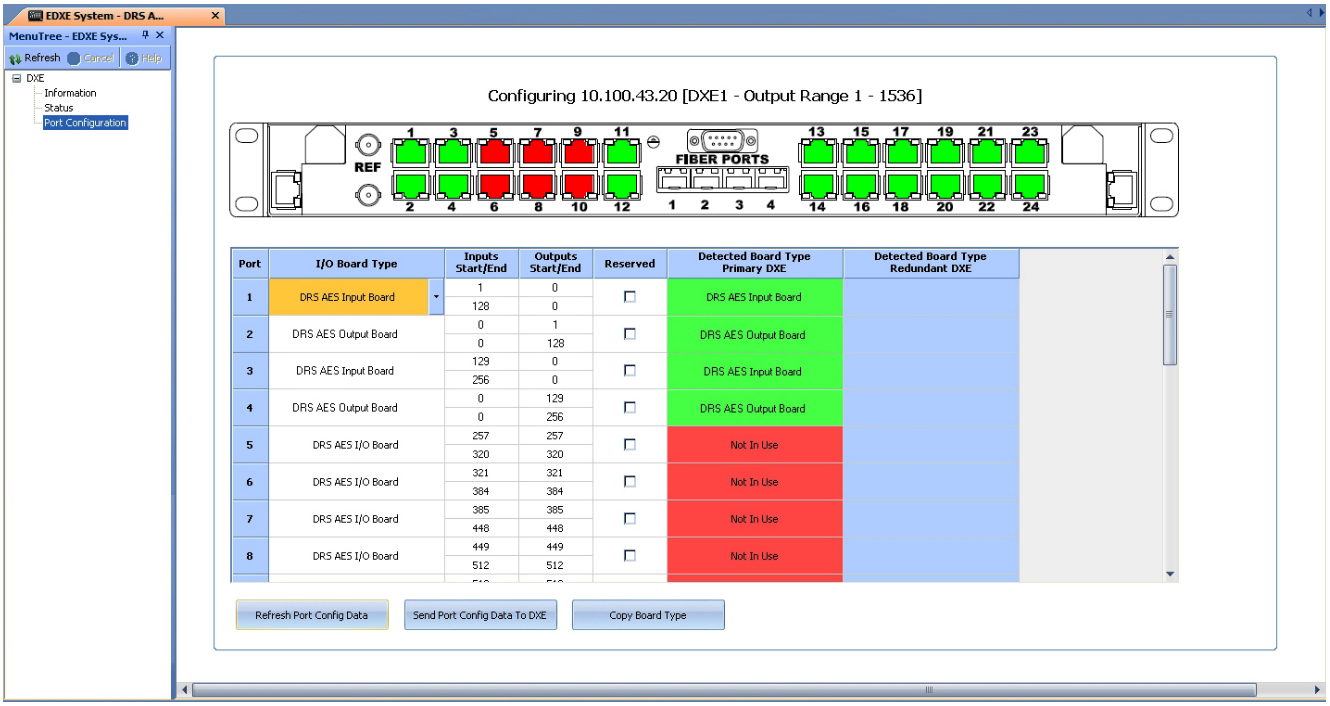


Figure 4-2 Example EDXE Port Configuration Screen

The DXE (channel group) being configured 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 10.100.43.20 and the DXE that processes channel group 1 thru 1536.

Notice from the figure that DXE frame ports 1 thru 24 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 signal 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 signal frame interfaced to the I/O port, until the maximum of 1536 input and output channels is reached. Once 1536 input channels are assigned, regardless of the frame port number, the control software does not allow any more frames with input channels to be configured. Likewise, when 1536 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 the output block were connected to frame port 1 and the input block to port 2 – since both are the first numerical blocks of each signal type. An example Cattrax configuration screen showing this connection is shown by Figure 4-3.

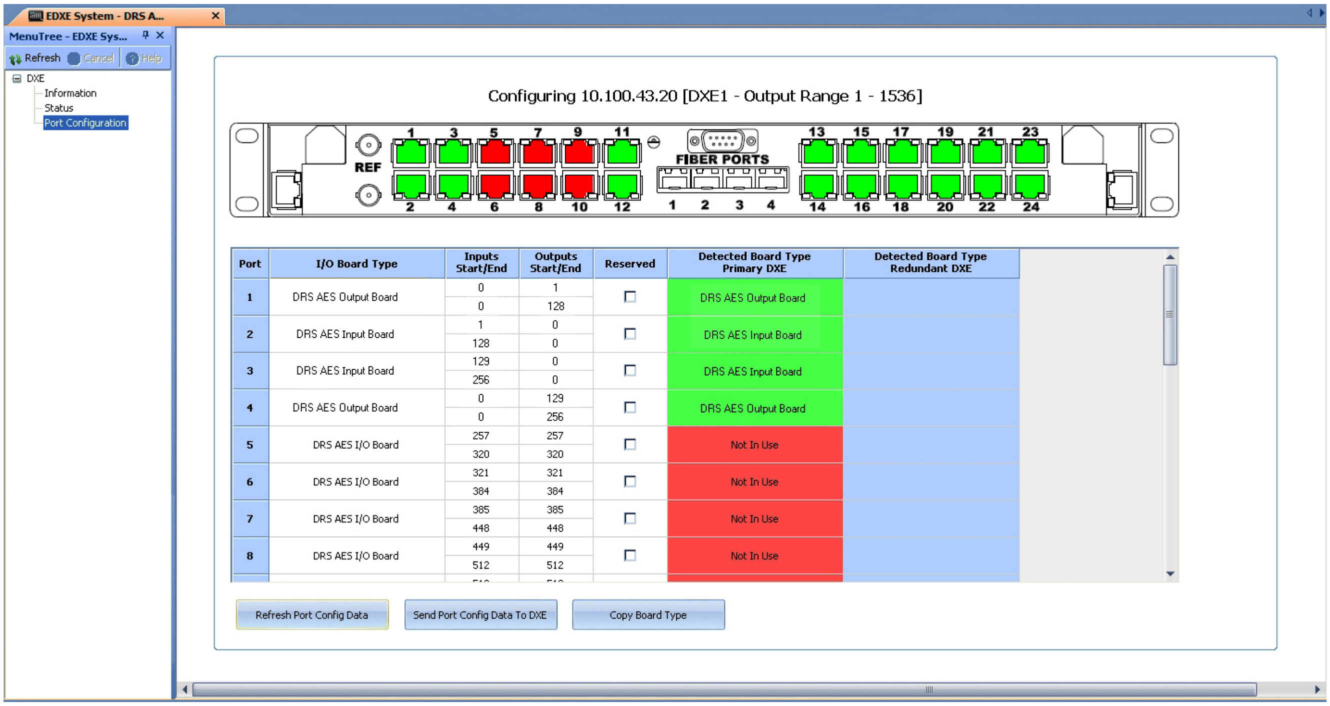


Figure 4-3 Alternative EDXE Port Configuration

Expanding on this basic configuration, suppose a second input and output block were added 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 as shown in the previous figures.

Using this same principle of adding and configuring audio frames and blocks in numerical sequence, the single DXE system can be expanded to a maximum configuration of 1536 inputs and 1536 outputs.

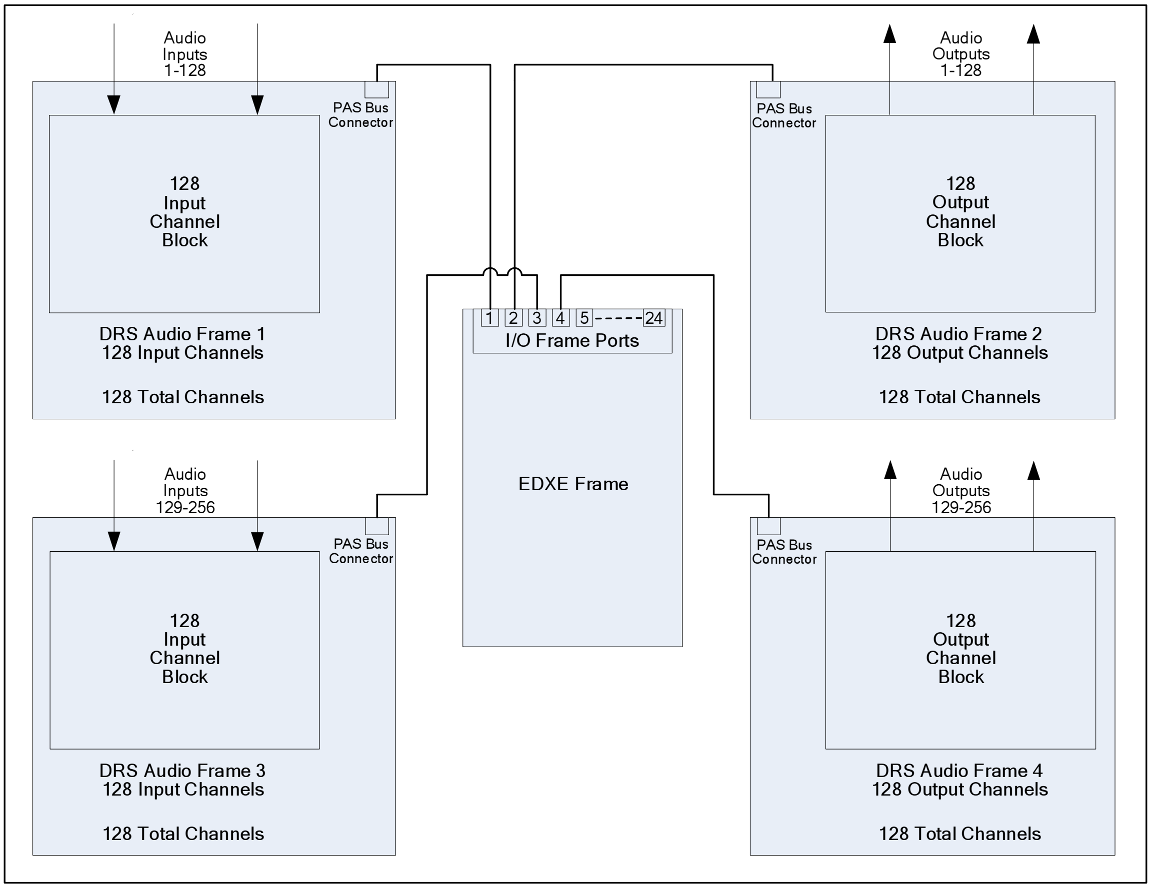


Figure 4-4 256x256 Router Configuration

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 4-5 is a simplified block diagram of a system configured using one split input frame, one split output frame and an EDXE. This configuration allows routing a mix of analog and AES signals through the same frame. Figure 4-6 shows the Cattrax 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.

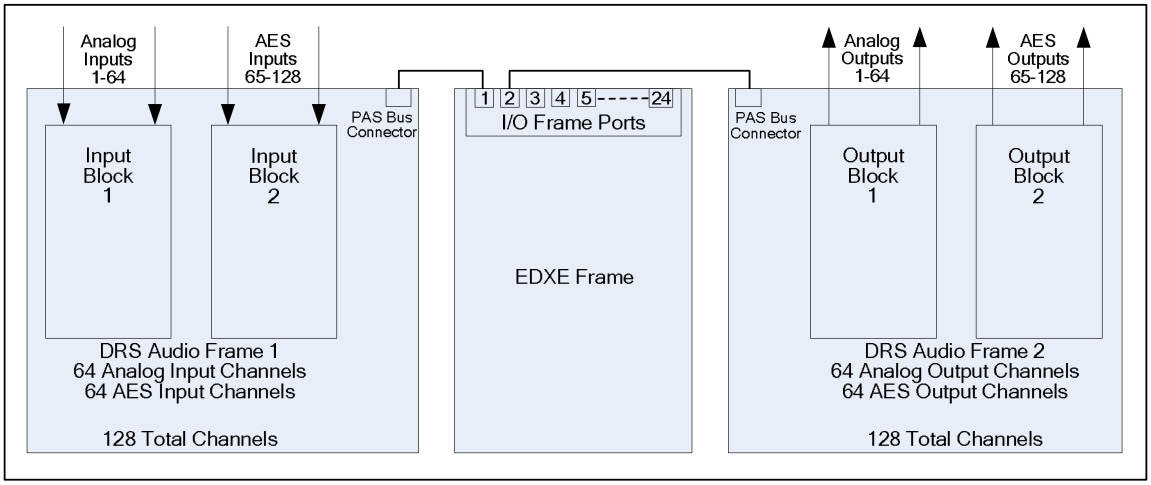


Figure 4-5 Basic Split Frame System

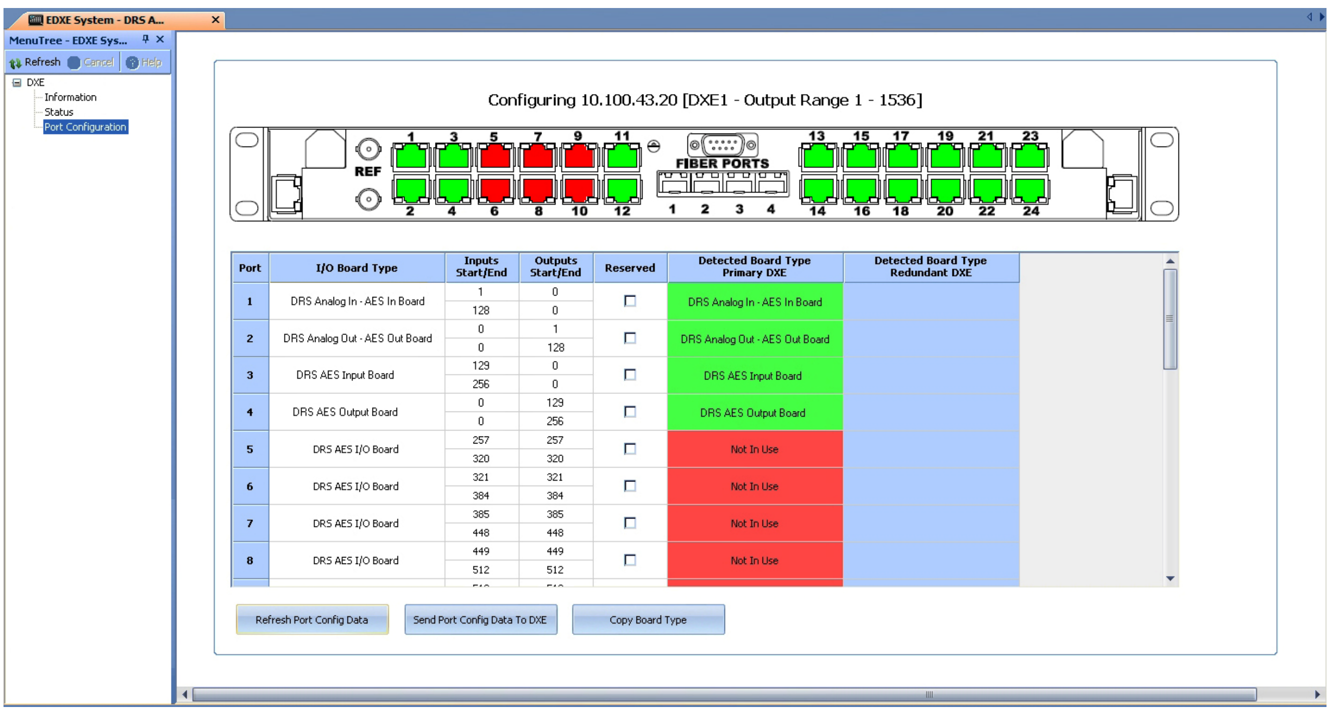


Figure 4-6 Example Split Frame Port Configuration

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, consider a two audio frame system for AES signals - each frame with a block of 64 input signals and a block of 64 output signals. As shown in Figure 4-7, 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.

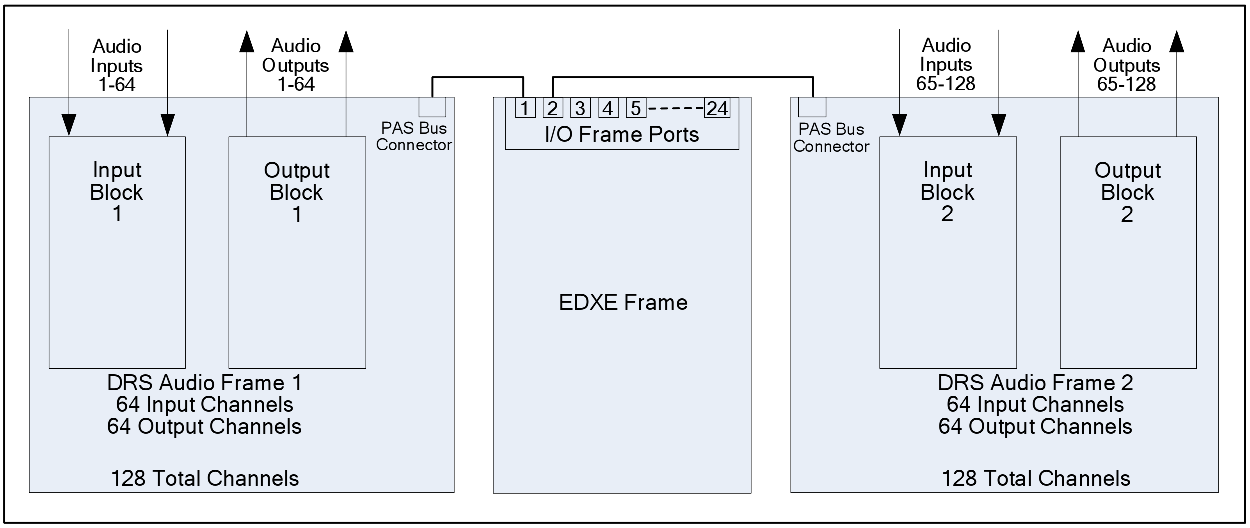


Figure 4-7 Basic Mixed I/O Configuration

The Cattrax configuration screen for this system is shown in Figure 4-8. 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.

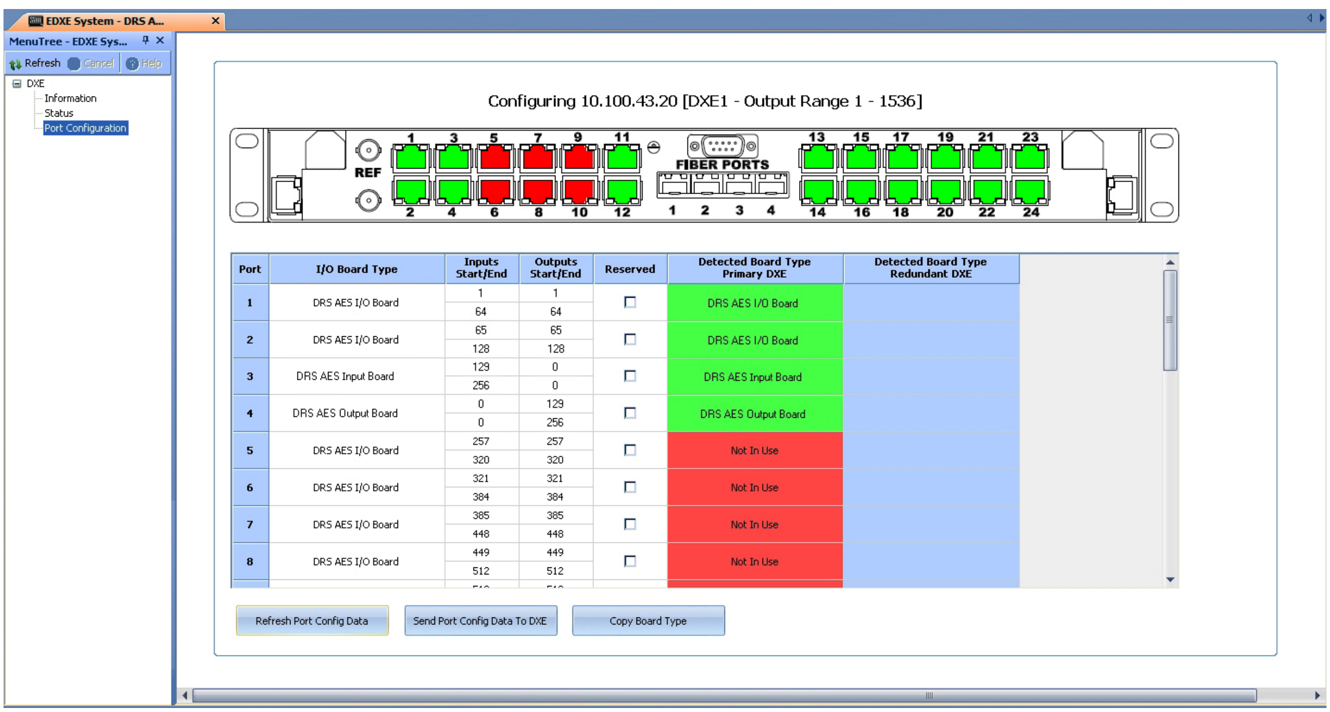


Figure 4-8 Example Mixed I/O Port Configuration

Mixing Dedicated and Split Frames

Dedicated and split audio frames may be intermixed within a system. Figure 4-9 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 Cattrax configuration screen for this example system is shown in Figure 4-10.

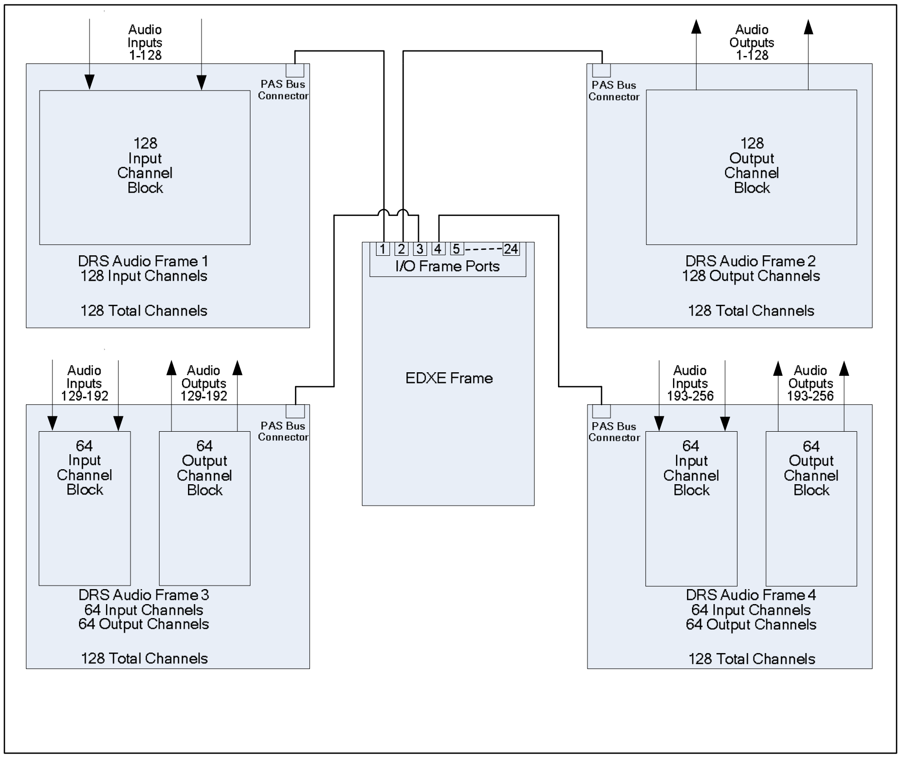


Figure 4-9 Mixed Dedicated and Split Frame Configuration

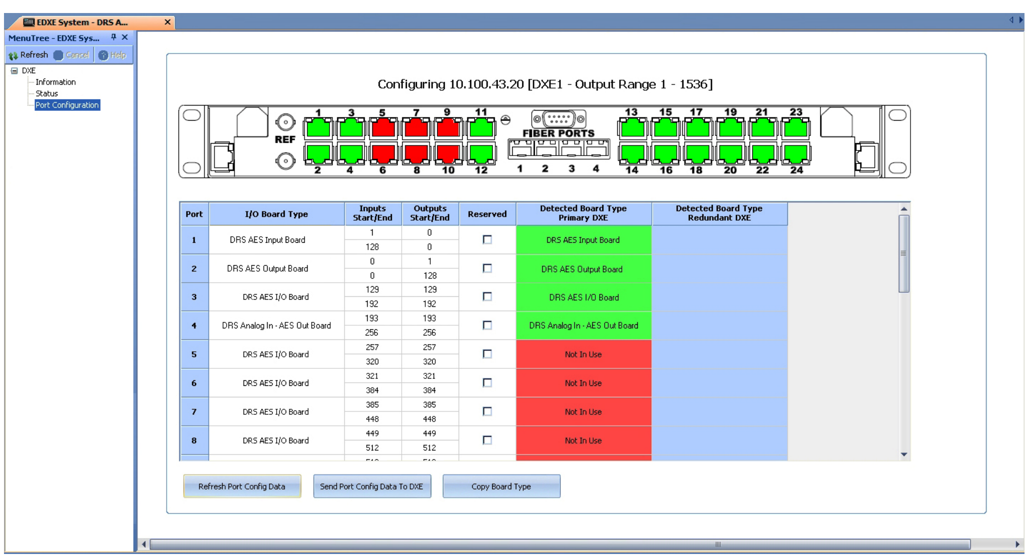


Figure 4-10 Mixed Frame Port Configuration Example

Notice in Figure 4-10 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 1536 inputs or 1536 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 4-11 illustrates system control and sync connections for a single EDXE. For simplicity, signal frames are not shown in this illustration.

The single EDXE frame must have a Power Supply/PERC1500 Controller Module (Primary Controller) installed in module slot 1. Communication between the frame controller and the system controller is over an Ethernet connection either in closed-loop communication with the system controller or over the facility local area network (LAN).

Each EDXE 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 rear panel of every EDXE. Sync may be routed in a daisy-chain configuration through the EDXE to another piece of equipment, or the chain terminated at the second BNC with a 75 Ohm terminator. Remember, if the EDXE 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.

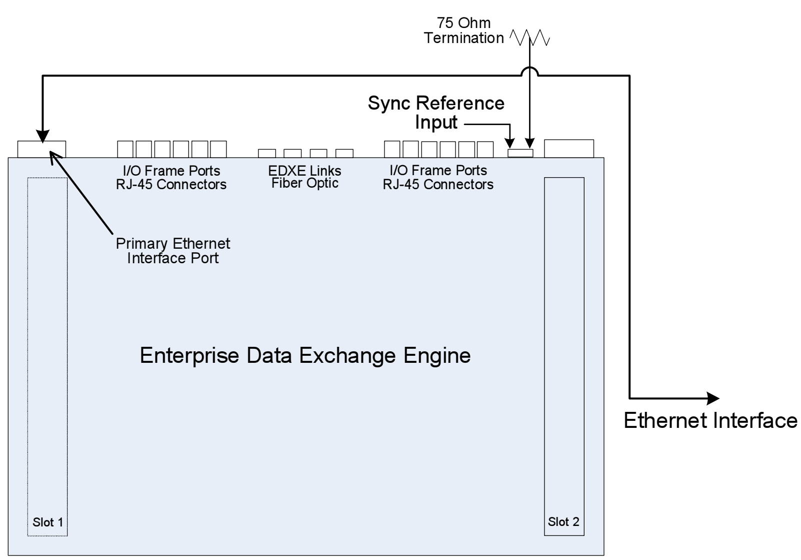


Figure 4-11 Non-Redundant Router System

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 secondary module slot of all system frames. Audio frames should have a second Power Supply/Fan Controller Module installed; and each EDXE frame must have a second Power Supply/PERC1500 Module installed in module slot 2. As shown in Figure 4-12, an Ethernet switch is used to provide a direct network connection to each frame controller module. When a second controller is installed in a EDXE, 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.

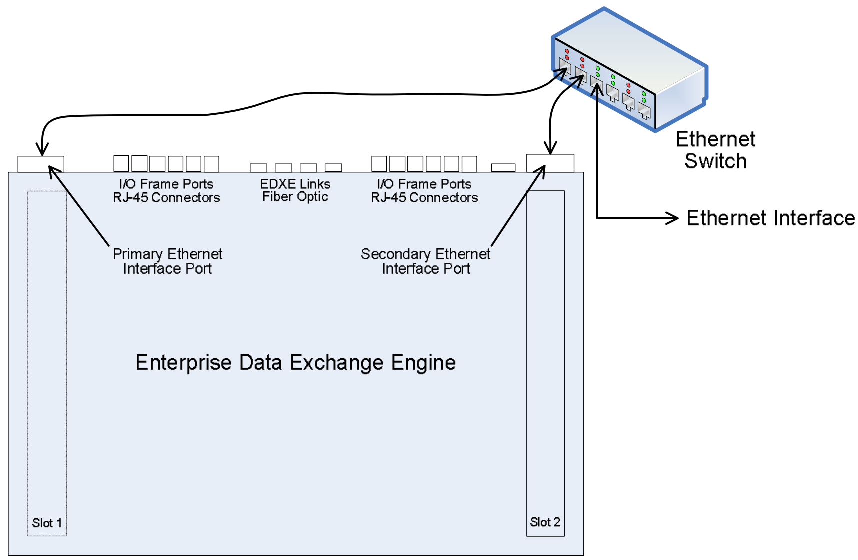


Figure 4-12 Single EDXE with Redundant Power & Controller

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, EDXE frames equipped with two Power Supply/PERC 1500 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. 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.

By installing a second TDM bus interconnection using the second TDM bus port on each signal frame and an additional EDXE frame to perform exchange of the redundant bus data, a second TDM bus is established. Should either TDM 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. The process of adding a second EDXE to a channel group is identical to adding a second DXE to a channel group with a traditional DRS router. Refer to the DRS Technical Manual for further information.

4.2.2 SYSTEM EXPANSION

It is possible to expand either the input or output capacity, or both, of the EDRS system, up to a maximum configuration of 7680 x 7680. Expanded systems use multiple signal frames and one or more EDXE frames. Any combination of analog and digital channel blocks is allowed in an expanded system.

Single EDXE Frame System An example of a 1536 input x 1536 output expanded system using 24 split I/O frames and a single EDXE frame is represented in the chart below. Analog audio and AES digital audio sources may be mixed within an expanded system, and mixed within audio frames using split frames. Audio frames are identified as frames 1 thru 24, 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
9	513 thru 576	513 thru 576
10	577 thru 640	577 thru 640
11	641 thru 704	641 thru 704
12	705 thru 768	705 thru 768
13	792 thru 832	792 thru 832
14	833 thru 896	833 thru 896
15	897 thru 960	897 thru 960
16	961 thru 1024	961 thru 1024
17	1025 thru 1088	1025 thru 1088
18	1089 thru 1152	1089 thru 1152
19	1153 thru 1216	1153 thru 1216
20	1217 thru 1280	1217 thru 1280
21	1281 thru 1344	1281 thru 1344
22	1345 thru 1408	1345 thru 1408
23	1409 thru 1472	1409 thru 1472
24	1473 thru 1536	1473 thru 1536

Multiple DXE System Systems requiring greater than a single channel group of 1536 inputs or 1536 outputs are configured using two or more EDXE 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 120 frames, providing up to 7680 input and 7680 output channels. Since each EDXE supports up to 24 signal frames - up to 5 primary DXE and 5 redundant DXE frames may be used in a system to link the signal frames.

The previous section introduced and discussed system expansion for a 1536 X 1536 router using 24 audio frames and a single EDXE; and interconnecting the I/O frames to the EDXE in an ascending numerical sequence. Building a system greater than 1536 X 1536 expands the same principle and is accomplished by interconnecting EDXE channel groups to one another in an ascending numerical sequence, using fiber optic cable.

Remember that an EDXE frame and its associated signal frames together form a channel group, and the channel group assumes the nomenclature of the I/O channel range it contains. If each channel group is considered a 1536 input by 1536 output "building block" of the overall expanded system, then in an expanded system the EDXE frames process the following input and output channel groups:

System Channel Groups

DXE	Inputs	Outputs	Group Nomenclature
1	1 - 1536	1 - 1536	I/O Range 1 - 1536
2	1537 – 3072	1537 – 3072	I/O Range 1537 – 3072
3	3073 – 4608	3073 – 4608	I/O Range 3073 – 4608
4	4609 – 6144	4609 – 6144	I/O Range 4609 – 6144
5	6145 – 7680	6145 – 7680	I/O Range 6145 – 7680

Signal blocks are interconnected to each EDXE in the system in exactly the same way as for a single EDXE configuration. Each EDXE, along with its input blocks and output blocks, is then interconnected as a channel group with all the other EDXE 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 1400 of the 1536 input or output channels of group *I/O Range 1 -1536* are used, the next block of audio channels in group *I/O Range 1537 - 3072* still begins with channel number 1537 for both inputs and outputs. Channels 1401 thru 1536 are available in group *I/O Range 1 - 1536* for future use.

EDXE frames are interconnected via the EDXE Links connectors (fiber optic) labeled EDXE 1 thru EDXE 4 located along the top edge of each EDXE rear panel. Just as with DXE frames in a traditional DRS installation, each EDXE frame is interconnected with other EDXE frames in the system using a "star" networking arrangement whereby each frame has a direct connection with every other frame. More information on proper cabling of a multiple DXE system, and a hook-up table, is presented in Chapter 5 of this manual.

Chapter 5 Installation

5.1 MOUNT EACH ROUTER 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 an EDRS 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.

Installation of signal frames in an EDRS system is identical to a traditional DRS router. Refer to the DRS Technical Manual for more information and detailed frame installation procedures.

Every EDRS chassis frame is shipped with a Rear Rack Rail Kit. It is important that this kit be installed as part of the mounting procedure for the frame. Refer to the DRS Technical Manual for more information and detailed installation procedures.

5.2 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.

Once each 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 signal, sync, TDM bus, 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 signal cables are correctly installed.

1. Connect an external sync source to the Sync Reference Input (REF) of each EDXE Frame using 75 Ohm coaxial cable such as Belden 8281, or equivalent. Be sure to properly terminate external sync sources into a 75Ω terminator.
2. If using shell connectors such as the ELCO/EDAC or 6-pin, prepare each connector with its associated input or output 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 TDM bus between frames. Use high quality LC to LC duplex fiber optic cable for interconnecting EDXE frames in an expanded system.
4. You must configure each EDXE frame, using PESA's Cattrax, for the signal 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 7 of this manual.
5. Before the EDRS system can be used to make signal switches, a router configuration file must be loaded into the system controller. This file is generated using the router control application and contains I/O signal configuration data, level and component assignments and all operational data for the EDRS audio router as well as all other switching components of the installation.

5.3 CONNECTOR PIN-OUT DATA – INPUT OR OUTPUT FRAMES WITH 128 CHANNEL DEDICATED SIGNAL BLOCK

Each 128 channel, dedicated signal frame in a DRS system is configured with a rear panel equipped with one of the connector types listed below. The type of rear panel 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)	AES Balanced Audio, 110 Ohm or Analog Balanced Audio

Each AES input or output channel contains a pair of audio signals, therefore the full 128 channel capacity of the signal frame is realized with 64 AES audio ports. In the case of the BNC rear panel there are 64 physical connectors for I/O and all inputs or outputs are AC coupled to router circuitry. With the 6-pin and ELCO/EDAC connector rear panel there are actually 128 physical connections (2 sets of connection pins per connector) for input or output signals. When connecting AES digital audio signals to the router, this equates to two sets of physical connection pins for each I/O signal. DRS is designed such that connecting an audio signal to one set of input pins on a connector AC couples the signal to router circuitry and the other connector pins DC couple the signal. Pin-out charts contained in the following paragraphs identify how to connect an input source or an output signal for AC or DC coupling.

5.3.1 BNC CONNECTOR REAR PANEL

There are 64 BNC I/O connectors on a BNC rear panel; each connects to a source of unbalanced AES-compliant digital audio. Figure 5-1 illustrates a BNC rear panel 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.

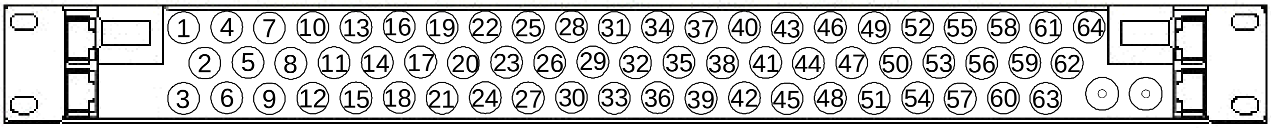
Channel pairs of each AES input signal applied to a BNC connector are de-muxed and each individual audio channel is assigned a source number through the router.

Likewise, the two router destination signals that form the pair for each output channel are multiplexed into an AES compliant signal available at the BNC connector indicated in the table.

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.**

Top Side

Digital Audio I/O Connectors 1 – 64 (128 Channels) Shown By Connector Position



Rear View Of
I/O Frame

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 5-1 BNC Rear Panel – Connector and I/O Channel Identification
(Viewed From Chassis Rear)

5.3.2 ELCO/EDAC CONNECTOR REAR PANEL

There are four ELCO/EDAC 120 pin connectors used on a rear panel, each providing 32 input or output connections, for a total of 128 connections. Figure 5-2 illustrates the ELCO/EDAC rear panel and identifies I/O connection layout. Notice 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 rear panels 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 5-3 and Figure 5-4; and a pin identification chart is provided by Table 5-1.

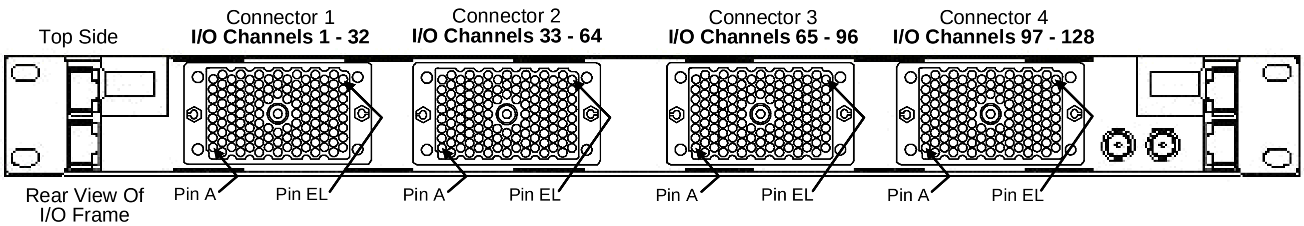


Figure 5-2 ELCO/EDAC Rear Panel - Connector and I/O Channel Identification
(Viewed From Chassis Rear)

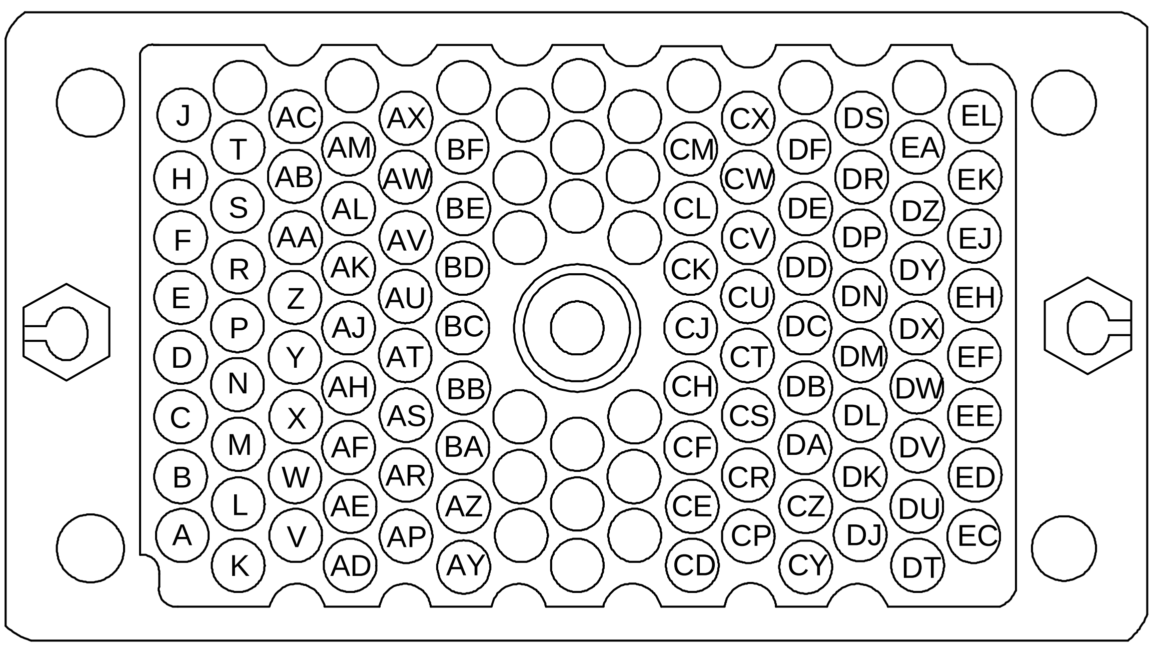


Figure 5-3 ELCO/EDAC Audio Connector Pin-Out Diagram (Refer To Table 5-1)
(Connector As Mounted On I/O Rear Panel, Viewed From Chassis Rear)

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

Connection Pin-Outs By Input/Output Number
for ELCO/EDAC Audio Connectors
Refer To Figures 5-4, 5-5 and 5-6 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

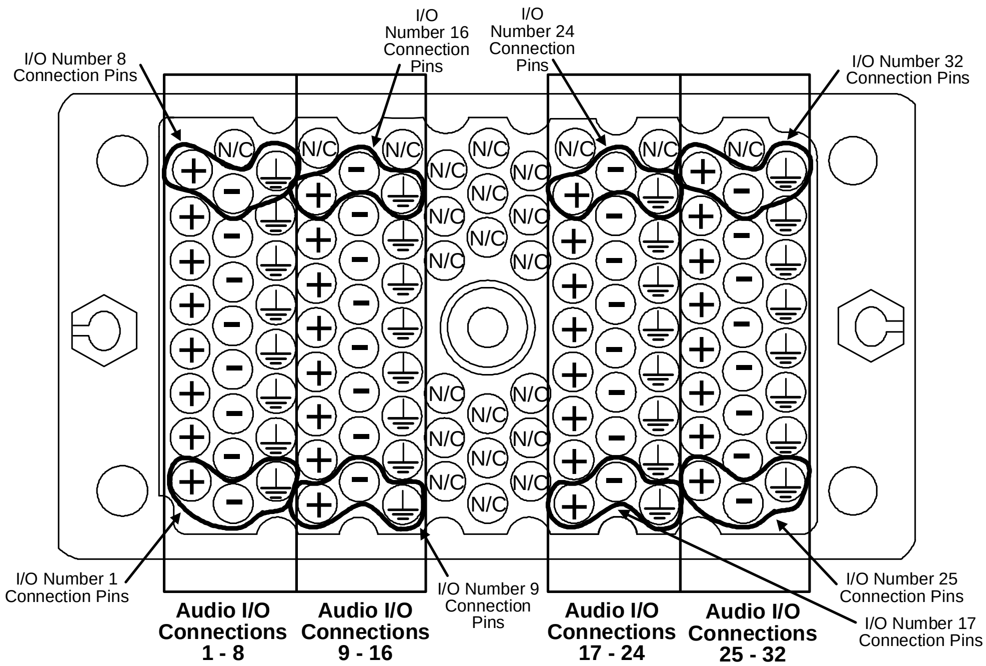


Figure 5-4 ELCO/EDAC Audio Connector I/O Channel Grouping

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 audio frame.

5.3.3 6-PIN DETACHABLE CONNECTOR REAR PANEL

There are 64 6-Pin I/O connectors on the rear panel; each connector provides 2 physical input or output connections for a total of 128 I/O connections on a rear panel. Figure 5-5 illustrates the 6-pin connector rear panel and shows in detail the orientation of rear panel 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. Analog Audio Outputs MUST be connected to a high-impedance load, ≥10K Ohms. When wiring UNBALANCED analog output signals to external loads, NEVER connect the negative (-) output terminal to any external connection point or to ground. The negative terminal MUST be left floating.

Connector orientation and pin identification diagrams are provided by Figure 5-5. Figure 5-6 provides a detailed view of I/O connector numbering layout and Figure 5-7 illustrates channel I/O pin arrangement for a typical 6-pin connector. Table 5-2 is a detailed I/O channel pin-out chart.

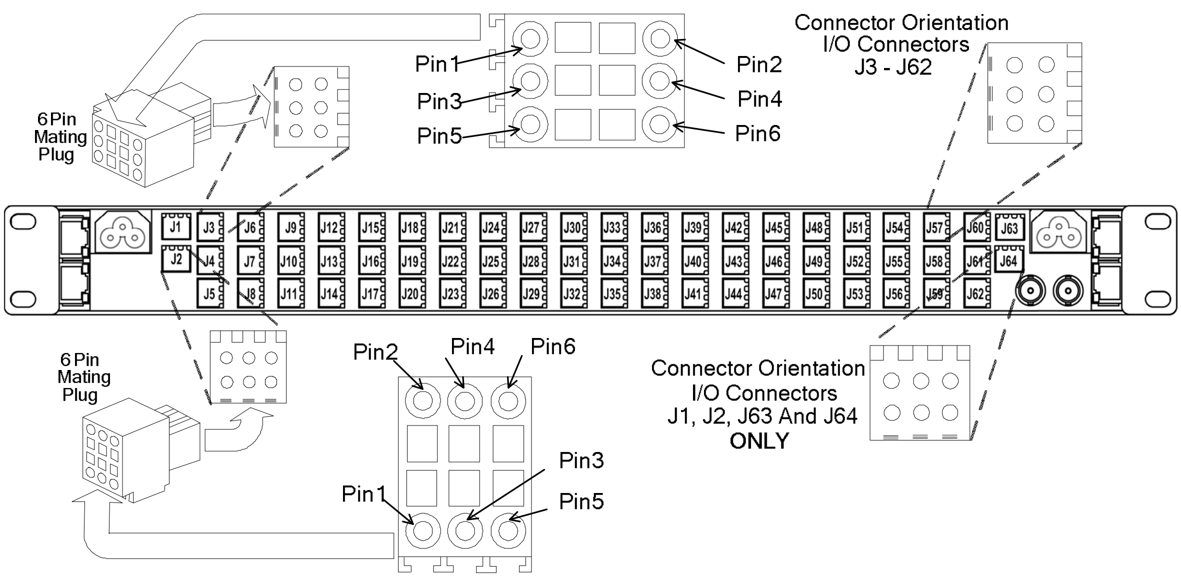


Figure 5-5 6-Pin Connector Rear Panel - Orientation and Pin-Out Diagram

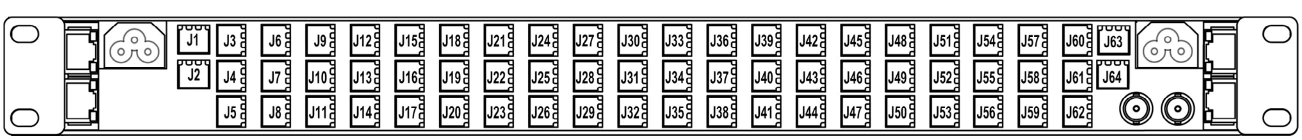


Figure 5-6 6-Pin Connector Rear Panel – Connector Numbering Layout

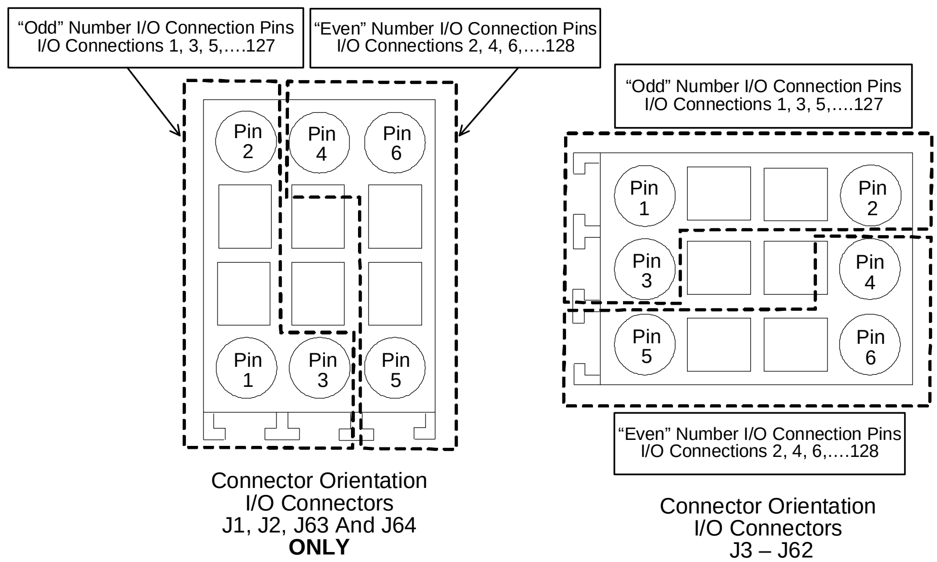


Figure 5-7 6-Pin Detachable Connector – I/O Channel Pin Grouping

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

Connection Pin-Outs By Input/Output Channel for 6-Pin Detachable Audio Connectors Refer To Figures 5-7, 5-8 and 5-9 for Proper Connector Orientation and Channel Assignments												
Rear Panel Connector Number	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J1	1 & 2 DC CPLD	1	1	2	3		J7	13 & 14 DC CPLD	13	1	2	3
J1	1 & 2 AC CPLD	2	5	6	4		J7	13 & 14 AC CPLD	14	5	6	4
J2	3 & 4 DC CPLD	3	1	2	3		J8	15 & 16 DC CPLD	15	1	2	3
J2	3 & 4 AC CPLD	4	5	6	4		J8	15 & 16 AC CPLD	16	5	6	4
J3	5 & 6 DC CPLD	5	1	2	3		J9	17 & 18 DC CPLD	17	1	2	3
J3	5 & 6 AC CPLD	6	5	6	4		J9	17 & 18 AC CPLD	18	5	6	4
J4	7 & 8 DC CPLD	7	1	2	3		J10	19 & 20 DC CPLD	19	1	2	3
J4	7 & 8 AC CPLD	8	5	6	4		J10	19 & 20 AC CPLD	20	5	6	4
J5	9 & 10 DC CPLD	9	1	2	3		J11	21 & 22 DC CPLD	21	1	2	3
J5	9 & 10 AC CPLD	10	5	6	4		J11	21 & 22 AC CPLD	22	5	6	4
J6	11 & 12 DC CPLD	11	1	2	3		J12	23 & 24 DC CPLD	23	1	2	3
J6	11 & 12 AC CPLD	12	5	6	4		J12	23 & 24 AC CPLD	24	5	6	4

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

Rear Panel Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J13	25 & 26 DC CPLD	25	1	2	3		J23	45 & 46 AC CPLD	45	1	2	3
J13	25 & 26 AC CPLD	26	5	6	4		J23	47 & 48 DC CPLD	46	5	6	4
J14	27 & 28 DC CPLD	27	1	2	3		J24	47 & 48 AC CPLD	47	1	2	3
J14	27 & 28 AC CPLD	28	5	6	4		J24	49 & 50 DC CPLD	48	5	6	4
J15	29 & 30 DC CPLD	29	1	2	3		J25	49 & 50 AC CPLD	49	1	2	3
J15	29 & 30 AC CPLD	30	5	6	4		J25	51 & 52 DC CPLD	50	5	6	4
J16	31 & 32 DC CPLD	31	1	2	3		J26	51 & 52 AC CPLD	51	1	2	3
J16	31 & 32 AC CPLD	32	5	6	4		J26	53 & 54 DC CPLD	52	5	6	4
J17	33 & 34 DC CPLD	33	1	2	3		J27	53 & 54 AC CPLD	53	1	2	3
J17	33 & 34 AC CPLD	34	5	6	4		J27	45 & 46 AC CPLD	54	5	6	4
J18	35 & 36 DC CPLD	35	1	2	3		J28	55 & 56 DC CPLD	55	1	2	3
J18	35 & 36 AC CPLD	36	5	6	4		J28	55 & 56 AC CPLD	56	5	6	4
J19	37 & 38 DC CPLD	37	1	2	3		J29	57 & 58 DC CPLD	57	1	2	3
J19	37 & 38 AC CPLD	38	5	6	4		J29	57 & 58 AC CPLD	58	5	6	4
J20	39 & 40 DC CPLD	39	1	2	3		J30	59 & 60 DC CPLD	59	1	2	3
J20	39 & 40 AC CPLD	40	5	6	4		J30	59 & 60 AC CPLD	60	5	6	4
J21	41 & 42 DC CPLD	41	1	2	3		J31	61 & 62 DC CPLD	61	1	2	3
J21	41 & 42 AC CPLD	42	5	6	4		J31	61 & 62 AC CPLD	62	5	6	4
J22	43 & 44 DC CPLD	43	1	2	3		J32	63 & 64 DC CPLD	63	1	2	3
J22	43 & 44 AC CPLD	44	5	6	4		J32	63 & 64 AC CPLD	64	5	6	4

Table 5-2 Continued on Page 5-13 for Connectors J33 – J64

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

Rear Panel Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J33	65 & 66 DC CPLD	65	1	2	3		J45	89 & 90 DC CPLD	89	1	2	3
J33	65 & 66 AC CPLD	66	5	6	4		J45	89 & 90 AC CPLD	90	5	6	4
J34	67 & 68 DC CPLD	67	1	2	3		J46	91 & 92 DC CPLD	91	1	2	3
J34	67 & 68 AC CPLD	68	5	6	4		J46	91 & 92 AC CPLD	92	5	6	4
J35	69 & 70 DC CPLD	69	1	2	3		J47	93 & 94 DC CPLD	93	1	2	3
J35	69 & 70 AC CPLD	70	5	6	4		J47	93 & 94 AC CPLD	94	5	6	4
J36	71 & 72 DC CPLD	71	1	2	3		J48	95 & 96 DC CPLD	95	1	2	3
J36	71 & 72 AC CPLD	72	5	6	4		J48	95 & 96 AC CPLD	96	5	6	4
J37	73 & 74 DC CPLD	73	1	2	3		J49	97 & 98 DC CPLD	97	1	2	3
J37	73 & 74 AC CPLD	74	5	6	4		J49	97 & 98 AC CPLD	98	5	6	4
J38	75 & 76 DC CPLD	75	1	2	3		J50	99 & 100 DC CPLD	99	1	2	3
J38	75 & 76 AC CPLD	76	5	6	4		J50	99 & 100 AC CPLD	100	5	6	4
J39	77 & 78 DC CPLD	77	1	2	3		J51	101 & 102 DC CPLD	101	1	2	3
J39	77 & 78 AC CPLD	78	5	6	4		J51	101 & 102 AC CPLD	102	5	6	4
J40	79 & 80 DC CPLD	79	1	2	3		J52	103 & 104 DC CPLD	103	1	2	3
J40	79 & 80 AC CPLD	80	5	6	4		J52	103 & 104 AC CPLD	104	5	6	4
J41	81 & 82 DC CPLD	81	1	2	3		J53	105 & 106 DC CPLD	105	1	2	3
J41	81 & 82 AC CPLD	82	5	6	4		J53	105 & 106 AC CPLD	106	5	6	4
J42	83 & 84 DC CPLD	83	1	2	3		J54	107 & 108 DC CPLD	107	1	2	3
J42	83 & 84 AC CPLD	84	5	6	4		J54	107 & 108 AC CPLD	108	5	6	4
J43	85 & 86 DC CPLD	85	1	2	3		J55	109 & 110 DC CPLD	109	1	2	3
J43	85 & 86 AC CPLD	86	5	6	4		J55	109 & 110 AC CPLD	110	5	6	4
J44	87 & 88 DC CPLD	87	1	2	3		J56	111 & 112 DC CPLD	111	1	2	3
J44	87 & 88 AC CPLD	88	5	6	4		J56	111 & 112 AC CPLD	112	5	6	4

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

Rear Panel Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	AES Digital Audio Channel	Audio I/O Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J57	113 & 114 DC CPLD	113	1	2	3		J61	121 & 122 DC CPLD	121	1	2	3
J57	113 & 114 AC CPLD	114	5	6	4		J61	121 & 122 AC CPLD	122	5	6	4
J58	115 & 116 DC CPLD	115	1	2	3		J62	123 & 124 DC CPLD	123	1	2	3
J58	115 & 116 AC CPLD	116	5	6	4		J62	123 & 124 AC CPLD	124	5	6	4
J59	117 & 118 DC CPLD	117	1	2	3		J63	125 & 126 DC CPLD	125	1	2	3
J59	117 & 118 AC CPLD	118	5	6	4		J63	125 & 126 AC CPLD	126	5	6	4
J60	119 & 120 DC CPLD	119	1	2	3		J64	127 & 128 DC CPLD	127	1	2	3
J60	119 & 120 AC CPLD	120	5	6	4		J64	127 & 128 AC CPLD	128	5	6	4

5.4 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.

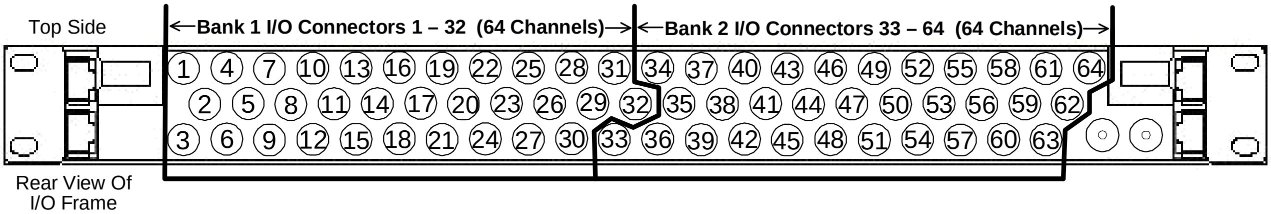
Connector population for a split frame rear panel is dependent on the type of signals connected and type of connectors used in the installation. In the following paragraphs, each rear panel variant is illustrated and pin-out data is provided as a guide when wiring mating connectors to interconnect with 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 rear panel 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.

5.4.1 SPLIT FRAME BNC CONNECTOR REAR PANEL

Figure 5-8 illustrates a split frame BNC rear panel 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 in each connector bank on the rear panel used for connection of AES audio sources. Since each AES audio signal carries a pair of monaural audio channels, each bank of 32 BNC connectors actually carries 64 channels, for a frame total of 64 input channels and 64 output channels.



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

Figure 5-8 BNC Rear Panel – Connector and I/O Channel Identification
(Viewed From Chassis Rear)

5.4.2 SPLIT FRAME ELCO/EDAC CONNECTOR REAR PANEL

There are four ELCO/EDAC 120 pin connectors on the split frame rear panel, divided into two banks of two connectors, each providing 32 input or output connections, for a total of 64 connections per bank. Figure 5-9 illustrates the split frame ELCO/EDAC rear panel and identifies I/O connection layout. 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 rear panels 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 set of connector pins is used for a separate single-channel, balanced audio input or output. Analog Audio Outputs MUST be connected to a high-impedance load, ≥10K Ohms. When wiring UNBALANCED analog output signals to external loads, NEVER connect the negative (-) output terminal to any external connection point or to ground. The negative terminal MUST be left floating.

Detailed pin-out diagrams are provided by Figure 5-3 and Figure 5-4; 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.

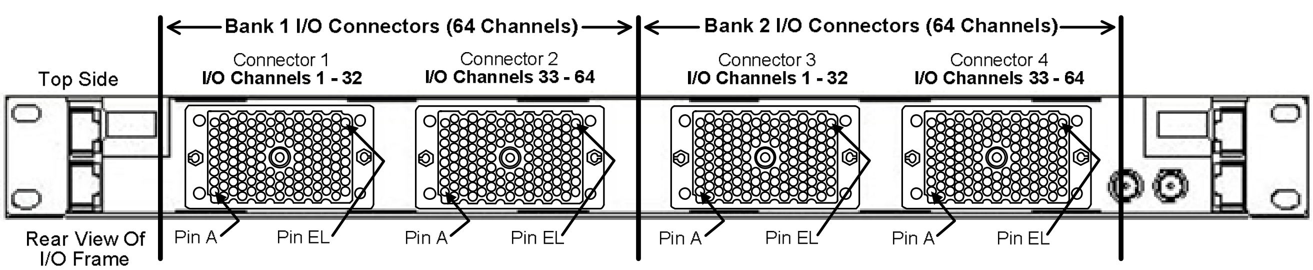


Figure 5-9 Split Frame ELCO/EDAC Rear Panel - Connector and I/O Channel Identification
(Viewed From Chassis Rear)

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 5-5, 5-6 and 5-11 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.

5.4.3 SPLIT FRAME 6-PIN DETACHABLE CONNECTOR REAR PANEL

There are 64 6-Pin I/O connectors on a rear panel, 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 5-10 illustrates the split frame 6-pin connector rear panel and identifies connector layout.

The mating plug used with the rear panel 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.

AES digital channels contain a pair of audio signals, therefore each AES signal cable is connected to only one set of connector pins on each 6-pin connector. Thus, the 64 input connections of each bank allow for two physical connection points in each physical connector for each AES digital audio signal. One set of pins allows input sources or output signals to be AC coupled to the router and the other set allows signals to be DC coupled. The AES Digital column in the pin-out chart identifies the pins that provide DC coupling to the signal and the pins that provide AC coupling; you may use either set of connector pins, depending on how you wish to connect the signal to the router.

When connecting analog input or output signals each set of connector pins is used for a separate single-channel, balanced audio input or output. Analog Audio Outputs <u>MUST</u> be connected to a high-impedance load, $\geq$10K Ohms. When wiring UNBALANCED analog output signals to external loads, <u>NEVER</u> connect the negative (-) output terminal to any external connection point or to ground. The negative terminal <u>MUST</u> be left floating.

Depending on the system configuration, each connector bank may support input or output signals. The following connector pin-out data is applicable for either signal type. **Carefully** follow 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 5-5. Figure 5-10 provides a detailed view of I/O connector numbering layout for the split rear panel and Figure 5-7 illustrates channel I/O pin arrangement for a typical 6-pin connector. Table 5-4 is a detailed I/O channel pin-out chart.

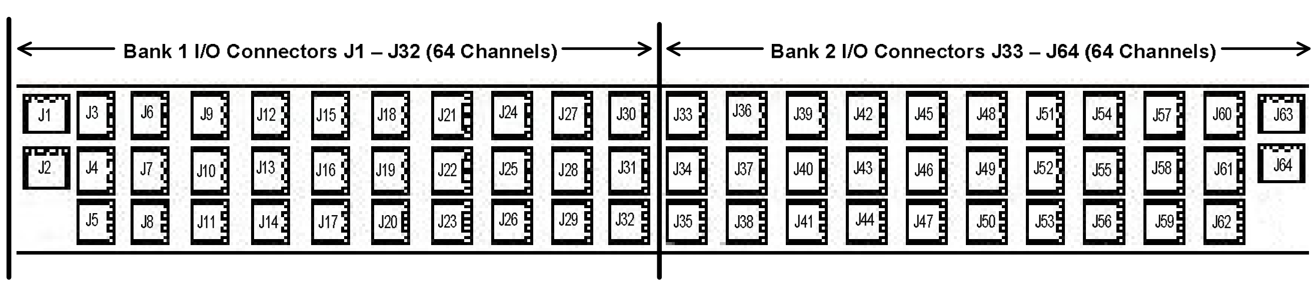


Figure 5-10 6-Pin Connector Split Rear Panel – Connector Numbering Layout

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

Pin-Outs By Connector Bank and Input/Output Channel
Refer To Figures 5-7, 5-9 for Connector Pin Diagrams
and Figure 5-12 for Rear Panel Layout and Channel Assignments

Rear Panel Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J1 / J33	1 & 2 DC CPLD	1	1	2	3		J12 / J44	23 & 24 DC CPLD	23	1	2	3
J1 / J33	1 & 2 AC CPLD	2	5	6	4		J12 / J44	23 & 24 AC CPLD	24	5	6	4
J2 / J34	3 & 4 DC CPLD	3	1	2	3		J13 / J45	25 & 26 DC CPLD	25	1	2	3
J2 / J34	3 & 4 AC CPLD	4	5	6	4		J13 / J45	25 & 26 AC CPLD	26	5	6	4
J3 / J35	5 & 6 DC CPLD	5	1	2	3		J14 / J46	27 & 28 DC CPLD	27	1	2	3
J3 / J35	5 & 6 AC CPLD	6	5	6	4		J14 / J46	27 & 28 AC CPLD	28	5	6	4
J4 / J36	7 & 8 DC CPLD	7	1	2	3		J15 / J47	29 & 30 DC CPLD	29	1	2	3
J4 / J36	7 & 8 AC CPLD	8	5	6	4		J15 / J47	29 & 30 AC CPLD	30	5	6	4
J5 / J37	9 & 10 DC CPLD	9	1	2	3		J16 / J48	31 & 32 DC CPLD	31	1	2	3
J5 / J37	9 & 10 AC CPLD	10	5	6	4		J16 / J48	31 & 32 AC CPLD	32	5	6	4
J6 / J38	11 & 12 DC CPLD	11	1	2	3		J17 / J49	33 & 34 DC CPLD	33	1	2	3
J6 / J38	11 & 12 AC CPLD	12	5	6	4		J17 / J49	33 & 34 AC CPLD	34	5	6	4
J7 / J39	13 & 14 DC CPLD	13	1	2	3		J18 / J50	35 & 36 DC CPLD	35	1	2	3
J7 / J39	13 & 14 AC CPLD	14	5	6	4		J18 / J50	35 & 36 AC CPLD	36	5	6	4
J8 / J40	15 & 16 DC CPLD	15	1	2	3		J19 / J51	37 & 38 DC CPLD	37	1	2	3
J8 / J40	15 & 16 AC CPLD	16	5	6	4		J19 / J51	37 & 38 AC CPLD	38	5	6	4
J9 / J41	17 & 18 DC CPLD	17	1	2	3		J20 / J52	39 & 40 DC CPLD	39	1	2	3
J9 / J41	17 & 18 AC CPLD	18	5	6	4		J20 / J52	39 & 40 AC CPLD	40	5	6	4
J10 / J42	19 & 20 DC CPLD	19	1	2	3		J21 / J53	41 & 42 DC CPLD	41	1	2	3
J10 / J42	19 & 20 AC CPLD	20	5	6	4		J21 / J53	41 & 42 AC CPLD	42	5	6	4
J11 / J43	21 & 22 DC CPLD	21	1	2	3		J22 / J54	43 & 44 DC CPLD	43	1	2	3
J11 / J43	21 & 22 AC CPLD	22	5	6	4		J22 / J54	43 & 44 AC CPLD	44	5	6	4

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

Rear Panel Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number Bank 1/ Bank 2	AES Digital Audio Channel	Analog Audio Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J23 / J55	45 & 46 DC CPLD	45	1	2	3		J28 / J60	55 & 56 DC CPLD	55	1	2	3
J23 / J55	45 & 46 AC CPLD	46	5	6	4		J28 / J60	55 & 56 AC CPLD	56	5	6	4
J24 / J56	47 & 48 DC CPLD	47	1	2	3		J29 / J61	57 & 58 DC CPLD	57	1	2	3
J24 / J56	47 & 48 AC CPLD	48	5	6	4		J29 / J61	57 & 58 AC CPLD	58	5	6	4
J25 / J57	49 & 50 DC CPLD	49	1	2	3		J30 / J62	59 & 60 DC CPLD	59	1	2	3
J25 / J57	49 & 50 AC CPLD	50	5	6	4		J30 / J62	59 & 60 AC CPLD	60	5	6	4
J26 / J58	51 & 52 DC CPLD	51	1	2	3		J31 / J63	61 & 62 DC CPLD	61	1	2	3
J26 / J58	51 & 52 AC CPLD	52	5	6	4		J31 / J63	61 & 62 AC CPLD	62	5	6	4
J27 / J59	53 & 54 DC CPLD	53	1	2	3		J32 / J64	63 & 64 DC CPLD	63	1	2	3
J27 / J59	53 & 54 AC CPLD	54	5	6	4		J32 / J64	63 & 64 AC CPLD	64	5	6	4

5.4.4 SPLIT FRAME MIXED ELCO/EDAC AND BNC CONNECTOR REAR PANEL

There are two ELCO/EDAC I/O connectors and 32 BNC I/O connectors on the mixed rear panel, divided into two banks of 64 channels. Figure 5-11 illustrates the mixed rear panel 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.

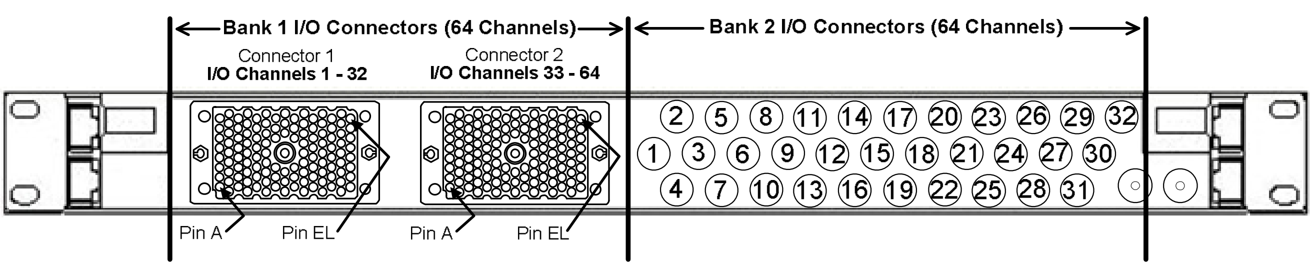


Figure 5-11 Split Frame Mixed ELCO/EDAC and BNC Connectors Shown By Channel Bank and Connector Position

ELCO/EDAC Connector Wiring

Figure 5-11 illustrates the mixed rear panel 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 rear panels 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 5-3 and Figure 5-4.

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 5-11, and the channel assignment chart, Table 5-5, when attaching cables to the BNC connectors on the mixed rear panel.

NOTE	**There are 32 BNC connectors for connector bank 2 on the mixed rear panel, 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

5.4.5 SPLIT FRAME MIXED 6-PIN DETACHABLE AND BNC CONNECTOR REAR PANEL

There are 32 6-pin detachable I/O connectors and 32 BNC I/O connectors on the mixed rear panel, divided into two banks of 64 channels. Figure 5-12 illustrates the mixed rear panel 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.

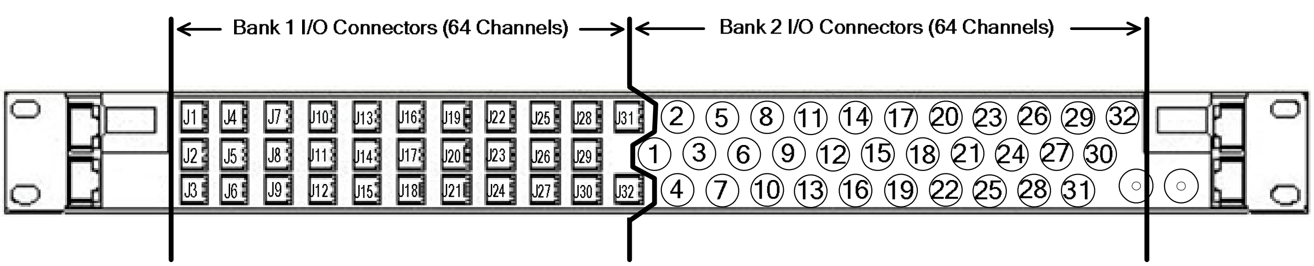


Figure 5-12 Split Frame Mixed 6-Pin and BNC Connectors Shown By Channel Bank and Connector Position

6-Pin Detachable Connector Wiring

Figure 5-12 illustrates the mixed rear panel and identifies connector layout. 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 5-5. Figure 5-12 provides a detailed view of I/O connector numbering layout for the mixed rear panel and Figure 5-7 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 5-12, and the channel assignment chart, Table 5-5, when attaching cables to the BNC connectors on the mixed rear panel.

NOTE	**There are 32 BNC connectors for connector bank 2 on the mixed rear panel, 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.**

5.5 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 rear panels used for dedicated audio frames; however, connection pin-outs for the ELCO/EDAC and 6-pin detachable connector rear panels are different than with audio signals.

DRS rear panels, with the exception of the BNC rear panel, 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 rear panels. 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 rear panel, all inputs and outputs are connected as single-ended sources.

5.5.1 BNC CONNECTOR REAR PANEL FOR TIME CODE

There are 64 BNC I/O connectors on a rear panel; each connects to a source of single-ended time code. BNC rear panel I/O channel layout for time code is identical to the audio layout as shown in Figure 5-1. Carefully follow the connector layout and channel identification chart when completing time code connections to the DRS router to prevent inadvertent signal swapping.

5.5.2 ELCO/EDAC CONNECTOR REAR PANEL FOR TIME CODE

There are four ELCO/EDAC 120 pin connectors used on a rear panel, each providing 16 input or output time code connections, for a total of 64 connections. Figure 5-13 illustrates the ELCO/EDAC rear panel for time code signals and identifies I/O connection layout. Notice 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 rear panels 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 5-3 and Figure 5-4; and a pin identification chart is provided by Table 5-6.

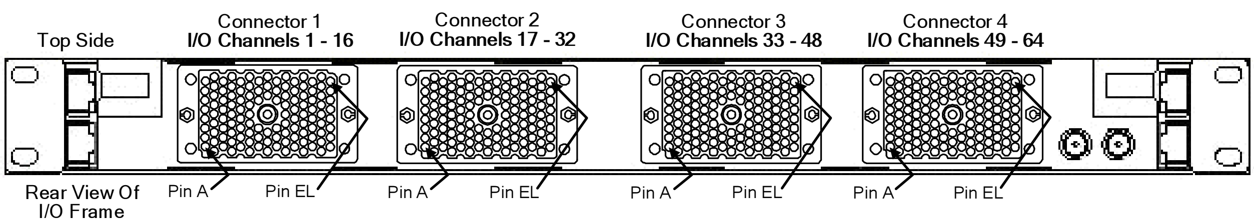


Figure 5-13 ELCO/EDAC Time Code Rear Panel - Connector and I/O Channel Identification
(Viewed From Chassis Rear)

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 5-15, 5-5 and 5-6 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

5.5.3 6-PIN (WEIDMULLER) CONNECTOR REAR PANEL FOR TIME CODE

There are 64 6-Pin I/O connectors on a 6-pin connector rear panel, 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 rear panel. Figure 5-5 illustrates a typical 6-pin connector rear panel and shows in detail the orientation of rear panel 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 5-5. Figure 5-6 provides a detailed view of I/O connector numbering layout and Figure 5-7 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 Rear Panel for Time Code – Channel Pin-Out Chart

Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J1	1 SINGLE-ENDED	5		3		J5	5 SINGLE-ENDED	5		3
J1	1 DIFFERENTIAL	5	6	3		J5	5 DIFFERENTIAL	5	6	3
J2	2 SINGLE-ENDED	5		3		J6	6 SINGLE-ENDED	5		3
J2	2 DIFFERENTIAL	5	6	3		J6	6 DIFFERENTIAL	5	6	3
J3	3 SINGLE-ENDED	5		3		J7	7 SINGLE-ENDED	5		3
J3	3 DIFFERENTIAL	5	6	3		J7	7 DIFFERENTIAL	5	6	3
J4	4 SINGLE-ENDED	5		3		J8	8 SINGLE-ENDED	5		3
J4	4 DIFFERENTIAL	5	6	3		J8	8 DIFFERENTIAL	5	6	3

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

Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J9	9 SINGLE-ENDED	5		3		J21	21 SINGLE-ENDED	5		3
J9	9 DIFFERENTIAL	5	6	3		J21	21 DIFFERENTIAL	5	6	3
J10	10 SINGLE-ENDED	5		3		J22	22 SINGLE-ENDED	5		3
J10	10 DIFFERENTIAL	5	6	3		J22	22 DIFFERENTIAL	5	6	3
J11	11 SINGLE-ENDED	5		3		J23	23 SINGLE-ENDED	5		3
J11	11 DIFFERENTIAL	5	6	3		J23	23 DIFFERENTIAL	5	6	3
J12	12 SINGLE-ENDED	5		3		J24	24 SINGLE-ENDED	5		3
J12	12 DIFFERENTIAL	5	6	3		J24	24 DIFFERENTIAL	5	6	3
J13	13 SINGLE-ENDED	5		3		J25	25 SINGLE-ENDED	5		3
J13	13 DIFFERENTIAL	5	6	3		J25	25 DIFFERENTIAL	5	6	3
J14	14 SINGLE-ENDED	5		3		J26	26 SINGLE-ENDED	5		3
J14	14 DIFFERENTIAL	5	6	3		J26	26 DIFFERENTIAL	5	6	3
J15	15 SINGLE-ENDED	5		3		J27	27 SINGLE-ENDED	5		3
J15	15 DIFFERENTIAL	5	6	3		J27	27 DIFFERENTIAL	5	6	3
J16	16 SINGLE-ENDED	5		3		J28	28 SINGLE-ENDED	5		3
J16	16 DIFFERENTIAL	5	6	3		J28	28 DIFFERENTIAL	5	6	3
J17	17 SINGLE-ENDED	5		3		J29	29 SINGLE-ENDED	5		3
J17	17 DIFFERENTIAL	5	6	3		J29	29 DIFFERENTIAL	5	6	3
J18	18 SINGLE-ENDED	5		3		J30	30 SINGLE-ENDED	5		3
J18	18 DIFFERENTIAL	5	6	3		J30	30 DIFFERENTIAL	5	6	3
J19	19 SINGLE-ENDED	5		3		J31	31 SINGLE-ENDED	5		3
J19	19 DIFFERENTIAL	5	6	3		J31	31 DIFFERENTIAL	5	6	3
J20	20 SINGLE-ENDED	5		3		J32	32 SINGLE-ENDED	5		3
J20	20 DIFFERENTIAL	5	6	3		J32	32 DIFFERENTIAL	5	6	3

Table 5-7 Continued on Page 5-28 for Connectors J33 – J64

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

Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J33	33 SINGLE-ENDED	5		3		J46	46 SINGLE-ENDED	5		3
J33	33 DIFFERENTIAL	5	6	3		J46	46 DIFFERENTIAL	5	6	3
J34	34 SINGLE-ENDED	5		3		J47	47 SINGLE-ENDED	5		3
J34	34 DIFFERENTIAL	5	6	3		J47	47 DIFFERENTIAL	5	6	3
J35	35 SINGLE-ENDED	5		3		J48	48 SINGLE-ENDED	5		3
J35	35 DIFFERENTIAL	5	6	3		J48	48 DIFFERENTIAL	5	6	3
J36	36 SINGLE-ENDED	5		3		J49	49 SINGLE-ENDED	5		3
J36	36 DIFFERENTIAL	5	6	3		J49	49 DIFFERENTIAL	5	6	3
J37	37 SINGLE-ENDED	5		3		J50	50 SINGLE-ENDED	5		3
J37	37 DIFFERENTIAL	5	6	3		J50	50 DIFFERENTIAL	5	6	3
J38	38 SINGLE-ENDED	5		3		J51	51 SINGLE-ENDED	5		3
J38	38 DIFFERENTIAL	5	6	3		J51	51 DIFFERENTIAL	5	6	3
J39	39 SINGLE-ENDED	5		3		J52	52 SINGLE-ENDED	5		3
J39	39 DIFFERENTIAL	5	6	3		J52	52 DIFFERENTIAL	5	6	3
J40	40 SINGLE-ENDED	5		3		J53	53 SINGLE-ENDED	5		3
J40	40 DIFFERENTIAL	5	6	3		J53	53 DIFFERENTIAL	5	6	3
J41	41 SINGLE-ENDED	5		3		J54	54 SINGLE-ENDED	5		3
J41	41 DIFFERENTIAL	5	6	3		J54	54 DIFFERENTIAL	5	6	3
J42	42 SINGLE-ENDED	5		3		J55	55 SINGLE-ENDED	5		3
J42	42 DIFFERENTIAL	5	6	3		J55	55 DIFFERENTIAL	5	6	3
J43	43 SINGLE-ENDED	5		3		J56	56 SINGLE-ENDED	5		3
J43	43 DIFFERENTIAL	5	6	3		J56	56 DIFFERENTIAL	5	6	3
J44	44 SINGLE-ENDED	5		3		J57	57 SINGLE-ENDED	5		3
J44	44 DIFFERENTIAL	5	6	3		J57	57 DIFFERENTIAL	5	6	3
J45	45 SINGLE-ENDED	5		3		J58	58 SINGLE-ENDED	5		3
J45	45 DIFFERENTIAL	5	6	3		J58	58 DIFFERENTIAL	5	6	3

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

Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin		Rear Panel Connector Number	Time Code Input/Output Channel	Pos. (+) Pin	Neg. (-) Pin	Ground (Shield) Pin
J59	59 SINGLE-ENDED	5		3		J62	62 SINGLE-ENDED	5		3
J59	59 DIFFERENTIAL	5	6	3		J62	62 DIFFERENTIAL	5	6	3
J60	60 SINGLE-ENDED	5		3		J63	63 SINGLE-ENDED	5		3
J60	60 DIFFERENTIAL	5	6	3		J63	63 DIFFERENTIAL	5	6	3
J61	61 SINGLE-ENDED	5		3		J64	64 SINGLE-ENDED	5		3
J61	61 DIFFERENTIAL	5	6	3		J64	64 DIFFERENTIAL	5	6	3

5.6 DRS INTERCONNECT CABLES

Ethernet Connections and TDM bus interconnects between frames are made using common CAT5x 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 TDM bus 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 high quality cable and connectors, 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. For 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 5-14. Pin numbering for a standard RJ-45 connector is also provided in Figure 5-14 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

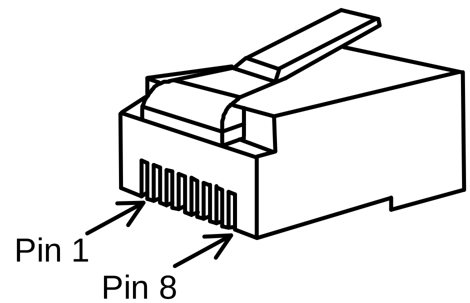


Figure 5-14 EIA 568B Color Code for Ethernet Cable and RJ-45 Pin-Out Diagram

5.7 INTRA-SYSTEM CABLING AND CONNECTIONS

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 signal 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: TDM data bus, DXE Fiber Optic Links (if used) and Ethernet connection. Each connection type is identified and discussed in the following paragraphs.

5.7.1 TDM DATA BUS

Installation of TDM data bus configurations for EDRS systems is identical to traditional DRS installations. Refer to the DRS Technical Manual for further information.

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

5.7.2 EDXE FIBER OPTIC LINKS

When multiple EDXE 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, transmit and receive, are required for a two-way communication system. 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 connector ends to fiber optic cable, or when 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 5-15. Table 5-8 is a hook-up chart providing quick reference for determining proper DXE to DXE frame connection.

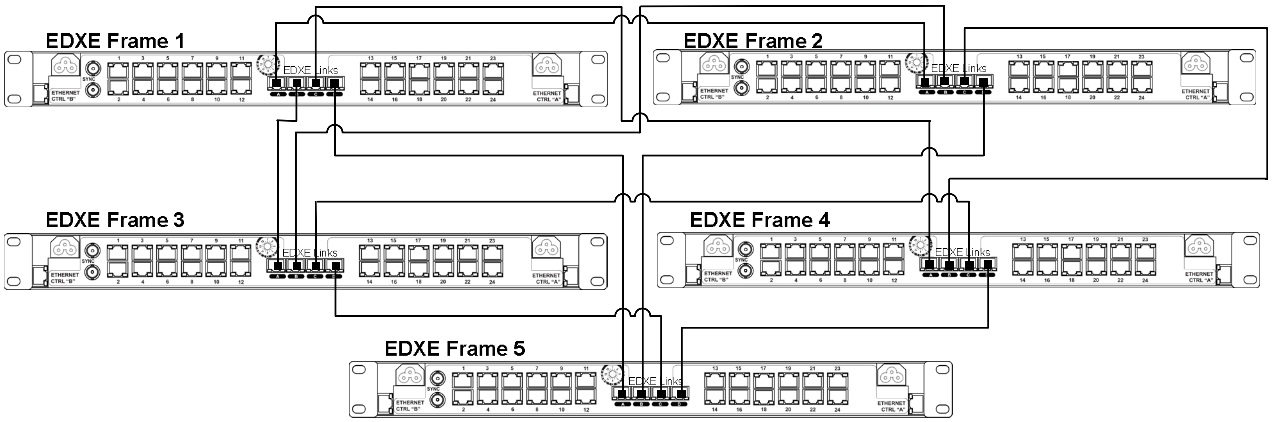


Figure 5-15 Multiple EDXE Fiber Optic Links - Cable Interconnect Diagram

Table 5-8 EDXE Frame Interconnection Chart

System Frame	Rear Panel EDXE Link A Connects To -	Rear Panel EDXE Link B Connects To -	Rear Panel EDXE Link C Connects To -	Rear Panel EDXE Link D Connects To -
EDXE Frame 1	EDXE Frame 2 – EDXE Link A	EDXE Frame 3 – EDXE Link A	EDXE Frame 4 – EDXE Link A	EDXE Frame 5 – EDXE Link A
EDXE Frame 2	EDXE Frame 1 – EDXE Link A	EDXE Frame 3 – EDXE Link B	EDXE Frame 4 – EDXE Link B	EDXE Frame 5 – EDXE Link B
EDXE Frame 3	EDXE Frame 1 – EDXE Link B	EDXE Frame 2 – EDXE Link B	EDXE Frame 4 – EDXE Link C	EDXE Frame 5 – EDXE Link C
EDXE Frame 4	EDXE Frame 1 – EDXE Link C	EDXE Frame 2 – EDXE Link C	EDXE Frame 3 – EDXE Link C	EDXE Frame 5 – EDXE Link D
EDXE Frame 5	EDXE Frame 1 – EDXE Link D	EDXE Frame 2 – EDXE Link D	EDXE Frame 3 – EDXE Link D	EDXE Frame 5 – EDXE Link D

Interconnecting between the proper EDXE 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 EDXE 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.**

5.8 PESA CONTROL SYSTEM INSTALLATION

PESA router installations have two major 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 PESA installation, there is only one system controller, or two for systems with control bus redundancy. 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 EDRS systems, PERC1500 (P1500) identifies the frame controller circuitry installed in each EDXE frame. P1500 uses a 10/100 Ethernet protocol for communication and must be paired with a PESA system controller, such as the PERC2000, to complete the DRS control system requirements.

Control layout and connection of the P1500 to the system controller is identical to the methods used with a traditional DRS installation. Refer to the DRS Technical Manual for further information.

5.9 POWER CONNECTIONS

Power for all EDRS 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 EDRS 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.

5.10 INITIAL POWER-UP

Before applying power to the EDRS 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 EDXE 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 circuit cards and power supply/controller modules are securely installed in each system frame.
- Verify settings of the rotary configuration switches on each EDXE rear panel.

There are no power switches on the EDRS 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 RUN/ERROR LED located on front edge of each logic card as shown by Figure 5-16.
- This LED will initially light red upon application of power, but should change to green after the on-board processor has completed start-up.
- Verify that the LED is green on all EDXE frames.

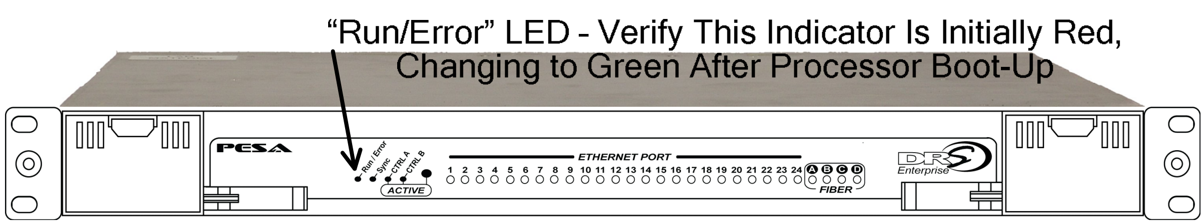


Figure 5-16 Run/Error LED Location

- 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 5-17.

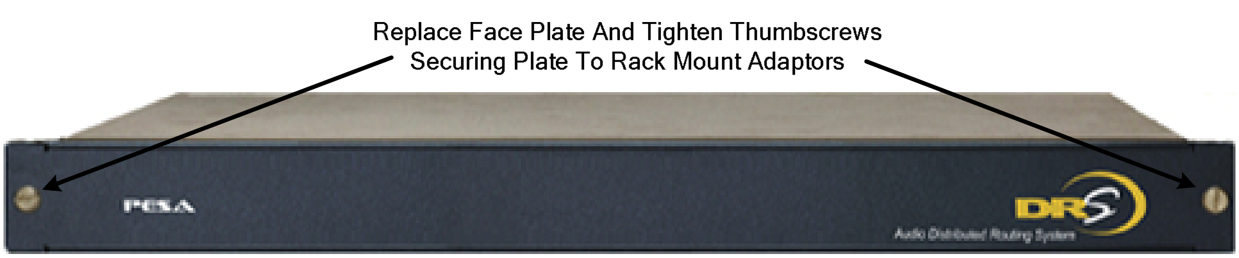


Figure 5-17 Front Panel Replacement

Chapter 6 Introduction to DRS Operation

6.1 ROUTER SYSTEM CONTROL SOFTWARE

Control and set-up operations for the EDRS router system are done through the graphical user interface (GUI) screens of PESA's Cattrax software control application communicating with the individual frame controller(s) located in each DXE frame, and the system controller hardware located external to the DRS router.

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 entering or editing configuration data through screens of Cattrax and downloading data to the controllers.

When you select a status or control screen for any channel group, hardware configuration is read from the active frame controller module for the channel group EDXE and the pertinent configuration data is displayed by the screen or menu. Through Cattrax, you may view or modify existing configuration settings or data. As configuration data is entered or modified on the GUI screen, it is stored by the control application on the host PC – and only on the host PC. Changes entered do not get written to the frame controller, or become active, until the operator issues a command from the control application to download the hardware configuration data.

6.2 HARDWARE AND ROUTER CONFIGURATION FILES

Hardware configuration is where the PERC1500 (P1K) *Frame* Controller in each EDXE 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 Cattrax, the system controller hardware has no real intervention in this procedure.

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 router configuration file, however, it may be saved as a separate file onto storage media for future modification or use. Refer to DRS Technical Manual for further information.

In order for the *system* controller to operate, a ***Router*** configuration file must be written and loaded 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 you wish to associate with each; as well as switching levels, components, source groups, destination groups, and other system functions.

Router configuration procedures are typically performed when configuring an entire router system as a function of installing the system controller. Procedural steps for creating or editing a router configuration file are included with system controller documentation. If the router configuration file is not already programmed into the system controller, or if you need to modify the configuration to include audio signal assignments, please refer to the User Guide for your specific system controller device.

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.

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

With respect to the EDRS router, all control system components (system controller, host PC running Cattrax, and up to 20 PERC1500 frame controllers) communicate over a standard 10/100 Ethernet link. Any EDRS system must have a system controller interfacing with the PERC1500 frame controller(s) located in each DXE frame 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 Cattrax software control application. If the control system components are not set-up for either stand-alone network or LAN Ethernet communication, establish this connection before continuing. In order to upload or download a router configuration file, modify operational parameters or perform monitoring/diagnostic functions to the DRS system, the host PC and Cattrax must have an established link with the system controller.

6.3 SETTING FRAME CONTROLLER IP ADDRESS AND DXE FRAME CONFIGURATION

Each EDXE 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 Frame I/D Selector switch located on the frame rear panel. Figure 6-1 illustrates the location of the rotary switch.

In previous text we introduced the rotary switch present on each EDXE 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 EDXE frame for the channel group.

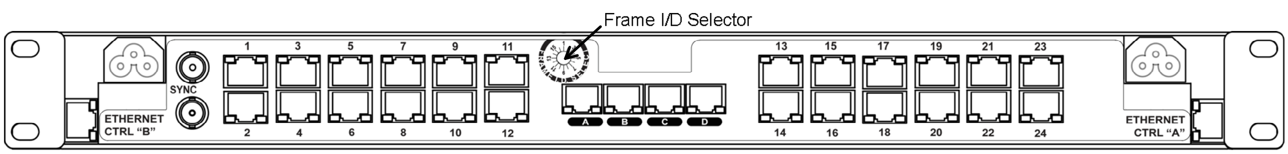


Figure 6-1 Rotary Switch Location – EDXE Rear Panel

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

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

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

IP Address - Determines the IP Address increment of the PERC1500 Frame Controller Module(s) installed in each EDXE. 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 in the fourth octet of the address.

Each PERC1500 module is **factory configured** to a ***Base IP Address of 192.168.1.201*** and a ***Subnet Mask of 255.255.0.0***. The operating IP Address assumed by an individual frame controller 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 module occupies.

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

Table 6-1 EDXE Frame Configuration Settings

EDXE Rotary Switch Setting	Primary/Redundant EDXE	EDXE I/O Range	IP Address Controller in Slot 1	IP Address Controller in Slot 2
0	Primary	1 – 1536	Base IP Address	Base IP Address + 1
1	Primary	1537 – 3072	Base IP Address + 2	Base IP Address + 3
2	Primary	3073 – 4608	Base IP Address + 4	Base IP Address + 5
3	Primary	4609 – 6144	Base IP Address + 6	Base IP Address + 7
4	Primary	6145 - 7680	Base IP Address + 8	Base IP Address + 9
5	Redundant	1 – 1536	Base IP Address + 10	Base IP Address + 11
6	Redundant	1537 – 3072	Base IP Address + 12	Base IP Address + 13
7	Redundant	3073 – 4608	Base IP Address + 14	Base IP Address + 15
8	Redundant	4609 – 6144	Base IP Address + 16	Base IP Address + 17
9	Redundant	6145 - 7680	Base IP Address + 18	Base IP Address + 19

- If you are configuring a 1536 x 1536, non-redundant system, the switch setting on the single EDXE required for the configuration is Zero (0). This setting identifies the EDXE as Primary with I/O channels 1-1536. A single Power Supply/Frame Controller Module is installed in Slot 1 (Primary Controller). Assuming a base IP Address of 192.168.1.201, the operating IP Address for the frame controller is 192.168.1.201.

- If a redundant Frame Controller is added to slot 2 (Secondary Controller) of this frame, the operating IP Address assumed by this controller is 192.168.1.202.

- As a final example, if a second EDXE frame is added to this configuration for system redundancy, the rotary switch setting for this second frame is Five (5) – Redundant EDXE for I/O Channels 1 – 1536. The primary controller assumes the operating IP Address of 192.168.1.211, and if a second controller (redundant slot) is added to this frame it assumes the operating IP Address of 192.168.1.212.

The Frame I/D Select switches are set at the factory to order specifications, and should not require resetting. If, however, a switch setting is 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 EDXE 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 EDXE frame used in the configuration.

6.4 CHANGING THE DEFAULT IP ADDRESS OF A FRAME CONTROLLER MODULE

Remember the base IP address is the address programmed into flash memory of ***all*** PERC1500 frame controllers in the EDRS system, and it becomes the nomenclature used to identify the entire EDRS system on the network. On power-up of the EDXE frames in the system, each frame controller determines and assumes a unique operating IP address as discussed in Paragraph 4.1.5.

In some applications it may be necessary to set the base IP address of the EDRS system to a value other than the factory assigned address to accommodate your particular installation; this is easily accomplished through the control application. Changing the IP address may be required for a number of reasons; for example, in new EDRS 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 EDRS system and wish to use the IP addresses 192.168.5.101 through 192.168.5.120 for the P1500 frame controllers, rather than the default values set by the factory. Using the control application you would change the base address loaded into all frame controllers 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 operating addresses derived from the changed base address.

The base IP address of the P1500 frame controllers may be set to a 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 PESA recommends that you dedicate a block of 20 sequential numbers even if your system has less than 20 frame controllers to allow for future expansion.

Complete procedures for changing the system base IP address using Cattrax are the same as for a traditional DRS router. Refer to DRS Technical Manual for further information.

6.5 DUAL (REDUNDANT) P1500 FRAME CONTROLLERS

When an EDXE frame is equipped with dual frame 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 EDXE 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 P1500 become active by a command from Cattrax.
- Standby P1500 loses serial communication with the active P1500.
- Active P1500 cannot make an Ethernet connection.
- Active P1500 experiences communication failure with the EDXE.
- Active P1500 controller is removed from its frame slot.

Chapter 7 EDRS Operation Using Cattrax

7.1 INTRODUCTION

Most functions and procedures of Cattrax used with the Enterprise DRS router are the same as for the traditional DRS router as presented and discussed in Chapter 8 of the DRS Technical Manual.

This chapter presents and discusses the following operations that are unique to the Enterprise DRS:

- EDRS Devices View Entries
- EDXE Summary Screen Display
- Channel Group Status and Set-Up Screens
- Status Display Screen
- Channel Group Port Configuration Screen
- I/O Port Summary Screen Display

For an introduction to Cattrax, basic operation of the software application and operational procedures for all DRS-specific Cattrax menus and operator screens not included in the following paragraphs, refer to the DRS Technical Manual, Chapter 8.

7.2 EDRS DEVICES VIEW ENTRIES

When an EDRS router is discovered on the network, its assigned name is added under the Routers parent header, shown by Figure 7-1 using the system name EDXE System as an example menu entry. Expanding the menu entry reveals a listing of all channel groups and components in the system. Clicking any entry in the listing opens a menu of control and status screens available for the component in the Menu Tree window, and also displays operational properties for the selected assembly in the Device Properties Window area.

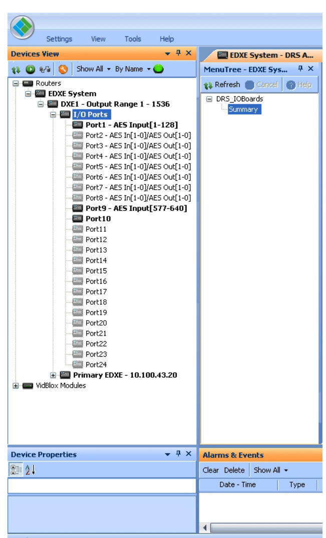
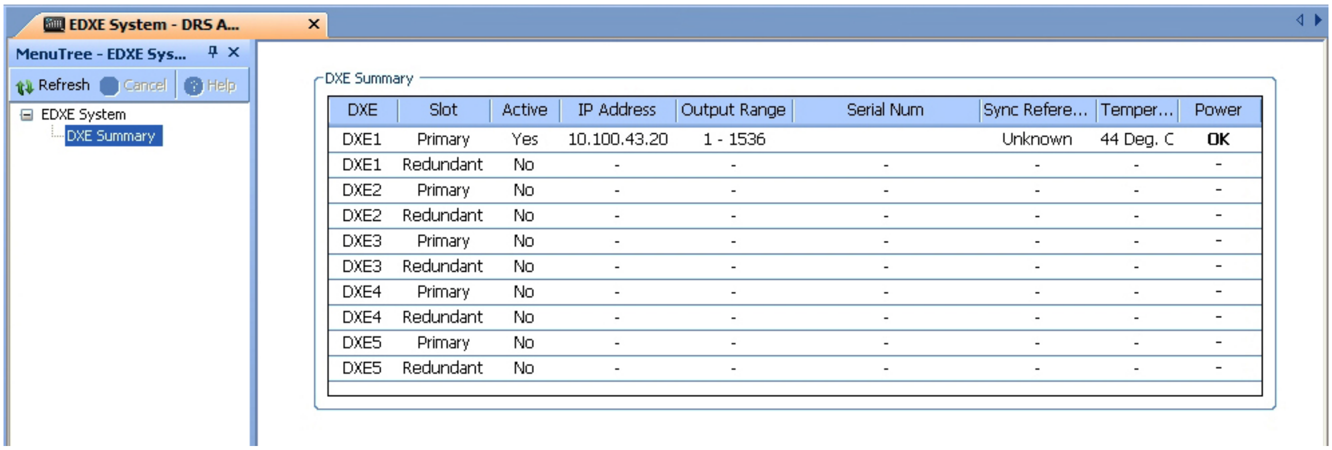


Figure 7-1 Example Device Properties Display

7.3 EDXE SUMMARY SCREEN DISPLAY

With the top-level EDRS entry selected, the EDXE Summary window is displayed in the Main Window area, as shown by Figure 7-2. This screen is a display-only window that identifies the operational characteristics of each DXE in the EDRS system.



DXE	Slot	Active	IP Address	Output Range	Serial Num	Sync Refere...	Temper...	Power
DXE1	Primary	Yes	10.100.43.20	1 - 1536		Unknown	44 Deg. C	OK
DXE1	Redundant	No	-	-	-	-	-	-
DXE2	Primary	No	-	-	-	-	-	-
DXE2	Redundant	No	-	-	-	-	-	-
DXE3	Primary	No	-	-	-	-	-	-
DXE3	Redundant	No	-	-	-	-	-	-
DXE4	Primary	No	-	-	-	-	-	-
DXE4	Redundant	No	-	-	-	-	-	-
DXE5	Primary	No	-	-	-	-	-	-
DXE5	Redundant	No	-	-	-	-	-	-

Figure 7-2 EDXE Summary Screen

7.4 CHANNEL GROUP STATUS AND SET-UP SCREENS

Locate and expand the Routers entry in the Devices View window, as shown in Figure 7-3, expand the DRS router entry to reveal a listing of all channel groups in the system. Each entry in the listing identifies a channel group by its DXE group identifier and the numerical *output* channel range of the specified group.

Expanding the menu entry for any of the channel groups reveals entries for components that configure that specific group. Selecting any of these entries opens a menu of status and control menus available for the component under the Menu Tree window. Within the menu structure you will find entries under the heading **I/O Ports** that correspond to control menus for each of the signal frames attached to the EDXE I/O ports. At the same level as I/O Ports, there are entries for the **EDXE** frame(s), primary and redundant, if present. Each EDXE frame is further identified by the IP address of the PERC1500 frame controller that is currently *active* for the frame. Expanding the entry for either EDXE reveals an entry for the PERC1500 Frame Controller. Clicking this entry opens a status and control menu listing in the Menu Tree window for functions pertinent to the frame controller(s) within the indicated EDXE, and also reveals entries that identify the active/standby status for each frame controller in the frame.

Selecting any EDXE channel group top level entry in the Devices View window displays the status and set-up screen menu for the group in the Menu Tree window as shown in Figure 7-3. For this example screen, channel group I/O Range 1 – 1536 supported by DXE1 is selected.

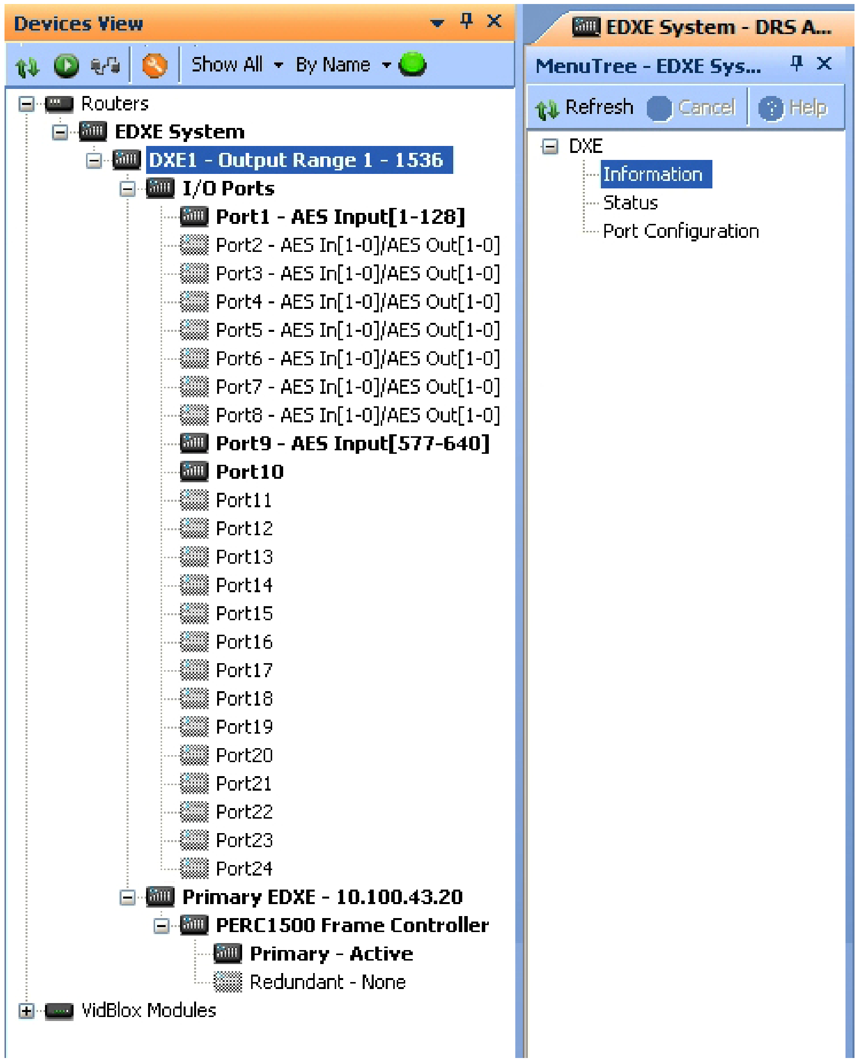


Figure 7-3 Channel Group Menu Entries

7.5 STATUS DISPLAY SCREEN

Selecting the Status entry in the Menu Tree window displays the channel group Status screen as shown in Figure 7-4. This screen is a display of the real-time operational status of the EDXE frames in the channel group.

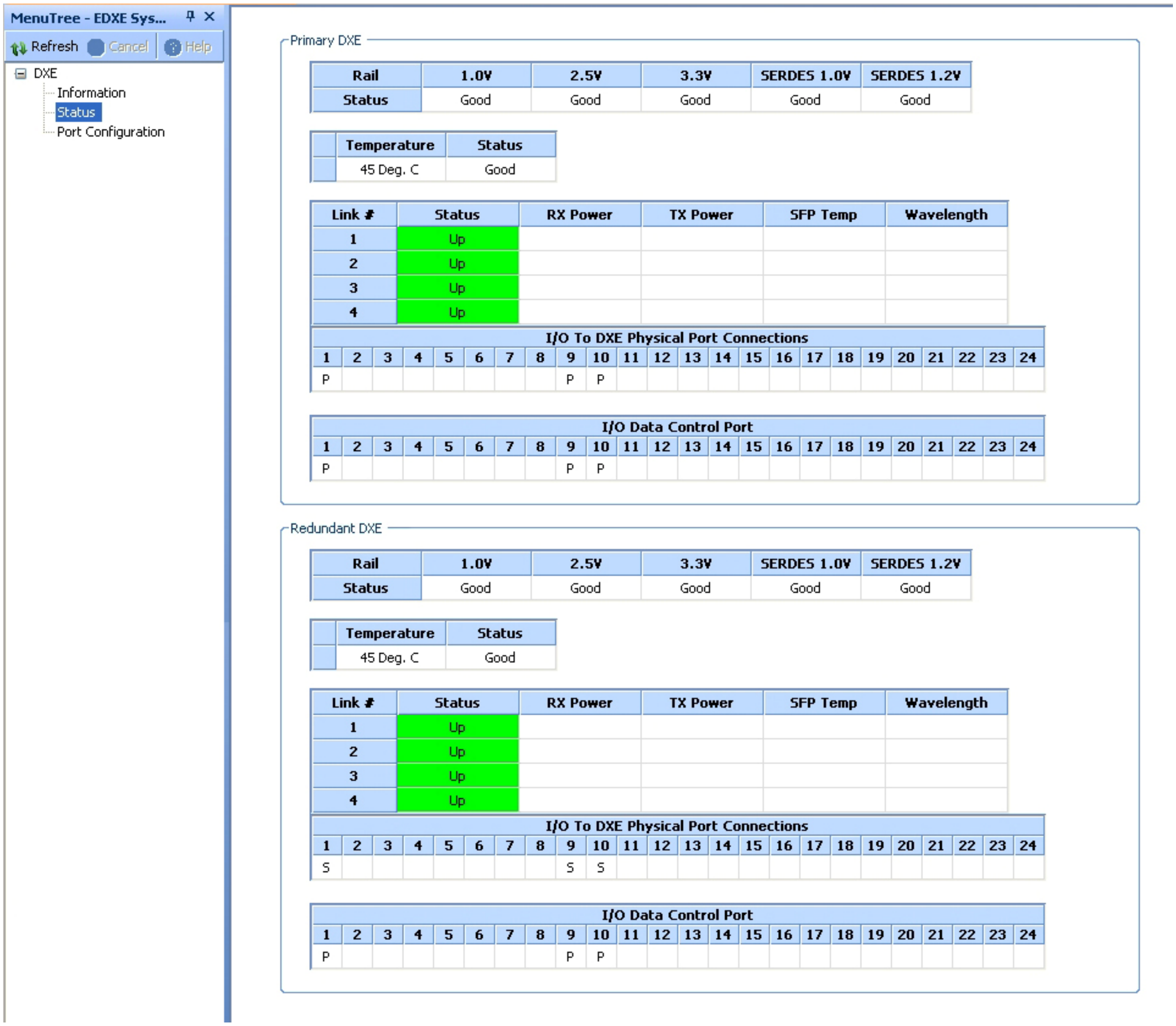


Figure 7-4 Status Display Screen

Looking at Figure 7-4, for each DXE frame in the channel group, the display provides real-time status of frame power supply voltages, and the surface temperature and temperature status of the circuit board.

The Link box provides status display for the fiber optic links between channel group EDXE frames in DRS systems expanded beyond 1536 x 1536. 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.

The next two boxes indicate status of certain communication connections between the signal frames and the DXE. This information is not pertinent to daily DRS operation and is provided for use by technicians when servicing the DRS system.

7.6 CHANNEL GROUP PORT CONFIGURATION SCREEN

As was discussed in Chapter 4, a channel group consists of at least one EDXE 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 EDXE 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 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 7-5 shows a typical port configuration menu screen.

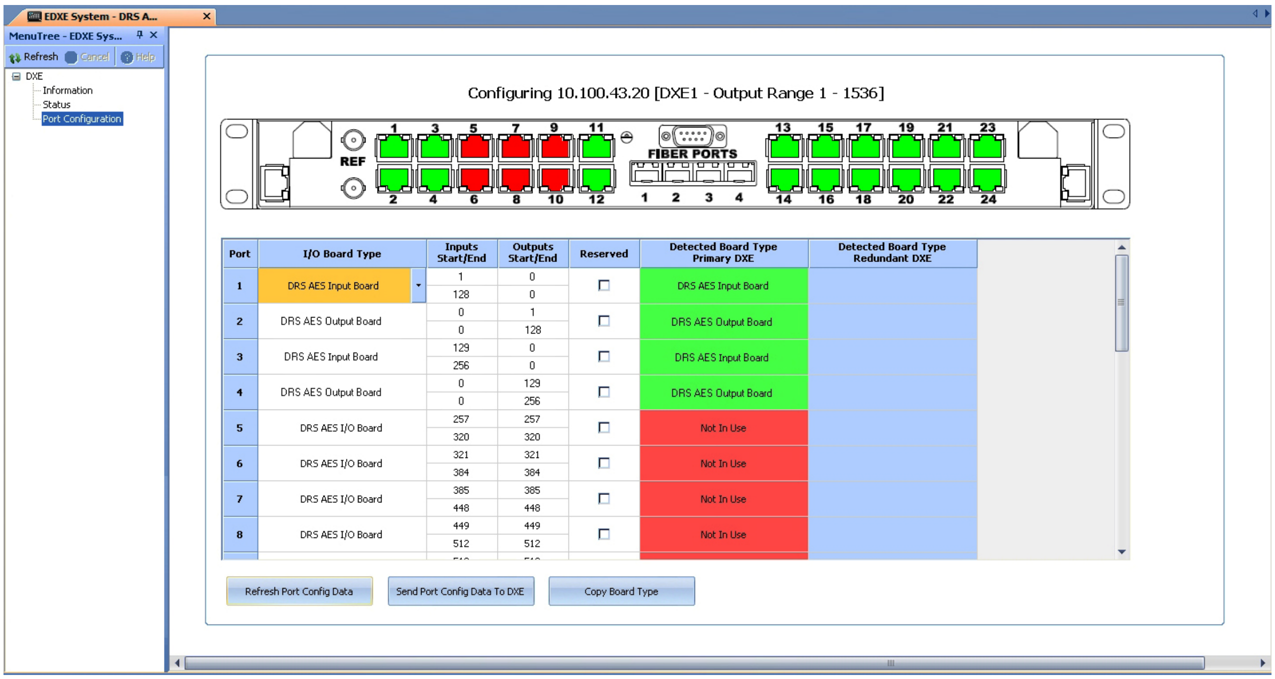


Figure 7-5 Example Port Configuration Screen

The main display portion of this window contains a table with a row entry for each of the 24 frame ports on the EDXE. Each row is composed of columns that identify certain operational and configuration parameters about the frame port. Before continuing 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 7-5. You might also find it helpful to have a "live" port configuration screen open on the host PC for reference.

When the Port Configuration entry is selected from the Menu Tree listing, data for the channel group is refreshed as follows prior to display:

- Each EDXE, primary and redundant, if present, 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 primary frame controller in the primary EDXE frame 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 7 columns, and displays configuration data for the primary EDXE and, if equipped, the redundant EDXE 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 24 physical EDXE input/output ports.
- **I/O Board Type** – This entry displays for each of the I/O ports the type of signal frame that is **currently defined by the configuration file read from the primary frame controller in the primary DXE for the indicated port**. This column allows the user to modify the hardware definition for any port using the pull-down menu in the cell.
- **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.
- **Outputs Start/End** – Same as the previous column, except it displays the numerical range of output channels assigned to the port.
- **Reserved** – A check in the box indicates that the range of input/output channel numbers and frame type have been reserved for future implementation.
- **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 I/O Board Type column**. If the actual and indicated frame types are the same, the cell is displayed with a green background. Should the hardware configuration file 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 I/O Board Type column**. If the actual and indicated frame types are the same, the cell is displayed with a green background. Should the configuration file 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 is grayed-out.

The Port Configuration screen also includes a graphic image of the EDXE rear panel with the I/O port connectors color coded for a quick visual reference to port status.

To summarize the Port Configuration Screen:

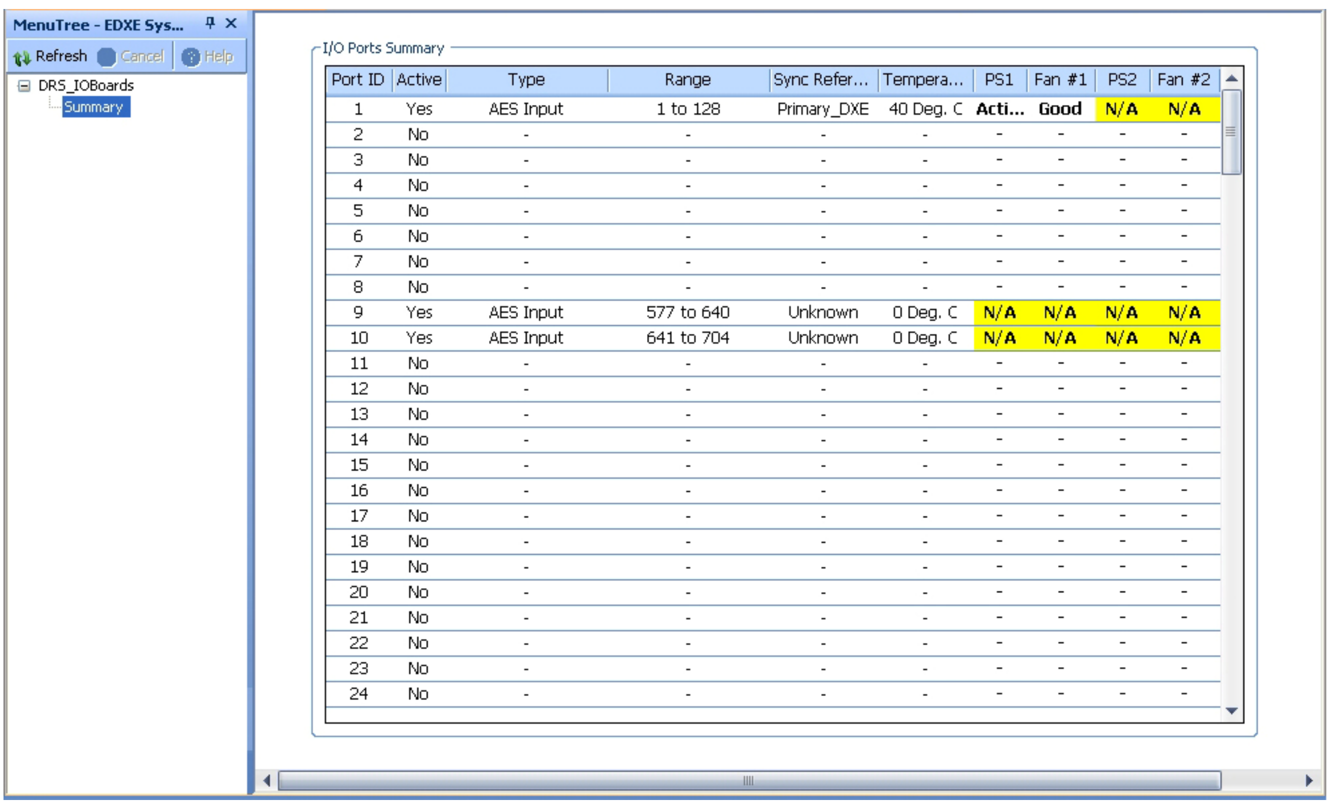
- When the screen is open from the GUI, the frame type for each frame attached to each I/O port of the indicated DXE is detected.
- For each I/O port, a comparison is made between the actual frame type connected and the frame type programmed into the configuration file read from the primary frame controller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

7.7 PORT CONFIGURATION PROCEDURE

Port Configuration for the Enterprise DXE frame is an identical process to configuration for the traditional DRS router, with the exception that there are 24 ports to configure instead of 8. Refer to Chapter 8 of the DRS Technical Manual for procedural steps.

7.8 I/O PORT SUMMARY SCREEN DISPLAY

With the top-level I/O Ports entry selected, the I/O Ports Summary window is displayed in the Main Window area, as shown by Figure 7-6. This screen is a display-only window that provides real-time readout of the operational characteristics for each signal frame attached to the DXE.



Port ID	Active	Type	Range	Sync Refer...	Tempera...	PS1	Fan #1	PS2	Fan #2
1	Yes	AES Input	1 to 128	Primary_DXE	40 Deg. C	Acti...	Good	N/A	N/A
2	No	-	-	-	-	-	-	-	-
3	No	-	-	-	-	-	-	-	-
4	No	-	-	-	-	-	-	-	-
5	No	-	-	-	-	-	-	-	-
6	No	-	-	-	-	-	-	-	-
7	No	-	-	-	-	-	-	-	-
8	No	-	-	-	-	-	-	-	-
9	Yes	AES Input	577 to 640	Unknown	0 Deg. C	N/A	N/A	N/A	N/A
10	Yes	AES Input	641 to 704	Unknown	0 Deg. C	N/A	N/A	N/A	N/A
11	No	-	-	-	-	-	-	-	-
12	No	-	-	-	-	-	-	-	-
13	No	-	-	-	-	-	-	-	-
14	No	-	-	-	-	-	-	-	-
15	No	-	-	-	-	-	-	-	-
16	No	-	-	-	-	-	-	-	-
17	No	-	-	-	-	-	-	-	-
18	No	-	-	-	-	-	-	-	-
19	No	-	-	-	-	-	-	-	-
20	No	-	-	-	-	-	-	-	-
21	No	-	-	-	-	-	-	-	-
22	No	-	-	-	-	-	-	-	-
23	No	-	-	-	-	-	-	-	-
24	No	-	-	-	-	-	-	-	-

Figure 7-6 Port Summary Screen

- **ID** – Identifies the DXE I/O interface port to which the signal frame is attached.
- **Active** – Displays a yes/no readout of the current status of the signal frame.
- **Type** – Identifies the frame type (signal block configuration) of the signal frame attached to the indicated I/O interface port.
- **Range** – Displays the I/O channel number range of the signals supported by the signal frame.
- **Sync Reference –** Indicates the source of sync reference .
- **Temperature** – Displays the current surface temperature of the main circuit board in the indicated signal frame.
- **PS1/Fan#1** – Displays current operational status of power supply module located in the primary module slot of the signal frame, and the good/bad status of the cooling fan on-board the module. N/A indicates there is no module installed in the frame slot.
- **PS2/Fan#2** – Displays current operational status of power supply module located in the redundant module slot of the signal frame, and the good/bad status of the cooling fan on-board the module. N/A indicates there is no module installed in the frame slot.

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