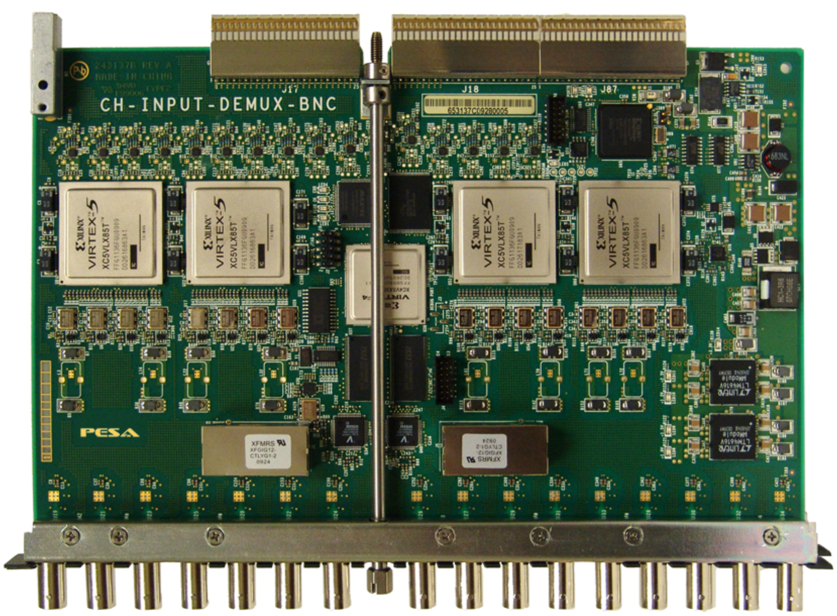
Cheetah 3
video matrix routers

USER MANUAL

3G VIDEO INPUT CARD WITH AUDIO/TIME CODE DE-EMBEDDING

AND

3G VIDEO OUTPUT CARD WITH AUDIO/TIME CODE EMBEDDING



PESA

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Chapter 1 About This Manual

1.1 DOCUMENTATION AND SAFETY OVERVIEW

This manual provides product introduction, and instructions for installation and operation of Video Input Cards with Audio De-Embedding and Video Output Cards with Audio Embedding for use in the Cheetah Series of Video Matrix Routing Switchers built By PESA. System circuit cards introduced herein are not stand-alone products and will not function unless mounted in a compatible Cheetah video matrix router mainframe.

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 CAUTIONS AND NOTES

Throughout this document, you may notice various Cautions and Notes. These addendum statements supply necessary information pertaining to the text or topic they address. You should read and understand the statements to avoid possible damage to the equipment. These additional statements 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 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.**

1.2.2 NOTE

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

Chapter 2 Introduction

2.1 DESCRIPTION

PESA's Cheetah router family includes four special purpose system circuit cards: two for de-embedding (DEMUX Card) and two for embedding (MUX Card) digital audio with SDI video that marry the video routing capability of the Cheetah Video Matrix Routers with the audio and timecode routing capability of the Cheetah DRS Audio Router. The difference in the two DEMUX cards and two MUX cards being the number of audio channels each can process – 128 channels or 256 channels, and their DRS DXE compatibility. All cards are fully compatible with SDI video signals up to 3Gbps and compliant with SMPTE 259M, 292M and 424M. These cards are used in place of the "standard" SDI video input buffer and video output combiner cards in a Cheetah video router mainframe.

The Cheetah DEMUX card extracts embedded digital audio signals or embedded timecode data from input video signals and introduces these signals to the DRS router as discrete input channels through a DXE or EDXE frame. Cheetah MUX cards embed selected discrete DRS signals into the audio channels of the output video signal. Timecode signals routed through DRS may also be selected and embedded as ancillary data into the outgoing video. Unless stated otherwise, text, configuration and operation procedures in this manual are pertinent to both audio and timecode signals.

Configuration and operation of the de-embedding and embedding functions are accomplished through graphical user interface (GUI) screens of control software, such as PESA's Cattrax, a multi-purpose control application. 128 channel DEMUX and MUX cards may also be controlled with the dedicated PERC2000 system controller graphical user interface (GUI) application. Regardless of which application is used, the software is run on a host PC communicating with the system controller over an Ethernet link.

Each video card with audio capability must be interfaced to a DRS audio routing system through an available DXE Interface Port. 256 audio channel cards must be connected to a high-capacity EDXE frame. 128 channel cards may be used with standard capacity DXE frames or EDXE frames. Common CAT5E cable, up to 100M in length, is used to interconnect the audio portion of the MUX and DEMUX cards with a DRS DXE frame. Audio may be de-embedded from any incoming SDI signal through a DEMUX card, and may be embedded to any SDI signal (SD, HD or 3G) through a MUX card.

This manual assumes the user has a clear understanding and working knowledge of both a Cheetah video router and a DRS audio router, and further assumes the user has access to Technical Manuals for the video router, audio router and the P2K system controller.

2.2 VIDEO INPUT CARD WITH AUDIO DE-EMBEDDING (DEMUX CARD)

Considering the audio functions of the card, we may think of the DEMUX card as operationally similar to a "standard" DRS digital audio input frame.

Incoming HD or 3G SDI video signals may contain up to four groups of digital audio, and each group may contain up to four discrete audio signals. SD-SDI video contains up to two audio groups, with up to four discrete audio signals per group.

Both the 128 channel and 256 channel DEMUX cards provide 16 input channels for SDI video with embedded audio and de-embed all audio groups and signals on each video input source - in groups of four signals each with up to 64 possible groups - for a total of up to 256 discrete audio signals. While both cards de-embed all audio signals from incoming video, the process by which de-embedded signals become DRS audio signal sources is different:

Using the 256 channel DEMUX card, all de-embedded signals are available as audio source signals for the Enterprise DRS router. When a 256 channel DEMUX card is attached to an EDXE port, the Cattrax control system creates a block of 256 DRS output signals – one for each signal of every possible audio signal group processed by the card. Each de-embedded signal is automatically configured as a discrete DRS source signal. Each source signal is sequentially assigned a router signal number determined by the channel range of the input signal block. Should any of the 256 channels not be present or not have a valid audio signal embedded, DEMUX card circuitry inserts audio silence data into the signal channel.

Each 128 channel DEMUX card allows you to select, through system control software, any 32 of the 64 possible audio signal groups for a total of 128 discrete signals that may be configured as DRS audio signal sources. De-embedded signals are always selected by group – not individual signals. Should any of the audio channels not be present or not have a valid audio signal embedded, DEMUX card circuitry inserts audio silence data into the signal channel.

256 channel DEMUX cards will not operate with a standard DRS DXE; however 128 channel cards may be used with a standard DXE or an EDXE. 128 and 256 channel cards may be intermixed to an EDXE frame. The Cheetah DEMUX card is shown in Figure 2-1, and Figure 2-2 is a simplified block diagram of the DEMUX card circuitry.

Video circuitry is virtually identical to that present on the “standard” Cheetah 3Gbps video input card, and operation is completely transparent to the audio functions. Video configuration commands and operations are identical to existing cards, and installing the DEMUX card in place of a standard input card should require no changes to video set-ups.

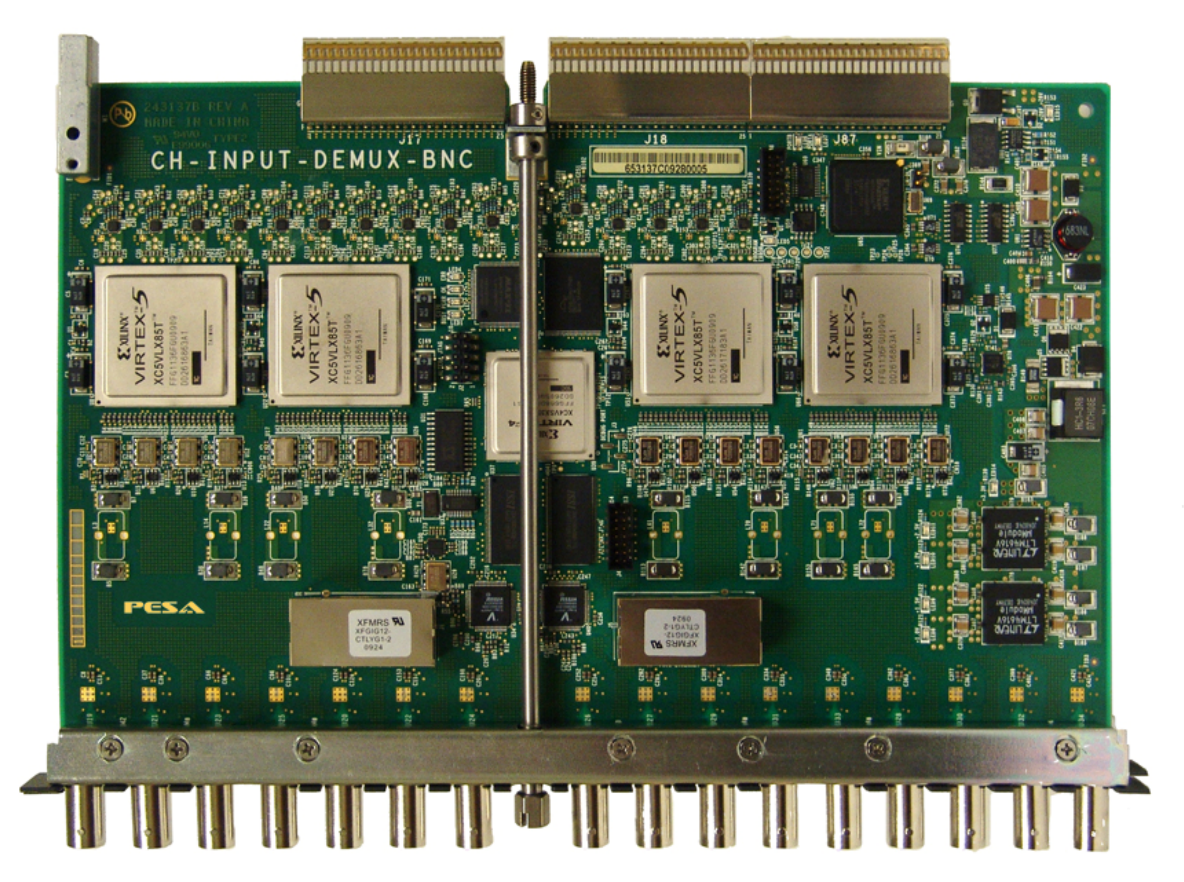


Figure 2-1 Cheetah Input DEMUX 3G Video Card

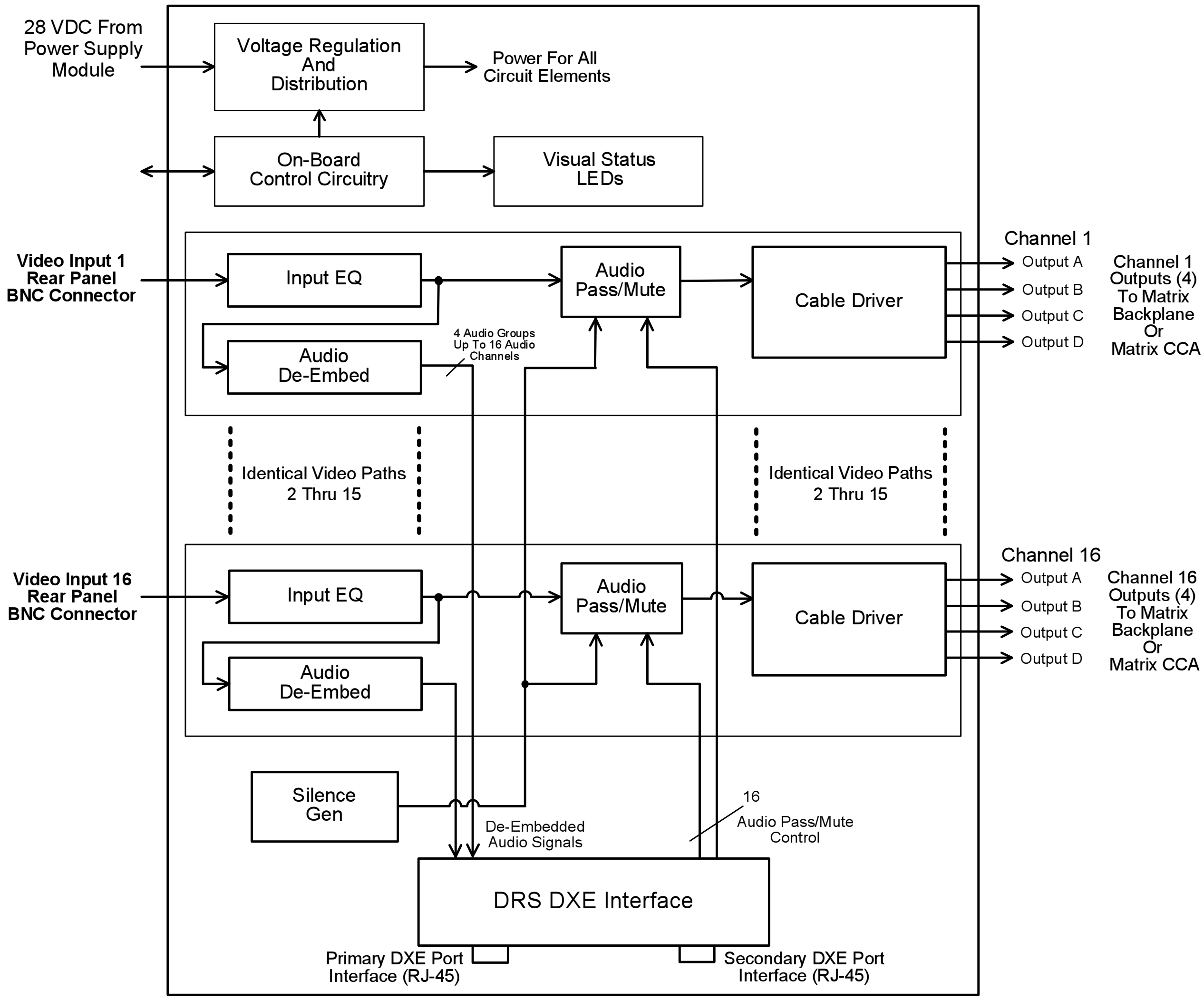


Figure 2-2 Block Diagram – Input DEMUX Card

De-embedding is not a destructive process, and audio signals present in the video stream are still fully intact following the de-embedder. Through the control system software, however, the user may select to “mute” any or all audio groups present on the video signal. Muting is accomplished by replacing original audio data with “silence” data generated by circuitry on-board the DEMUX card. If muting is not selected, the video signal is passed through to the router matrix cards with all original audio content.

There are two RJ-45 connectors on each DEMUX card, and these are the primary and secondary connection points to interface the card with a DRS DXE (or EDXE) frame. Functionally, the DEMUX card interfaces to DRS exactly as any other audio frame – using CAT5E cable to connect the primary DXE port connector to an open port on the DXE of the channel group to which you wish to assign the de-embedded signals. In systems using a second DXE frame for TDM bus redundancy, the secondary port interface connector on the DEMUX card provides the redundant bus function.

2.3 VIDEO OUTPUT COMBINER CARD WITH AUDIO EMBEDDING

Considering the audio functions of the card, we may think of the MUX card as being operationally similar to a DRS digital audio output frame.

Both the 128 channel and 256 channel MUX card provide 16 channels for SDI video. Each of the 16 video signal paths receives an SDI input signal from the matrix cards contained in the video router chassis. In addition to video processing circuitry, every video path of a MUX card also contains audio processing circuitry where, through system control software, the user may select any one of the following options for the audio signals embedded in each video channel:

- Pass the video with all original digital audio content intact
- Embed any or all channel groups with audio signals selected from DRS source signals
- Effectively "mute" audio content on any or all groups by replacing audio data with "silence" data generated on the MUX card.

Audio data is embedded in signal groups and may be embedded into any SDI video signal (SD, HD or 3G) with four discrete signals contained within a group. The number of audio signal groups each video signal may contain depends on the format of the signal as follows:

- SD video signals may embed one or two groups of four discrete signals for a total of up to eight audio channels per video signal
- HD or 3G video signals may embed up to four groups of four discrete signals for a total of up to 16 audio channels per video signal

The DRS control system considers each audio channel of the MUX card as a discrete destination or router output signal and allows you to map router outputs, always grouped as four signals per audio group for embedding, to the desired audio channel group. Both the 128 channel and the 256 channel MUX card map signals; however, the process by which DRS source signals are selected for inclusion in a SDI audio group is different:

When a 256 channel MUX card is attached to an EDXE port, the Cattrax control system creates a block of 256 DRS output signals – one for each discrete signal of every possible audio signal group processed by the card. Beginning with the first audio channel of the first embedded audio group on the first video channel of the MUX card, followed by the second audio channel of the first group, up to the last audio channel on the last video channel; all 256 possible embedded audio signals become discrete DRS destination signals and are sequentially assigned destination channel numbers beginning with the first numerical output signal channel assigned by the EDXE port to which the MUX card is attached.

When a 128 channel MUX card is attached to a standard DXE or an EDXE port, the Cattrax control system creates a block of 128 DRS output signals. These discrete output signals are always grouped as four signals per audio group for embedding. Any four individual DRS source signals may be selected for routing to any of the output signals included in a designated embed group. Up to 128 individual audio signals may be selected for the groups, thereby allowing up to 32 embeddable groups to be created. Any of the created groups may be embedded into any or all of the SDI video output signals.

256 channel MUX cards will not operate with a standard DRS DXE; however 128 channel cards may be used with a standard DXE or an EDXE. 128 and 256 channel cards may be intermixed to an EDXE frame. The Cheetah MUX card is shown in Figure 2-3, and Figure 2-4 is a simplified block diagram of the MUX card circuitry.

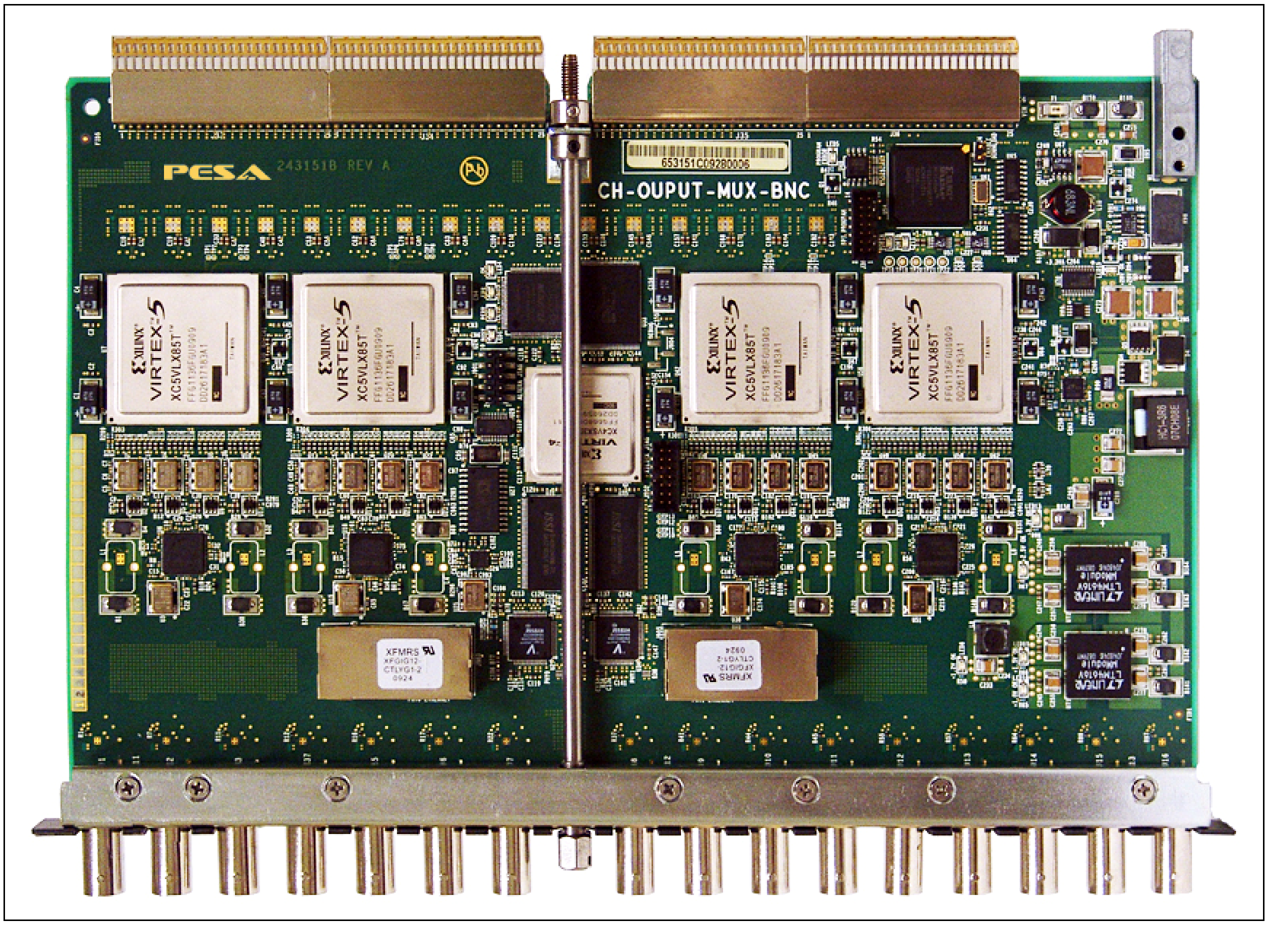


Figure 2-3 Cheetah Output MUX 3G Video Card

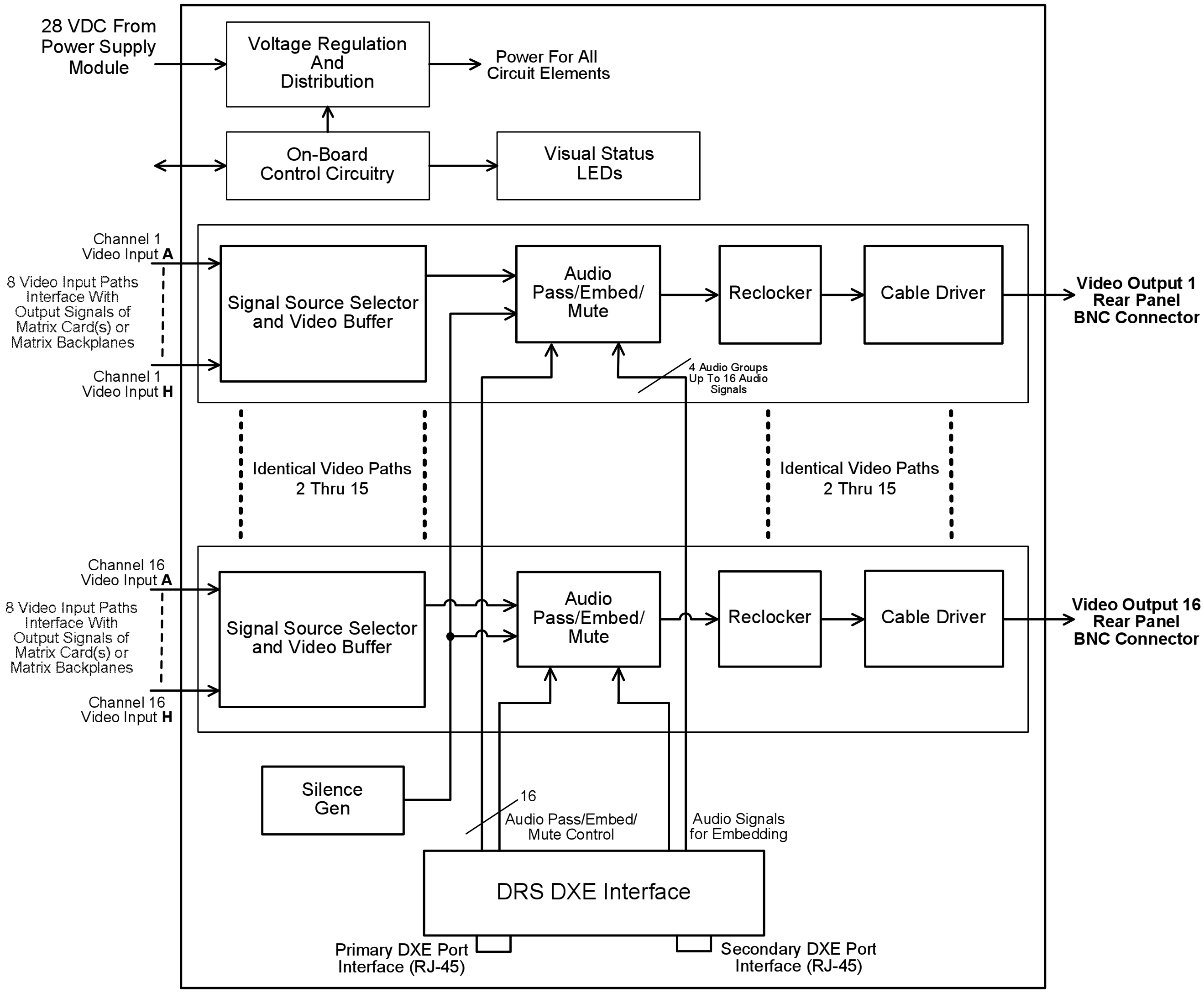


Figure 2-4 Block Diagram – Output MUX Card

Video circuitry is virtually identical to that present on the “standard” Cheetah 3Gbps output combiner card, and operation is completely transparent to the audio functions. Video configuration commands and operations are identical to existing cards, and installing the MUX card in place of a standard output card should not require changes to video set-ups.

There are two RJ-45 connector blocks on each MUX card, and these are the primary and secondary connection points to interface the card with a DRS DXE (or EDXE) frame. The MUX card interfaces to DRS using CAT5E cable to connect the primary DXE port connector to an open port on the DXE. Each embed group consists of four individual output channels. Just as with a “standard” audio frame, output channel numbers are assigned to the card as a 128 channel block by the DXE port (256 channel block by the EDXE with a 256 channel MUX card); however these are always treated as embed groups composed of four numerically sequential output channels. In systems using a second DXE frame for TDM bus redundancy, the secondary port interface connector on the MUX card provides the redundant bus function.

2.4 SPECIFICATIONS

2.4.1 INPUT DEMUX CARD SPECIFICATIONS

- Card Type: Cheetah Input Buffer with Audio De-Embedding
- Number Inputs: 16 independent channels
- Video Inputs SDI up to 3Gbps, compliant with SMPTE 259M, 292M and 424M
- Connector Type BNC
- Data Rates: 3Mb to 3Gbps
- Status Monitoring Power, Temp, Signal Presence
- De-Embedding All audio groups per input, all audio signals per group, ancillary timecode data
- Audio Outputs: Discrete audio signals selected by group from de-embedded audio
- Form Factor: Standard Cheetah Input Card

2.4.2 OUTPUT MUX CARD SPECIFICATIONS

- Card Type: Cheetah Output Combiner with Audio Embedding
- Number Outputs: 16 independent channels
- Video Outputs SDI up to 3Gbps, compliant with SMPTE 259M, 292M and 424M
- Connector Type BNC
- Data Rates: 3Mb to 3Gbps
- Status Monitoring Power, Temp, Signal Presence
- Embedding Any or all audio groups on SD, HD or 3G SDI signals, ancillary timecode data
- Audio Inputs: Groups of four signals per group derived from DRS sources
- Form Factor: Standard Cheetah Output Card

Chapter 3 Installation

3.1 DESCRIPTION

Cheetah 128 channel and 256 channel MUX and DEMUX system cards install in a standard Cheetah mainframe in place of the "standard" digital video output combiner and input buffer cards. As part of installation, it is necessary to complete connection of a CAT5E interface cable between each MUX and DEMUX card in the system and the DRS DXE (or EDXE).

Upon completion of hardware installation all operational configuration for de-embed and embed functions is accomplished through menu screens of the system control software. These procedures are discussed in Chapter 4 for the Cattrax control application and Chapter 5 for the PERC2000 GUI application.

3.2 DXE INTERFACE CABLE INSTALLATION

MUX and DEMUX cards are shipped from the factory with a pigtail cable installed between the port connector on the card and a supplied female-to-female RJ-45 cable coupler, as shown in Figure 3-1.

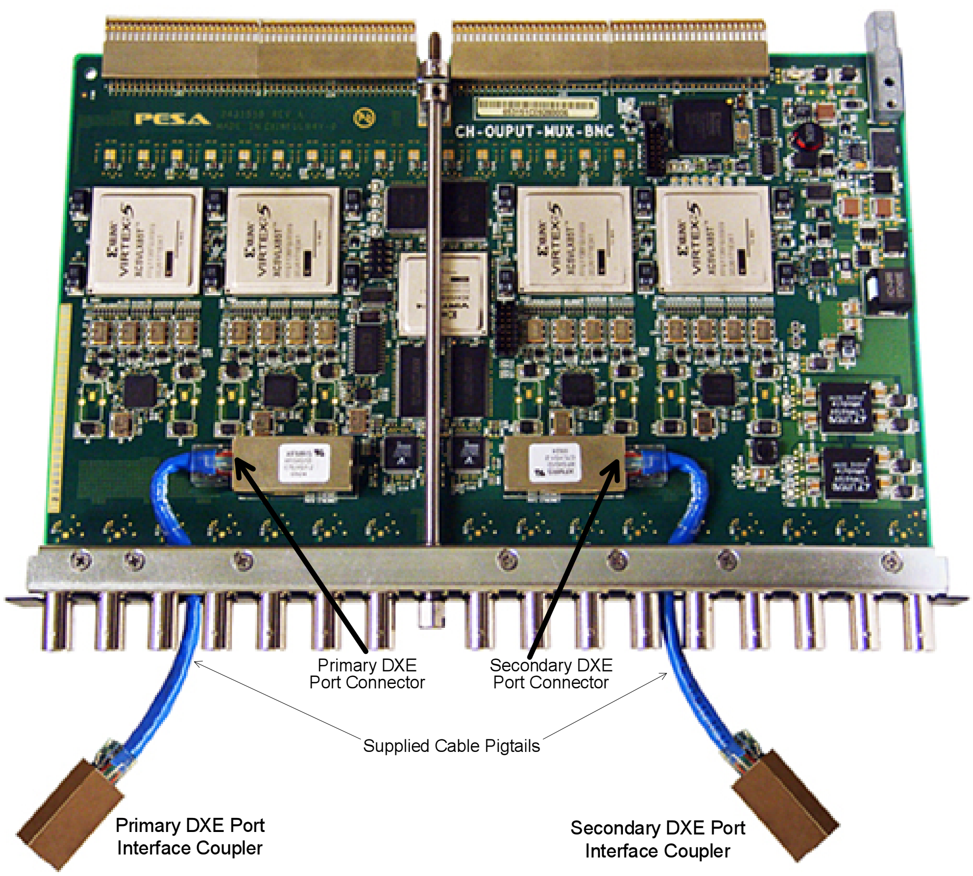


Figure 3-1 RJ-45 Connector and Coupler Locations – DEMUX and MUX Card

Before you install the system cards in the video matrix router mainframe, verify that each supplied pigtail cable on each card is securely installed into its DXE port connector on the card. Verify that a female-to-female cable coupler is securely attached to the loose end of each pigtail cable.

3.3 INSTALL MUX AND DEMUX SYSTEM CARDS

Upon completion of cable verification on all cards, install cards in the Cheetah router mainframe as follows:

1. If you are replacing existing system input or output cards, loosen the hex card retaining screw, as shown in Figure 3-2, securing card into mainframe.

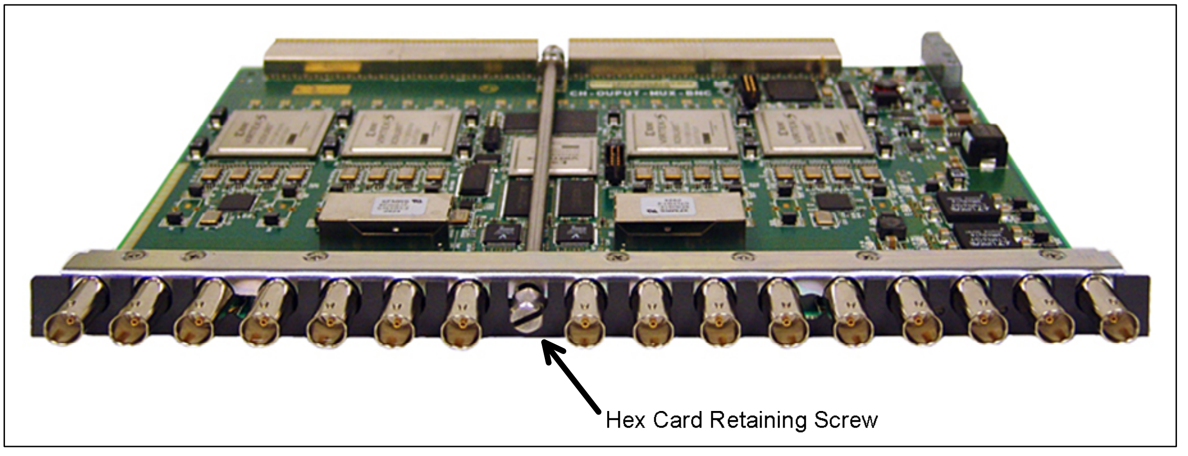


Figure 3-2 Video Card Retaining Screw Location

2. Carefully remove card from mainframe and set aside.
3. Install DEMUX cards, with CAT5E DXE interface cables attached, in place of Cheetah input buffer cards.
4. Carefully install DEMUX cards and ensure that all card edge connectors seat properly and firmly with mating connectors on mainframe mid-plane.
5. Secure card into mainframe by tightening hex card retaining screw, as shown in Figure 3-2.
6. Repeat steps 3 thru 5 for all MUX cards to be installed in place of Cheetah output combiner cards.

3.4 INSTALL DRS DXE INTERFACE PORT CABLES

A CAT5E TDM bus cable must be installed between the I/O Port interface connector on the rear panel of the DXE (EDXE) and the RJ-45 coupler attached to the pigtail cable supplied with each MUX or DEMUX card. Installation is identical for both card types, an output MUX card is shown here for example. Make sure you have a CAT5E cable of proper length to complete connection between the cable coupler and the DRS DXE frame, and that an RJ45 connector is securely attached to each cable end. Install interface cable as follows:

1. Locate the primary and secondary DXE port interface couplers as shown in Figure 3-1.
2. Install RJ-45 connector of CAT5E interface cable to mating primary DXE port coupler and secondary port coupler (if used) on each system card, as shown in Figure 3-3.

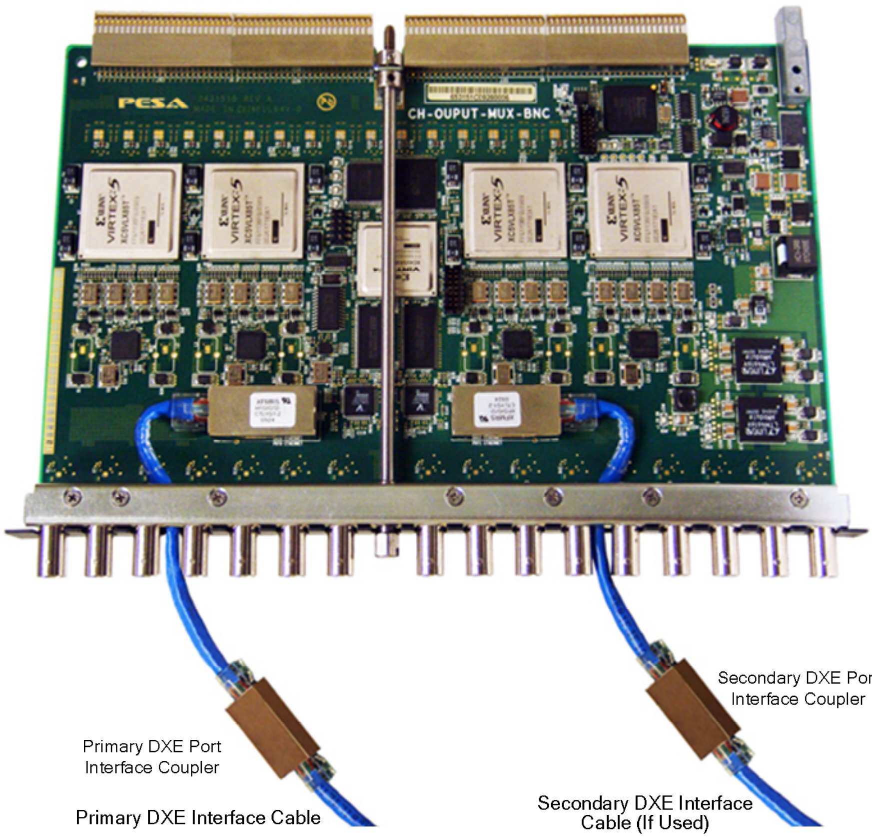


Figure 3-3 DXE Interface Cable Installation

[128 Channel MUX and DEMUX Cards] 128 channel MUX and DEMUX cards may be interfaced to either a standard DRS DXE or an EDXE frame. With either DXE type, you may, for all practical purposes, consider a 128 channel Cheetah DEMUX card as a 128 channel input block, and a 128 channel MUX card as a 128 channel output signal block. Each DXE I/O frame port supports a block of 128 channels, therefore a single 128 channel MUX or DEMUX card fills the entire capacity of one port with input or output signals. Cheetah MUX and DEMUX cards may be mixed with other DRS audio frames within a channel group. A simplified installation procedure is presented here, refer to the DRS Technical Manual if greater detail is needed. An illustration of a standard DXE rear panel is shown in Figure 3-4 for reference.

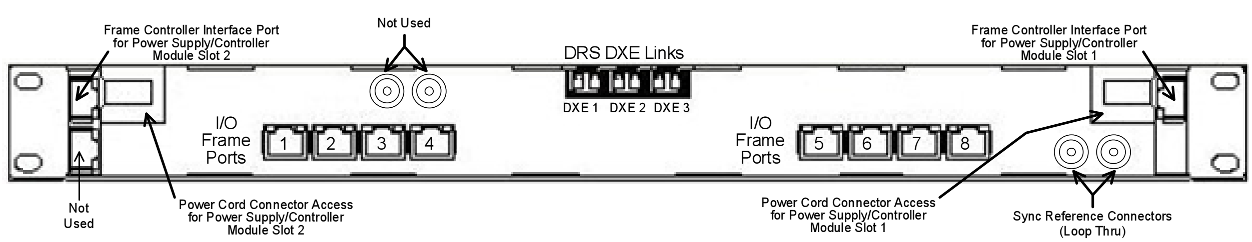


Figure 3-4 Typical DXE Rear Panel

[256 Channel MUX and DEMUX Cards] When a 256 channel MUX or DEMUX card is interfaced to an EDXE I/O Frame Port, Cattrax automatically detects the card type and instead of a block of 128 channels, creates a block of 256 channels during port configuration. Even though the interface cable from the card installs to a single EDXE I/O port connector, the larger signal block is created by software and requires no operator input. For example, if you attach the TDM bus cable from a 256 channel DEMUX card to I/O port 1 of an EDXE frame supporting DRS channel group 1 – 1536, Cattrax will allocate a block of 256 input source channels to the card. If a second input frame or DEMUX card is connected to I/O port 2, the channel numbering will begin at 257. Creating larger signal blocks does not increase the total channel capacity of the EDXE, and once a total of 1536 input or output signals is reached by any combination of 256 channel cards or standard 128 channel frames, Cattrax will not allocate any further channels, regardless of how many I/O ports were used to reach the maximum number of channels.

Remember that I/O channel numbers are assigned to an audio block by the order in which the frame containing the block is attached to the I/O frame ports. Be sure that you are connecting the cables from the cards to the DXE (EDXE) in the order you wish to assign channel numbers to the audio signals. Once you know the order you wish to connect the cables, proceed to complete connections in accordance with the following guidelines:

1. When connecting a single DXE (non-redundant) system, connect the cable from the Primary TDM Bus Connector on the system card to a DXE Frame Port connector, as shown in Figure 3-5. For illustrative purposes only, the figure shows the hook-up for one DEMUX and one MUX card in a 128X128 router arrangement.

2. TDM bus redundancy requires a second DXE frame. In this installation use the Primary TDM Bus connectors to interconnect packet audio stream cables from system cards to the Primary DXE frame, and Secondary DXE connectors to form the second TDM bus with the Redundant DXE frame. Figure 3-6 illustrates a redundant TDM bus system. Use this figure as a guide for installation.

3. Connect all TDM bus cables from system cards to open DXE I/O ports.

When installation of TDM bus cables between all system cards and DXE ports is complete, configure DXE I/O frame ports for the type of system card or audio frame connected to each, through the GUI application of the P2K System Controller. Depending on the control software application you are using, refer to Paragraph 4.3 (Cattrax) or 5.2 (P2K GUI) of this manual for a discussion of the port configuration procedure.

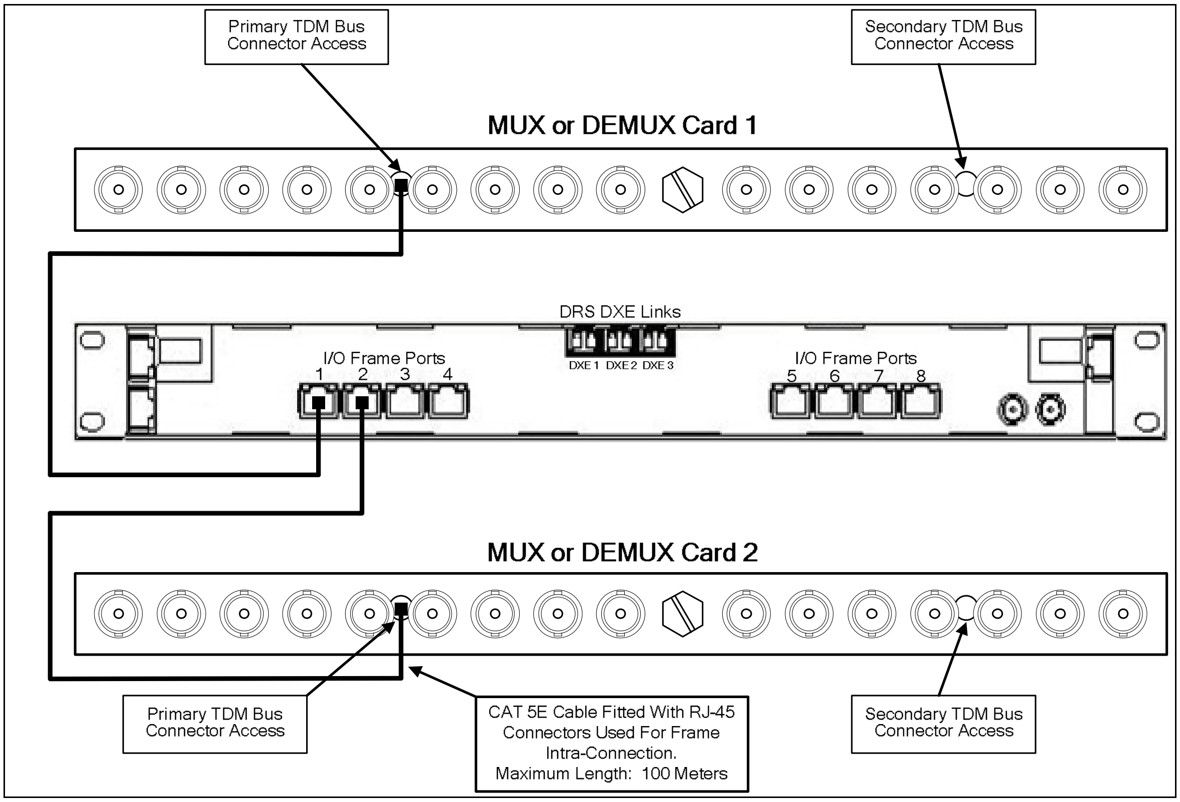


Figure 3-5 Packet Audio Stream Connection (Non-Redundant TDM Bus)

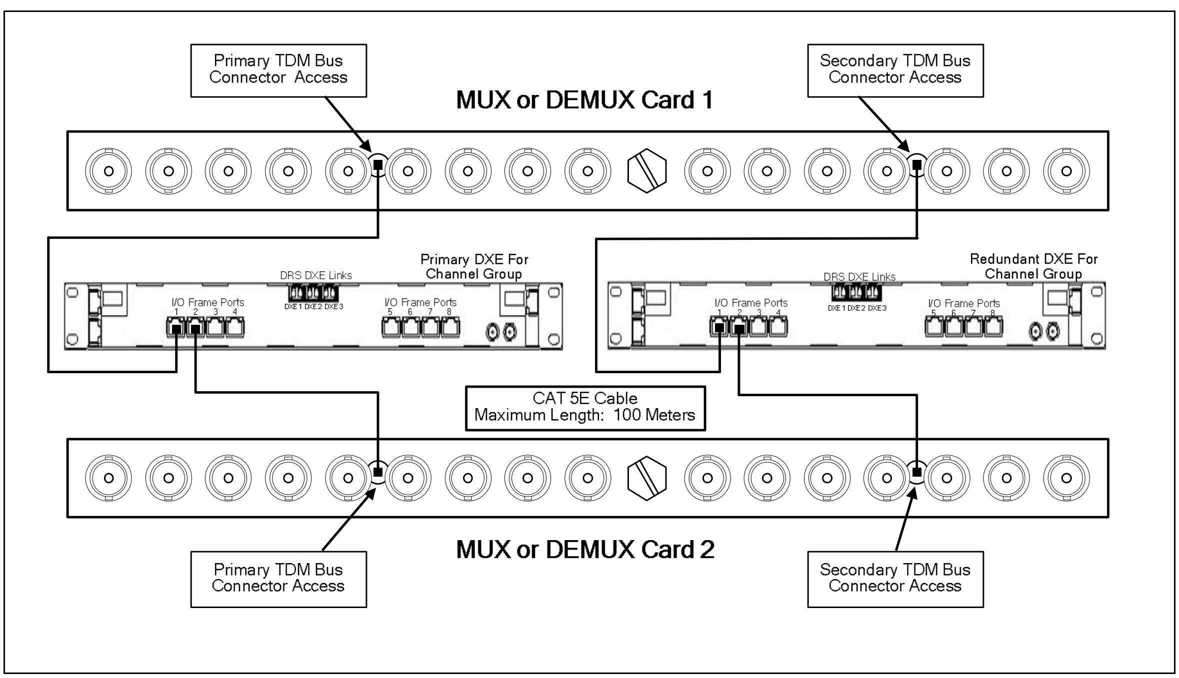


Figure 3-6 Packet Audio Stream Connection (Redundant TDM Bus)

Chapter 4 128 and 256 Channel MUX/DEMUX Card Operation with Cattrax

4.1 ROUTER SYSTEM CONTROL SOFTWARE

A major component of any PESA router installation is the system control application software installed on a Windows™ based PC that serves as a "host" computer for the router installation. All control and set-up operations for the entire system, including DRS and the MUX/DEMUX cards, are done through the system control software communicating with the individual frame controller(s) located in each DXE (EDXE) frame, and the system controller hardware located external to the DRS router.

In order to interface the MUX and DEMUX cards for operation with DRS, each card must be added to the DRS hardware configuration by entering or editing configuration data through pages of the control application and downloading data to the controllers.

PESA's Cattrax, a software application that allows unified control of a wide range of PESA routers and signal processors, provides operator interface through graphical user interface (GUI) pages and is used to configure and operate both the 128 channel and 256 channel MUX and DEMUX cards. While Cattrax is the preferred system control platform, some router installations may still be using the legacy PERC2000 GUI software, a control software application specifically for use with the PERC2000 system controller. The P2K GUI may be used to configure and control 128 channel MUX and DEMUX cards; it does not, however, support 256 channel cards or DRS EDXE frames. While both applications provide control capability for creating and editing standard DRS hardware and router configuration files, the user interface is different. Full procedures pertinent to 128 channel MUX and DEMUX card configuration and specific control functions for each card using the P2K GUI are presented in Chapter 5 of this User Guide.

The remainder of this chapter serves as an adjunct to both Chapter 8 of the DRS Technical Manual and the Enterprise DRS Supplement document, and presents configuration and control procedures that are pertinent to both the 128 and 256 channel MUX and DEMUX cards using the Cattrax control application. It is assumed throughout the remainder of this chapter that the user has a thorough working knowledge of Cattrax and is familiar with the process of configuring a DRS router using Cattrax.

4.2 REVIEW OF HARDWARE AND ROUTER CONFIGURATION FILES

Cheetah MUX and DEMUX cards attach to DXE or EDXE I/O frame ports in the same manner as "standard" input or output audio frames; and when discussing MUX and DEMUX cards in relation to DRS installations, we may consider and refer to the cards as "frames." In examples and discussions in the following paragraphs, the term frame may generically address either an audio frame or a MUX or DEMUX card. The term input frame, or block, refers to the source of audio signals to the DXE from either an audio frame or a DEMUX card. Likewise, the term output frame, or block, refers to the destination of output audio signals from the DXE, whether it is an actual audio frame or a Cheetah MUX card.

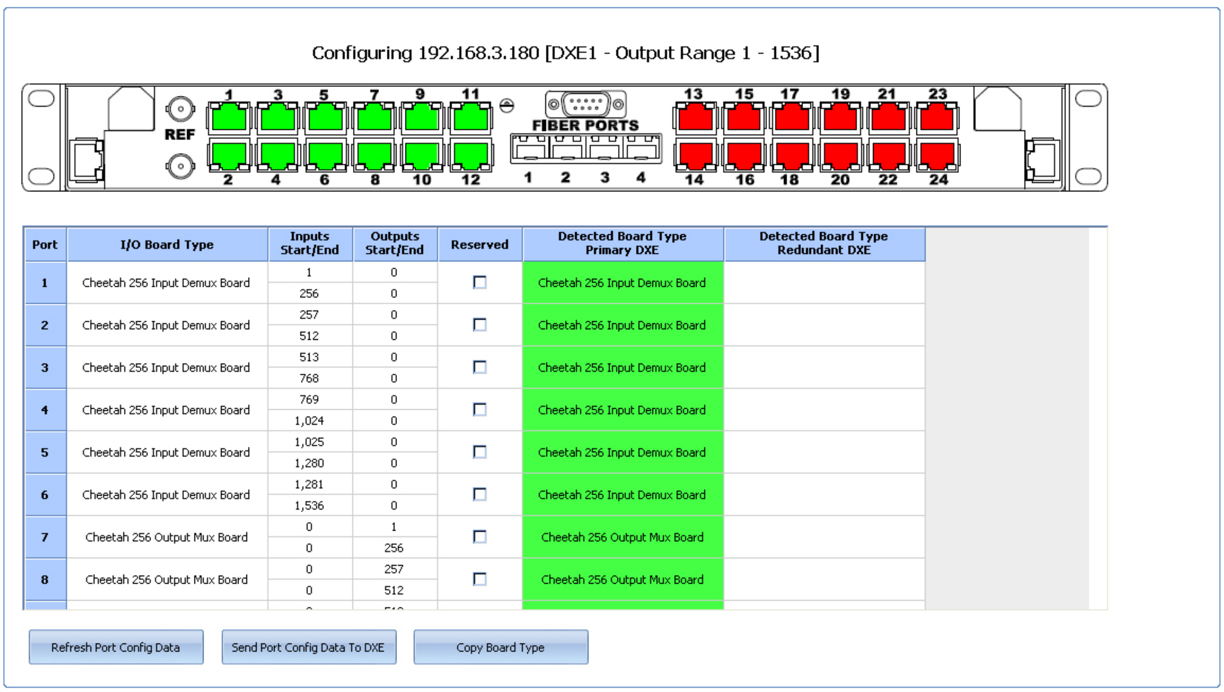
Remember that ***Hardware*** configuration is where the Frame Controller in each DXE frame is configured for the number and type of audio blocks under its control and a numerical input/output channel range is assigned to each block.

In order for the system controller to operate, we must write a ***Router*** configuration file and load it into controller memory. This file contains programming data for individual sources and destinations such as where (frame and physical connector) each signal connects to the system, the type of signal and names we wish to associate with each; as well as switching levels, components, source groups, destination groups, and other system functions.

4.3 DXE (EDXE) FRAME PORT CONFIGURATION SCREEN

In DRS system architecture, a *channel group* consists of at least one DXE (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 DXE frames through the I/O Frame Port connectors on the DXE rear panel in a numerical sequence, and the order of connection assigns the numerical range of input or output channels handled by each block. Every I/O port must be configured through the DXE Frame Port Configuration menu screen to identify the type of audio block(s) connected to the port and assign a numerical bank of channels to the block. Figure 4-1 shows a port configuration menu using an EDXE frame and Cheetah MUX and DEMUX boards as example entries.

The main display portion of this window contains a table with a row entry for each of the 8 frame ports on the DXE (24 ports on the EDXE). Each row is composed of columns that identify certain operational and configuration parameters about the frame port. Refer to the example EDXE Frame Port Configuration Screen shown by Figure 4-1.



Port	I/O Board Type	Inputs Start/End	Outputs Start/End	Reserved	Detected Board Type Primary DXE	Detected Board Type Redundant DXE
1	Cheetah 256 Input Demux Board	1 / 256	0 / 0	☐	Cheetah 256 Input Demux Board	
2	Cheetah 256 Input Demux Board	257 / 512	0 / 0	☐	Cheetah 256 Input Demux Board	
3	Cheetah 256 Input Demux Board	513 / 768	0 / 0	☐	Cheetah 256 Input Demux Board	
4	Cheetah 256 Input Demux Board	769 / 1,024	0 / 0	☐	Cheetah 256 Input Demux Board	
5	Cheetah 256 Input Demux Board	1,025 / 1,280	0 / 0	☐	Cheetah 256 Input Demux Board	
6	Cheetah 256 Input Demux Board	1,281 / 1,536	0 / 0	☐	Cheetah 256 Input Demux Board	
7	Cheetah 256 Output Mux Board	0 / 0	1 / 256	☐	Cheetah 256 Output Mux Board	
8	Cheetah 256 Output Mux Board	0 / 0	257 / 512	☐	Cheetah 256 Output Mux Board	

Figure 4-1 EDXE Frame Port Configuration Screen Example

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 DXE (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 DXE 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 DXE and, if equipped, the redundant DXE for the channel group. A brief explanation of the data displayed in each column follows:

- **PORT -** The left-most column labeled PORT, is a listing by port number of the physical DXE or 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 (EDXE) 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.

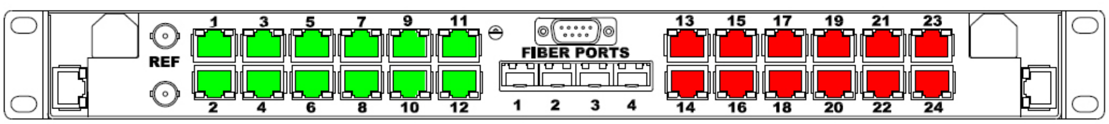
4.4 DXE (EDXE) FRAME PORT CONFIGURATION

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

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

- Open Cattrax to the Port Configuration screen for the desired channel group.
- Using an EDXE for example, the port configuration screen is displayed as shown by Figure 4-2, with the channel group being configured identified as the DXE, by the system base IP address and its I/O range nomenclature displayed. In this example, the display is for the EDXE frame(s), identified as DXE1, contained in the DRS system identified by base IP address 192.168.3.180 that process signal data for numerical input channels 1 thru 1536 and numerical output channels 1 thru 1536.

Configuring 192.168.3.180 [DXE1 - Output Range 1 - 1536]



Port	I/O Board Type	Inputs Start/End	Outputs Start/End	Reserved	Detected Board Type Primary DXE	Detected Board Type Redundant DXE
1	Cheetah 256 Input Demux Board	1 256	0 0	☐	Cheetah 256 Input Demux Board	
2	Cheetah 256 Input Demux Board	257 512	0 0	☐	Cheetah 256 Input Demux Board	
3	Cheetah 256 Input Demux Board	513 768	0 0	☐	Cheetah 256 Input Demux Board	
4	Cheetah 256 Input Demux Board	769 1,024	0 0	☐	Cheetah 256 Input Demux Board	
5	Cheetah 256 Input Demux Board	1,025 1,280	0 0	☐	Cheetah 256 Input Demux Board	
6	Cheetah 256 Input Demux Board	1,281 1,536	0 0	☐	Cheetah 256 Input Demux Board	
7	Cheetah 256 Output Mux Board	0 0	1 256	☐	Cheetah 256 Output Mux Board	
8	Cheetah 256 Output Mux Board	0 0	257 512	☐	Cheetah 256 Output Mux Board	

Refresh Port Config Data | Send Port Config Data To DXE | Copy Board Type

Figure 4-2 Port Configuration Screen Entries

- When the port configuration screen is selected the frame type detected on each interface port on each DXE, primary and redundant – if present, is displayed in the two right-most columns.
- The hardware configuration data loaded into the primary frame controller in the primary DXE frame is read to determine the type of audio block(s) programmed in the configuration file as being attached to each I/O port. This data is displayed in the I/O Board Type column.

- The detected board type for each DXE and the entry in the I/O board type column SHOULD agree. If they do not, it means that hardware cabling has been swapped between ports or for some reason the audio frames at the ports have been changed since the current configuration file was loaded into the frame controller.
- If you wish to enter or modify the board type in the board type column, you may use the drop-down menu to assign the board type to each I/O port. Optionally, you may click the "Copy Board Type" button below the table and the detected board types at each port will automatically be entered in the I/O board type column.
- Input and output channel range is automatically assigned based on the frame type and port order. If you have used the "Copy Board Type" option to enter board types, the input and output channel numbers are assigned to all ports.
- If you wish to "reserve" a block of channels for future implementation, select the type of frame you will add in the port number slot for the channel range desired, and check the "Reserved" box next to the board type assignment. The I/O channel range will be assigned to the port based on the entered "future" frame type.
- Once data for each frame type has been entered to the ports, click on the "Send Port Config Data to DXE" button to download the hardware configuration to all P1K frame controllers in the channel group.
- Repeat this procedure for each channel group and its associated DXE frames.
- Clicking the "Refresh Port Config Data" button causes the DXE to perform board detection at each I/O port and update the data shown in the Detected Board Type columns.

4.5 I/O PORT MENUS

Expanding the I/O Ports entry under the Devices View tree, opens a listing, by port number, of the DXE I/O interface ports and the type of signal frame, MUX card or DEMUX card attached to each port. Signal frames are identified by the audio blocks supported by the main circuit board in the frame and the I/O channel range of the signals routed through the frame, as shown by Figure 4-3. Selecting any of the port entries in the listing opens the status and control menus for the signal frame in the Menu Tree window under the parent header DRS IOBoard. The menus listed in the Menu Tree window will vary depending on the type of signal frame on the port. Each menu entry is discussed in the following paragraphs.

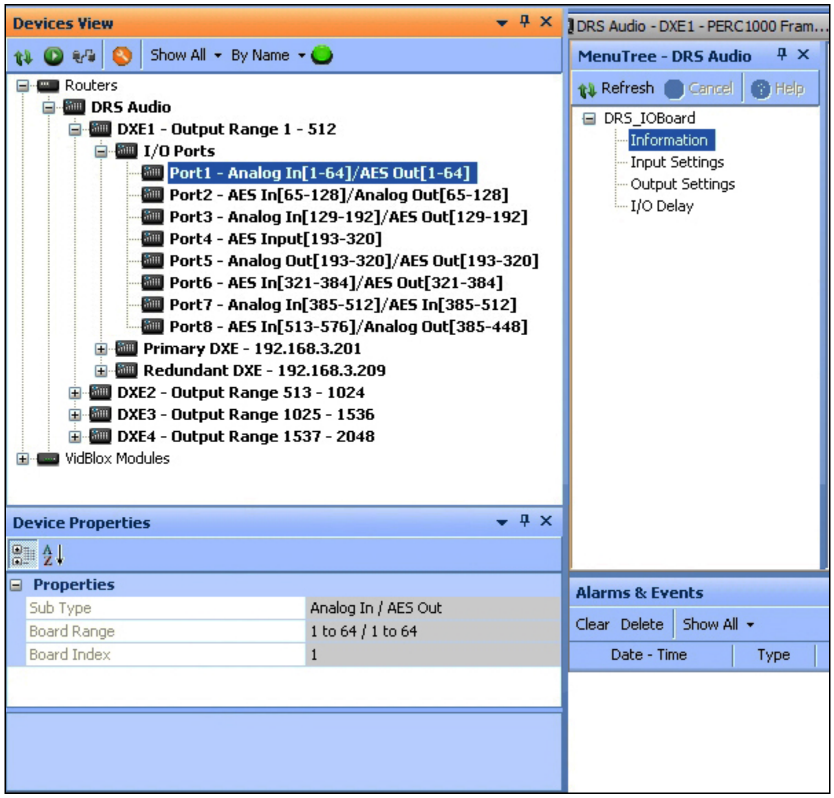


Figure 4-3 Signal Port Menu Listing

4.6 INFORMATION DISPLAY

Selecting the Information entry in the Menu Tree window provides real-time display of the operational characteristics for the selected MUX or DEMUX card. Figure 4-4 shows a typical signal frame information screen. The chassis graphic image is included to identify the “signal frame” as a Cheetah video card with audio processing capability.

- **Card Type Display –** Identifies the card as a MUX or DEMUX card. The I/O Range entry displays the numerical range of I/O signals processed by the signal frame. The example illustration is for an *Input Demux* card that processes input channels 1 – 256.
- **Information**

  CPLD and FPGA – These entries identify the version number of firmware code loaded into the respective on-board device.

  Serial Number – Serial number of card.

  Sync Reference – Identifies presence and signal characteristics of sync reference input signal.

  Temperature – Meter graphic provides a direct analog readout of current surface temperature of the circuit board in the video card.
- **Power Rail –** Displays real-time Good/Bad status of each voltage rail present on the circuit card.

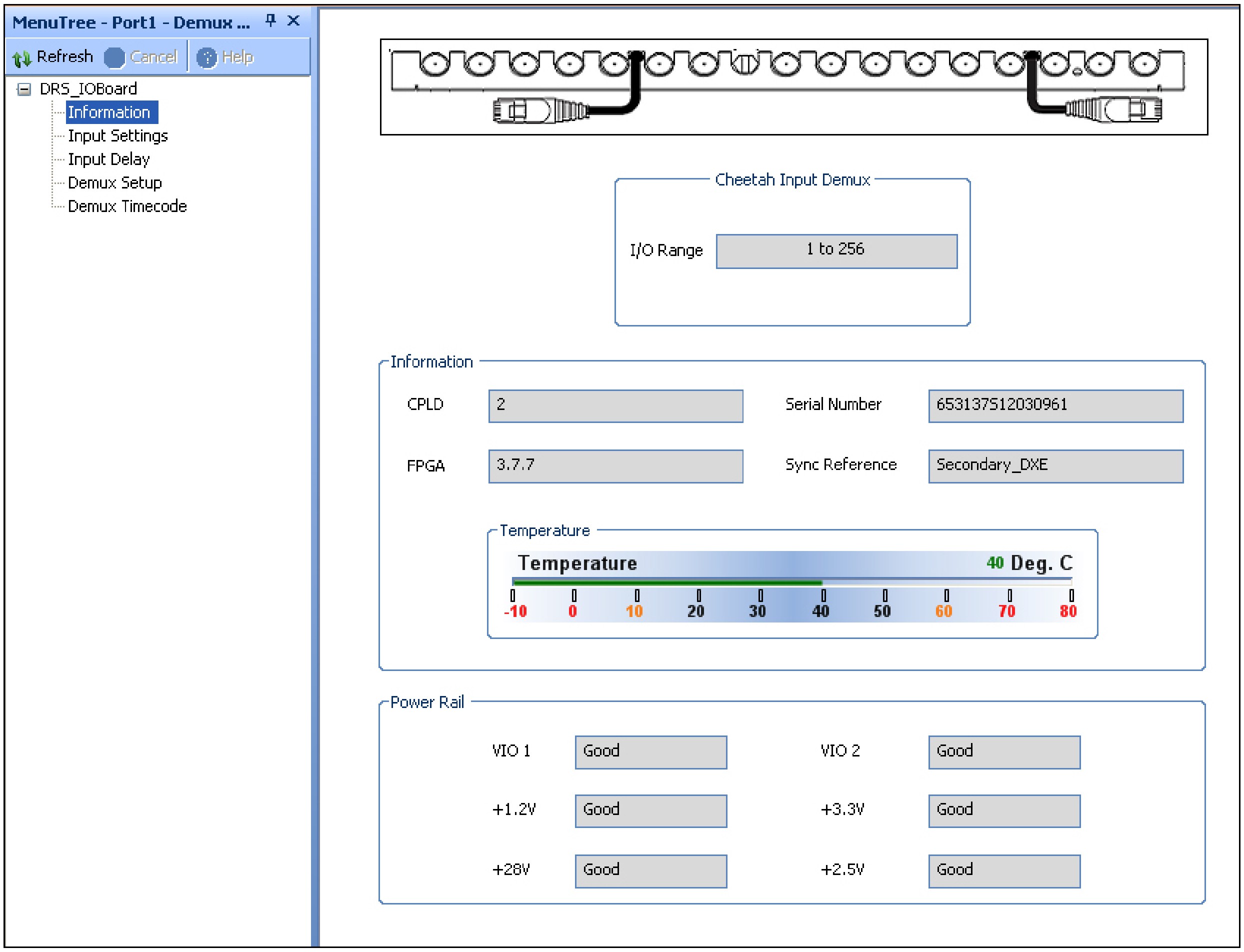


Figure 4-4 Typical MUX or DEMUX Card Information Display

4.7 DEMUX INPUT CARD STATUS AND CONTROL PAGES

Each Cheetah Input DEMUX card receives up to 16 SDI video inputs, of which each input may contain up to four groups (two for SD-SDI inputs) of embedded digital audio. Each group may contain up to four discrete audio signals, for a possible total of 256 audio signals that may be de-embedded from incoming video sources on each DEMUX card. Both the 128 channel and 256 channel DEMUX card de-embed all audio groups and signals on each video input source - in groups of four signals per group.

Using the 256 channel DEMUX card, all de-embedded signals are available as audio source signals for the Enterprise DRS router. Beginning with the first audio channel of the first embedded audio group on the video signal applied to the first physical input of the DEMUX card, followed by the second audio channel of the first group, up to the last audio channel on the last video input signal; all 256 possible de-embedded audio signals become DRS source signals and are sequentially assigned audio source channel numbers beginning with the first numerical input signal channel assigned by the DXE port to which the DEMUX card is attached. When any of the 256 channels does not have an active audio signal embedded, DEMUX card circuitry inserts audio silence data into the signal channel.

Each 128 channel DEMUX card allows you to select, through system control software, any 32 of the 64 possible audio signal groups for a total of 128 discrete signals that become DRS audio signal sources. De-embedded audio signals are always selected as DRS input sources by groups of four – called DRS Group Assignments - not by individual signals. For example, if you wish to access the first audio signal contained in group 1 of video input 1, then you would define a DRS Group Assignment of audio group 1 from video input 1 as a de-embedded source; and associate these four audio signals as four discrete, numerically sequential input sources to the DRS router. For our example assume we assign signals in group 1 to DRS channels 1 thru 4; collectively, these four signals would be identified as DRS Group Assignment 1 – 4. To access the first audio signal of the group we would select the signal on physical input 1 of the router for our destination output. If we also assign the four audio signals in group 2 of video input 1 to DRS channels 5 thru 8, identified as DRS Group Assignment 5 – 8, we can further this example by assuming that audio signals 1 and 2 of group 2 are a stereo pair for program audio. If we want to access these signals for routing to a console or other device, we would select DRS inputs 5 and 6 as outputs to our external device. If any audio channel of any of the selected groups does not have an active embedded audio signal, DEMUX card circuitry inserts audio silence data into the signal channel.

4.7.1 DEMUX SETUP PAGE – 128 CHANNEL AND 256 CHANNEL DEMUX CARD

Through the Demux Setup page, de-embedded signals from the audio signal groups are associated to DRS input source channels. There are also mute functions that allow audio signals, by group, to be replaced with silence data on either the audio signals to DRS or the video signal outputs from the card. Though functionally similar, the 128 channel and 256 channel Demux card are configured by different procedures. Each card is discussed below.

[128 Channel DEMUX Card] Clicking the Demux Setup button in the menu tree window opens the Input Demux Setup page, as shown in Figure 4-5. From here up to 128 de-embedded audio signals may be selected by groups of four as DRS input signals by associating the desired embedded signal group with a DRS Group Assignment. Notice the header at the top of the box identifies the DRS audio input channel number range and the channel number of the video inputs selected through this page. In our example we are selecting sources for DRS inputs 1 – 128 from video inputs 1 – 16. The left-most column, labeled ***Embedded Groups***, contains entries for each physical video input to the card, with a separate entry for each of that channel’s four embedded audio groups (two groups if the video source is SD-SDI).

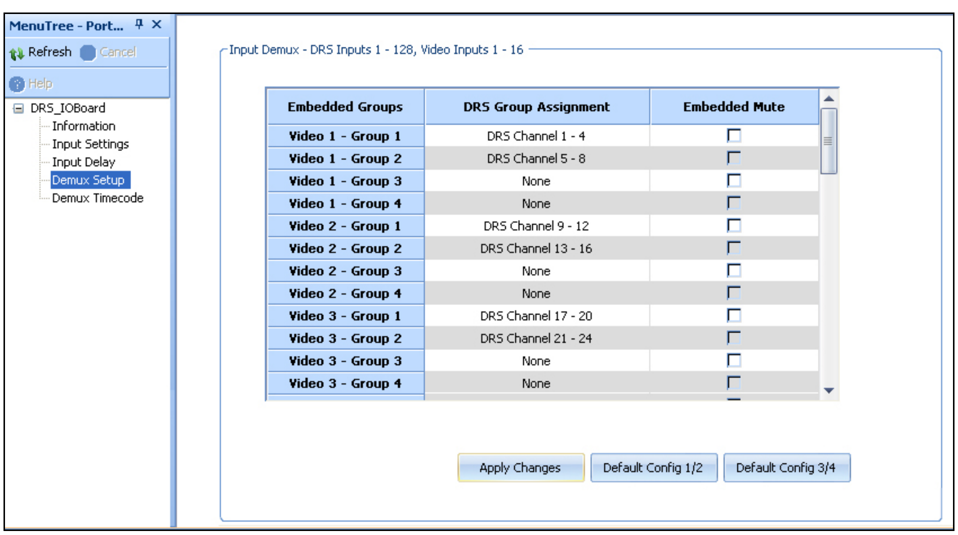


Figure 4-5 128 Channel Demux Setup Page

The ***DRS Group Assignment*** column is where the association is made between embedded audio groups and that groups DRS channel number assignment. The default assignment for all groups is *None*, meaning that the group is not selected as a DRS signal source. In order to assign an audio group click in the DRS Group Assignment box on the same row as the desired embed group to open the pull-down menu as shown in Figure 4-6. Highlight the entry for the DRS channels you wish to associate with the indicated audio group and click to complete the selection. The group channel assignment is now shown in the box. In our example screen we have associated the four audio signals present in embed group 1 on physical video input 1 with DRS input channels 1 – 4. When you have completed DRS Group Assignment associations for all desired audio groups, click on the **Apply Changes** button.

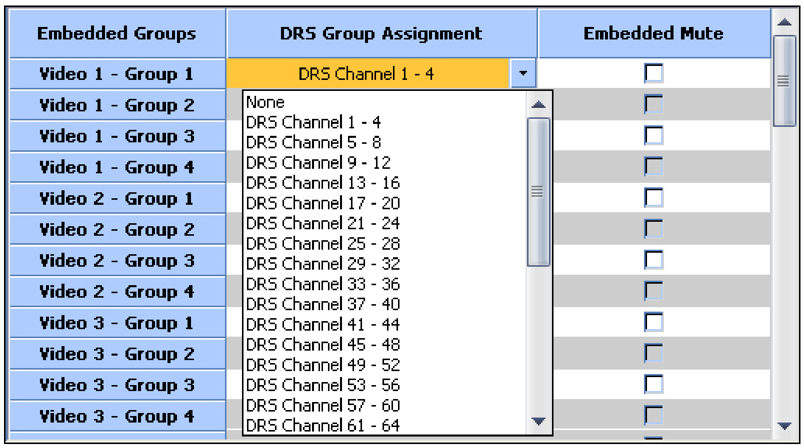
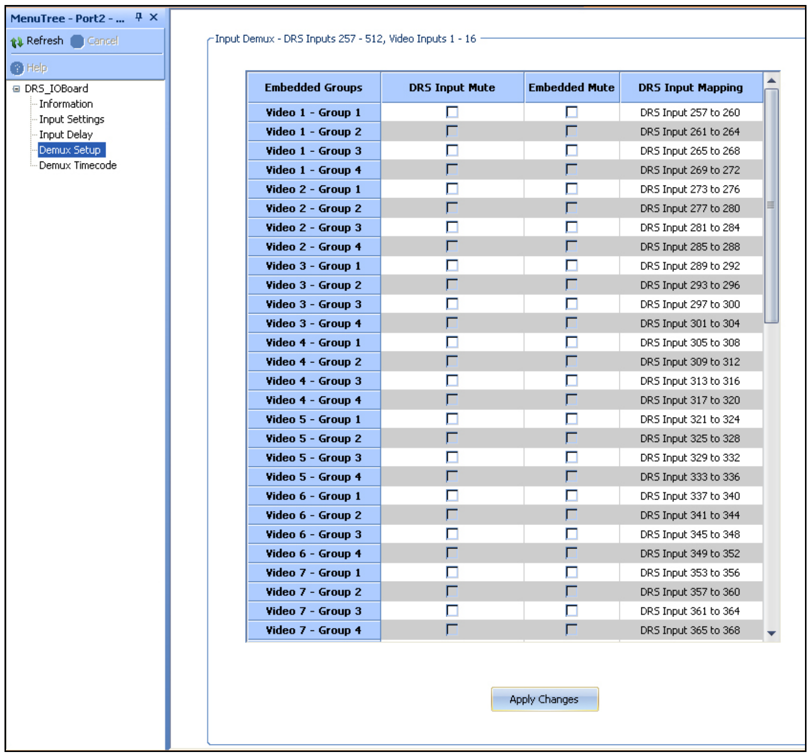


Figure 4-6 Demux Group Assignment Listing

The ***Embedded Mute*** column contains checkboxes that may be selected or deselected by mouse click. When a check is present in the box, all audio signals in the indicated group will be replaced with silence data on the video output signal to the matrix cards in the Cheetah router. This data replacement occurs downstream of the de-embedding function. If the group is given a DRS Group Assignment as a DRS signal source, de-embedded audio is present regardless of the status of the Mute box. Deactivate the mute function and restore embedded audio signals by removing the check from the box. When you have selected or deselected the mute function for all desired audio groups, click on the **Apply Changes** button.

There are two Default Configuration buttons – ***Default Config 1/2*** and ***Default Config 3/4***, located beneath the configuration display area. Clicking on either of these buttons will select default DRS Group Assignments for video groups 1 and 2 or 3 and 4 of all 16 video signal inputs – depending on the configuration button selected. DRS signal groups are assigned sequentially to the video groups beginning with DRS Group Assignment 1 – 4 associated to Video 1 – Group 1; group 5 – 8 associated to Video 1 – Group 2, etc. In all Embedded Groups default configuration associates a DRS Group Assignment to two of the video signal groups (1/2 or 3/4) and associates the selection *None* to the remaining two groups of each video signal. Figure 4-5 illustrates the resulting configuration when the Default 1/2 button is selected. Click on the **Apply Changes** button to implement the default configuration.

[256 Channel DEMUX Card] Clicking the Demux Setup button in the menu tree window opens the Input Demux Setup page as shown by Figure 4-7. Notice the header at the top of the box identifies the DRS audio input channel number range and the channel number of the video inputs selected through this page. In our example we are selecting sources for DRS inputs 257 – 512 from video inputs 1 – 16. This page displays the mapping of each embedded group to its associated DRS input signal group. Each de-embedded signal is mapped one-for-one to the 256 signal source channels created during hardware configuration for the I/O port to which the DEMUX card is connected. If audio is not present on any de-embedded signal, audio silence (mute) is automatically inserted on that channel.



Embedded Groups	DRS Input Mute	Embedded Mute	DRS Input Mapping
Video 1 - Group 1			DRS Input 257 to 260
Video 1 - Group 2			DRS Input 261 to 264
Video 1 - Group 3			DRS Input 265 to 268
Video 1 - Group 4			DRS Input 269 to 272
Video 2 - Group 1			DRS Input 273 to 276
Video 2 - Group 2			DRS Input 277 to 280
Video 2 - Group 3			DRS Input 281 to 284
Video 2 - Group 4			DRS Input 285 to 288
Video 3 - Group 1			DRS Input 289 to 292
Video 3 - Group 2			DRS Input 293 to 296
Video 3 - Group 3			DRS Input 297 to 300
Video 3 - Group 4			DRS Input 301 to 304
Video 4 - Group 1			DRS Input 305 to 308
Video 4 - Group 2			DRS Input 309 to 312
Video 4 - Group 3			DRS Input 313 to 316
Video 4 - Group 4			DRS Input 317 to 320
Video 5 - Group 1			DRS Input 321 to 324
Video 5 - Group 2			DRS Input 325 to 328
Video 5 - Group 3			DRS Input 329 to 332
Video 5 - Group 4			DRS Input 333 to 336
Video 6 - Group 1			DRS Input 337 to 340
Video 6 - Group 2			DRS Input 341 to 344
Video 6 - Group 3			DRS Input 345 to 348
Video 6 - Group 4			DRS Input 349 to 352
Video 7 - Group 1			DRS Input 353 to 356
Video 7 - Group 2			DRS Input 357 to 360
Video 7 - Group 3			DRS Input 361 to 364
Video 7 - Group 4			DRS Input 365 to 368

Figure 4-7 256 Channel Demux Setup Page

The left-most column, labeled ***Embedded Groups***, contains entries for each physical video input to the card, with a separate entry for each of that channel's four embedded audio groups (two groups if the video source is SD-SDI). The right-most column, labeled ***DRS Input Mapping***, displays the DRS source signal group, by channel number, associated to each group of de-embedded signals. With the 256 channel Demux card, the signal mapping is fixed and can not be modified.

The ***DRS Input Mute*** column contains checkboxes that may be selected or deselected by mouse click. When a check is present in the box, de-embedded audio on all DRS input source signals for the indicated group will be replaced with silence data. This data replacement occurs downstream of the de-embedding function. All embedded audio signals in the indicated group will be present on the video output signal to the matrix cards in the Cheetah router regardless of the status of the DRS Input Mute box. Deactivate the mute function and restore de-embedded audio signals to the DRS by removing the check from the box. When you have selected or deselected the mute function for all desired audio groups, click on the **Apply Changes** button.

The ***Embedded Mute*** column contains checkboxes that may be selected or deselected by mouse click. When a check is present in the box, all audio signals in the indicated group will be replaced with silence data on the video output signal to the matrix cards in the Cheetah router. This data replacement occurs downstream of the de-embedding function. De-embedded audio is available as a DRS signal source regardless of the status of the Embedded Mute box. Deactivate the mute function and restore embedded audio signals by removing the check from the box. When you have selected or deselected the mute function for all desired audio groups, click on the **Apply Changes** button.

4.7.2 DEMUX TIMECODE PAGE

In addition to the embedded audio groups, each SDI video input may also have timecode data embedded as ancillary data into the signal. Through the Demux Timecode page, Figure 4-8, you may de-embed timecode data and associate it to a DRS input channel for routing. Each video signal can only have one timecode signal embedded. When the *Enable* box for a video input signal listed in the left-hand column on the Demux Timecode page is checked, Demux card circuitry extracts the timecode data from that signal, and it becomes the signal routed through DRS on the selected input channel.

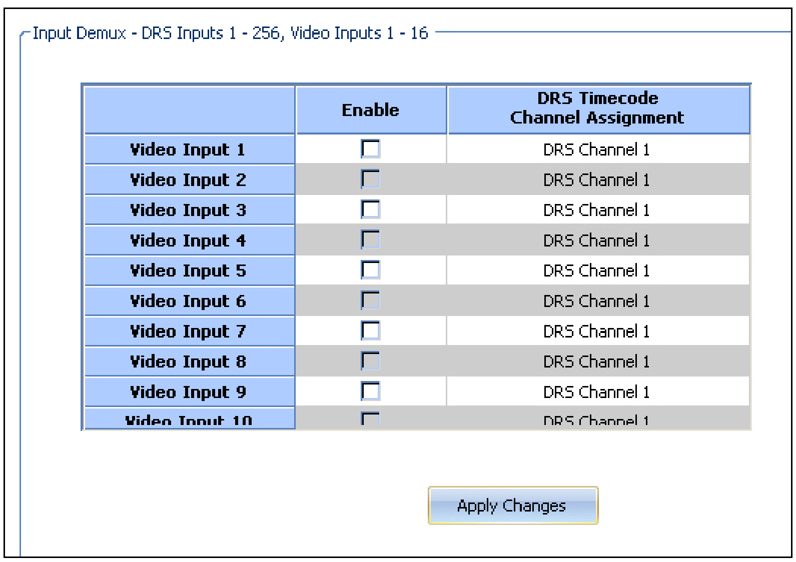


Figure 4-8 Demux Timecode Page

The *DRS Timecode Channel Assignment* column is where the input channel is selected. When you click in the channel assignment cell for the enabled video, a pull-down list, as shown by Figure 4-9, is displayed. This list contains the DRS input channels configured through the Demux card. You may associate the timecode signal to any DRS input channel in the list. Anytime you use an input signal for timecode that channel is no longer available for routing audio. This must be considered when configuring the 256 channel Demux card since all of the de-embedded audio channels from each video input signal are mapped to specific DRS inputs. When you use a channel for timecode routing the audio signal that would be mapped to that input channel is not available to DRS outputs as audio.

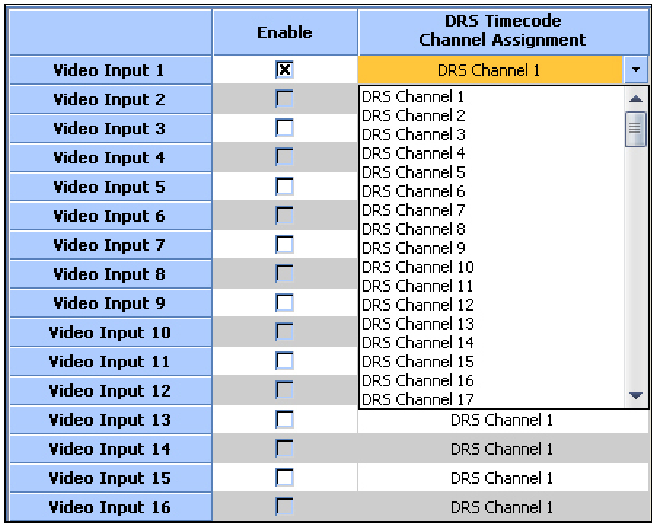


Figure 4-9 Demux Timecode Channel Assignment

4.7.3 INPUT SETTINGS PAGE

Controls available through the Input Settings page provide adjustments for each discrete de-embedded audio signal. Operational parameters such as gain, balance, phase inversion, delay and stereo remedies may be applied individually to each DRS input source signal.

An example DEMUX Input Setting Screen is shown by Figure 4-10. The left-most column, labeled ***Ch. #***, is a list of the sequential numbers (in our example beginning with channel 257) that correspond to the DRS input channel number of audio signals selected from the de-embedded sources. The second column, identified as ***Input Label***, contains a series of boxes that each span four input channel numbers. Each box identifies the video input embedded signal group for the four signals that comprise the DRS group assignment.

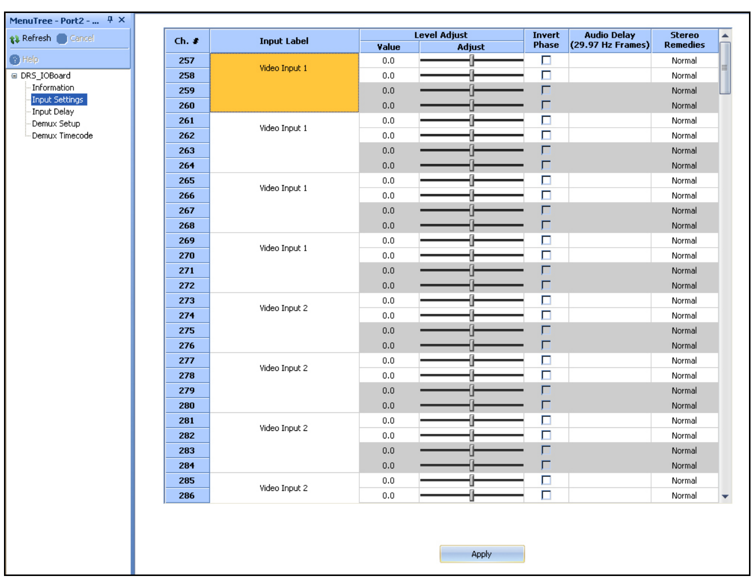


Figure 4-10 Demux Input Settings Screen

On our example screen notice that channel numbers 257 thru 260 span one entry in the second column. The label Video Input 1 in the box means that DRS source signals 257 – 260 are derived from one of the audio groups embedded into video input 1. Likewise, channels 261 – 264 (DRS group assignment 261 – 264) are also labeled Video Input 1, meaning that this signal group was selected from another of the audio groups embedded into video input 1. With 128 channel cards, the Input Label column entry will reflect the Video Input signal from which the embedded signal group associated to the indicated DRS Group Assignment is derived. With 256 channel cards, the Input Label entry will always reflect the sequential mapping of the audio channels to the video input signal embedded groups.

On the example screen each audio channel is listed on an individual row for audio adjustment functions. Notice that beginning with the *Level Adjust* columns, and continuing through all of the remaining audio adjustment columns, two channels are always paired, as indicated by alternating row colors. The two audio channels contained in the pair are said to be *adjacent* channels. Signal pairing and channel adjacency are very important considerations in certain of the audio attribute adjustments – such as stereo remedies. On the example page shown by Figure 4-10, adjacent channels 257 and 258 are paired, as are channels 259 and 260, etc. Individual signals on each audio routing channel can be independently set for level, phase inversion and delay. Stereo remedies may be applied to paired adjacent signals.

- **Level Adjust - A**llows you to set the gain level of an individual audio signal, with an adjustment range of ±6dB. Use your mouse to move the level adjust slider to the desired output level. The box next to the slider labeled Value displays the amount of gain adjustment applied to the signal in dB. You may also click at each end of the slider bar to move the value up or down in 0.1 dB increments.
- **Invert Phase -** Allows you to apply a 180 degree phase shift to the audio channel. To apply phase inversion, simply click in the Invert Phase click box for the channel you wish to invert. A check in the box indicates that phase inversion is active for that channel.
- **Audio Delay** - Allows you to apply a delay factor to an audio signal channel. Delay is applied through the Input Delay page, Paragraph 4.9. The field on this screen indicates whether or not a delay factor is applied to an individual channel; and if so, how much delay is applied.
- **Stereo Remedies -** Describes a group of commands that allow you to select operational parameters for paired audio channels. To access Stereo Remedies, click in the cell of the Stereo Remedies column on the row of the audio channel you wish to modify and open the pull down menu. For more information on stereo remedies, refer to Paragraph 4.10.

When you have entered the desired input channel settings on the page, click the **Apply** button to immediately apply the change.

4.8 MUX OUTPUT CARD STATUS AND CONTROL PAGES

Each Cheetah Output MUX card provides 16 signal paths for SDI video, each of which receives an input signal from the video matrix cards contained in the Cheetah router chassis. In addition to video processing circuitry, every video path of a MUX card also contains processing circuitry that allows control over the digital audio signals embedded into the video output stream. Audio data is embedded as signal groups and may be embedded into any SDI video signal (SD, HD or 3G) with four discrete signals contained within a group. SD video signals may embed one or two groups of four discrete signals for a total of up to eight audio channels per video signal, and HD or 3G video signals may embed up to four groups of four discrete signals for a total of up to 16 audio channels per video signal.

The DRS control system associates each audio channel of the MUX card to a discrete destination (output signal) of the DRS router and allows you to map router outputs, always grouped as four signals per audio embedding group, to the desired audio channel group. Both the 128 channel and the 256 channel MUX card map signals; however, the process by which DRS source signals are selected for inclusion in a SDI audio group is different:

When a 256 channel MUX card is attached to an EDXE port, the Cattrax control system creates a block of 256 DRS output signals – one for each discrete signal of every possible audio signal group processed by the card. Beginning with the first audio channel of the first embedded audio group on the first video channel of the MUX card, followed by the second audio channel of the first group, up to the last audio channel on the last video channel; all 256 possible embedded audio signals become discrete DRS destination signals and are sequentially assigned destination channel numbers beginning with the first numerical output signal channel assigned by the EDXE port to which the MUX card is attached.

When a 128 channel MUX card is attached to a standard DXE or an EDXE port, the Cattrax control system creates a block of 128 DRS output signals. These discrete output signals are always grouped for embedding as four numerically sequential signals per audio group – called a DRS Group Assignment. Each group assignment is identified in Cattrax by the four output channel numbers that form it. Group assignments are pre-defined, beginning with the first four numerically sequential channels of the output signal block as the first embedding group and continuing up to embed group 32 composed of the final four sequential channel numbers of the signal block. Any discrete DRS source signal may be selected for routing to any of the four output signals included in a group assignment. Up to 128 individual audio signals may be selected for the groups, thereby allowing up to 32 embeddable groups to be created. Any of the created groups may be embedded into any or all of the SDI video output signals.

4.8.1 MUX SETUP PAGE – 128 CHANNEL AND 256 CHANNEL MUX CARD

Control functions on the Mux Setup page allow you to select the desired processing option for each embedded audio group on each of the 16 video signals processed by the card.

Through the Mux Setup page DRS destination signals are associated, by groups of four, to audio embed groups. Control functions on this page also allow you to select one of the following options for the audio signals embedded in each video channel:

- Pass the video with all original digital audio content intact
- Embed any or all channel groups with audio signals selected from DRS source signals
- Effectively “mute” audio content on any or all groups by replacing audio data with “silence” data generated on the MUX card.

Though functionally similar, the 128 channel and 256 channel Mux cards are configured by different procedures. Each card is individually discussed below.

[128 Channel MUX Card] Clicking the Mux Setup button in the menu tree window opens the Output Mux Setup page, as shown in Figure 4-11. It is from this screen that DRS output channel groups are selected for embedding into video output signals by associating a DRS Group Assignment with the desired video output signal, and audio group of that signal. An example Mux Setup Screen is shown in Figure 4-11. Notice the header at the top of the screen identifies the DRS output channel number range and the video output signals configured through this screen. In our example we are selecting DRS group assignments from audio output signals 1 – 128 for embedding into video outputs 1 – 16.

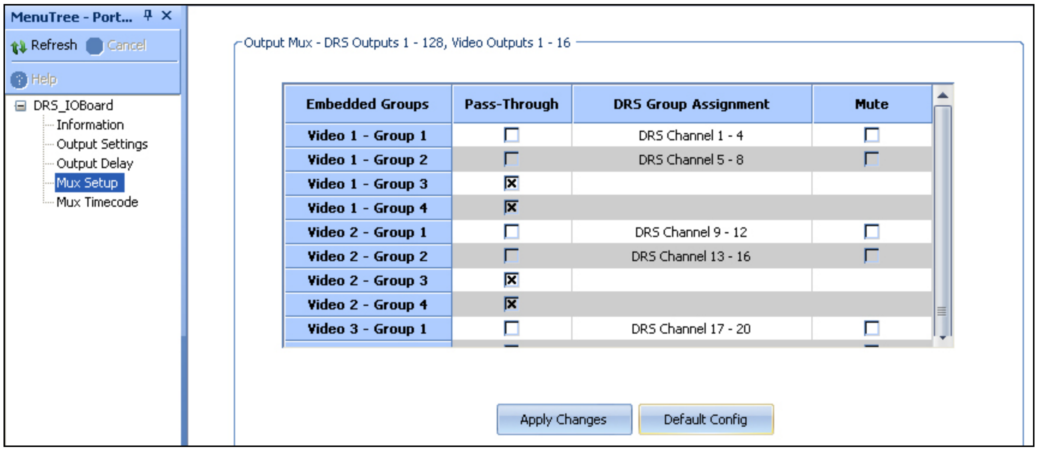


Figure 4-11 Mux Setup Menu

The left-most column, labeled ***Embedded Groups***, contains entries for each physical video output channel, with an entry for each of that channel's four embedded audio groups.

The ***Pass-Through*** column contains a checkbox for each audio embedding group of each video output signal. When a check is present in the box, all audio signals in the indicated group present on the video signal as it enters the output MUX card will be passed through the card unaltered. Mute may not be selected for the group when Pass-Through is selected.

The ***Mute*** column contains checkboxes that may be selected or deselected by mouse click. When a check is present in the box, all audio signals in the indicated group on the indicated video output signal will be replaced with silence data. This data replacement occurs regardless of whether or not a DRS group assignment is associated to the embed group. Deactivate the mute function and restore output audio signals by removing the check from the box.

When you have selected or deselected the mute and pass-through functions for all desired audio groups, click on the **Apply Changes** button, Figure 4-11, to apply changes to the channels.

The ***DRS Group Assignment*** column is where the association is made between audio embed groups and the video outputs and specific audio groups of that output on which you wish to embed the selected DRS group assignment. The default assignment for all groups is *None*, meaning that no audio will be embedded into the indicated output group. In order to assign an audio group for embedding, click in the DRS Group Assignment box on the row of the desired video signal and output group to open the pull-down menu as shown in Figure 4-12. Highlight the DRS channel group you wish to embed into the indicated audio group and click to complete the selection. The group channel assignment is now shown in the box. In our example screen we have associated the four audio signals on DRS output channels 1 thru 4 for embedding into group 1 of physical video output 1. When you have completed DRS Group Assignment associations for all desired audio output groups, click on the **Apply Changes** button, Figure 4-11 to apply the functions to the channels.

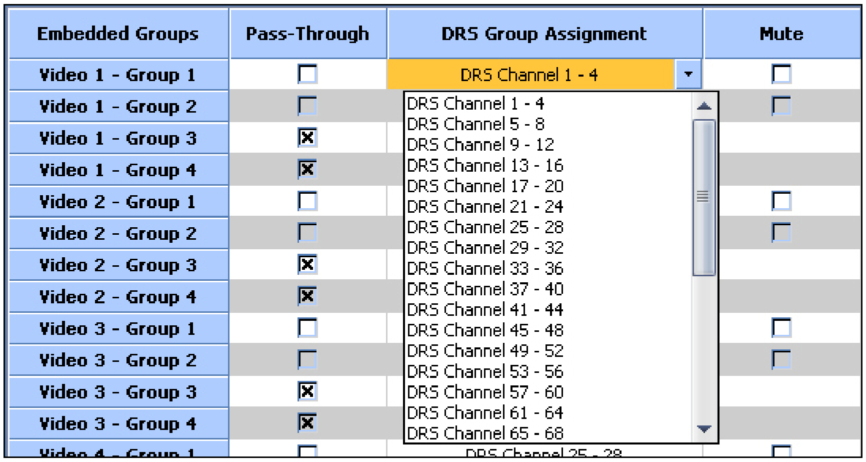


Figure 4-12 Mux Group Assignment Listing

[256 Channel MUX Card] Clicking the Mux Setup button in the menu tree window opens the Output Mux Setup page as shown by Figure 4-13. The header at the top of the box identifies the DRS audio output channel number range and the video output signals processed by the MUX card. In our example we are configuring audio embed groups for video outputs 1 – 16 from DRS destination output signals 1 – 256. This page displays the mapping of each embedded group to its associated DRS output signal group. Each signal in a signal group is mapped one-for-one to the 256 signal destination channels created during hardware configuration for the I/O port to which the MUX card is connected. If audio is not present on any embedded signal, audio silence (mute) is automatically inserted on that channel.

The left-most column, labeled ***Embedded Groups***, contains entries for each physical video output from the MUX card, with a separate entry for each of that channel's four embedded audio groups (two groups if the video source is SD-SDI). The right-most column, labeled ***DRS Output Mapping***, displays the DRS output signal group, by channel number, associated to each group of embedded signals. With the 256 channel Mux card, the signal mapping is fixed and can not be modified.

The ***Pass-Through*** column contains a checkbox for each audio embedding group of each video output signal. When a check is present in the box, all audio signals in the indicated group present on the video signal as it enters the output MUX card will be passed through the card unaltered. Mute may not be selected for the group when Pass-Through is selected.

The ***Mute*** column contains checkboxes that may be selected or deselected by mouse click. When a check is present in the box, all audio signals in the indicated group on the indicated video output signal will be replaced with silence data. This data replacement occurs regardless of whether or not a DRS group assignment is associated to the embed group. Deactivate the mute function and restore output audio signals by removing the check from the box.

When you have selected or deselected the mute and pass-through functions for all desired audio groups, click on the **Apply Changes** button, Figure 4-13, to apply changes to the channels.

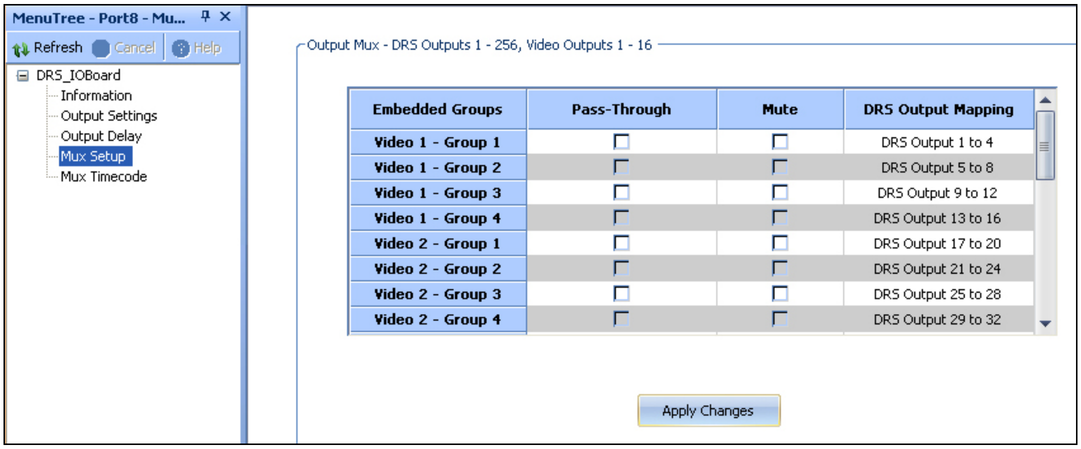


Figure 4-13 Output Mux Setup Page

4.8.2 MUX TIMECODE PAGE

In addition to embedded audio, each SDI video output may also have timecode data embedded as ancillary data into the signal. Through the Mux Timecode page, Figure 4-14, you may select a DRS output destination channel as the signal source for embedding into the timecode data of the video output signal. Each video signal can only have one timecode signal embedded. When the *Enable* box for a video output signal listed in the left-hand column on the Mux Timecode page is checked, Mux card circuitry embeds the timecode signal present on the selected DRS output channel into the enabled video output signal.

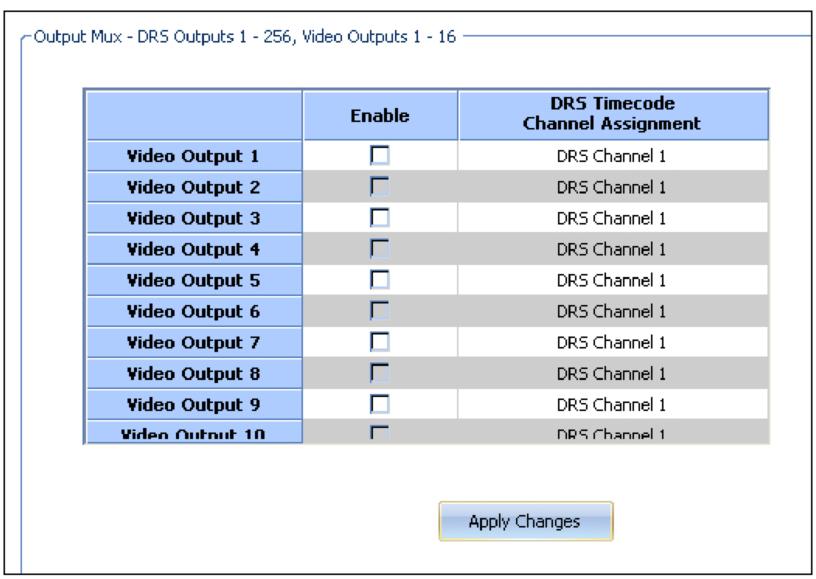


Figure 4-14 Mux Timecode Page

The *DRS Timecode Channel Assignment* column is where the output channel is selected. When you click in the channel assignment cell for the enabled video, a pull-down list, as shown by Figure 4-15, is displayed. This list contains the DRS output channels mapped to the Mux card. You may associate the video output signal to any DRS output channel in the list. Anytime you use a DRS output channel for timecode that channel is no longer available for routing audio. This must be considered when configuring the 256 channel Mux card since all of the audio channels for each video output signal are mapped to specific DRS outputs. When you use a DRS output channel for timecode routing the audio signal that would be mapped to the channel of the DRS group assignment associated with that router output is not available as an audio signal.

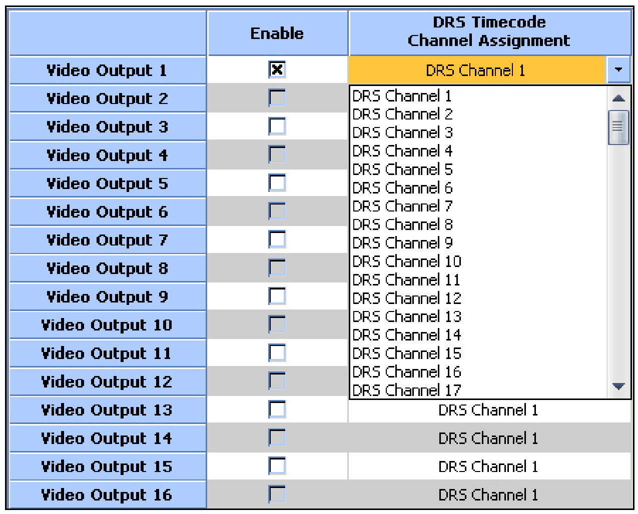


Figure 4-15 Mux Timcode Channel Assignment

4.8.3 OUTPUT SETTINGS PAGE

Controls available through the Output Settings page provide adjustments for each discrete embedded audio signal. Operational parameters such as gain, balance, phase inversion, delay and stereo remedies may be applied individually to each DRS output destination signal.

An example MUX Output Setting Screen is shown by Figure 4-16. The left-most column, labeled ***Ch. #***, is a list of the DRS output signal channel numbers (in our example beginning with channel 1) contained in the audio block assigned though the DXE port to the MUX card. Remember that audio signals are always grouped by four to form an embedded group. Notice the second column, identified as ***Output Label***, contains a series of boxes that each span four output channel numbers. The four numbers are the four signals that comprise the DRS group assignment, and the video channel identified in the label box is the video output signal containing the audio group to which the group is assigned. The 128 channel MUX card allows each DRS group assignment to be associated to more than one embed group. When this occurs, the label in the box spanning the four channel numbers of the group will read "*Multiple Associations*". With 256 channel cards, the Output Label entry will always reflect the sequential mapping of the audio channels to the video output signal embedded groups.

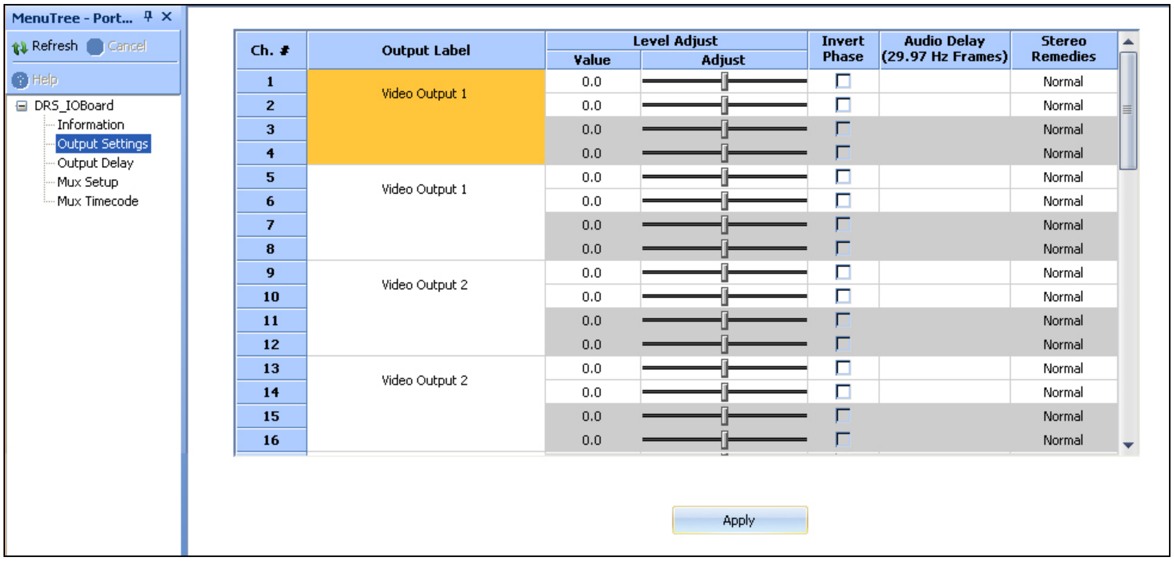


Figure 4-16 Audio Output Settings Screen

On the example screen each audio channel is listed on an individual row for audio adjustment functions. Notice that beginning with the *Level Adjust* columns, and continuing through all of the remaining audio adjustment columns, two channels are always paired, as indicated by alternating row colors. The two audio channels contained in the pair are said to be *adjacent* channels. Signal pairing and channel adjacency are very important considerations in certain of the audio attribute adjustments – such as stereo remedies. On the example page shown by Figure 4-16, adjacent channels 1 and 2 are paired, as are channels 3 and 4, etc. Individual signals on each audio routing channel can be independently set for level, phase inversion and delay. Stereo remedies may be applied to paired adjacent signals.

- **Level Adjust - A**llows you to set the gain level of an individual audio signal, with an adjustment range of ±6dB. Use your mouse to move the level adjust slider to the desired output level. The box next to the slider labeled Value displays the amount of gain adjustment applied to the signal in dB. You may also click at each end of the slider bar to move the value up or down in 0.1 dB increments.
- **Invert Phase -** Allows you to apply a 180 degree phase shift to the audio channel. To apply phase inversion, simply click in the Invert Phase click box for the channel you wish to invert. A check in the box indicates that phase inversion is active for that channel.
- **Audio Delay** - Allows you to apply a delay factor to an audio signal channel. Delay is applied through the Input Delay page, Paragraph 4.9. The field on this screen indicates whether or not a delay factor is applied to an individual channel; and if so, how much delay is applied.
- **Stereo Remedies -** Describes a group of commands that allow you to select operational parameters for paired audio channels. To access Stereo Remedies, click in the cell of the Stereo Remedies column on the row of the audio channel you wish to modify and open the pull down menu. For more information on stereo remedies, refer to Paragraph 4.10.

When you have entered the desired output channel settings on the page, click the **Apply** button to immediately apply the change.

4.9 I/O DELAY

Audio Delay allows you to apply a delay factor to an audio signal channel. Audio channels to delay and delay values are selected through the Delay Setup Screen, Figure 4-17. An Analog Input/AES Output audio board is used for this example; however, the audio adjustment columns are identical for all audio boards, including the Cheetah MUX and DEMUX cards.

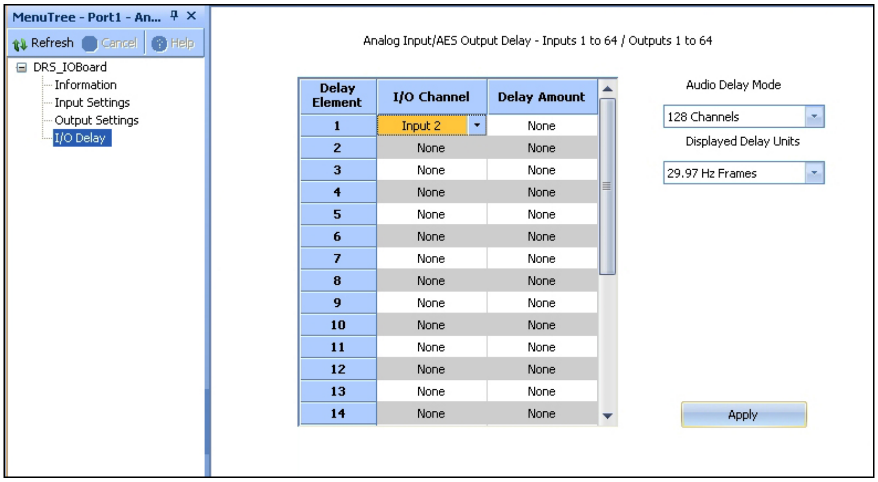


Figure 4-17 Audio I/O Delay Menu

The leftmost column is labeled **Delay Element**, the next column is labeled **I/O Channel** and the third column is labeled **Delay Amount**. Two drop-down menus are located on the right side of the screen – these are the **Audio Delay Mode** menu and the **Displayed Delay Units** menu.

Audio Delay Mode menu determines how many Delay Elements are available for assignment and also determines the length of delay available to a channel. Options available from the drop-down menu are 128 channels, 64 channels and 32 channels.

In order to understand the available options we need to briefly discuss the method used to delay audio. Every channel to which you wish to apply a delay must be assigned to one of the available delay elements. Think of a delay element as a discrete delay line, and the number of channels you select from the delay mode drop-down as the number of available delay lines. Every available delay element requires a block of system memory, and the system memory space available for the delay function is divided among all of the delay element allocations. Therefore, the fewer delay elements you allocate, the more memory available for performing the delay algorithm, and a greater amount of delay time can be allocated to each delay element.

The selection you make in **Displayed Delay Units** menu determines by what unit of measure the delay time is displayed. You may display the delay in terms of 29.97 Hz video frames, 25 Hz video frames or in milliseconds. Click the unit you wish to use.

There is a direct correlation to the number of delay elements you allocate and the amount of delay available to each. Table 4-1 displays the range of delay time that can be selected for each delay element for each of the Audio Delay Mode options. The table also lists the delay times in all three of the available display units.

Table 4-1 DELAY TIMES FOR AVAILABLE CHANNEL OPTIONS

	29.97 Hz Frames	25 Hz Frames	Milliseconds
128 Channels	0.160 – 10.230	0.133 – 8.533	5.333 – 341.333
64 Channels	0.160 – 20-460	0.133 – 17.067	5.333 – 682.667
32 Channels	0.160 – 40.919	0.133 – 34.133	5.333 – 1365.333

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

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

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

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

Repeat this process for all channels to which you wish to apply a delay. Once all delay assignments are made, click on the **Apply** button to apply the delay times to the channels. Once entered and activated, audio delay values are displayed on the Input or Output Settings menu screens in the Audio Delay column using the selected unit of time measure.

Each data entry cell in both the **I/O Channel** box and the **Delay Amount** box has associated right-click menus. Each menu function is discussed in the following chart:

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

Delay Amount Box Right-Click Menu Item

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

4.10 STEREO REMEDIES OPTIONS

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

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

To access Stereo Remedies, click in the cell of the Stereo Remedies column on the row of the audio channel you wish to modify. Our example screen, Figure 4-18, shows the remedies menu selected for router output channel 1 on a MUX Output board. The page appearance and menu choices are the same for both MUX and DEMUX boards. Each selection option is discussed below:

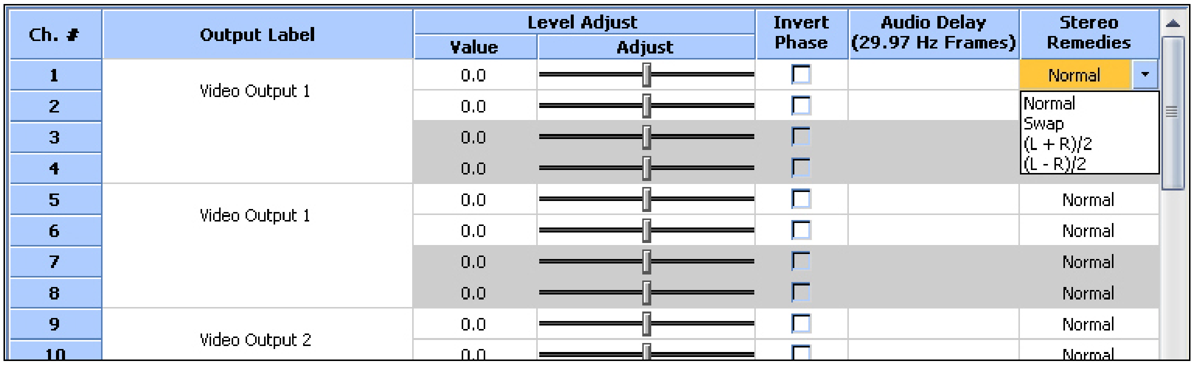


Figure 4-18 Stereo Remedies Menu

- **Normal** applies no change to the paired channels.
- **Swap** replaces the input signal for the selected channel with the audio signal from the adjacent channel. In the example screen, clicking *Swap* would cause the signal on physical input 1 to not be routed through channel 1 to the matrix; instead audio from input 2 would be routed through channel 1. Audio from input 2 is also routed through channel 2 as normal – provided the remedies selection for channel 2 is *Normal*. If the *Swap* function is selected for both channels of the pair, the inputs are totally swapped, meaning that the input signal on physical input 1 is routed through channel 2 and vice-versa.
- **(L+R)/2** adds the adjacent channel to the selected channel. Again in our example screen, if the (L+R)/2 option is selected for channel 1, audio from physical input 2 is summed with audio from physical input 1 and routed through the matrix as a mixed signal. The signal on channel 2 is not altered and is still available for routing through the matrix. Selecting the (L+R)/2 function for both channels of the pair derives two identical signals, both of which are a summation of physical inputs 1 and 2.
- **(L-R)/2** subtracts the second signal of an adjacent pair from the first signal of the pair and routes the stereo difference signal as the output of the selected channel. Remember that the first signal of an adjacent pair is processed as the left channel audio and the second signal is processed as the right channel audio. For example, by selecting the (L-R)/2 option for channel 1, audio from physical input 2 is subtracted from audio of physical input 1 and the difference signal is routed through the matrix on channel 1. If the (L-R)/2 option is selected for channel 2, the algorithm performs exactly the same function - audio from physical input 2 is subtracted from audio of physical input 1 (right audio is subtracted from left audio) and the difference signal is routed through the matrix on channel 2. In this instance, the signal on channel 1 is not altered and is still available for routing through the matrix. Selecting the (L-R)/2 function for both channels of the pair derives two identical difference signals, both of which are the audio from input signal 2 subtracted from audio input signal 1.

4.11 ACCESSING INTERNALLY GENERATED SIGNALS

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

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

Chapter 5 128 Channel MUX/DEMUX Card Operation with PERC2000 GUI

5.1 REVIEW OF HARDWARE AND ROUTER CONFIGURATION FILES

Throughout this manual discussions of DRS system installation and operation have assumed that the user has a working knowledge of PESA's DRS router and is familiar with the functional descriptions and system theory presented in the DRS Technical Manual. Before we continue to system setup procedures, let's quickly review configuration and setup information and present it with the MUX and DEMUX cards included in the discussions. If you are already familiar with DRS configuration and setup, you may choose to skip over this material and proceed to the setup paragraphs.

Cheetah MUX and DEMUX cards attach to DXE I/O frame ports in the same manner as "standard" input or output audio frames; and when discussing MUX and DEMUX cards in relation to DRS installations, we may consider and refer to the cards as "frames." In examples and discussions in the following paragraphs, the term frame may generically address either an audio frame or a MUX or DEMUX card. The term input frame, or block, refers to the source of audio signals to the DXE from either an audio frame or a DEMUX card. Likewise, the term output frame, or block, refers to the destination of output audio signals from the DXE, whether it is an actual audio frame or a Cheetah MUX card.

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

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

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

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

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

5.2 DXE FRAME PORT CONFIGURATION SCREEN

In DRS system architecture, a *channel group* consists of at least one DXE frame and its associated audio frames, and is identified by the numerical range of I/O signals it can process. Audio frames and blocks are connected to DXE frames through the I/O Frame Port connectors on the DXE rear panel in a numerical sequence, and the order of connection assigns the numerical range of input or output channels handled by each block. Every I/O port must be configured through the DXE Frame Port Configuration menu screen to identify the type of audio block(s) connected to the port and assign a numerical bank of channels to the block. Figure 5-1 shows a typical DXE port configuration menu screen using Cheetah MUX and DEMUX boards as example entries.

The main display portion of this window contains a table with a row entry for each of the 8 frame ports on the DXE. Each row is composed of columns that identify certain operational and configuration parameters about the frame port. Before we continue to the procedure for entering hardware configuration data, we need to closely look at each of the columns. Refer to the example DXE Frame Port Configuration Screen shown by Figure 5-1.

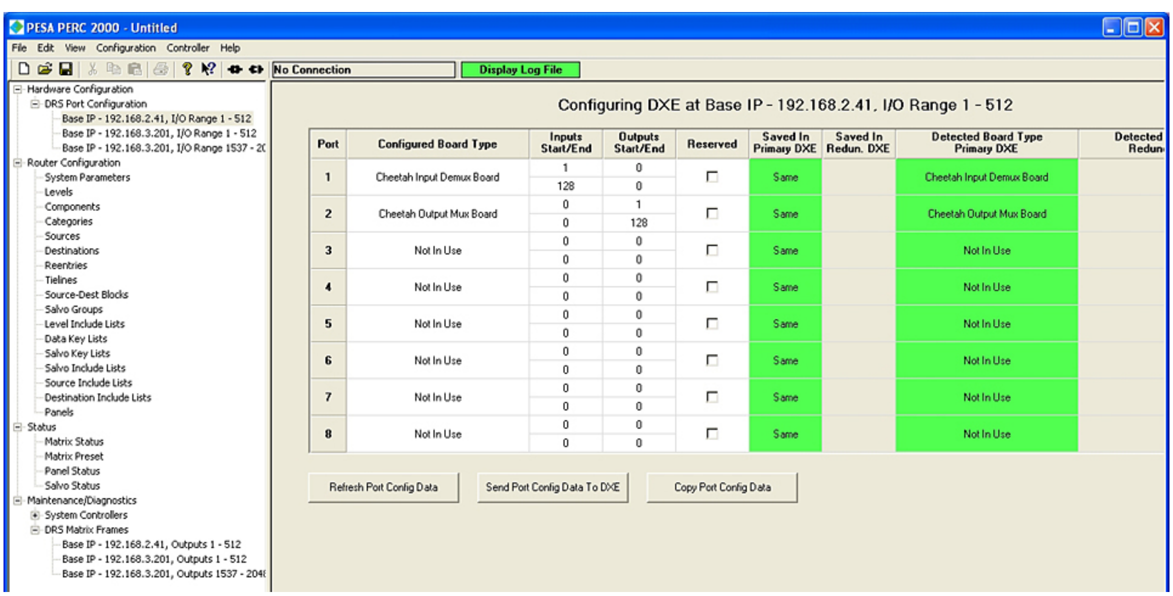


Figure 5-1 DXE Frame Port Configuration Screen Example

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

- The DXE, primary and redundant, if used, polls its frame I/O ports to determine the type of audio block(s) currently attached to each port.
- The hardware configuration data loaded into the frame controller(s) of each DXE is read to determine the type of audio block(s) programmed in the configuration file as being attached to each I/O port.

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

- **PORT -** The left-most column labeled PORT, is a listing by port number of the eight physical DXE input/output ports.
- **Configured Board Type** – This entry displays which type of audio frame the currently open GUI configuration file indicates is attached to each of the I/O ports. If an existing configuration file has not been either uploaded from the P2K or retrieved from storage media the currently open GUI file will contain no hardware config data for the ports and the cells in this column will be blank, and remain blank until the operator manually enters frame type data for the indicated I/O port using the pull-down menu in each cell. If data is present in any of the cells, the entry displays the frame type **currently defined in the configuration file open on the host PC for the indicated port**. Regardless of whether frame type data is displayed or not, this column allows the user to enter or modify hardware data using the pull-down menu.
- **Inputs Start/End** – Indicates the numeric range of input channels assigned to the port. This entry is determined by the frame type specified in the previous column and is automatically assigned by the GUI application. If no Configured Board Type entry is listed for the port, this column will also be blank.
- **Outputs Start/End** – Same as the previous column, except it displays the numerical range of output channels assigned to the port. If no Configured Board Type entry is listed for the port, this column will also be blank.
- **Reserved –** A check in the box indicates that the range of input/output channel numbers and frame type have been reserved for future implementation.
- **Saved In Primary DXE** – Compares the actual frame hardware type detected on the physical port to the frame type expected on the port, as **determined by the configuration file loaded into the primary P1K** frame controller. If the actual and expected frame types are the same, the message SAME is displayed on a green background. Should the frame type the P1K controller expects to be present on the port and the frame type actually detected on the port not be the same, the message DIFFERENT is displayed on a red background.

- **Saved In Redun. DXE** – Compares the actual frame hardware type detected on the physical port to the frame type expected on the port, as **determined by the configuration file loaded into the redundant P1K** frame controller, if a redundant DXE is present. If the actual and expected frame types are the same, the message SAME is displayed on a green background. Should the frame type the P1K controller expects to be present on the port and the frame type actually detected on the port not be the same, the message DIFFERENT is displayed on a red background. If a redundant DXE is not used in the installation, the column will be grayed-out or disabled.
- **Detected Board Type, Primary DXE** – When the port configuration screen is selected the Primary DXE frame for the channel group polls the audio block(s) attached to each of its I/O ports. This column displays the results – and indicates the frame type of the actual hardware connected to the indicated port. A comparison is then made between the actual detected hardware and the frame type **indicated in the Configured Board Type column**. If the actual and indicated frame types are the same, the cell is displayed with a green background. Should the GUI application file not yet contain hardware config data, or should it indicate a different frame type from what is actually detected, the cell is displayed with a red background.
- **Detected Board Type, Redundant DXE** – When the port configuration screen is opened, the Redundant DXE frame, if present, for the channel group automatically performs an audit of the frame hardware attached to each of its I/O ports. This column displays the results of the audit – and indicates the frame type of the actual hardware connected to the indicated port. A comparison is then made between the actual detected hardware and the frame type **indicated in the Configured Board Type column**. If the actual and indicated frame types are the same, the cell is displayed with a green background. Should the GUI application file not yet contain any hardware config data, or should it indicate a different frame type from what is actually detected, the cell is displayed with a red background. If a redundant DXE is not used in the installation, the column will be grayed-out or disabled.

To summarize the Frame Port Configuration Screen:

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

5.3 DXE FRAME PORT CONFIGURATION

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

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

- Launch the P2K GUI application from the desktop icon or browse to the PERC2000.exe file and double click to open the application.
- Expand the Hardware Configuration tree in the left pane of the GUI display, as shown in Figure 5-2; then expand the DRS Port Configuration tree.
- The DRS Port Configuration tree opens to a listing of all DXE frames in the system, identified by the base IP address and the I/O range of each. Remember in previous text we said that we can identify the DXE(s) for a given channel group by the system base IP address and the I/O range of the group. Select the channel group on which you wish to perform hardware configuration.
- The port configuration screen is displayed as shown. The DXE being configured is identified at the top of the configuration box by the base IP address of the DRS system and the numerical I/O range (channel group) of the specific DXE frame. In this example, the DXE at IP address 192.168.2.41 processes data for numerical input channels 1 thru 512 and numerical output channels 1 thru 512.
- When the port configuration screen is initialized the frame type detected on each interface port on each DXE, primary and redundant – if equipped, is displayed in the two right-most columns. Notice in our example screen, one *Cheetah Input Demux Board* and one *Cheetah Output Mux Board* are shown in the listing as a block of 128 input signals and 128 output signals, respectively, just the same as all other audio blocks.
- If you are generating a “new” hardware configuration, or doing an initial install of the system, and no configuration file has been uploaded from the system controller, the “Configured Board Type” column will be blank. It is from this column that you identify to the frame controller what type of audio frame is connected to each I/O port. If a configuration file has been uploaded from the controller, the detected board type and the configured board type SHOULD agree. If they do not, it means that hardware cabling has been swapped between ports or for some reason the audio frames at the ports have been changed since the loaded configuration file was written.
- If you wish to enter or modify the board type in the configured column, you may use the drop-down menu to assign the board type to each I/O port. Optionally, you may click the “Copy Port Config Data” button below the table and the detected board types at each port will automatically be entered in the configured board type column.
- Input and output channel range is automatically assigned based on the frame type and port order. If you have used the “Copy Port Config Data” option to enter board types, the input and output channel numbers are assigned to all ports.

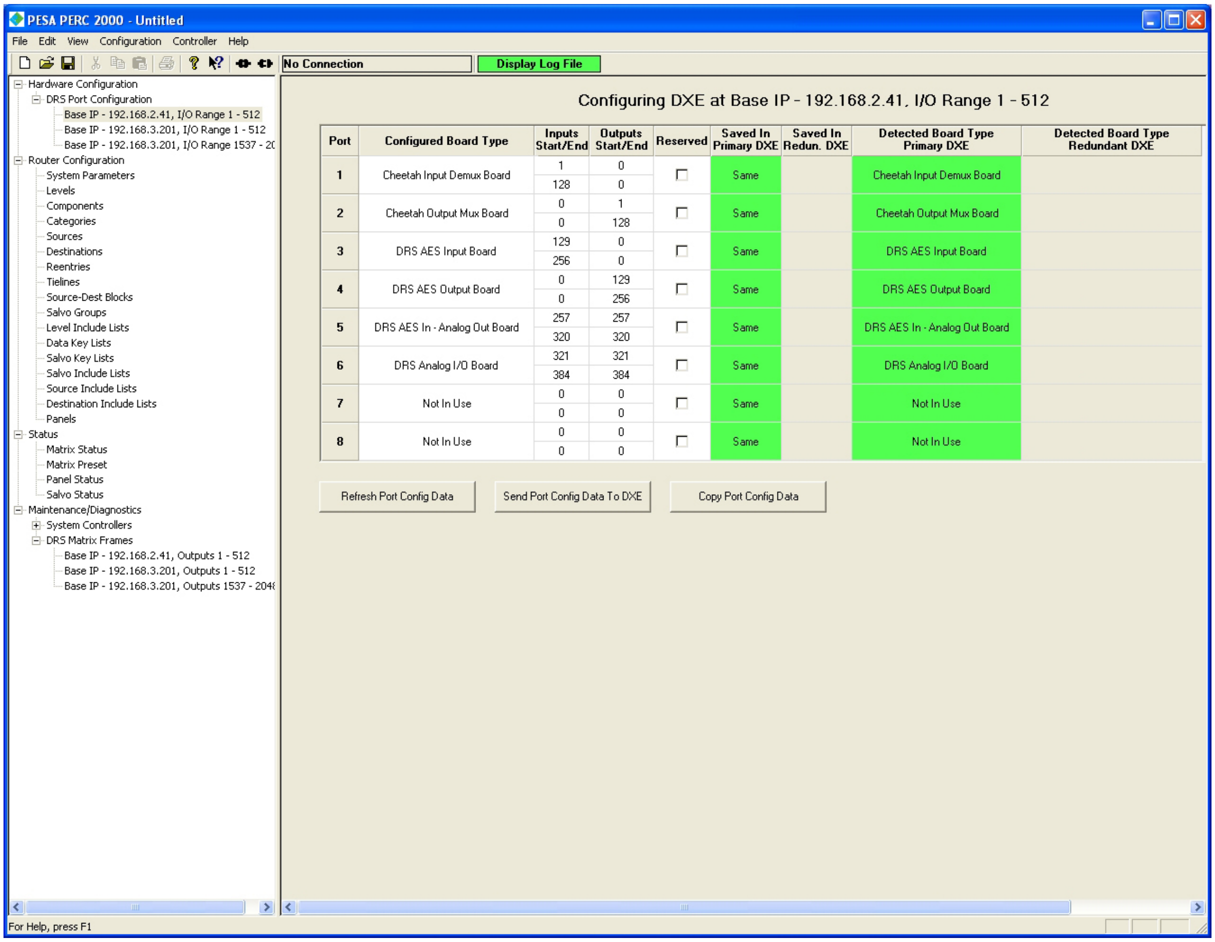


Figure 5-2 Accessing DXE Frame Port Configuration Screen

- If you wish to “reserve” a block of channels for future implementation, select the type of frame you will add in the port number slot for the channel range desired, and check the “Reserved” box next to the board type assignment. The I/O channel range will be assigned to the port based on the entered “future” frame type.
- Once the data for each frame type has been entered to the ports, click on the “Send Port Config Data to DXE” button to download the hardware configuration to all P1K frame controllers in the channel group.
- Repeat this procedure for each channel group and its associated DXE frames.
- Clicking the “Refresh Port Config Data” button causes the DXE to perform board detection at each I/O port and update the data shown in the Detected Board Type columns.

5.4 CHANNEL GROUP STATUS AND SET-UP SCREENS

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

Locate and expand the Maintenance/Diagnostics tree in the left pane of the GUI display, as shown in Figure 5-3. Then expand the DRS Matrix Frames tree; this action expands the tree to a listing of all channel groups in the system. Each entry in the listing identifies a channel group of the total system by the base IP address of the system and the numerical *output* channel range of the specified group. Click on any list entry to select and highlight that channel group. The main display screen shows real-time status and setup information for system components specific to the selected channel group. For our example screen, we have selected channel group I/O Range 1 – 512 within the DRS system residing at base IP address 192.168.3.201.

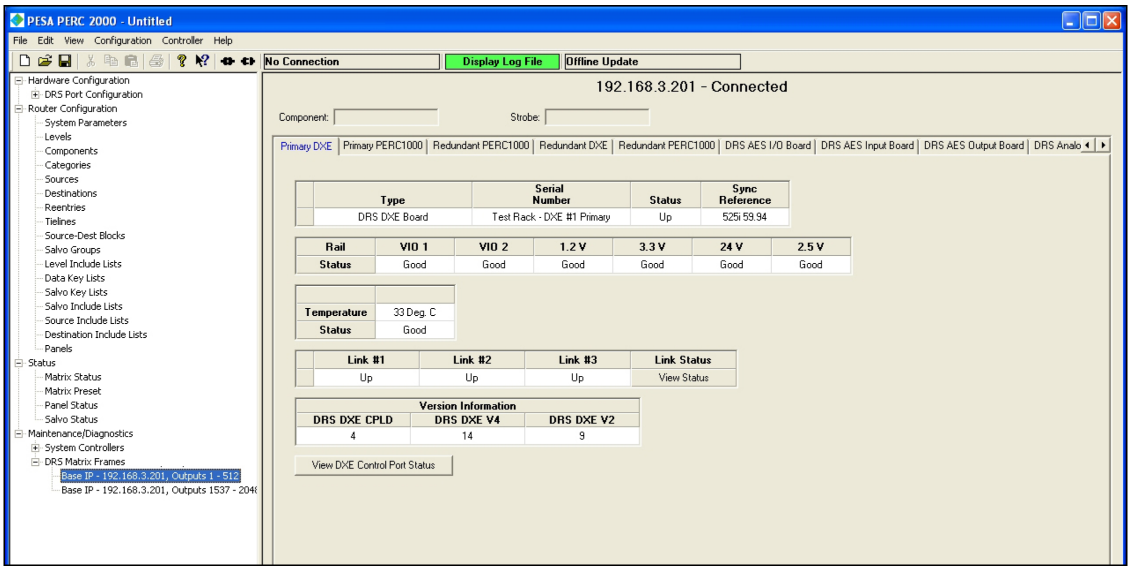


Figure 5-3 Channel Group DXE Status Screen

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

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

5.4.1 DXE FRAME STATUS SCREEN

Looking at Figure 5-3, the Primary DXE tab is selected. The displayed data identifies the board by type and serial number, its current operational status and its sync reference source. The next lines provide monitoring data for the frame power supply voltages, status of the power supply and its cooling fan and the surface temperature of the circuit board. The Link Status box displays status of the fiber optic links interconnecting the DXE frames, if any are present.

5.4.2 FRAME CONTROLLER STATUS SCREEN

There is a tab for every frame controller in the channel group located immediately following the tab for the DXE frame containing the controller. As an example we have highlighted the tab for the Primary PERC1000 controller located in the Redundant DXE frame, Figure 5-4.

Looking at Figure 5-4, the displayed data identifies the frame controller circuitry by its *unique* IP address, serial number and MAC address. Just beneath the serial number and MAC address display is a box labeled “Status” which identifies the location and operational status of the selected controller. In our example screen, status identifies the selected controller as the P1K installed in the Primary Controller slot of the frame and shows it is currently the ***active*** frame controller.

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

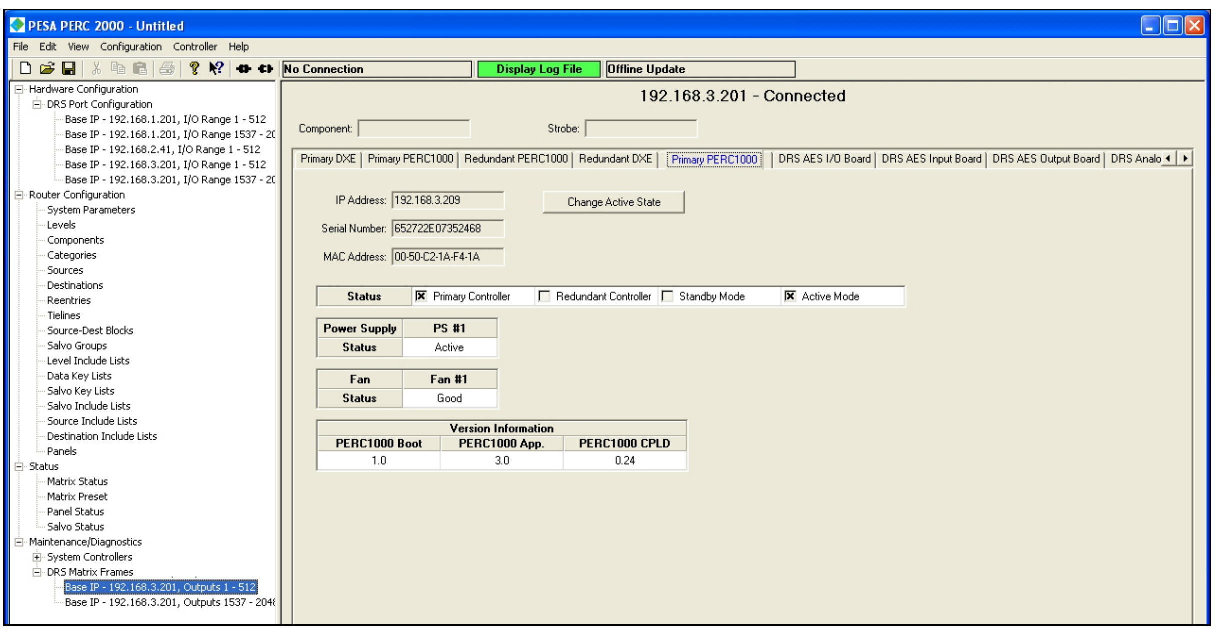


Figure 5-4 Frame Controller Status Screen

5.4.3 AUDIO BOARD STATUS SCREEN

When Cheetah MUX and DEMUX system cards are configured into a channel group, a tab for each card is displayed along with tabs for other DRS audio frames. An example is shown in Figure 5-5. If either the DEMUX or MUX card tab is selected, the display provides data and status for the selected card, just as with any other DRS board and frame. Figure 5-5 shows the audio board display using the Cheetah Input Demux Board tab as an example; however, the screen content is identical for both DEMUX and MUX cards. This audio board contains one input block of 128 channels from the de-embedded audio signals.

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

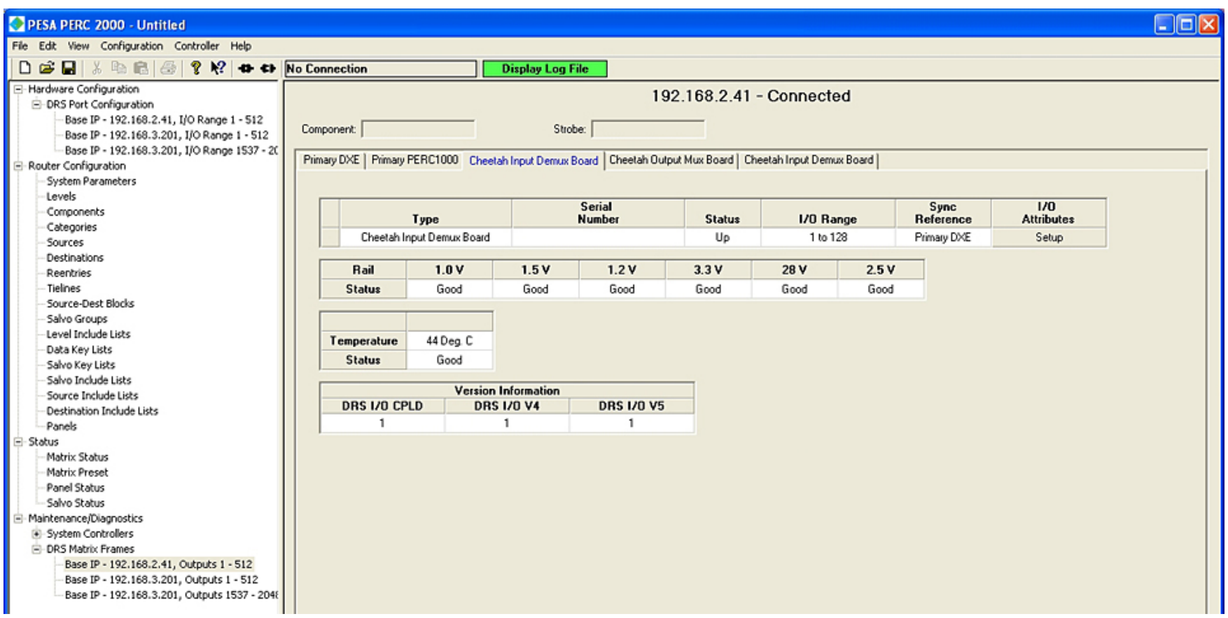


Figure 5-5 Audio Board Display

5.5 ACCESSING AND NAVIGATING MUX AND DEMUX CARD SETUP SCREENS

Setup screens for the Cheetah system cards are accessed through the I/O Attributes screen. The following steps guide you through the procedure to access the setup screen for a particular audio board. Specific operating instructions for modifying or selecting a specific audio attribute are covered in a separate paragraph for that function. Once you have accessed the setup screen for the system card you wish to configure, or the signal(s) or channel(s) you wish to modify, proceed to the paragraph addressing the particular function you wish to use.

From the list of frame controllers under the DRS Matrix Frames directory tree, select the ***base IP address*** of the DRS system and the channel group containing the DEMUX or MUX card you wish to configure. The status and monitoring screen as shown in Figure 5-5 is displayed for the selected channel group.

All components associated with the channel group appear as tabs across the top of the system monitor display screen – primary and redundant DXE frames, primary and secondary PERC1000 frame controllers and tabs for all audio blocks comprising the channel group. Select the tab for the DEMUX or MUX board you wish to setup. Figure 5-6 shows an example screen using the Input Demux Board. The upper line of the status display identifies the Board Type, Serial Number, Status, I/O Range, and the Sync Reference source. The final button on this row selects the Setup screen for the I/O Attributes. Click on the **Setup** button to bring up the attributes screen for the desired card. Setup screens are accessed identically for both DEMUX and MUX cards, as well as all other audio frames except time code. The following paragraphs present detailed configuration procedures for each card type.

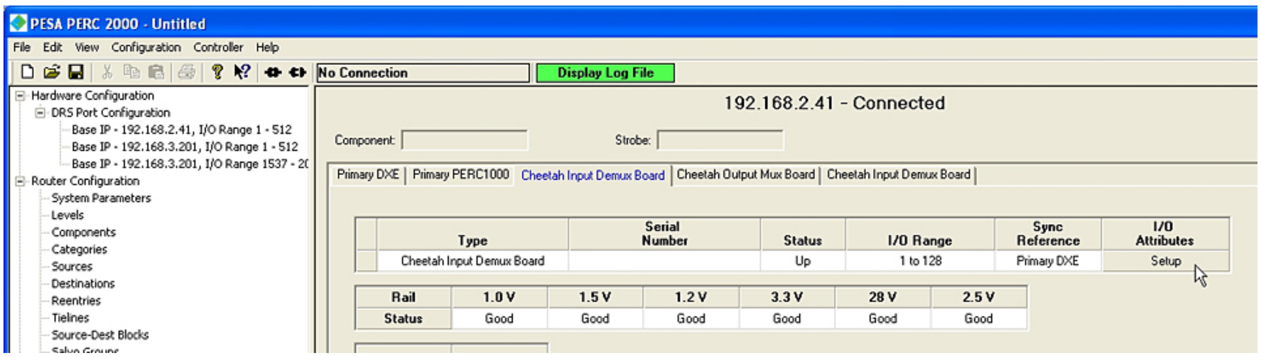


Figure 5-6 Location of I/O Attributes Setup Button

5.6 INPUT DEMUX CARD CONFIGURATION

Each Cheetah Input DEMUX Card receives up to 16 SDI video inputs, of which each video input may contain up to four groups (two for SD-SDI inputs) of embedded digital audio. Each group may contain up to four monaural audio signals, for a possible total of 256 independent audio signals that may be de-embedded from incoming video sources on each DEMUX card. Of these 256 de-embedded signals, up to 128 may be selected through GUI setup screens as audio sources for use by the DRS router. Before we proceed to a discussion of the configuration screens, there are a few operational principles we need to introduce.

Audio signals are always selected as DRS sources by de-embedded group – called DRS Group Assignments - not by individual signals. For example, if you wish to access the first audio signal contained in group 1 of video input 1, then through the GUI you would define a DRS Group Assignment of audio group 1 from video input 1 as a de-embedded source; and select one of the pre-defined ranges of four channel numbers to assign to the four audio signals as four independent, numerically sequential inputs to the DRS router. For our example assume we assign signals in group 1 to DRS channels 1 thru 4; collectively, these four signals would be identified as DRS Group Assignment 1 – 4. To access the first audio signal of the group we would select the signal on physical input 1 of the router for our destination output. If we also assign the four audio signals in group 2 of video input 1 to DRS channels 5 thru 8, identified as DRS Group Assignment 5 – 8, we can further this example by assuming that audio signals 1 and 2 of group 2 are a stereo pair for program audio. If we want to access these signals for routing to a console or other device, we would select DRS inputs 5 and 6 as outputs to our external device.

Once the de-embedded signals become individual audio channels in the DRS routing structure they are treated as any audio signal from any other DRS input frame. In fact, the DEMUX card becomes another type of DRS audio input frame. We can perform any DSP functions available through DRS to any or all of the input signals, and select these signals as a source for any DRS output channel in the system.

5.6.1 INPUT DEMUX PARAMETERS SCREENS

Clicking the I/O Attributes Setup button opens the Input DEMUX Parameters Screen as shown in Figure 5-7. The left-most column, labeled ***Ch. #***, is a list of 128 sequential numbers that correspond to the DRS input channel number of audio signals selected from the de-embedded sources. Remember that audio signals are always selected by group – not individual signals. Notice the second column, identified as ***Input Label***, contains a series of boxes that each span four input channel numbers. The four numbers are the four signals that comprise the DRS group assignment. De-embed groups are not assigned a group number nomenclature, but are identified by the router input channels of which they are composed.

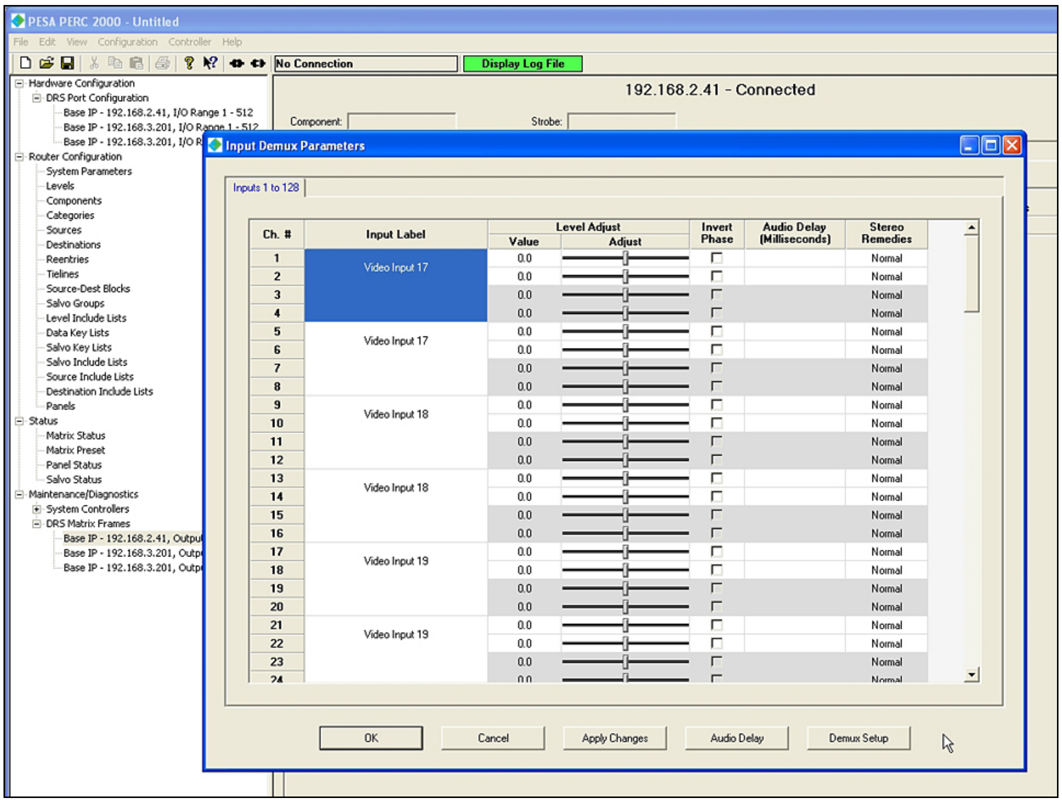


Figure 5-7 Example Input DEMUX Parameters Screen

On our example screen notice that channel numbers 1 thru 4 span one entry in the second column. The label Video Input 17 in the box means that DRS group assignment 1 – 4 is derived from one of the audio groups embedded into video input 17. Likewise, channels 5 – 8 (DRS group assignment 5 – 8) are also labeled Video Input 17, meaning that this signal group was selected from another of the audio groups embedded into video input 17.

Also on the example screen, we see that each audio channel is listed on an individual row for audio adjustment functions. Notice that beginning with the *Level Adjust* columns, and continuing through all of the remaining audio adjustment columns, two channels are always paired, as indicated by alternating row colors. The two audio channels contained in the pair are said to be *adjacent* channels. On our example input screen, adjacent channels 1 and 2 are paired, as are channels 3 and 4, etc. Remember that each channel of the pair represents a separate, independent physical input to the router – derived from the indicated audio group.

In many applications adjacent channels are related, such as left and right audio for stereo. Even though it is a common application, it is not necessary that the paired signals be related – each may carry totally independent audio sources; however, the two channels indicated as paired by the colored rows are always treated as adjacent channels. This is an important consideration in certain of the audio attribute adjustments – such as stereo remedies. In our example input screen channels 1 and 2 are adjacent channels, 3 and 4 are adjacent channels, etc. But, channels 2 and 3 are NOT adjacent channels, nor are channels 4 and 5, and so on. The importance of this is covered in the paragraph on stereo remedies, but for now just grasp the concept of which channels are adjacent – and which are not. Adjacent channels are always shown as paired by the alternating row color.

Each audio signal may be individually set for level, phase inversion and delay. Stereo remedies may be applied to paired adjacent signals. Paragraph 4.8 contains procedures for performing audio channel adjustments.

5.6.2 INPUT DEMUX SETUP SCREEN

Clicking the Demux Setup button on the Input DEMUX Parameters Screen, as shown in Figure 5-7, opens the Input Demux Setup Screen. It is from this screen that de-embedded audio groups are selected as DRS input signals by associating the desired groups with a DRS Group Assignment. An example Demux Setup Screen is shown in Figure 5-8. Notice the header at the top of the screen identifies the DRS audio input channel number range and the channel number of the video inputs selected through this screen. In our example we are selecting sources for DRS inputs 1 – 128 from video inputs 1 – 16. The tabs labeled Audio and TimeCode at the top of the setup screen select the type of de-embedded data being configured. The following example pertains to audio signals.

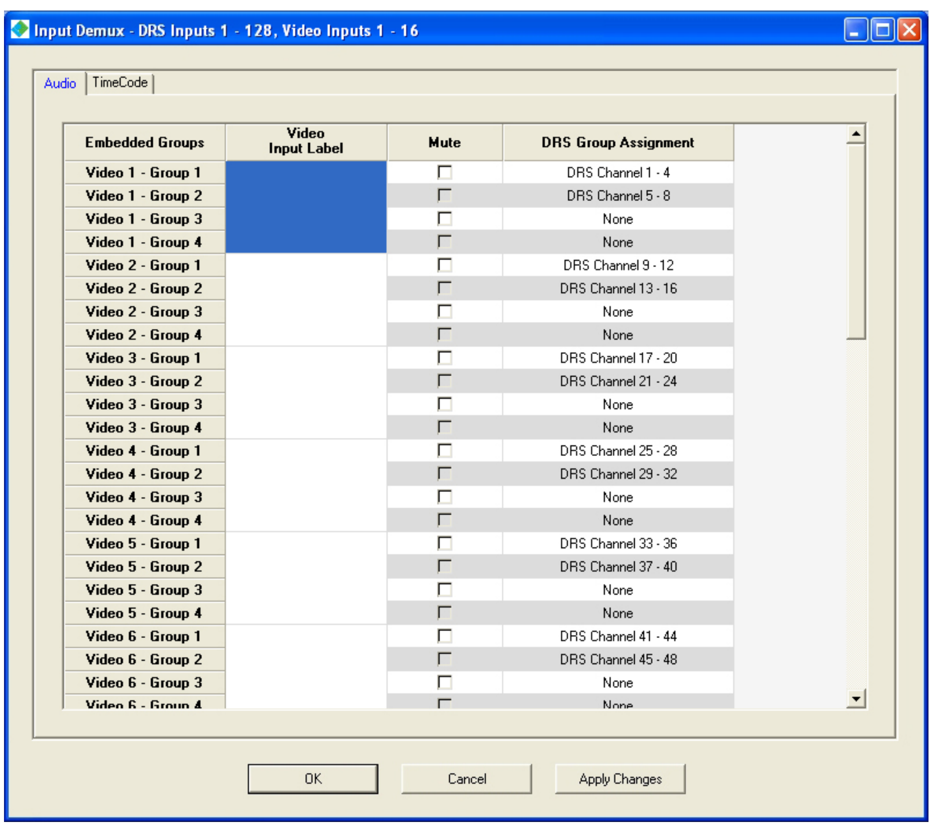


Figure 5-8 Example Input DEMUX Setup Screen

The left-most column, labeled ***Embedded Groups***, contains entries for the channel number of each physical video input to the card, with an entry for each of that channel's four embedded audio groups (two groups if the video source is SD-SDI). The second column, ***Video Input Label***, allows you to enter any text you wish identifying the video signal – such as VTR1, NET2, etc. Usually this label is the name of the video source, but you are free to enter any descriptive label you wish. When a label is present in this box, it will also appear on the Demux Parameters Screen along with the video input channel number to identify the source of the DRS Group Assignment. When you have entered labels for all desired inputs, click on the **Apply Changes** button, Figure 5-8, to apply the functions to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

The ***Mute*** column contains checkboxes that may be selected or deselected by mouse click. When a check is present in the box, all audio signals in the indicated group will be replaced with silence data on the video output signal to the matrix cards. This data replacement occurs downstream of the de-embedding function. If the group is given a DRS Group Assignment as a DRS signal source, de-embedded audio is present regardless of the status of the Mute box. Deactivate the mute function and restore embedded audio signals by removing the check from the box. When you have selected or deselected the mute function for all desired audio groups, click on the **Apply Changes** button, Figure 5-8, to apply changes to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

The DRS Group Assignment column is where the association is made between embedded audio groups and that groups DRS channel number assignment. The default assignment for all groups is None, meaning that the group is not selected as a DRS signal source. In order to assign an audio group click in the DRS Group Assignment box on the same row as the desired embed group to open the pull-down menu as shown in Figure 5-9. Highlight the entry for the DRS channels you wish to associate with the indicated audio group and click to complete the selection. The group channel assignment is now shown in the box. In our example screen we have associated the four audio signals present in embed group 1 on physical video input 1 with DRS input channels 1 – 4. When you have completed DRS Group Assignment associations for all desired audio groups, click on the **Apply Changes** button, Figure 5-9, to apply the functions to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

5.6.3 DEMUX TIMECODE PAGE

In addition to the embedded audio groups, each SDI video input may also have timecode data embedded as ancillary data into the signal. Access the timecode configuration page by clicking the TimeCode tab at the top of the Demux page display. Through the Demux Timecode page, Figure 5-10, you may de-embed timecode data and associate it to a DRS input channel for routing. Each video signal can only have one timecode signal embedded. When the *Enable* box for a video input signal listed in the left-hand column on the Demux Timecode page is checked, Demux card circuitry extracts the timecode data from that signal, and it becomes the signal routed through DRS on the selected input channel.

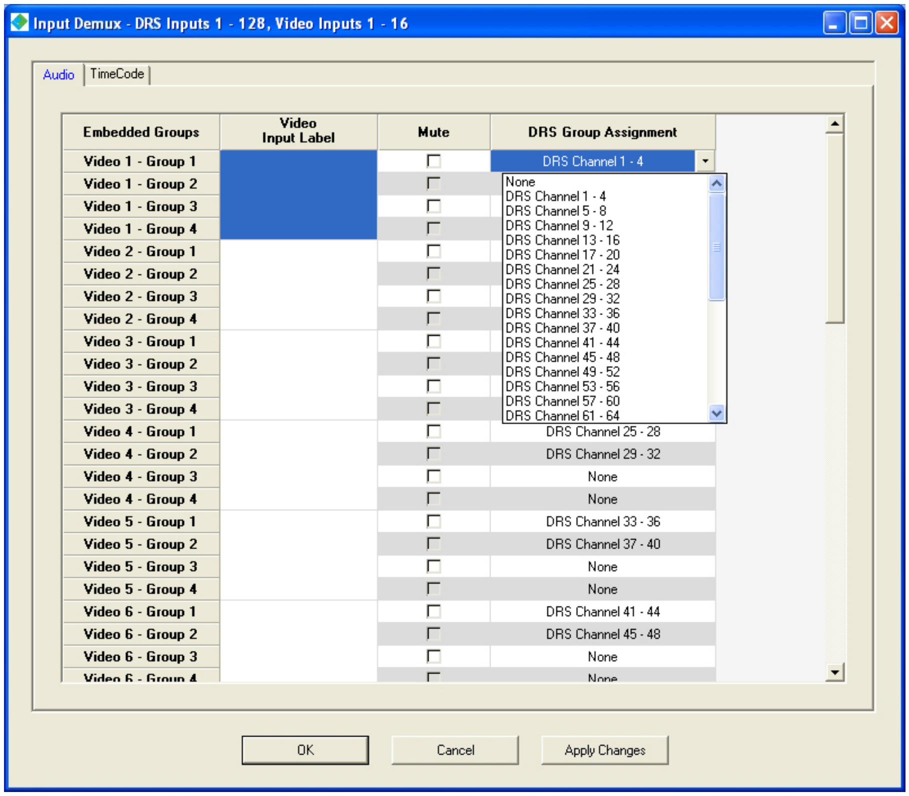


Figure 5-9 Group Assignment Menu

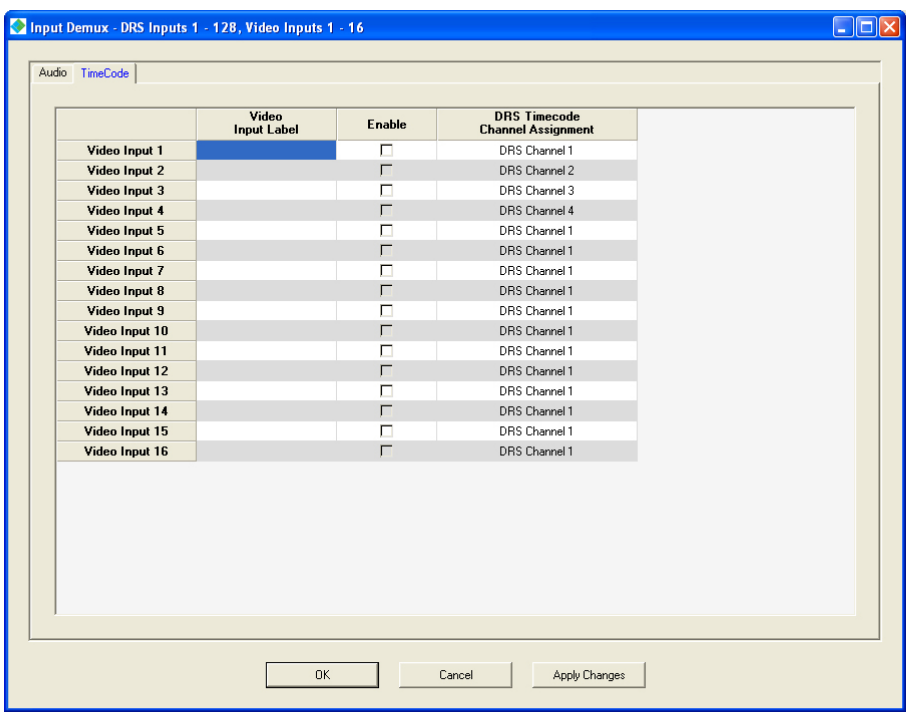


Figure 5-10 Demux Timecode Page

The *DRS Timecode Channel Assignment* column is where the input channel is selected. When you click in the channel assignment cell for the enabled video, a pull-down list, as shown by Figure 5-11, is displayed. This list contains the DRS input channels configured through the Demux card. You may associate the timecode signal to any DRS input channel in the list. Anytime you use an input signal for timecode all of the channels in that DRS assignment group are dedicated to timecode and may no longer be used for routing audio.

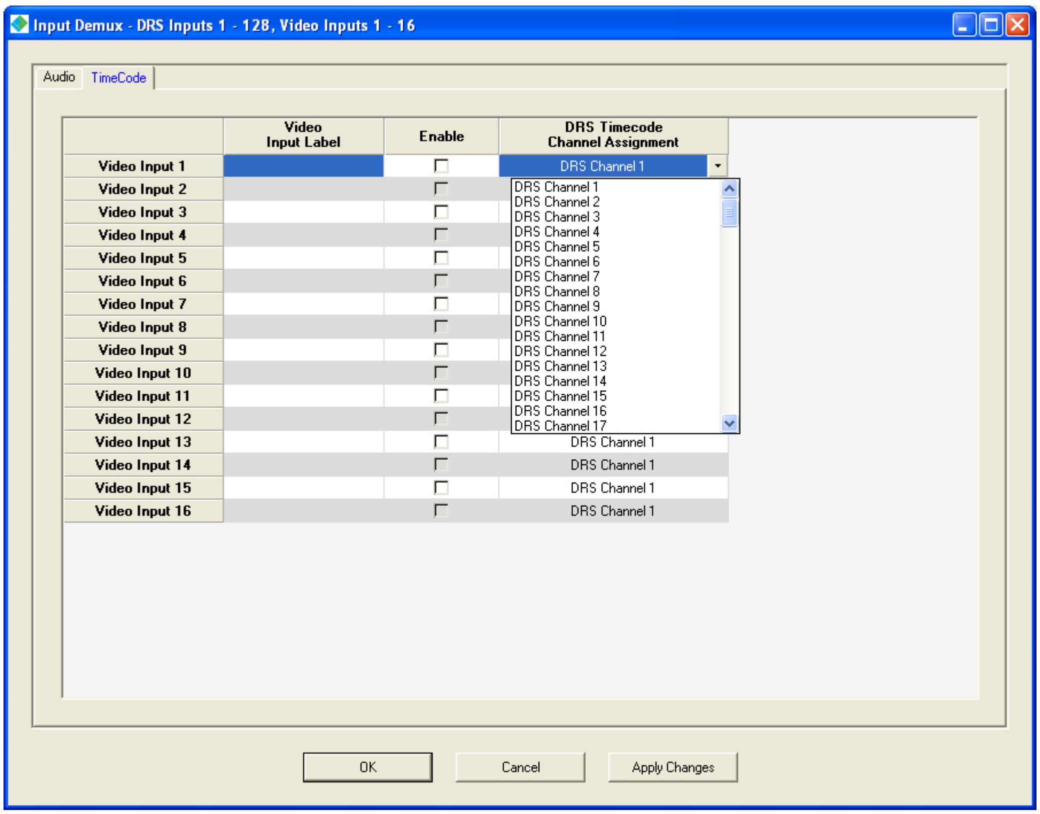


Figure 5-11 Demux Timecode Channel Assignment

5.7 OUTPUT MUX CARD CONFIGURATION

Each Cheetah Output MUX Card provides 16 SDI video outputs derived from any input source to the video matrix router. The audio MUX portion of the card allows up to four groups of digital audio to be embedded into each video output signal (HD and 3G-SDI only). Each group can contain up to four individual signals, for a total of 16 possible embedded audio signals on each video output. Audio signals for embedding are derived from the DRS audio router in the form of groups, each containing four audio output signals. Audio groups can be “built” by the user through GUI setup screens to contain any four DRS audio sources.

Just as the input DEMUX card is another type of DRS audio input frame, the output MUX card is basically another type of DRS audio output frame. This frame is a single block of 128 output signals - with one very important difference. While you may select up to 128 signals from DRS sources, through the GUI setup screens for the MUX card you will always combine four individually selected output signals into an audio group for embedding.

The 128 audio signals feeding an output mux card are DRS audio output channels, and are embedded into video by DRS Group Assignment. Any available DRS audio source may be routed to DRS output channels for embedding within the video. This allows you to assign up to 32 embed groups from any available DRS sources, with each group composed of four numerically sequential DRS output channels. Each embed group is referred to as a ***DRS Group Assignment***, and is identified in the GUI by the four output channel numbers that form it. Group assignments are pre-defined, beginning with outputs 1 thru 4, continuing with outputs 5 thru 8, 9 thru 12, etc., up to embed group 32 composed of output signals 125 thru 128. To form the embed group identified as ***DRS Channel 1-4***, you would route the first audio input signal you wish to include in the group to DRS output 1, the second signal to output 2, etc. Remember, embed groups are not assigned a group number nomenclature, but are identified by the output channels of which they are composed.

As an example, let's assume that you wish to embed DRS input signals 31, 32, 151 and 152 onto video output 1 as its first audio group. Through the *router configuration file* you would route DRS physical input 31 to physical output 1, input 32 to output 2, input 151 to output 3 and input 152 to output 4. This action "builds" embed group DRS Channel 1-4 containing the four desired signals. Through the GUI MUX setup screen, we can assign DRS Channel 1-4 for embedding to any audio groups on any video output signals we wish.

5.7.1 OUTPUT MUX PARAMETERS SCREENS

Clicking the I/O Attributes Setup button from the Output Mux card attributes screen opens the Output MUX Parameters Screen as shown in Figure 5-12. The left-most column, labeled ***Ch. #***, is a list of 128 sequential numbers that correspond to the DRS output channel number of audio signals contained in each DRS Group Assignment. Remember that audio signals are always grouped by four to form a group assignment. Notice the second column, identified as ***Output Label***, contains a series of boxes that each span four output channel numbers. The four numbers are the four signals that comprise the DRS group assignment. Embed groups are not assigned a group number nomenclature, but are identified by the output channels of which they are composed.

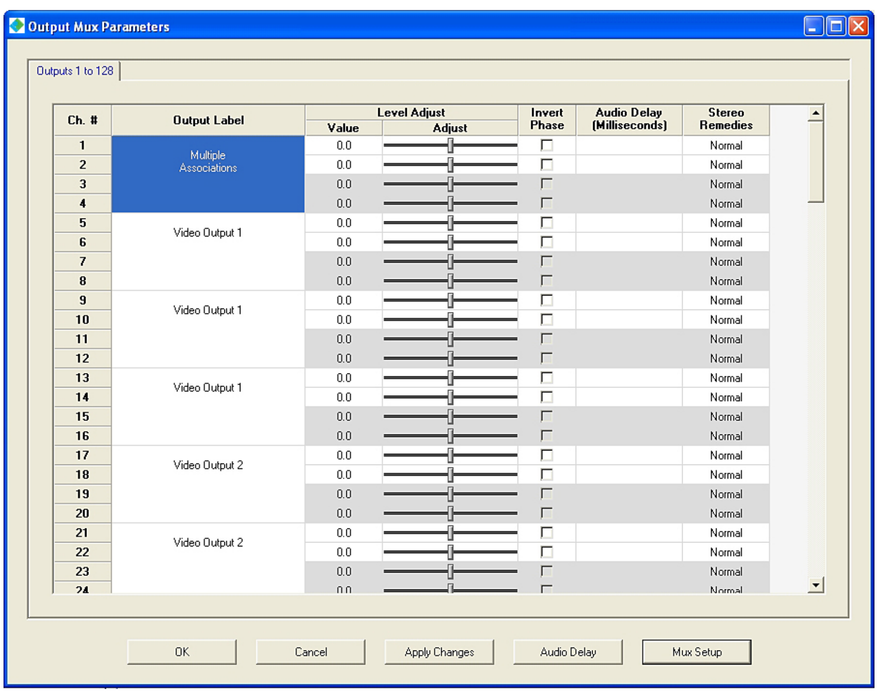


Figure 5-12 Example Output MUX Parameters Screen

On our example screen notice that channel numbers 1 thru 4 span one entry in the second column – under the heading of Output Label. The label displayed in the box indicates into which video output the four channel group is embedded. The term *Multiple Associations* displayed for DRS group assignment 1 – 4 indicates the embed group has been selected for embedding into more than one video output signal. Channels 5 – 8 (DRS group assignment 5 – 8) in our example screen are shown only associated to Video Output 1. This means that the embed group composed of DRS router output signals 5 thru 8 has been selected for embedding into one of the audio groups only on Video Output signal 1. Likewise, the embed group composed of router output signals 9 thru 12 is also selected for embedding into one of the audio groups on Video Output 1. Note that the display in the Output Label box does not identify into which output group of the indicated video signal the audio will be embedded, only that it will be embedded onto either a specified or multiple video output signals. Selections made on the MUX Setup Screen determine into which specific group of the output signal a given embed group will be embedded. Just as with the Input DEMUX screen, if an identification label has been entered for a particular video signal on the setup screen, that label will appear in the box along with the output channel number identifier if that signal is associated with a single embed (DRS Group Assignment) group.

Also on the example screen, we see that each audio channel is listed on an individual row for audio adjustment functions. Notice that beginning with the *Level Adjust* columns, and continuing through all of the remaining audio adjustment columns, two channels are always paired, as indicated by alternating row colors. The two audio channels contained in the pair are said to be *adjacent* channels. On our example input screen, adjacent channels 1 and 2 are paired, as are channels 3 and 4, etc. Remember that each channel of the pair represents a separate, independent physical input to the router – derived from the indicated audio group.

In many applications adjacent channels are related, such as left and right audio for stereo. Even though it is a common application, it is not necessary that the paired signals be related – each may carry totally independent audio sources; however, the two channels indicated as paired by the colored rows are always treated as adjacent channels. This is an important consideration in certain of the audio attribute adjustments – such as stereo remedies. In our example input screen channels 1 and 2 are adjacent channels, 3 and 4 are adjacent channels, etc. But, channels 2 and 3 are NOT adjacent channels, nor are channels 4 and 5, and so on. The importance of this is covered in the paragraph on stereo remedies, but for now just grasp the concept of which channels are adjacent – and which are not. Adjacent channels are always shown as paired by the alternating row color.

Each audio signal may be individually set for level, phase inversion and delay. Stereo remedies may be applied to paired adjacent signals. Paragraph 4.8 contains procedures for performing audio channel adjustments.

5.7.2 OUTPUT MUX SETUP SCREEN

Clicking the Mux Setup button on the Output MUX Parameters Screen, as shown in Figure 5-12, opens the Output Mux Setup Screen. It is from this screen that DRS output channel groups are selected for embedding into video output signals by associating a DRS Group Assignment with the desired video output signal, and audio group of that signal. An example Mux Setup Screen is shown in Figure 5-13. Notice the header at the top of the screen identifies the DRS output channel number range and the channel number of the video outputs selected through this screen. In our example we are selecting groups of DRS outputs 1 – 128 for embedding into video outputs 1 – 16. The tabs labeled Audio and TimeCode at the top of the setup screen select the type of embedded data being configured. The following example pertains to audio signals.

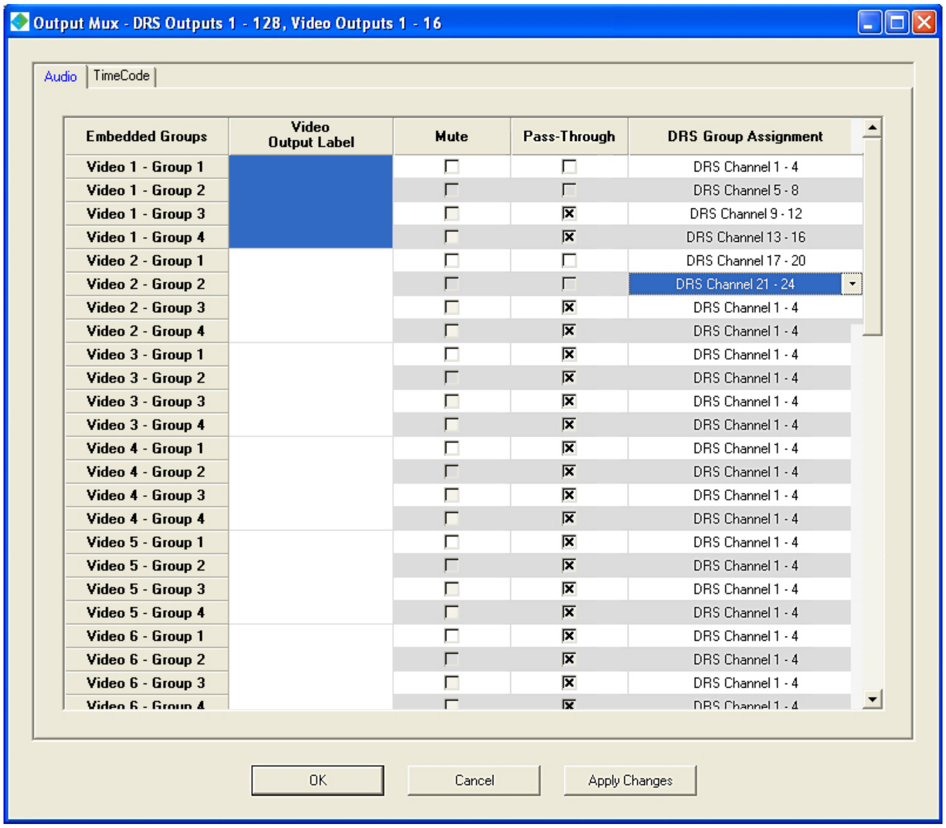


Figure 5-13 Example Output MUX Setup Screen

The left-most column, labeled ***Embedded Groups***, contains entries for each physical video output channel, with an entry for each of that channel's four embedded audio groups. The second column, ***Video Output Label***, allows you to enter any text you wish identifying the video output signal – such as VTR1, NET2, etc. Usually this label is the name of the video destination, but you are free to enter any descriptive label you wish. When a label is present in this box, it will also appear on the Mux Parameters Screen along with the video output channel number to identify the video channel embedded with the indicated DRS Group Assignment. When you have entered labels for all desired outputs, click on the **Apply Changes** button, Figure 5-13, to apply the functions to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

The ***Mute*** column contains checkboxes that may be selected or deselected by mouse click. When a check is present in the box, all audio signals in the indicated group on the indicated video output signal will be replaced with silence data. This data replacement occurs regardless of whether or not a DRS group assignment is associated to the embed group. Deactivate the mute function and restore output audio signals by removing the check from the box.

The ***Pass-Through*** column contains a checkbox for each audio embedding group of each video output signal. When a check is present in the box, all audio signals in the indicated group present on the video signal as it enters the output MUX card will be passed through the card unaltered, regardless of any channel assignments that may be displayed in the DRS Group Assignment column for the indicated group. Mute may not be selected for the group when Pass-Through is selected.

When you have selected or deselected the mute and pass-through functions for all desired audio groups, click on the **Apply Changes** button, Figure 5-13, to apply changes to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

The DRS Group Assignment column is where the association is made between audio embed groups and the video outputs and specific audio groups of that output on which you wish to embed the selected DRS group assignment. The default assignment for all groups is None, meaning that no audio will be embedded into the indicated output group. In order to assign an audio group for embedding, click in the DRS Group Assignment box on the row of the desired video signal and output group to open the pull-down menu as shown in Figure 5-14. Highlight the DRS channel group you wish to embed into the indicated audio group and click to complete the selection. The group channel assignment is now shown in the box. In our example screen we have associated the four audio signals on DRS physical outputs 1 thru 4 for embedding into group 1 of physical video output 1. When you have completed DRS Group Assignment associations for all desired audio output groups, click on the **Apply Changes** button, Figure 5-14, to apply the functions to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

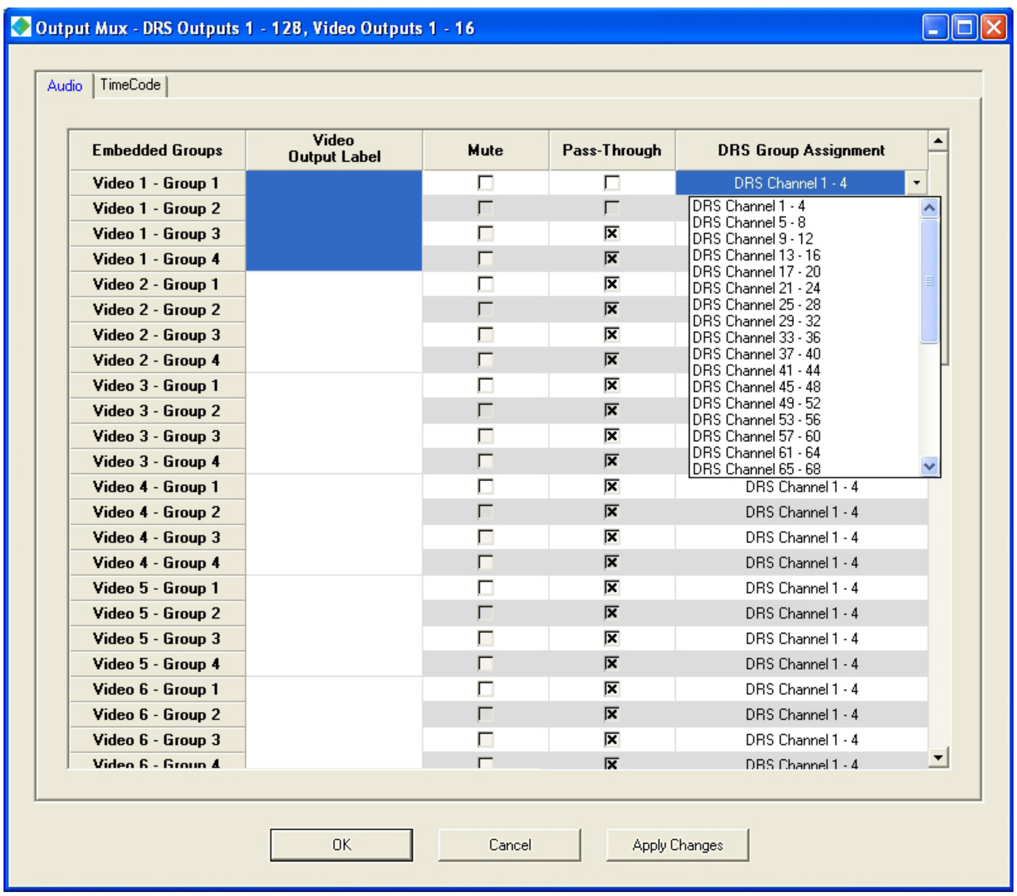


Figure 5-14 Group Assignment Menu

5.7.3 MUX TIMECODE PAGE

In addition to embedded audio, each SDI video output may also have timecode data embedded as ancillary data into the signal. Access the timecode configuration page by clicking the *TimeCode* tab at the top of the Mux page display. Through the Mux Timecode page, Figure 5-15, you may select a DRS output destination channel as the signal source for embedding into the timecode data of the video output signal. Each video signal can only have one timecode signal embedded. When the *Enable* box for a video output signal listed in the left-hand column on the Mux Timecode page is checked, Mux card circuitry embeds the timecode signal present on the selected DRS output channel into the enabled video output signal.

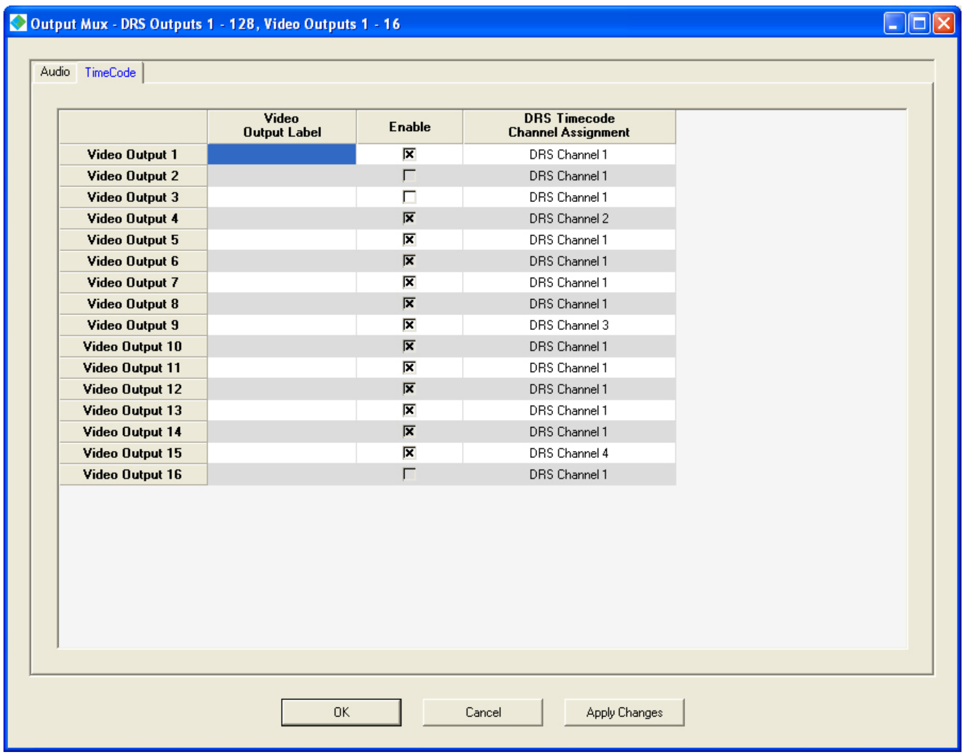


Figure 5-15 Mux Timecode Page

The *DRS Timecode Channel Assignment* column is where the output channel is selected. When you click in the channel assignment cell for the enabled video, a pull-down list, as shown by Figure 5-16, is displayed. This list contains the DRS output channels mapped to the Mux card. You may associate the video output signal to any DRS output channel in the list. Anytime you use a DRS output channel for timecode all of the channels in that DRS assignment group are dedicated to timecode and may no longer be used for routing audio.

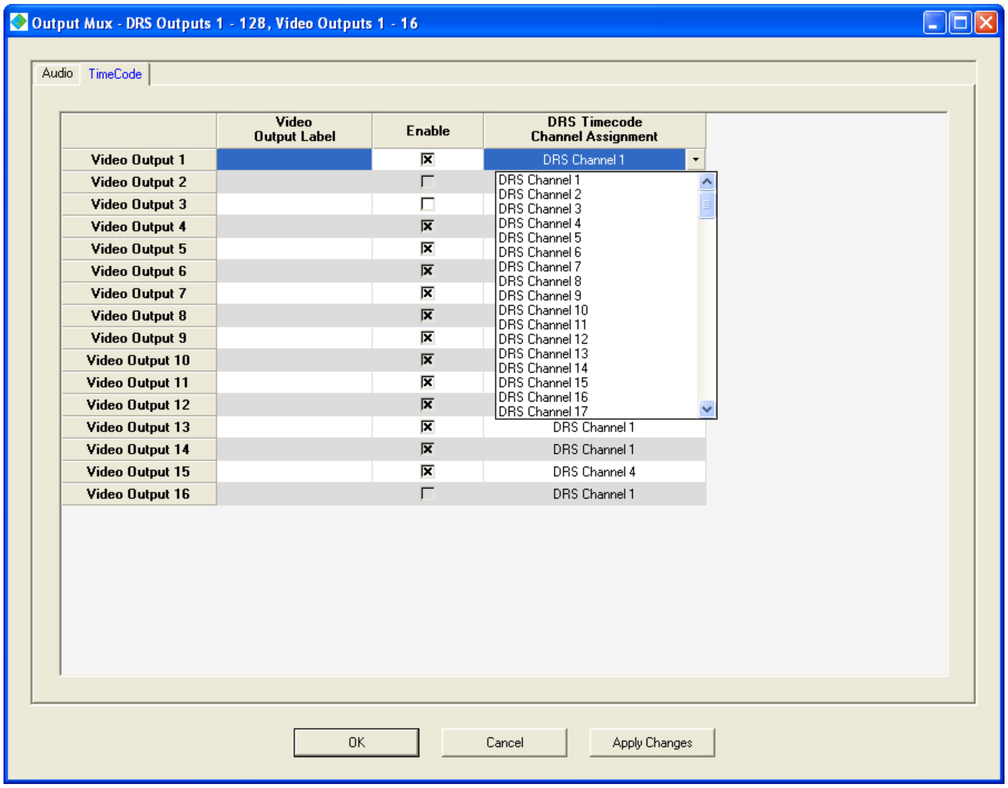


Figure 5-16 Mux Timecode Channel Assignment

5.8 AUDIO ADJUSTMENT AND DIGITAL SIGNAL PROCESSING FUNCTIONS

Each individual DRS input or output signal may be adjusted for signal level, phase inversion and delay; and stereo remedies may be applied to any pair of adjacent channels. Controls on the screen function identically when setting up a DEMUX board or a MUX board, refer to Figures 5-7 and 5-12.

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

5.8.1 CHANNEL LEVEL ADJUSTMENT

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

5.8.2 PHASE INVERSION OPTION

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

5.8.3 AUDIO DELAY OPTION

Audio Delay allows you to apply a delay factor to an audio signal channel. Audio channels to delay and delay values are selected through the Delay Setup Screen. To access the Delay Setup Screen, click on the "Audio Delay" button at the bottom of the DEMUX or MUX parameters screen, as shown in Figure 5-17. A DRS AES audio input board is used for this example screen, however, the audio adjustment columns are identical between all DRS audio boards. Clicking the button will bring up the Delay Setup Screen, Figure 5-18. The delay setup screen is identical in appearance and function for all DRS audio board types.

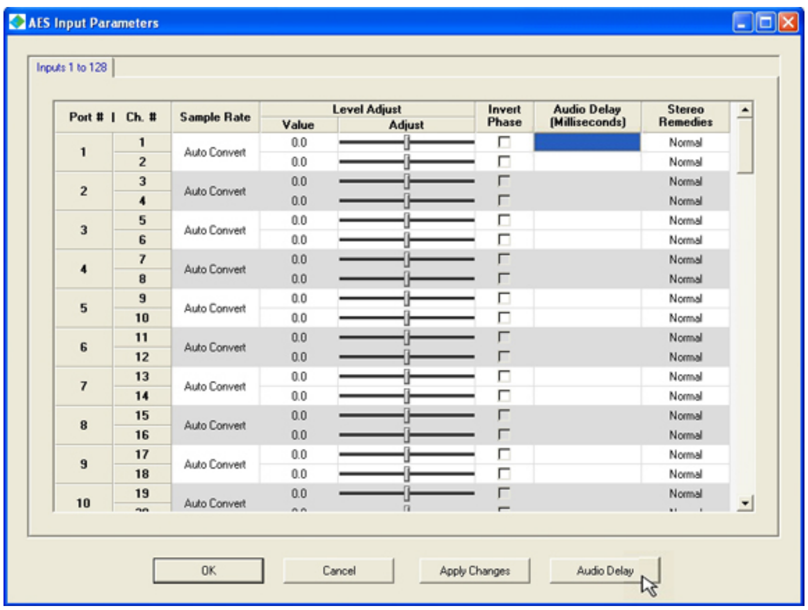


Figure 5-17 Location of Audio Delay Button

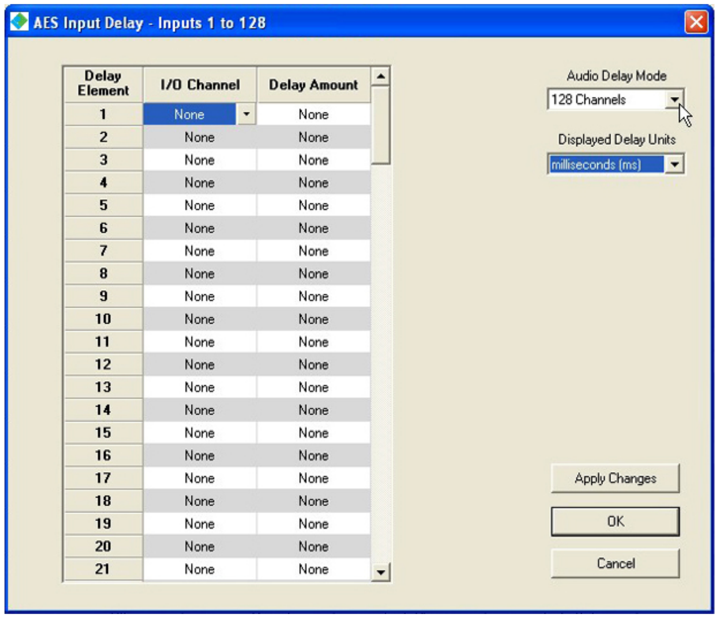


Figure 5-18 Delay Setup Screen

Refer to Figure 5-18 as we discuss the Delay Setup Screen. The leftmost column is labeled Delay Element, the next column is labeled I/O Channel and the third column is labeled Delay Amount. Two drop-down menus are located on the right side of the screen – these are the Audio Delay Mode menu and the Displayed Delay Units menu.

The selection you make from the Audio Delay Mode menu determines how many Delay Elements are available for assignment and also determines the length of delay available to a channel. Figure 5-19 shows the expanded Delay Mode Menu. Options available from the drop-down menu are 128 channels, 64 channels and 32 channels.

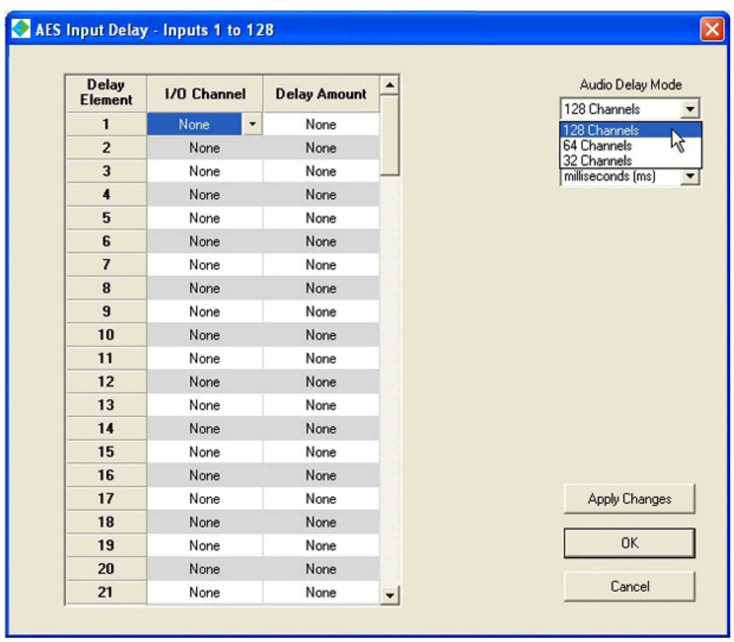


Figure 5-19 Delay Mode Menu

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

More on this, but for now let’s look at the next drop-down menu – the Displayed Delay Units menu, Figure 5-20. The selection you make in this menu determines by what unit of measure the delay time is displayed. You may display the delay in terms of NTSC video frames, PAL video frames or in milliseconds. Simply click the unit you wish to use. The selection will be highlighted.

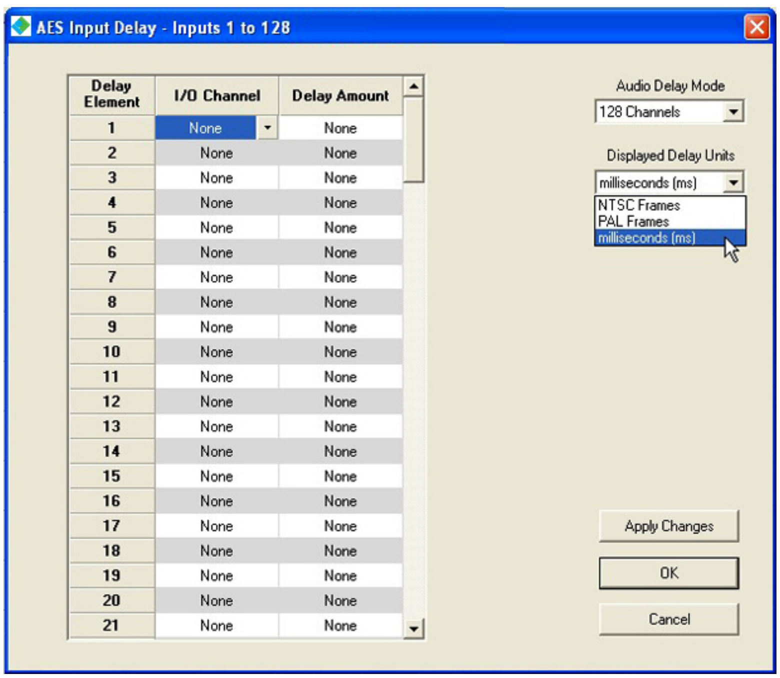


Figure 5-20 Displayed Delay Units Menu

From the previous paragraph we see there is a direct correlation to the number of delay elements we allocate and the amount of delay available to each. Table 5-1 shows the range of delay time that can be selected for each delay element for each of the Audio Delay Mode options. The table also lists the delay times in all three of the available display units.

	NTSC Frames	PAL Frames	Milliseconds
128 Channels	0.160 – 10.230	0.133 – 8.533	5.333 – 341.333
64 Channels	0.160 – 20.460	0.133 – 17.067	5.333 – 682.667
32 Channels	0.160 – 40.919	0.133 – 34.133	5.333 – 1365.333

Table 5-1 Delay Times for Available Channel Options

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

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

To apply delay to an audio channel choose a delay element (delay line) and open the I/O Channel drop-down list on the row of the desired element by clicking in the box as shown in Figure 5-21. The menu listing allows you to select the physical input or output of the audio frame, depending on frame type, you wish to delay. Use the scroll bar to locate the channel number and click the entry to select it. The channel number assigned is displayed in the box.

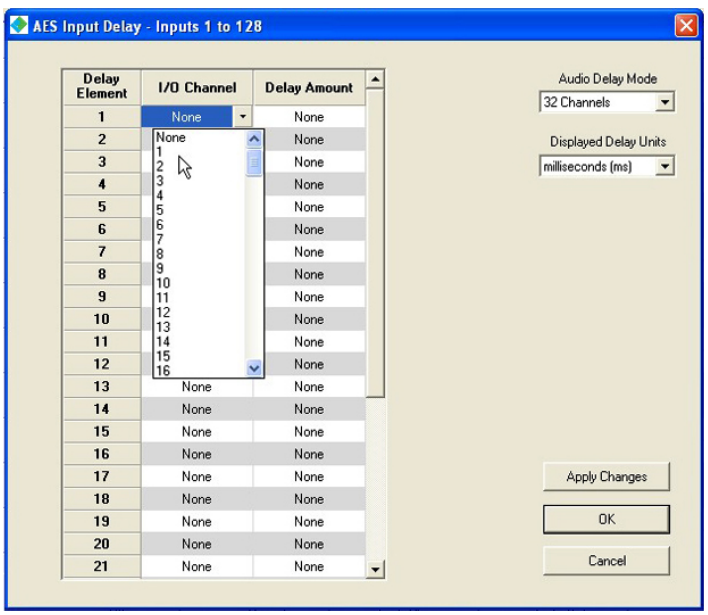


Figure 5-21 I/O Channel Listing

Use the Delay Amount drop-down menu to select the amount of delay you wish to apply to the audio channel as shown in Figure 5-22. The values shown in the menu are displayed in the units you chose in the Displayed Delay Units menu. Use the scroll bar to select the value and click the entry to select it. The delay time is displayed in the box.

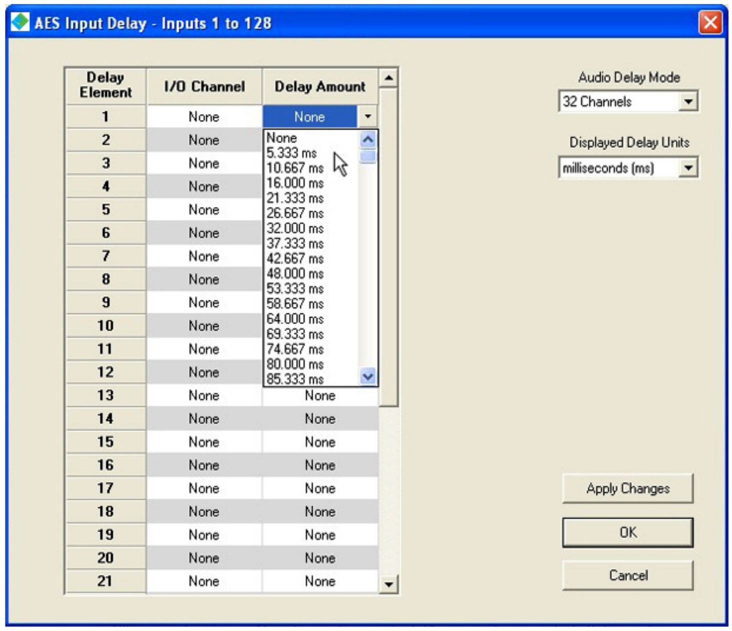


Figure 5-22 Delay Amount Menu

Repeat this process for all channels to which you wish to apply a delay. Once all delay assignments are made, click on the **Apply Changes** button, Figure 5-23, to apply the delay times to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the settings. Figure 5-23 illustrates a delay setup screen with delay assigned to various channels.

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

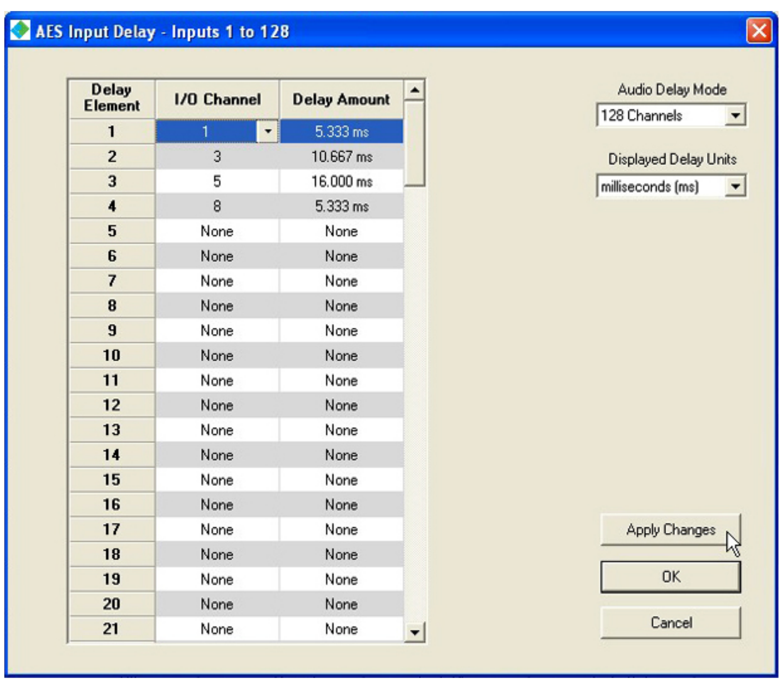


Figure 5-23 Example Delay Setup Screen

Both the I/O Channel box and the Delay Amount box have associated right-click menus. These are shown in Figures 5-24 and 5-25. Each menu function is discussed in the following chart:

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

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

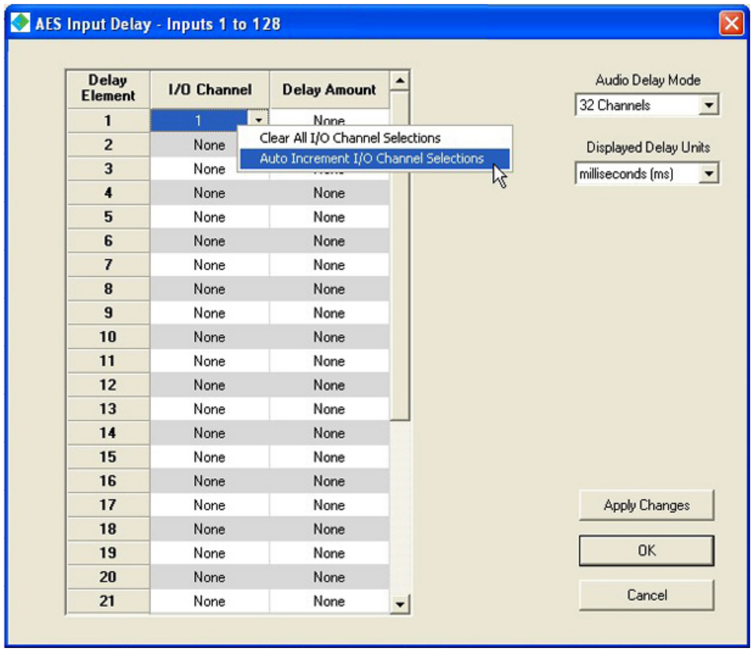


Figure 5-24 I/O Channel Right-Click Menu

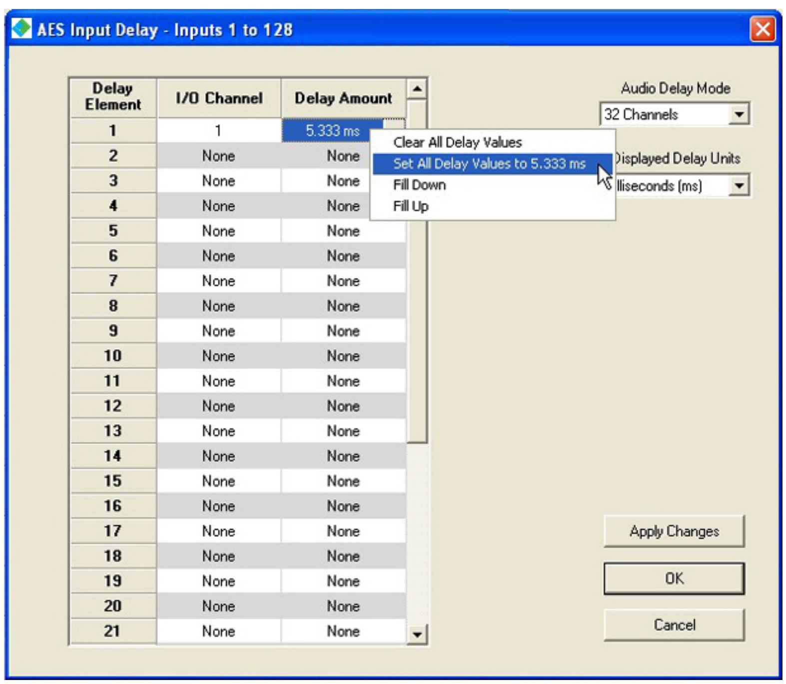


Figure 5-25 Delay Amount Right-Click Menu

5.8.4 STEREO REMEDIES OPTIONS

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

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

To access Stereo Remedies, click in the cell of the Stereo Remedies column on the row of the audio channel you wish to modify. Our example screen, Figure 5-26, shows the remedies menu selected for physical router input 641 on an analog input board. The menu choices are the same for all input and output boards. Each selection option is discussed below:

- **Normal** applies no change to the paired channels.
- **Swap** replaces the input signal for the selected channel with the audio signal from the adjacent channel. In the example screen, clicking Swap would cause the signal on physical input 641 to not be routed through channel 641 to the matrix. Instead the audio from input 642 would become the audio routed through channel 641. The audio from input 642 is also routed through channel 642 as normal – provided the remedies selection for channel 642 is Normal. If we select the Swap function in both channels of the pair, the inputs are totally swapped, meaning that the input signal on physical input 641 is routed through channel 642 and vice-versa.
- **L+R** adds the adjacent channel to the selected channel. Again in our example screen, if we select the L+R option for channel 641, audio from physical input 642 is summed with audio from physical input 641 and routed through the matrix as a mixed signal. The signal on channel 642 is not altered and is still available for routing through the matrix. If we select the L+R function for both channels of the pair, we will derive two identical signals, both of which are a summation of physical inputs 641 and 642.
- **L-R** subtracts the second signal of an adjacent pair from the first signal of the pair and routes the stereo difference signal as the output of the selected channel. Remember that the first signal of an adjacent pair is processed as the left channel audio and the second signal is processed as the right channel audio. For example, if we select the L-R option for channel 641, audio from physical input 642 is subtracted from audio of physical input 641 and the difference signal is routed through the matrix on channel 641. If we select the L-R option for channel 642, the algorithm performs exactly the same function - audio from physical input 642 is subtracted from audio of physical input 641 (right audio is subtracted from left audio) and the difference signal is routed through the matrix on channel 642. In this instance, the signal on channel 641 is not altered and is still available for routing through the matrix. If we select the L-R function for both channels of the pair, we will derive two identical difference signals, both of which are the audio from input signal 642 subtracted from audio input signal 641.

When you have entered stereo remedies for all desired channels, click on the **Apply Changes** button, Figure 5-26, to apply the functions to the channels and keep the setup screen open for further entries. If you wish to apply your settings and exit the screen, click the **OK** button. **Cancel** exits the screen without applying the changes.

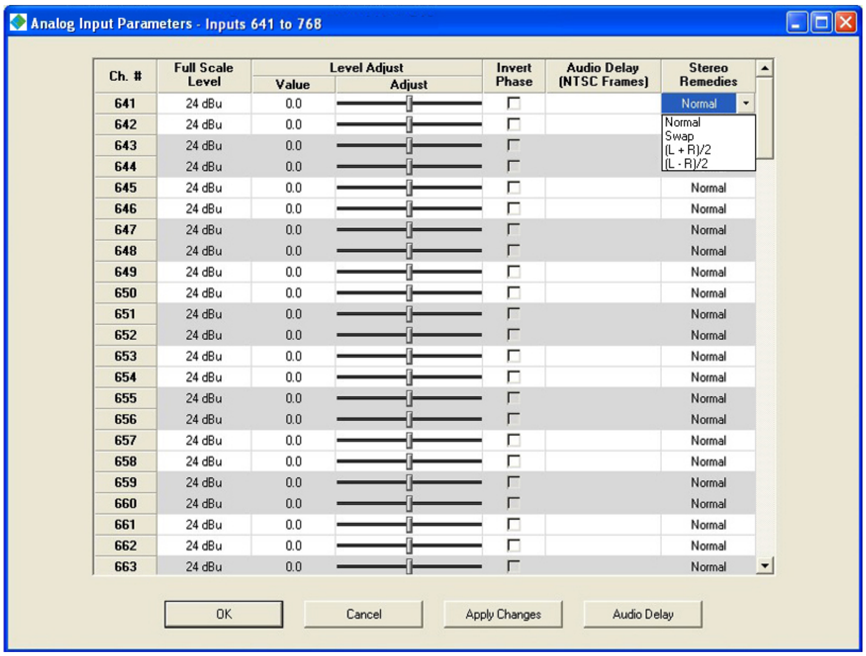


Figure 5-26 Stereo Remedies Menu

5.9 SAVE AND LOAD AUDIO BOARD PARAMETERS

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

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

- From the list of channel groups under the DRS Matrix Frames directory tree, select the channel group for which you wish to create an audio data file. Only one file is generated, regardless of the number of DXE frames or frame controllers in the group, but this single file contains audio setting data for all audio boards associated with the channel group.
- This will bring up the DRS Home Screen for the channel group.
- Right click on the highlighted channel group entry in the DRS Matrix Frames directory tree. The menu shown in Figure 5-27 is displayed.

- Select the “Save I/O Board Data” option from the menu.
- You will not be prompted to enter any file data. The audio data file is saved to the directory on the host PC containing the executable file for the P2K GUI. The file is saved with a filename derived from the channel group nomenclature, followed by a .dat extension. Our example screen, Figure 5-28, shows the audio data file we just created saved in the directory named P2K GUI with the filename IP-192.168.3.201.dat. This naming convention is always used when saving audio data files.
- Repeat this procedure for all channel groups in the system by selecting the channel group from the DRS Matrix Frames directory tree.
- Each audio data file is saved into the directory with a filename that allows easy identification of the channel group used to generate it as shown in Figure 5-28.

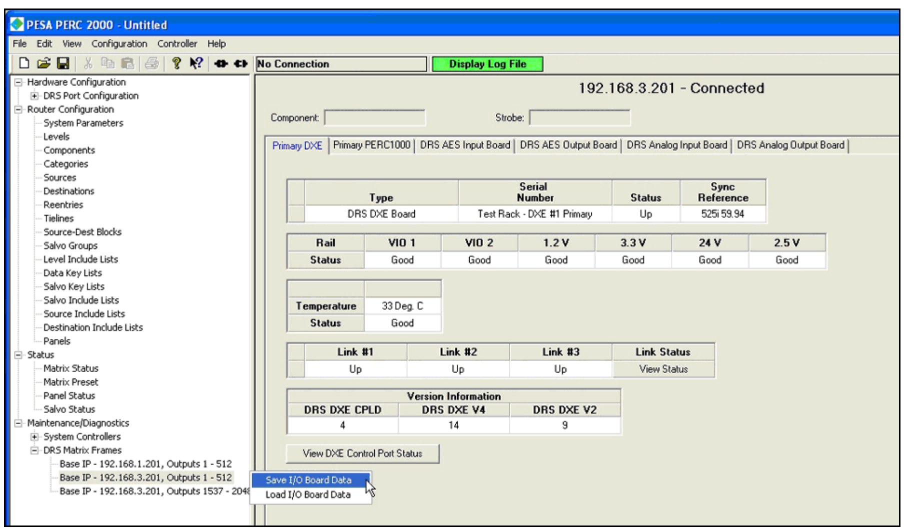


Figure 5-27 Audio Data Save and Load Commands

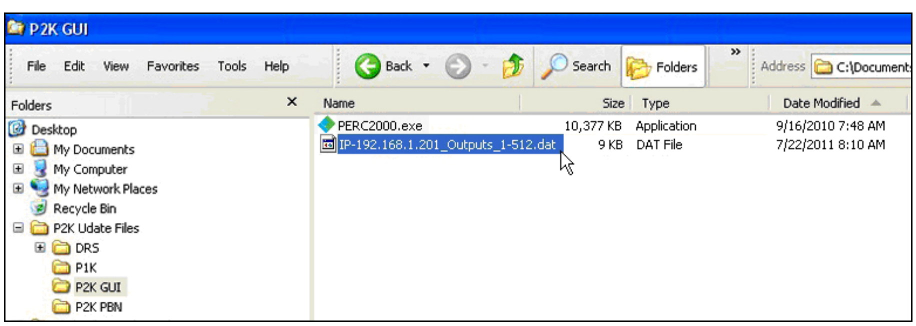


Figure 5-28 Audio Data Filename Location and Structure

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

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

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

- From the list of channel groups under the DRS Matrix Frames directory tree, select the channel group for the DXE frame on which you wish to load an audio data file.
- This will bring up the DRS Home Screen for the channel group.
- Ensure that the audio data file with the filename of the channel group you selected in the directory tree is available in the P2K GUI application folder.
- Right click on the highlighted channel group entry in the DRS Matrix Frames directory tree. The menu shown in Figure 5-27 is displayed.
- Select the "Load I/O Board Data" option from the menu.
- You will not be prompted to enter any file data. The audio data file is read from the directory on the host PC containing the executable file for the P2K GUI.
- Audio data will load and can be verified by checking the setting and parameters on the audio setup screens.
- You may repeat this procedure for all channel groups in the system, selecting the desired group from the DRS Matrix Frames directory tree.

5.10 ACCESSING INTERNALLY GENERATED SIGNALS

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

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

Chapter 6 In the Event of Trouble

6.1 CUSTOMER SERVICE

If you have any questions or problems with your Cheetah MUX or DEMUX System Cards, contact the PESA Customer Service Department:

By E-Mail – service@pesa.com

By Phone – 256-726-9222 (24/7)

6.2 PERIODIC MAINTENANCE

No periodic maintenance is required.

6.3 PESA SERVICE

If you are experiencing any difficulty with a Vidblox module, please contact PESA's Service Department. Skilled technicians are available to assist you 24 hours a day, every day of the year.

6.4 REPAIR

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

	**PC boards in this equipment contain Surface Mount Technology (SMT) components. Special tools and skills 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.**

6.5 REPLACEMENT PARTS

Only parts of the highest quality are 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.

6.6 FACTORY SERVICE

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

PESA