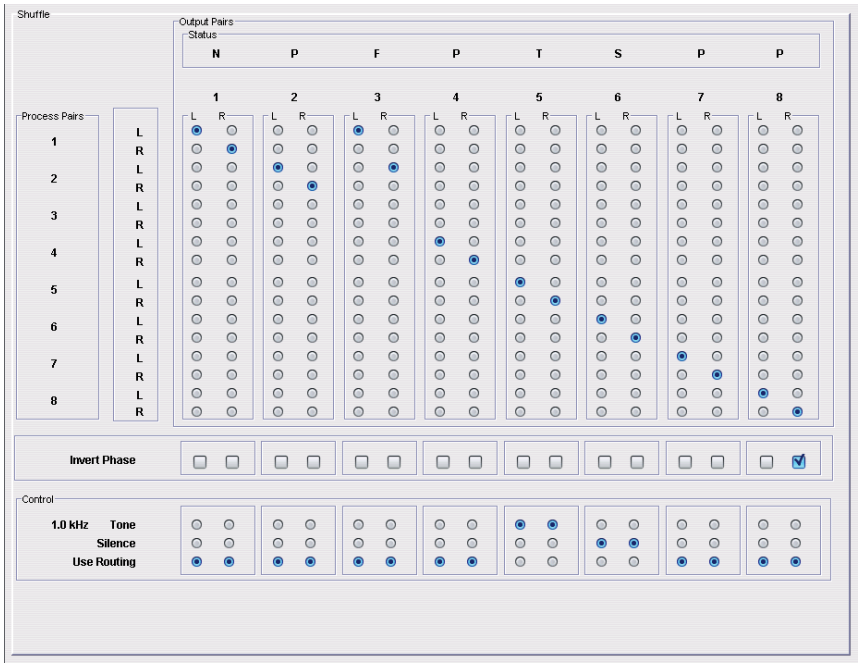
KudosPro Application note 8

Audio Processing

APPLICATION NOTE



Contents Page

Introduction

The KudosPro audio process has been extensively modified in version V1.3. The audio menus can appear daunting and complex at first glance. However, the interface is designed to be intuitive and can be mastered in a relatively short time.

There are various audio menus appearing at both system level and at channel level.

In the System menu there are two submenus:

- Audio Routing

- Audio Control

Each video channel has its own set of audio menus. These are:

- Audio Routing

- Audio Control

- Audio Shuffle

'System' menus control global settings that affect all video processing channels.

'Channel' menus adjust only parameters associate with a particular video channel.

System Audio Menus

Audio routing

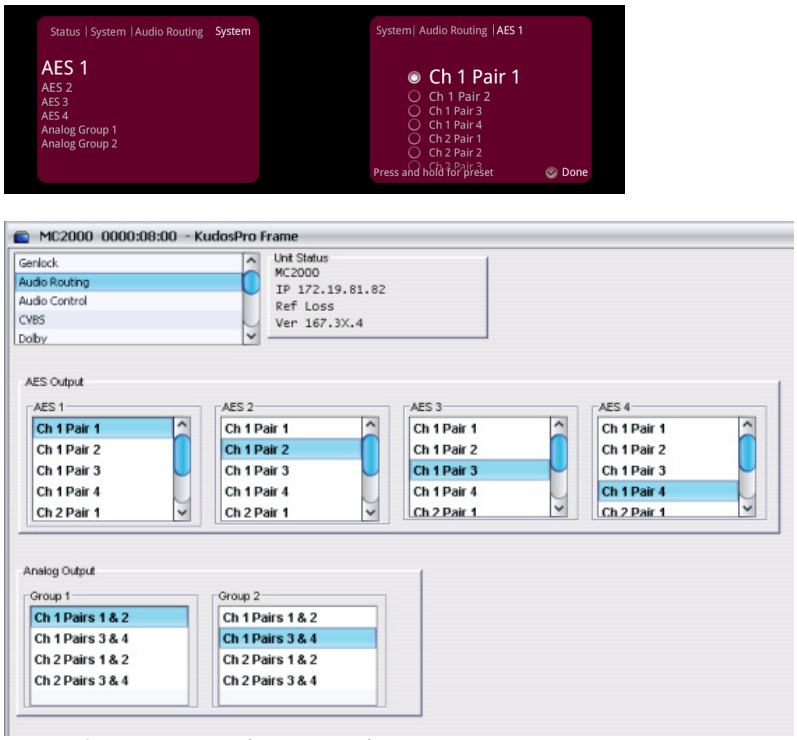


Figure 1: System Menu - Audio Routing submenu

There are two submenus in the Audio Routing Menu:

- AES Output

- Analog Output

AES Output

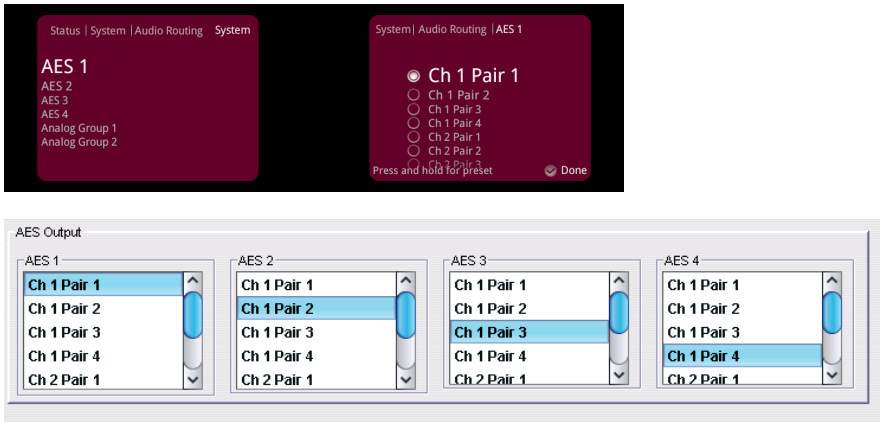
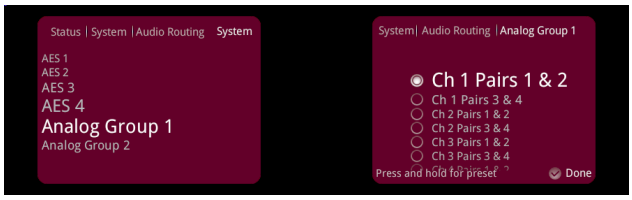


Figure 2: AES Output configuration

The AES outputs are derived from the Embedded Audio Pairs 1 to 4.

This menu allows configuration of which particular embedded audio pair that each AES output (balanced or unbalanced) is derived from.
Note - Only pairs 1–4 from each channel can be routed to the AES output. Pairs 5–8 are not available on the AES Output.

Analog Output



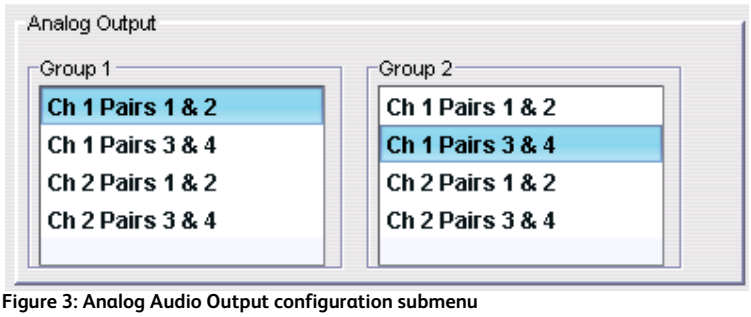


Figure 3: Analog Audio Output configuration submenu

The analog audio outputs can be derived from the embedded audio groups 1 and 2 of any video channel.

Note - Only groups 1–2 from each channel can be routed to the analog output groups. Groups 3- 4 are not available for configuration into the analog output groups.

Audio groups may be comprised of audio pairs from different video channels. The appropriate pairing may be selected in the 'Analog Output Group' selection menu. In the following example Group 1 Analog output has been configured to be derived from Video Channel 3, pair 2 and Video channel 4, pair 2

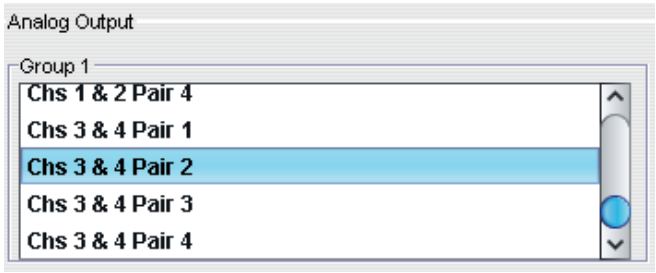


Figure 3a: Analog Audio routing example.

Note: Figure 3a shows an audio menu from a four channel KudosPro unit, such as an LC4000. Analog outputs may be configured any of the four video channels available.

Figure 3 shows the same menu, but for a two channel converter, such as an MC2000. Hence, only video channels 1 and 2 are offered as possible sources of audio for the analog audio output.

Audio Control

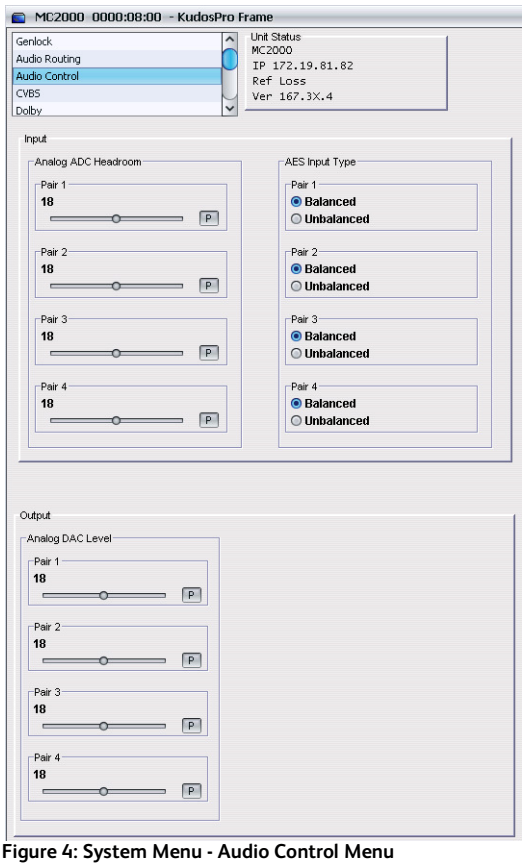


Figure 4: System Menu - Audio Control Menu

There are two submenus in the Audio Control Menu

- Input
- Output

Input

There are two further sub-menus in the 'Input' menu

- Analog ADC Headroom
- AES Input type

Analog ADC Headroom

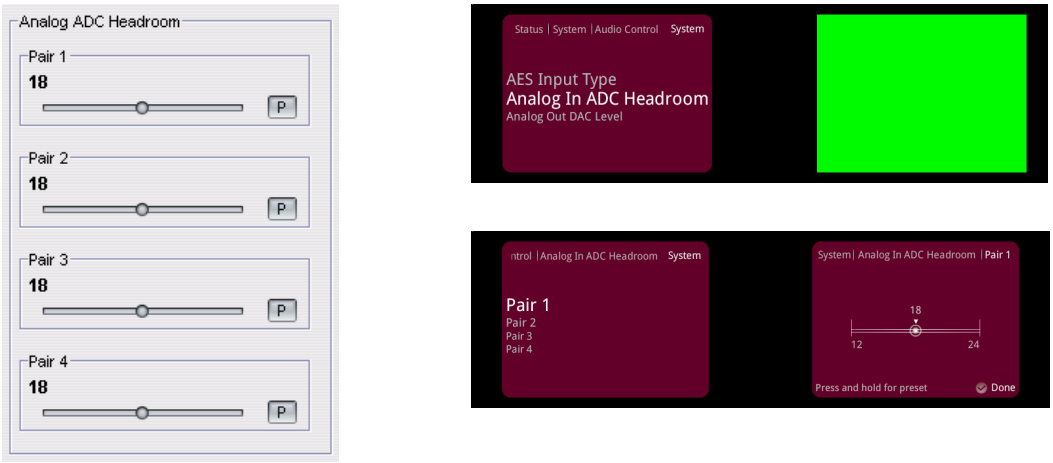


Figure 5: Input Analog ADC Headroom adjustment menu

This sub-menu allows for adjustment of the ADC headroom level for each analog input pair. The adjustment range is 12 dB to 24 dB. The preset value is 18 dB.

AES Input type

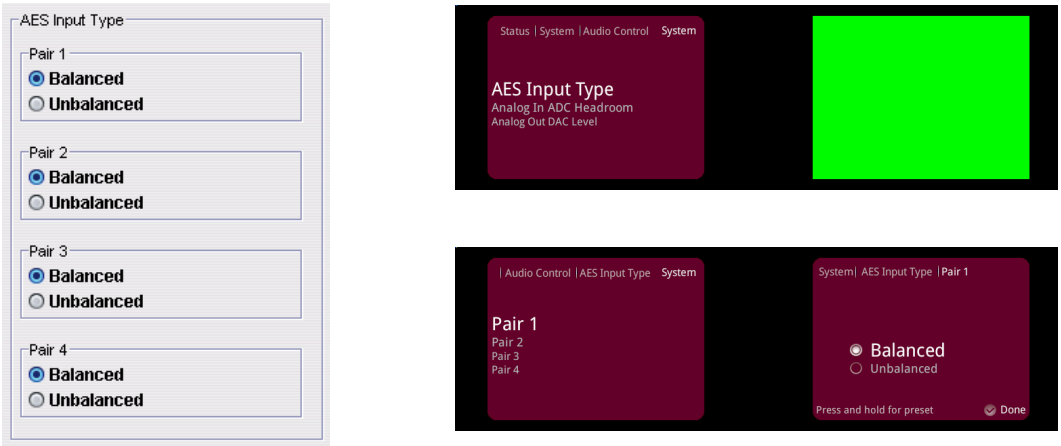


Figure 6: Input AES source type selection menu

This sub-menu is used to select an AES input source from either the balanced or unbalanced input connections (if fitted).

Output

There is only one sub-menu in the 'Output' menu

- Analog DAC level

Figure 7: Output Analog DAC headroom adjustment menu.

This sub-menu allows for adjustment of the DAC headroom level for each analog output pair. The range of adjustment is 12 dB to 24 dB. The preset value is 18 dB.

Channel Audio Menus

Each KudosPro channel has three audio menus associated with it:

- Audio Routing
- Audio Control
- Audio Shuffle

Audio Control Menu

Figure 8: The Channel 'Audio Control Menu'.

Within the Channel audio control menu there are several sub-menus

- Gain
- Tone Frequency
- Delay
- Global Delay

Gain

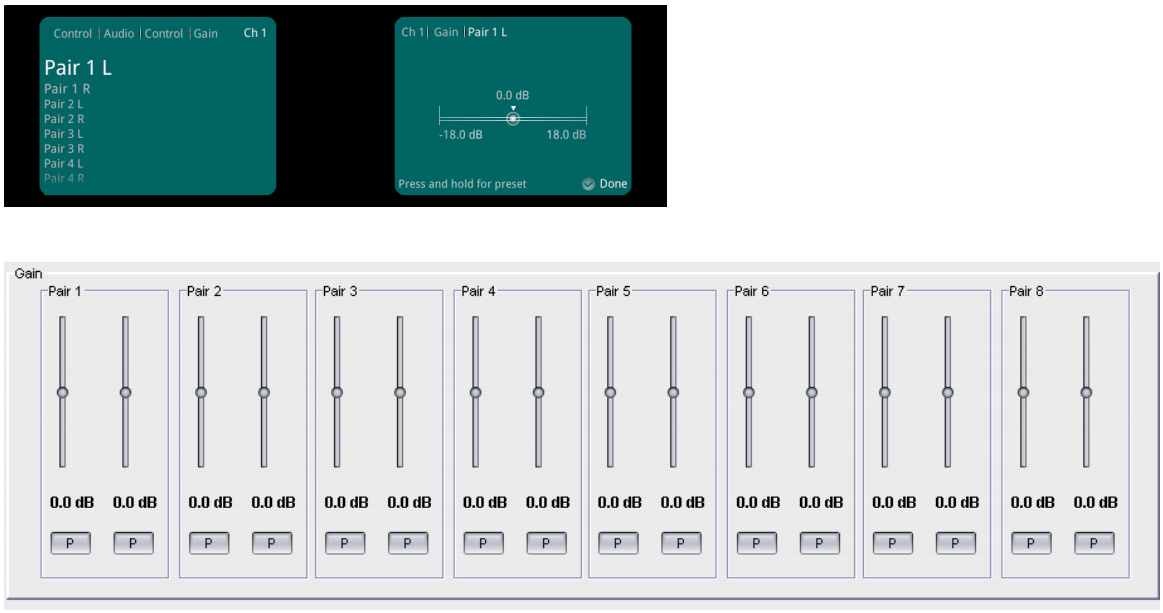
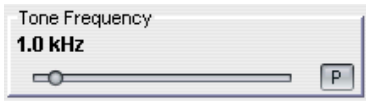


Figure 9: The 'Gain' control menu within the Channel audio Control menu.

This menu allows for audio gain adjustments of the individual audio channels. The adjustment range is -18dB to +18dB in 0.3dB steps. The default value is 0 dB.

Tone Frequency



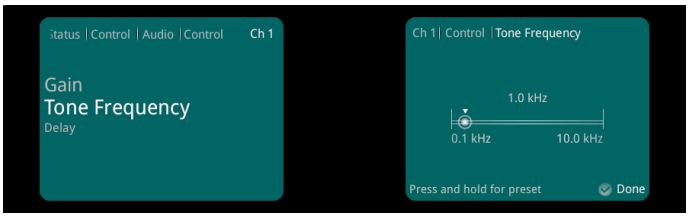


Figure 10: Tone Frequency adjustment control

This control allows the User to set the frequency of the internal Tone Generator. The range of adjustment is 100 Hz to 10 KHz.

Note: Audio Tones are Enabled/Disabled in the Audio Shuffle menu.

Delay

There are two sub-menus in the Delay menu:

- Global Delay Pair Offsets

- Global Delay

Global Delay

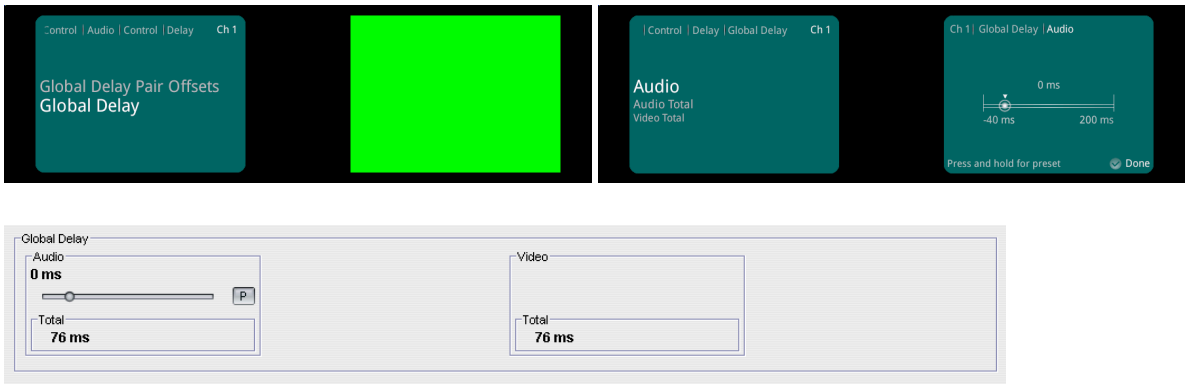


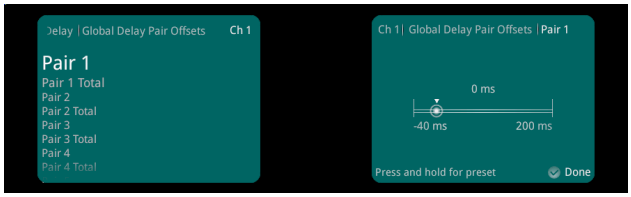
Figure 12: Global Delay submenu

The Global Delay control adjusts the audio delay relative to the video delay. The adjustment range is -40 ms to 200 ms. The preset value is 0 ms.

This control applies the same delay value to all 8 audio pairs.

The actual video propagation delay is also reported in this window. Any adjustment to the audio Global Delay is relative to the video delay.

Global Delay Pair Offsets



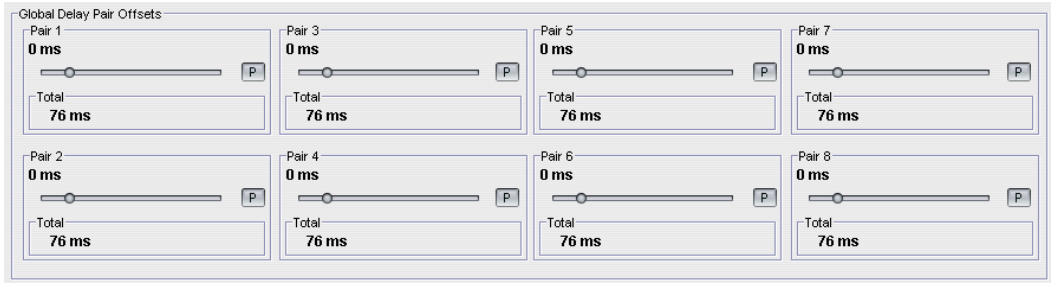


Figure 13: 'Global Delay Pair Offsets' menu

Individual audio pairs may have an audio delay offset applied to them in the 'Global Delay Pair Offset' menu. Any delay set here is added to the Global Delay value. The delay value displayed (Total) for each pair is the 'Global Delay' plus the 'Offset' delay.

Audio Routing and Audio Shuffle

As audio passes through the KudosPro product, it first encounters the 'Audio Routing' process. Here each of the 8 audio processor source pairs are defined. The defined audio pairs are then passed on to the 'Audio Shuffle' process. Here individual channel routing is possible. The 'Audio shuffle' menu also allows individual audio channels to be set to:

- Tone
- Silence (mute)
- Phase inverted

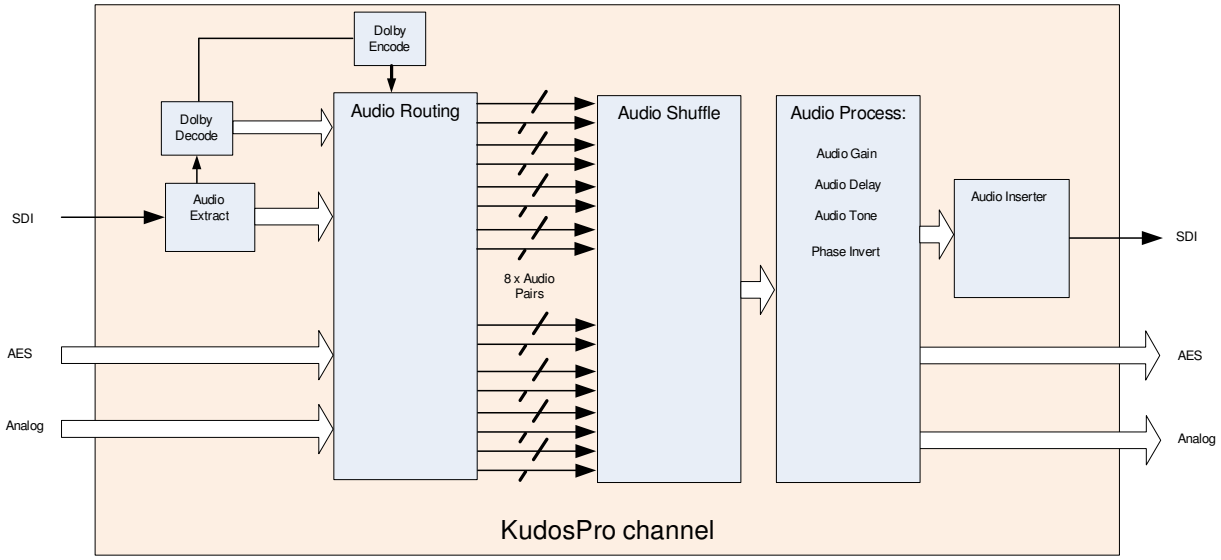
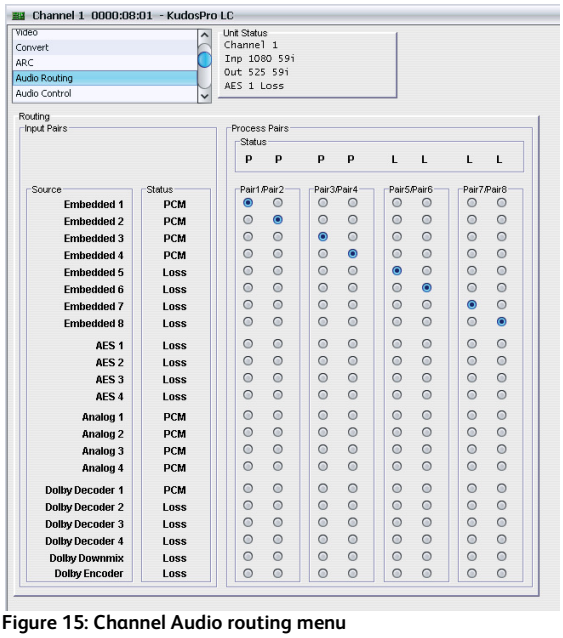


Figure 14: Channel Audio Process block diagram.

Audio Routing



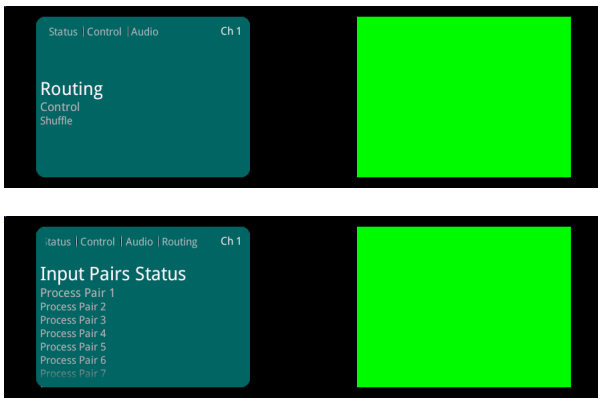
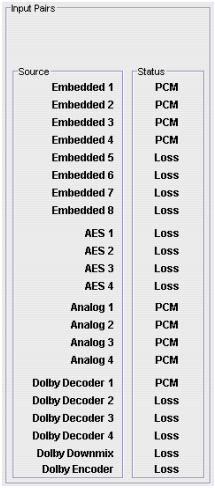


Figure 15: Channel Audio routing menu

The audio routing menu allows the user to define the audio pairs to be passed to the Audio Shuffler. Here audio signals are controlled in 'pairs'.

Source/Status



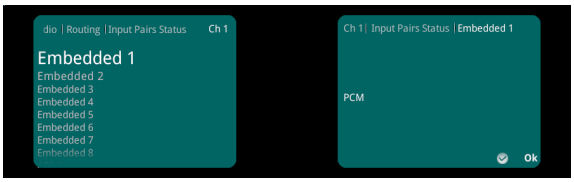


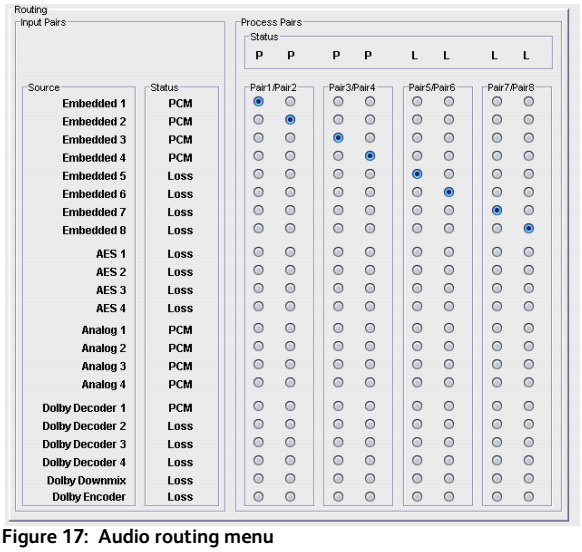
Figure 16: Available audio sources window

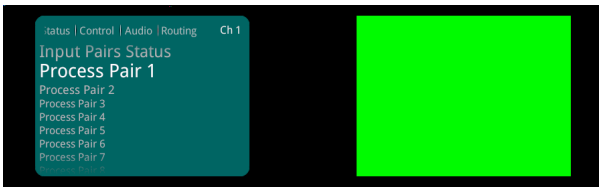
The 'Input Pairs' field shows the possible audio inputs available and the 'status' of these audio inputs.

Note: the analog audio inputs will always report 'PCM' regardless of whether or not audio is present. Any analog input will be converted via an ADC to PCM and then processed as PCM. Hence the 'Status' of the Analog source will indicate 'PCM'.

Note: Dolby Encoder inputs are routed from the Dolby Decoder outputs. If the particular video channel can support the Dolby option, but the option is not installed, the Dolby 'sources' and 'status' will be grayed out. If a particular video channel cannot support Dolby (LC/SV2000 Channel 2, LC/SV4000 Channels 2 & 4) then the Dolby sources will simply not appear.

Routing





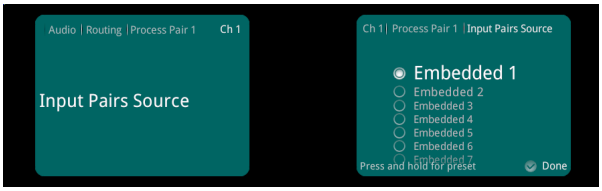


Figure 17: Audio routing menu

The 'Process Pairs' menu allows the input pair to each audio processor to be defined. Figure 17 shows the default settings.

The Processed Pairs 'status' displays the type of audio presented to the audio processor. The possible tags are:

P ……. PCM
L ……. Loss
N …… Non-PCM

Audio Shuffle

The outputs from the audio routing section are then passed on to the 'Audio Shuffle' process.

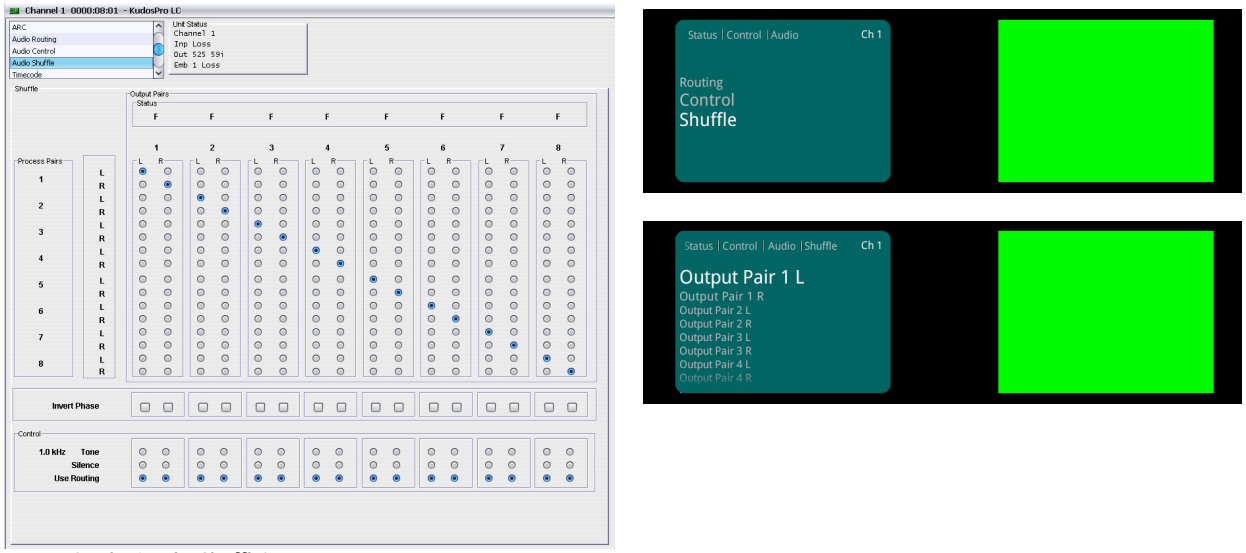


Figure 18 : The 'Audio Shuffle' menu.

Audio Shuffle Configuration

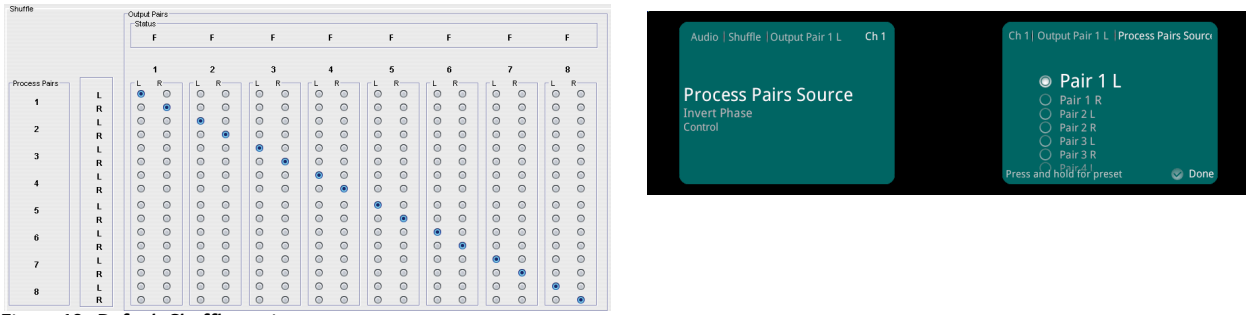


Figure 19: Default Shuffle setting

The eight audio processor pairs (as defined by the audio routing menu) are presented to the inputs to the Audio Shuffle process. The Audio Shuffle menu allows audio channel routing to be defined. The output pairs may be mapped from any audio channel coming from the audio routing process:

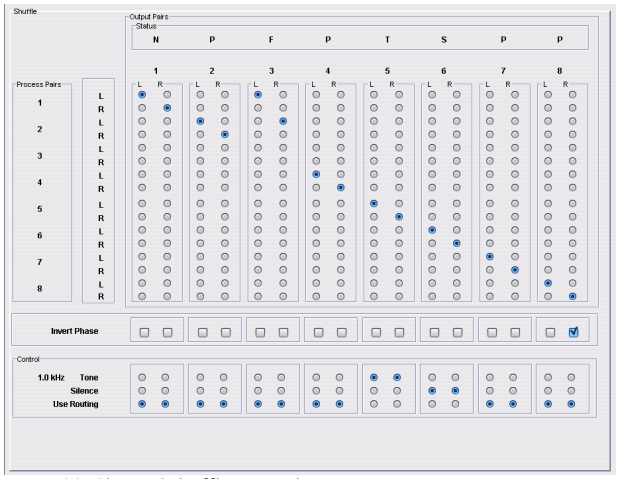


Figure 20: Channel shuffle example

The Audio Shuffle menu allows any configuration of audio channels to be routed to the output. However, a set of rules define what combinations are legal. Illegal combinations will result in the output being forced to silence. An example of this is shown in Figure 20 above.

Output pair 3 has been configured with the left channel derived from a non-PCM pair, and the right channel from a PCM pair. This is deemed illegal and this particular pair has been forced to 'silence'.

The rules that govern the output pair combinations are shown in the following table:

Ch 1 \ Ch 2	non-PCM	PCM	Tone	Silence	Loss
non-PCM	N or F	F	F	F	F
PCM	F	P	P	P	F
Tone	F	P	T	P	F
Silence	F	P	P	S	F
Loss	F	F	F	F	F

See Note below

Pair status is described by one of the following characters

P – Denotes 'PCM'
N – Denotes 'Non-PCM'
S – Denotes 'Silence'
T – Denotes 'Tone'
F – Denotes 'Forced mute' (silence)

Note: if both audio channels of an audio pair have been derived from non-PCM audio channels, there are two possible states: 'N' or 'F'.

To be recognized as valid non-PCM ('N') both channels must satisfy 3 conditions:

1) come from the same input pair

2) have the left and right channels the correct way round

3) not have the phase inverted

A failure of any of these conditions causes the pair to be muted and the status to be reported as "F".

Output Pairs 'status'

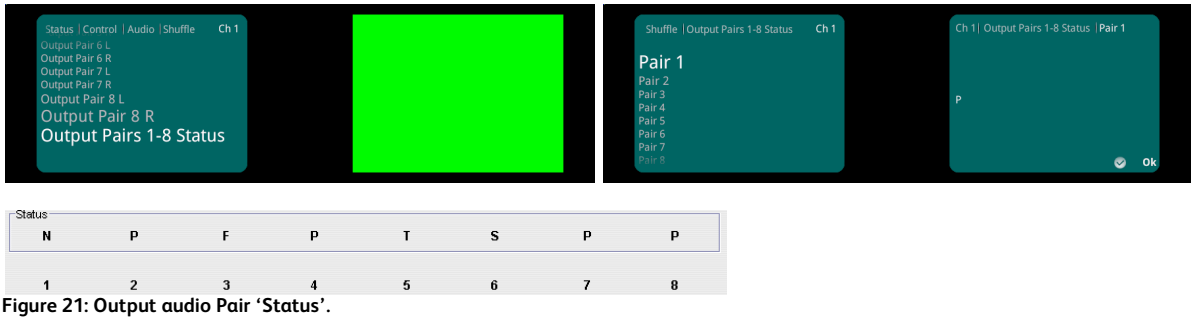


Figure 21: Output audio Pair 'Status'.

This field describes each audio output (pairs 1 to 8).

Invert Phase

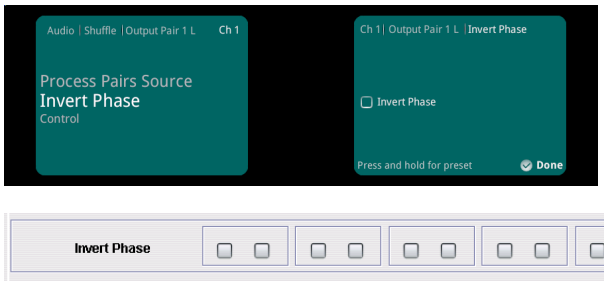
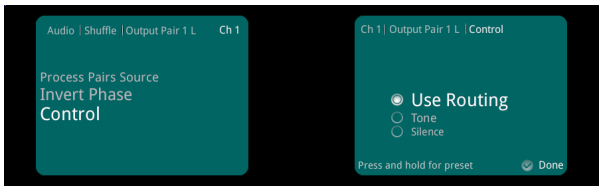


Figure 22: Invert Phase menu

In this field, the phase of any of the 16 audio channels maybe inverted. This is usually used as a correction tool for discrepancies associated with input audio.

Note that Non-PCM audio channels cannot be inverted.

Control



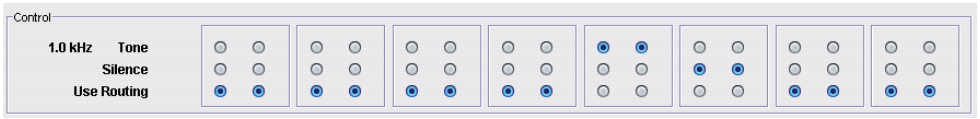


Figure 23: Audio shuffle Control menu

In this menu, each audio channel can be set to:

- Use Routing
- Silence
- Tone

When set, the 'Routing' the audio channel output is derived as per the configuration of the Audio Routing and the Audio Shuffle menus.

When set to 'Silence' a PCM carrier is output with no audio data.

When set to 'Tone', a test tone is output as defined in the channel Audio Control menu (see page 8).