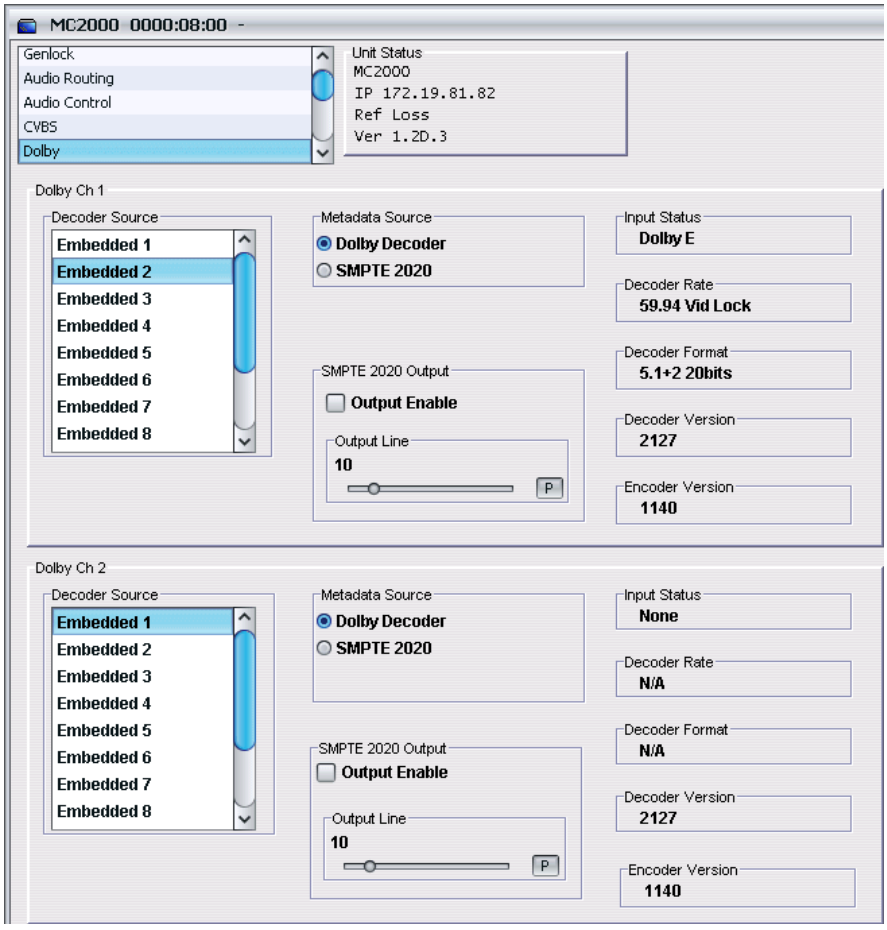
# KudosPro

# Product Application Note, # 3

# KudosPro Dolby Option

APPLICATION NOTE



# Contents

**KudosPro Dolby®E feature**

The KudosPro Dolby®E option supports the processing of either one or two Dolby®E audio bitstreams in frame rate conversion modes and allows Dolby®E decoding and transcoding. The actual number of Dolby®E audio bitstreams that can be processed is dependent upon how many Dolby®E Processors are fitted. Options allow for either a single Dolby®E Processor, or two, to be fitted, so allowing the corresponding number of Dolby®E bitstreams to be processed.

There are several modes of operation:

• **Frame rate convert Dolby®E :** Extracts Dolby®E bitstream from any embedded pair of the SDI source or external AES input. Data is decoded into 4 pairs of PCM audio and delayed to match typical video delay. These are then encoded into Dolby®E and embedded into any output SDI or AES pair. The 2 downmix output channels and 8 decoded channels are also available for routing to any output audio channels. Encode mode (program, bit stream, etc.) is set to be the same as the decode mode.

• **Frame rate convert Dolby®D:** Dolby Option not required. Dolby®D passed in Data mode. In cross-frame rate conversion environment. KudosPro must be I/O locked.

• **Same frame rate mode (pass-through)**: Dolby Option not required. Dolby®E / Dolby®D data are routed, delayed and embedded (no decode / encode necessary). Used only if incoming Dolby E is guard band aligned. KudosPro must be I/O locked.

• **Same frame rate mode (decode + encode):** Dolby®E data are decoded and encoded. Allows for non guard band aligned sources.

• **Dolby®E /Dolby®D decode** : Extracts Dolby®E data from any embedded pair of the SDI source or external AES input. The decoded channels of PCM audio are available for routing to any combination of output channels after delaying to compensate for the video delay. The 2 downmix output channels are available for routing to any output channels.

Note: KudosPro products without the Dolby Option installed, can pass-through Dolby®E bitstreams, providing that the KudosPro product Genlock state is configured to be I/O locked. In frame-rate conversion circumstances, Dolby ‘guard-band’ is not maintained.

## Introduction

The Dolby®E Option is available for all KudosPro models. The option can be in the form of a single channel Dolby®E processor or a dual Dolby®E processing option.

It should be understood that, because KudosPro units can be multi-channel video processors (up to four channels), there are constraints that affect the way that Dolby®E processing can be associated with each video channel.

### MC500 / MC1000

With respect to the MC500 and MC1000, these models have only a single video channel. If fitted with the Dolby®E Option, because there is only one video channel, the Dolby®E option is associated with this one video channel. The MC500 and MC1000 models can only support single channel Dolby®E processing.

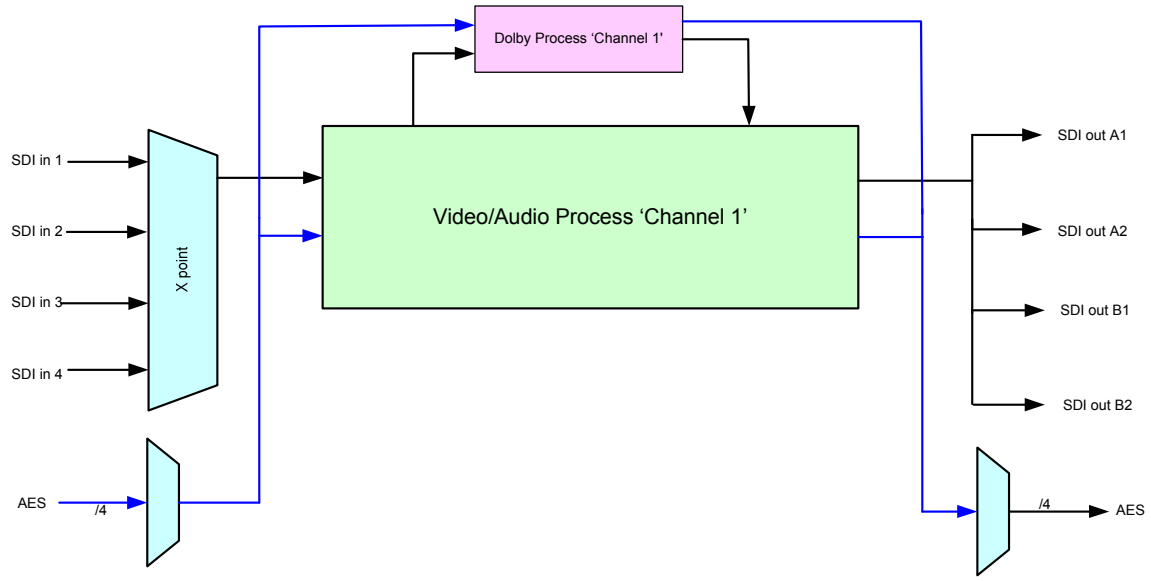



**Figure 1: MC500/MC1000 block diagram**

A single Dolby®E bitstream associated with any SDI input, or as an AES pair, may be routed to the Dolby®E Processor. Processed Dolby®E can be configured to emerge on the SDI outputs and any output AES pair can be configured to output the processed Dolby®E bitstream.

Multiple channel units have certain limitations regarding Dolby processing. These limitations are explored below:

### MC2000

The MC2000 can simultaneously convert two Video channels. With regard to Dolby processing, either single or dual Dolby Processor options are available.

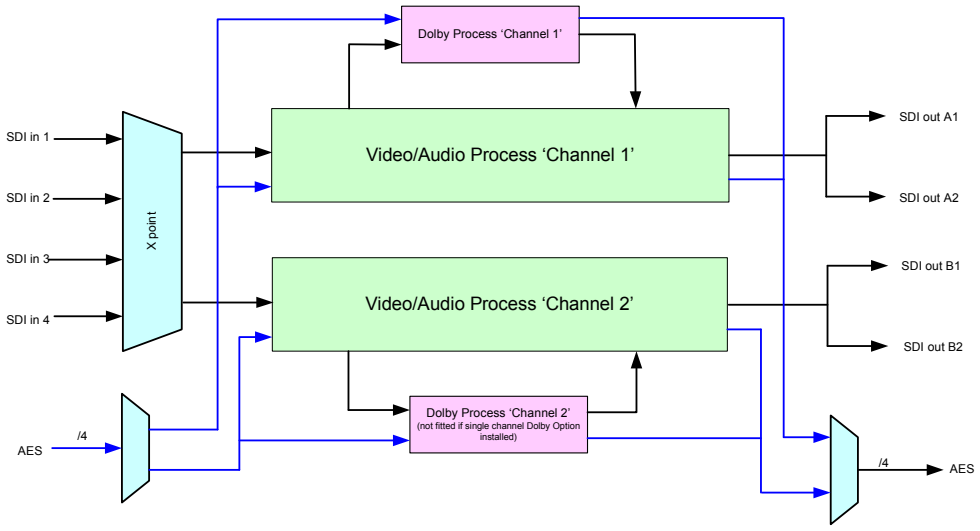



**Figure 2: MC2000 block diagram**

Where only a single channel Dolby option is installed:

- Only Dolby Processor 'Channel 1' is fitted.
- A processed Dolby®E bitstream can only emerge on 'SDI out A1', or 'SDI out A2'.
- Any input Dolby®E bitstream at the input must be routed to the Dolby Processor associated with Video Processor 'Channel 1' in order to be processed by the Dolby Processor.
- A Dolby®E bitstream associated with any of the SDI inputs, or an AES input, can be routed to the Dolby Processor.

Where Dual channel Dolby Processing option is installed:

- Up to two Dolby®E bitstreams can be processed from the input.
- The Dolby®E bitstreams may be associated with any of the SDI inputs, or an AES input and can be routed to either Dolby Processor.
- A processed Dolby®E bitstream associated with Dolby Processor 'Channel 1' will only emerge on 'SDI out A1', or 'SDI out A2', or on any defined AES output.
- A processed Dolby®E bitstream associated with Dolby Processor 'Channel 2' will only emerge on 'SDI out B1', or 'SDI out B2', or on any defined AES output.

### SV2000/LC2000

The SV2000 and LC2000 models can simultaneously convert two Video channels. With regard to Dolby®E processing, there is only the option to fit a single Dolby Processor, meaning that only a single Dolby®E bitstream can be processed.

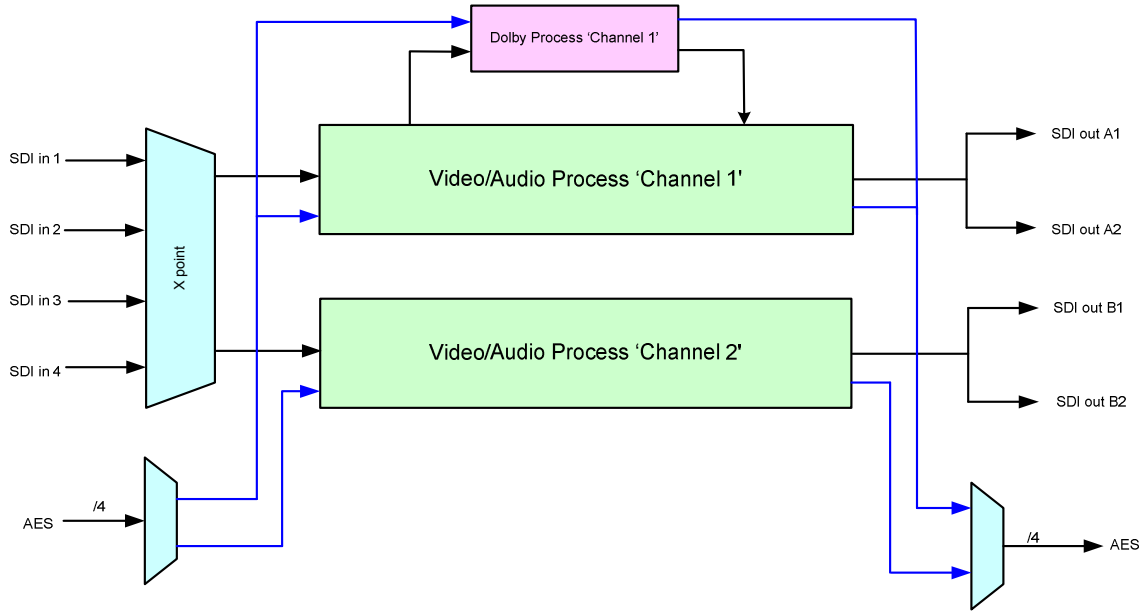



**Figure 3: SV2000/LC2000 block diagram**

- The installed Dolby Processor is defined as *Dolby Processor 'Channel 1'* and is associated with Video Processor 'Channel 1'.
- Video Processor 'Channel 2' cannot have a Dolby®E Processor associated with it.
- A processed Dolby®E bitstream can only emerge on 'SDI out A1', or 'SDI out A2', or on any defined AES output.
- Any Dolby®E bitstream associated with the input must be routed to the Dolby Processor 'Channel 1' associated with Video Processor 'Channel 1' in order to be processed by the Dolby Processor 'channel 1'.
- Any one Dolby®E bitstream associated with any of the SDI inputs, or an AES input, may be routed to the Dolby®E Processor.

### SV4000/LC4000

The SV4000 and LC4000 models can simultaneously convert four video channels. With regard to Dolby®E processing; either single, or dual, Dolby Processor options are available.

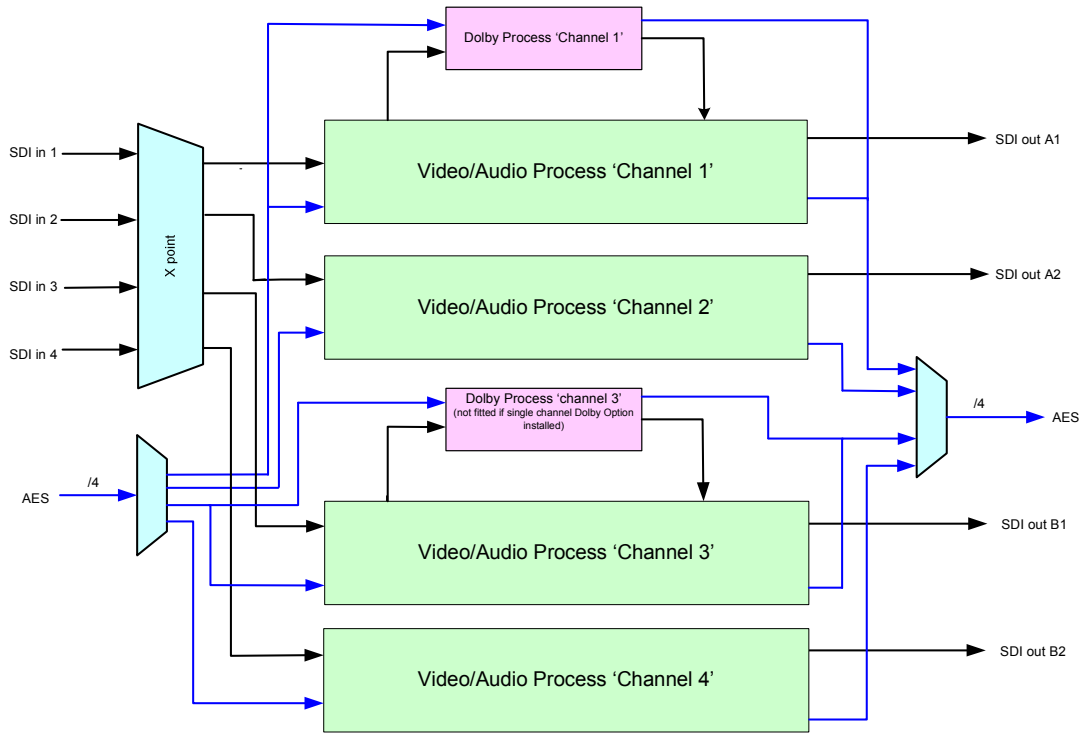



**Figure 4: SV4000/LC4000 block diagram**

Where only a single Dolby®E option is installed:

- Only Dolby®E Processor 'Channel 1' is fitted.
- A processed Dolby®E bitstream can only emerge on 'SDI out A1' or on any defined AES output.
- Any input Dolby®E bitstream at the input must be routed to the Dolby®E Processor 'channel 1' associated with Video Processor 'Channel 1' in order to be processed by the Dolby®E Processor 'channel 1'.
- A Dolby®E bitstream associated with any of the SDI inputs, or as an AES input, may be routed to the Dolby®E Processor.

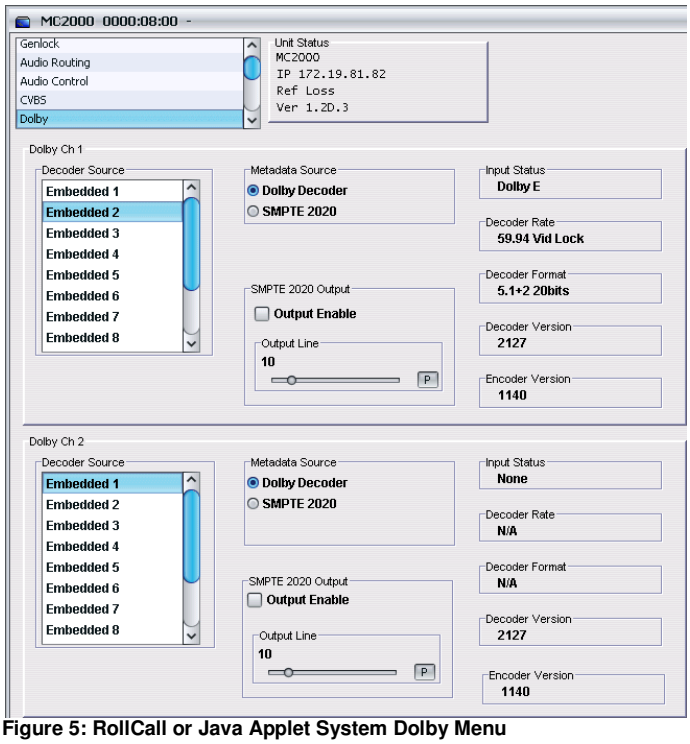
Where dual channel Dolby Processing option is installed:

- Up to two Dolby®E bitstreams can be processed from the input.
- The Dolby®E bitstreams may be associated with any of the SDI inputs, or as an AES input and can be routed to either Dolby®E Processor.
- A processed Dolby®E channel associated with Dolby®E Processor 'channel 1' will only emerge on 'SDI out A1', or on any defined AES output.
- A processed Dolby®E channel associated with Dolby®E Processor 'channel 3' will only emerge on 'SDI out B1', or on any defined AES output.

-

## System Dolby Menu

The main Dolby Menu is located in the System menu.




Control can be via the Front Panel, RollCall, or Embedded Java Applet.
Note – Java Applet employs RollCall templates, so the appearance is identical.

**Figure 5: RollCall or Java Applet System Dolby Menu**

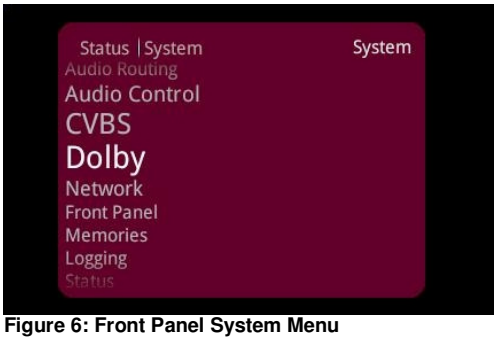



**Figure 6: Front Panel System Menu**

The Dolby menu resides in the System menu.

The Dolby template contains two menus, one for each Dolby Processor fitted. In circumstances where a Dolby Processor is not fitted, the controls are disabled.

Within this Dolby Menu, the Dolby Decoder source can be selected. The Dolby®E bitstream may be associated with any of the eight input Embedded pairs or with any of the four input AES pairs.

Dolby metadata can either be selected to be passed from the Dolby Decoder to the Dolby Encoder, or it can be derived from a SMPTE 2020 data packet.

Also in the System Dolby menu, important information regarding the Dolby source is reported.

### Dolby Source selection

The Dolby audio source is selected in the System menu

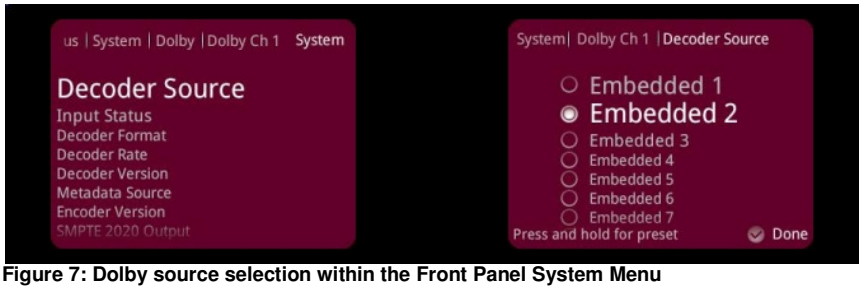



**Figure 7: Dolby source selection within the Front Panel System Menu**

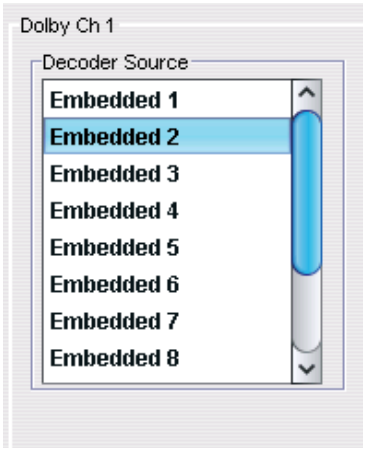



**Figure 8: Dolby source selection within the Rollcall System menu.**

### Input Status


**Figure 9: System RollCall template reporting Dolby Decoder 'Input Status'**

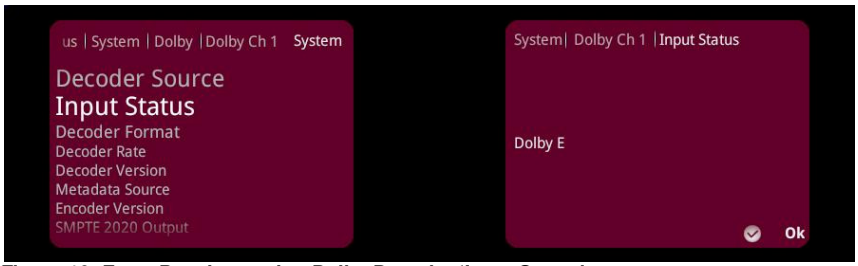



**Figure 10: Front Panel reporting Dolby Decoder 'Input Status'**

The 'Input Status' field will indicate the audio format routed to the Dolby Decoder. Non-Dolby audio will be reported as 'PCM'. If no audio is routed to the Dolby Decoder, this will be reported as 'Off'.

### Decoder Rate


**Figure 11: RollCall template reporting 'Decoder rate'.**

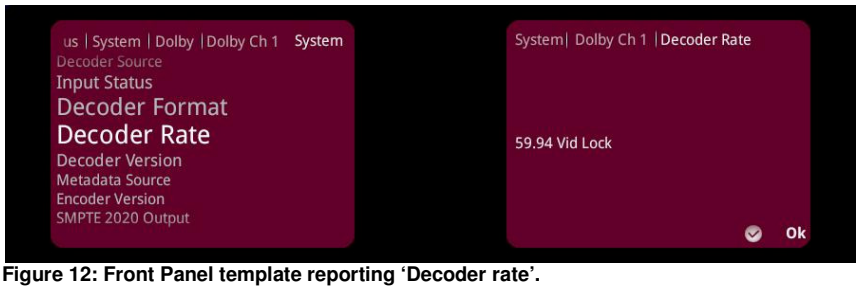



**Figure 12: Front Panel template reporting 'Decoder rate'.**

The 'Decoder Rate' field will report the video frame rate detected by the Dolby Decoder and will also report that the Dolby Decoder has locked to the incoming video stream.

If the source applied to the Dolby Decoder is a PCM pair, or no audio channel is routed to the Dolby Decoder, then this field will report 'N/A'.

### Decoder Format

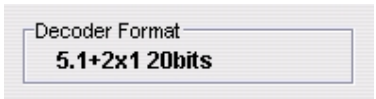



**Figure 13: RollCall template reporting 'Decoder Format'.**

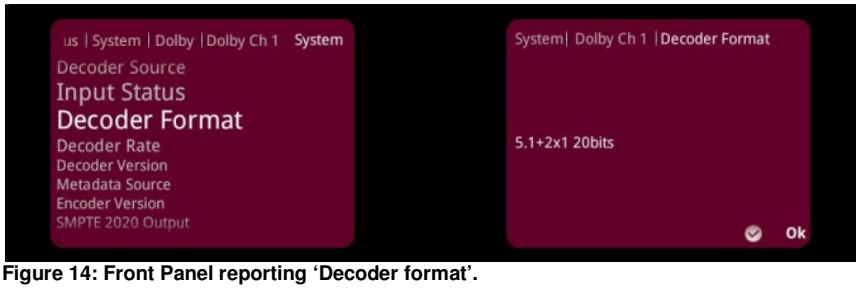



**Figure 14: Front Panel reporting 'Decoder format'.**

The 'Decoder Format' field reports the format of the incoming Dolby®E Bitstream. When no Dolby®E Bitstream is routed to the Dolby Decoder, this field will report 'N/A'.

### Encoder Version

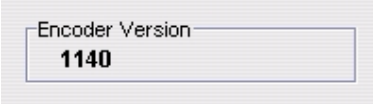



**Figure 15: RollCall template reporting Dolby Encoder Module code version**

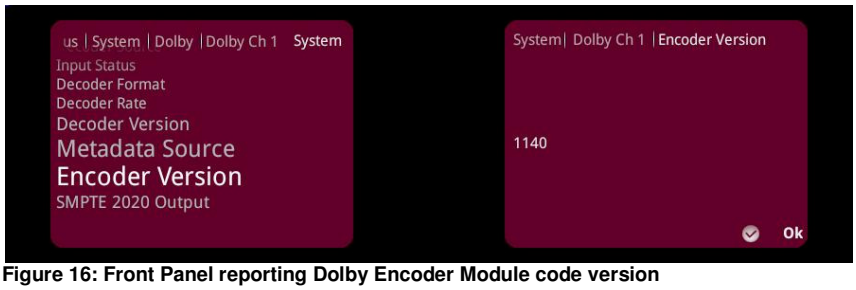



**Figure 16: Front Panel reporting Dolby Encoder Module code version**

The version of software currently installed in the Dolby Encoder module is reported by both the RollCall template and via the Front Panel.

### Decoder Version

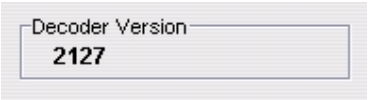



**Figure 17: RollCall template reporting Dolby Decoder Module code version**

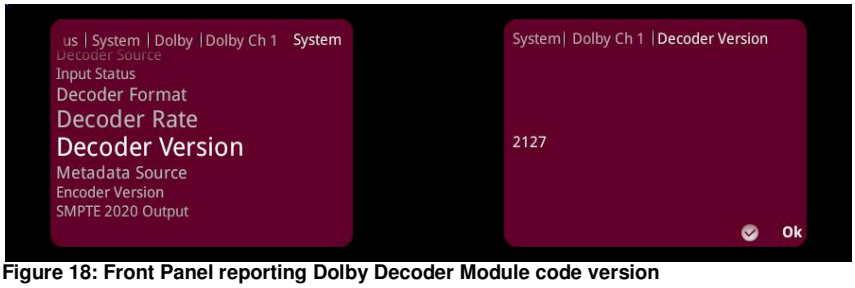



**Figure 18: Front Panel reporting Dolby Decoder Module code version**

The version of software currently installed in the Dolby Decoder module is reported by both the RollCall template and via the Front Panel.

### Dolby Metadata Source

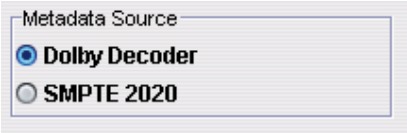



**Figure 19: Metadata source selection via the RollCall Template**

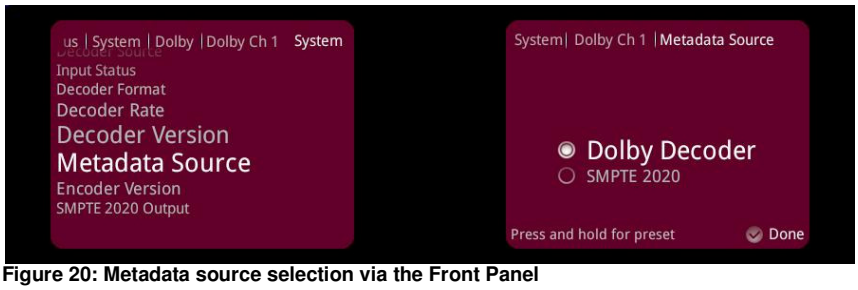



**Figure 20: Metadata source selection via the Front Panel**

Dolby Metadata can either be selected to be 'Decoder' or 'SMPTE 2020'.

If 'Decoder' is selected, the Metadata is passed from the Dolby Decoder to the Dolby Encoder.

If 'SMPTE 2020' is selected, the Dolby Metadata is derived from a VANC packet in the input, where the VANC Packet conforms to SMPTE 2020 specification.

### Channel Audio Routing

It can be seen in the block diagrams above (Figures 1, 2, 3 & 4) that depending on the specific model, Dolby Processing may only be associated with certain Video Channels.

If a channel menu is accessed and that channel does support Dolby Processing, Audio Routing options for Dolby will appear in the template:

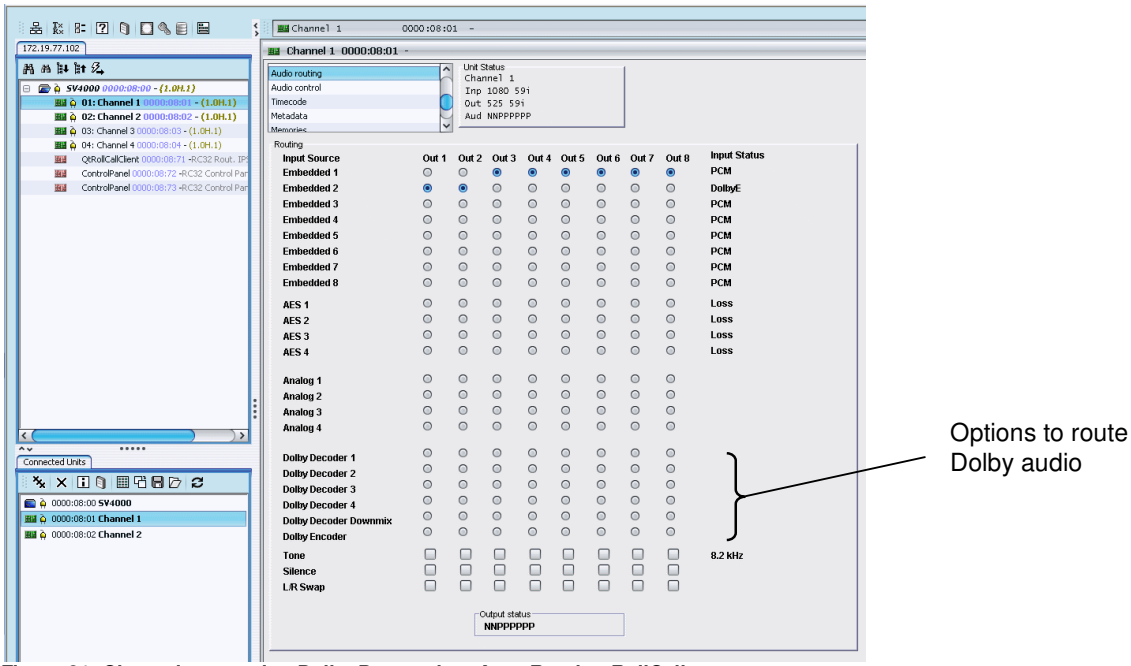



**Figure 21: Channel supporting Dolby Processing, Auto-Routing RollCall menu**

However, if a Channel menu is accessed and that channel does not support Dolby Processing, Audio Routing options for Dolby will not appear in the RollCall template.

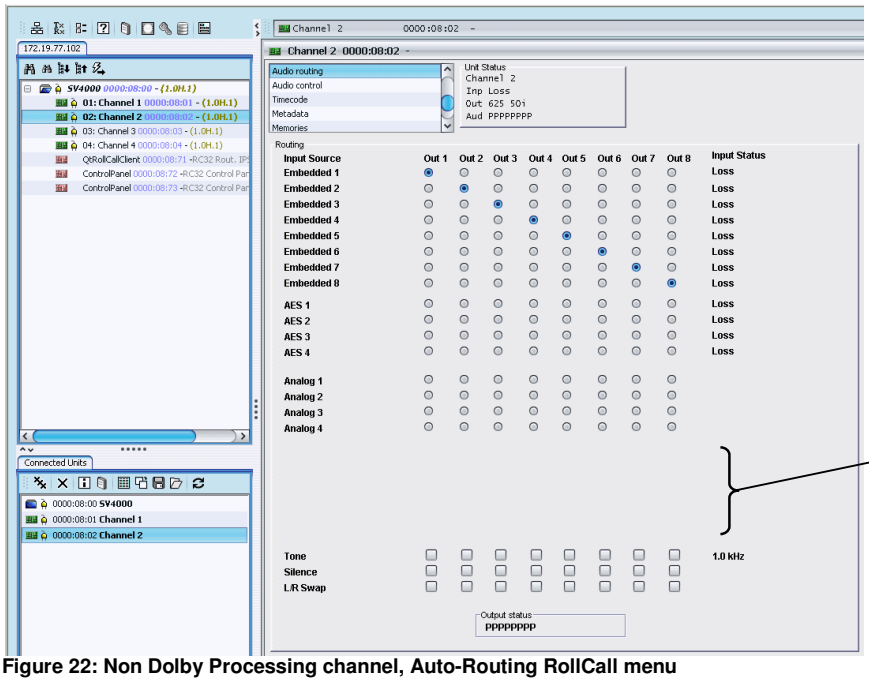



**Figure 22: Non Dolby Processing channel, Auto-Routing RollCall menu**

Similar menus may be accessed directly from the front panel:

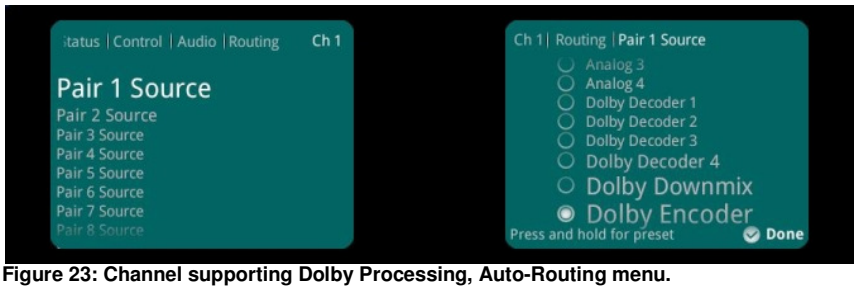



**Figure 23: Channel supporting Dolby Processing, Auto-Routing menu.**

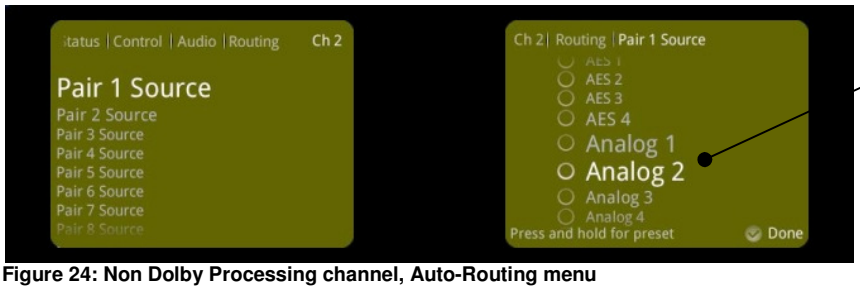



**Figure 24: Non Dolby Processing channel, Auto-Routing menu**

### Audio Routing Template

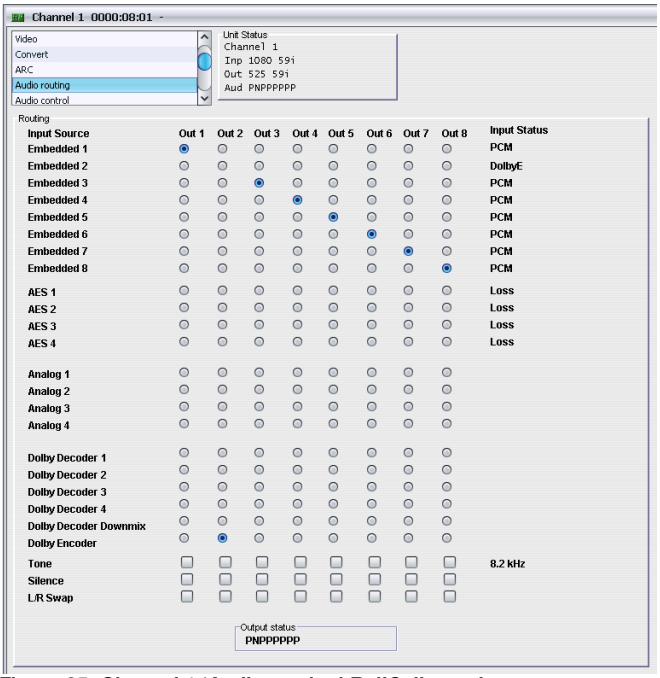



**Figure 25: Channel 1 'Audio routing' RollCall template**

From the Audio routing template, the audio source of each individual audio output can be configured.

Each output (pairs 1 to 8) has an associated column of possible source selections. The possible sources are listed in the column on the left hand side, titled 'Input source'.

On the right hand side the input status of each Embedded and AES input is listed. In the example shown in Figure 25, it can be seen that there is a valid Dolby®E bitstream detected on Embedded input 2.

Audio routing can also be performed directly from the Front Panel:

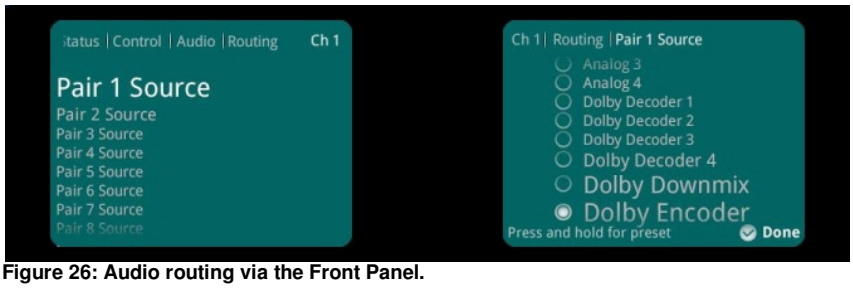



**Figure 26: Audio routing via the Front Panel.**

In the example in Figure 26, audio output pair 1 has been routed from the Dolby Encoder.

As with the RollCall template, the Front Panel can also display audio status:

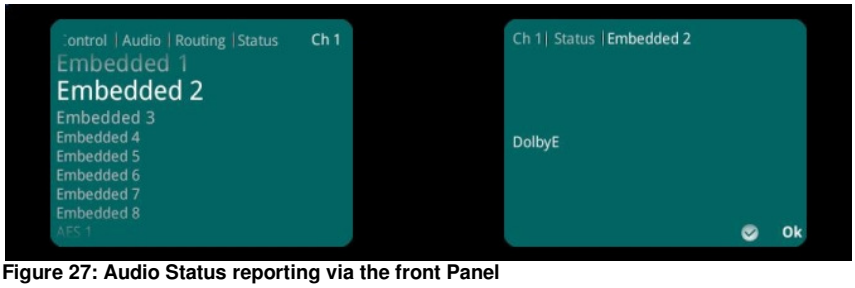



**Figure 27: Audio Status reporting via the front Panel**

In this example, it can be seen that a valid Dolby®E bitstream has been detected on Embedded input 2.

### Dolby Routing template

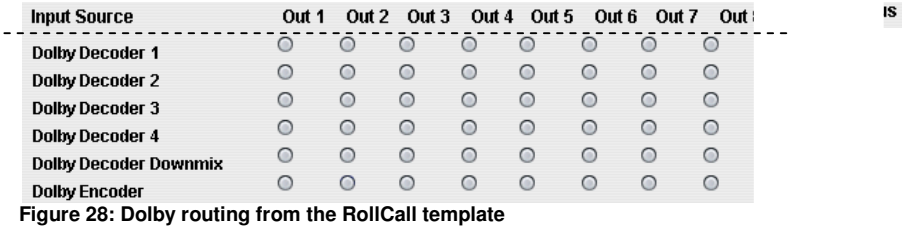



**Figure 28: Dolby routing from the RollCall template**

There are various options for routing the audio derived from the Dolby®E source.

### Dolby Encoder

When selected, the output of the Dolby Encoder is routed to a particular audio output. It should be considered that the input to the Dolby Encoder is always derived from the output of the Dolby Decoder. This setting would be selected for normal Dolby®E transcoding processes.

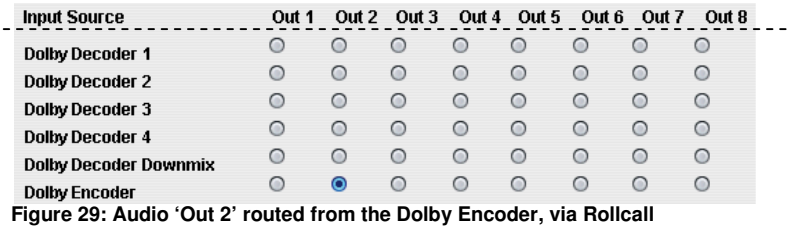



**Figure 29: Audio 'Out 2' routed from the Dolby Encoder, via Rollcall**

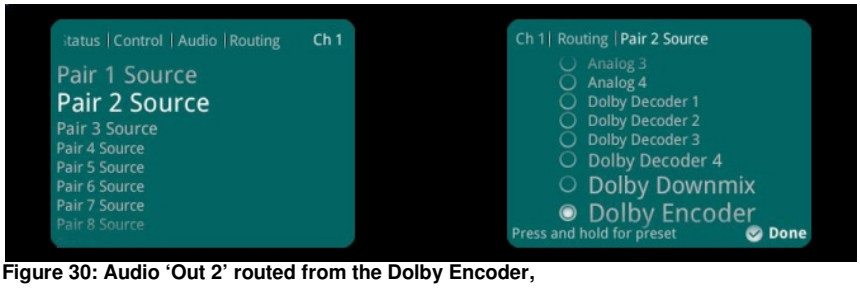



**Figure 30: Audio 'Out 2' routed from the Dolby Encoder,**

### Dolby Decode

The Dolby®E decoded channels can be mapped to pass through to the output as separate PCM pairs.

The Decoded outputs from the Dolby Decoder are defined as:

Dolby Decoder 1,
Dolby Decoder 2,
Dolby Decoder 3,
Dolby Decoder 4,

Consider a 7.1 Dolby®E bitstream. The decoded outputs would be:

Dolby Decoder 1 …… L/R (Front Left / Front Right)
Dolby Decoder 2 …… C/LFE (Centre / Low Frequency Effects)
Dolby Decoder 3 …… Ls/Rs (Left Surround (Rear) /Right Surround (Rear))
Dolby Decoder 4 …… Lm/Rm (Left Mid / Right Mid)

A typical Dolby Decoder decode configuration is shown in Figure 27:

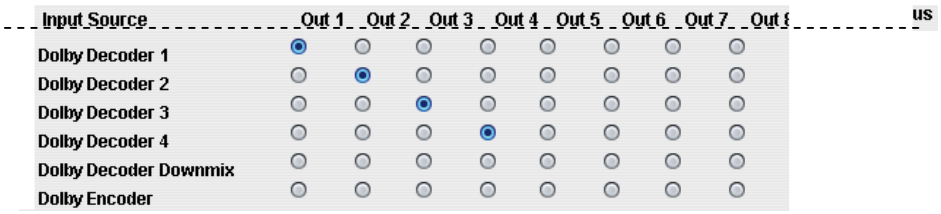



**Figure 31: Dolby Decode configured via RollCall**

For this configuration:

Audio 'Out 1' will output a stereo pair derived from the Dolby®E L/R channels.
Audio 'Out 2' will output a stereo pair derived from the Dolby®E C/LFE channels.
Audio 'Out 3' will output a stereo pair derived from the Dolby®E Ls/Rs channels.
Audio 'Out 4' will output a stereo pair derived from the Dolby®E Lm/Rm channels.

Dolby Decoder routing can also be performed directly from the Front Panel:

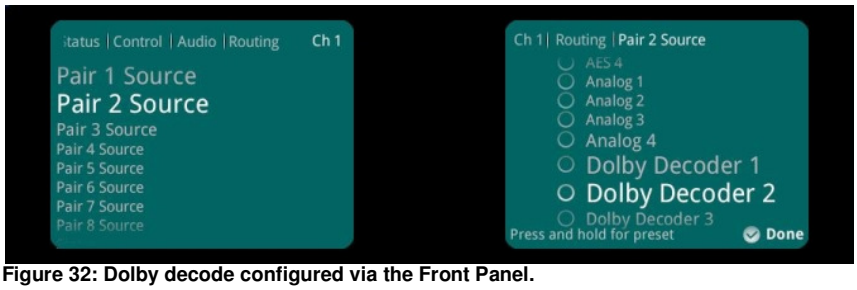



**Figure 32: Dolby decode configured via the Front Panel.**

### Dolby Decoder Downmix

This feature builds a stereo pair based on a 'downmix' of all the component parts of Dolby®E bitstream. This can be configured to emerge on any audio output and will appear at the output as a PCM pair.

The downmix process is performed by the Dolby Decoder.

Dolby Laboratories refer to the downmix channels as: Lt/Ft (Left total/Right total)

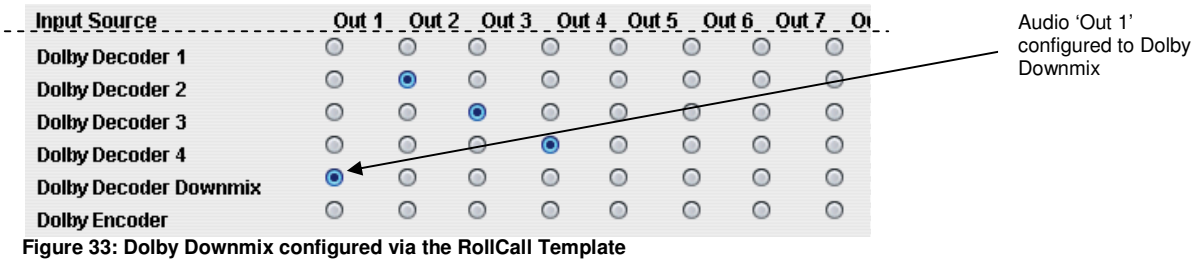



**Figure 33: Dolby Downmix configured via the RollCall Template**

In the example shown in Figure 32, audio output 1 has been configured to output a Dolby Downmix from the Dolby Decoder.

Dolby Downmix can also be configured from the Front Panel, as shown below in Figure 33.

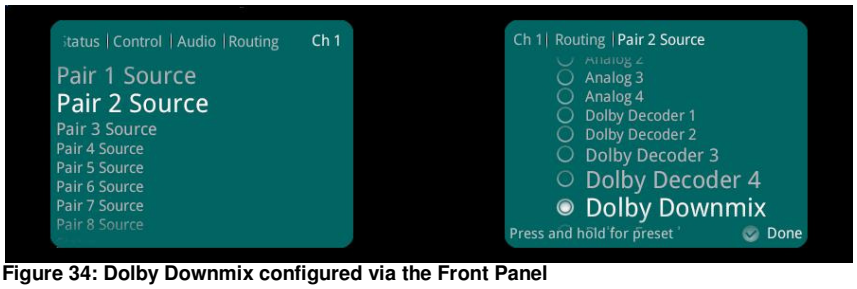



**Figure 34: Dolby Downmix configured via the Front Panel**

### Dolby®D pass through

Unlike Dolby®E, with Dolby®D the concept of locking the Dolby bitstream to the video Frame-rate (Guard-band) does not exist. Dolby®D can be passed through the KudosPro product without the need to have the Dolby Option installed.

Whether same frame-rate processing, or frame-rate converting, any Dolby®D bitstream can be passed in data mode. This does required that the Genlock state be configured to I/O locked. In this state, the propagation delay through the product is made constant, therefore a fixed audio delay may be applied to the audio to maintain co-timing with video.

Note that KudosPro products will auto-detect a Dolby bitstream and will automatically configure the audio processing mode to 'Data'.

If the KudosPro product does have the Dolby option installed, the Dolby Decode feature can be applied to Dolby®D bitstream sources.

### Dolby®E pass through

Dolby®E bitstream sources can be passed through the KudosPro product that does not have the Dolby Option installed.

In circumstances where no frame-rate conversion is configured, provided that the KudosPro product is I/O locked, then 'Guard-band' will be maintained on the output.

In circumstances where frame-rate conversion is configured, provided that the KudosPro product is I/O locked, then the Dolby®E bitstream can be passed through to the output, however Dolby Guard-Band will ***not*** be maintained.

Guard-band can only be preserved, when cross-field converting, when the Dolby Option is installed!

## Practical Application of the Dolby feature

### Working Example 1: Dolby Transcode as part of a video conversion process

Consider the following requirement:

-To use an MC2000 to convert a 1080 59i source to 1080 50i.
-The MC2000 has a single channel Dolby option installed.
-The source stream has a single Dolby®E bitstream on EMB pair 2.
-The 1080/59i source is applied to input 'SDI in 1'.
-The Dolby source is correct with respect to Guard Band.
-The output requirement is to output 1080 50i with a valid Dolby®E bitstream on EMB pair 2.
-The output Dolby®E bitstream should also be output on AES Output 2

Referring to the block diagram of the MC2000

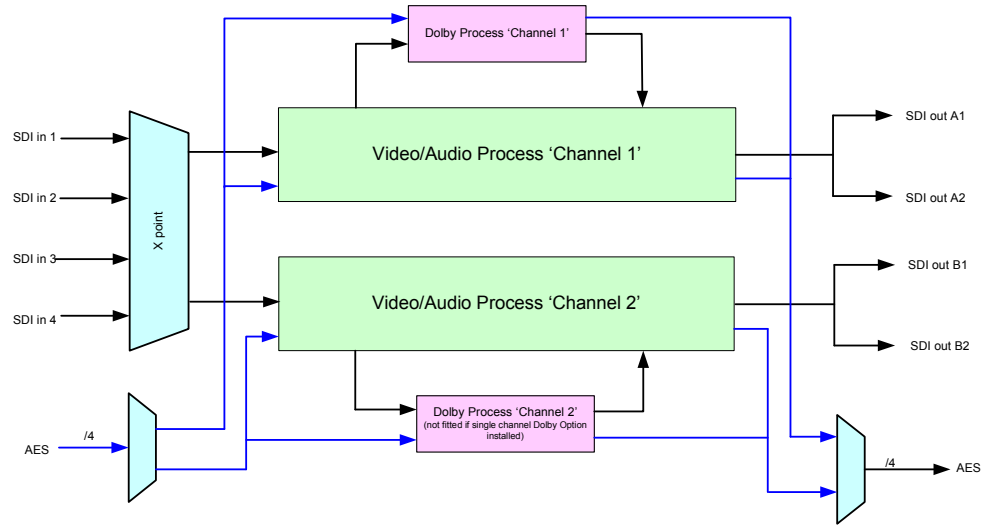



**Figure 35: MC2000 Block diagram.**

it can be seen that since the MC2000 has only a single Dolby Processor installed. Therefore input SDI 1 must be routed to Video Processor 1, to make the required Dolby®E transcode possible.

Video Processor 2 does not have a Dolby Processor associated with it, so it cannot perform the required Dolby®E transcode.

**Procedure**:

The first requirement is to route the input applied to 'SDI in 1' to Video Process 'Channel 1'

1. Select: Channel 1

2. Select: 'Input'.

3. Configure the input to be 'SDI 1'

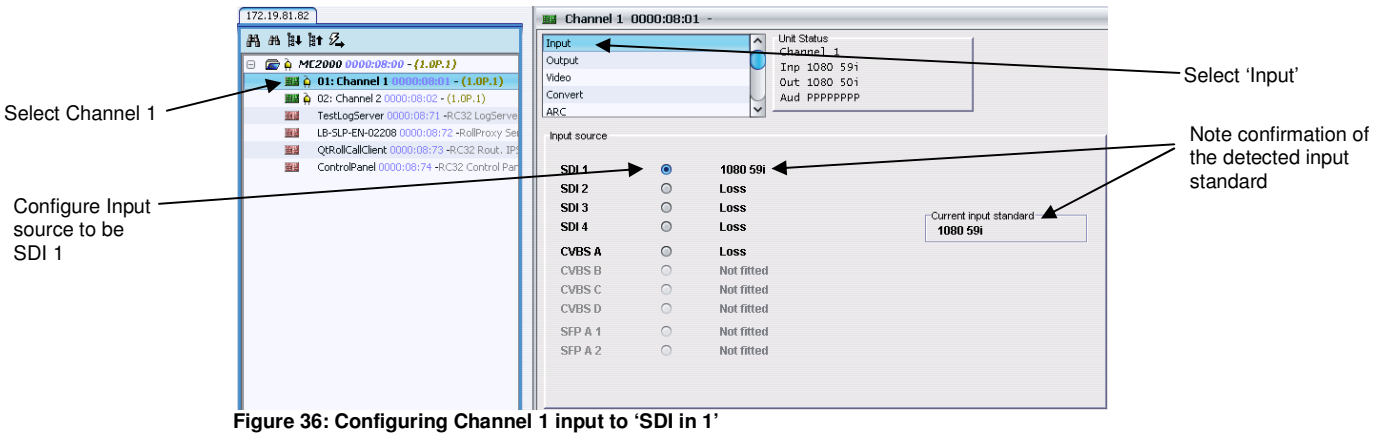



**Figure 36: Configuring Channel 1 input to 'SDI in 1'**

Now configure the output standard of 'Channel 1' to be 1080/50i

4. Select: Channel 1
5. Select: Output
6. Configure the output standard to be 1080 50i

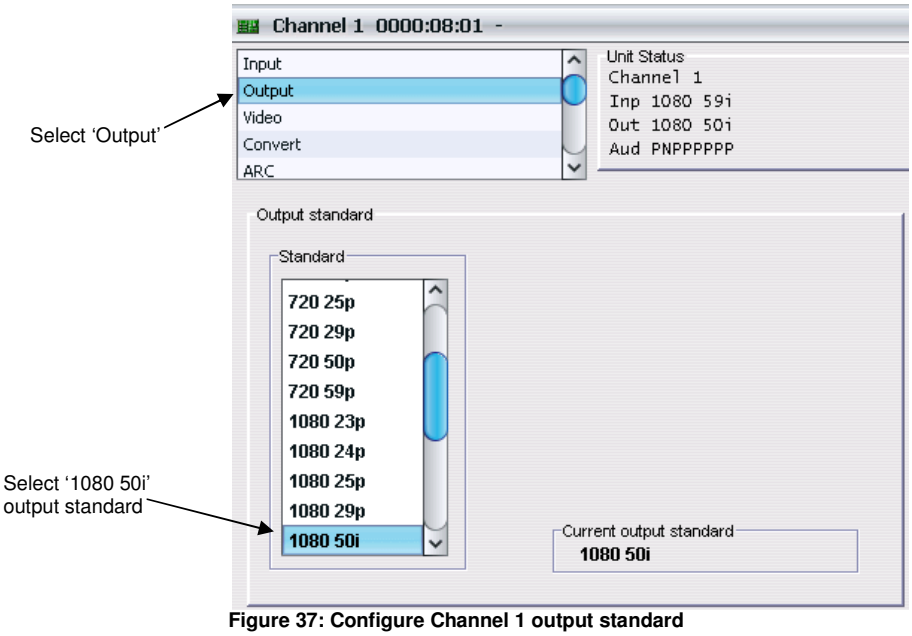



**Figure 37: Configure Channel 1 output standard**

Now configure the audio source to the Dolby Decoder.

7. In the System Menu, select Dolby. This will bring up the Dolby Template. Within the template, menus will appear for both Dolby Decoders. However, since Dolby Process 'Channel 2' is not installed in this MC2000, the controls for 'Dolby Ch 2' are 'greyed' out and cannot be accessed.

   Set the' Dolby Ch 1' source to be 'Embedded 2'

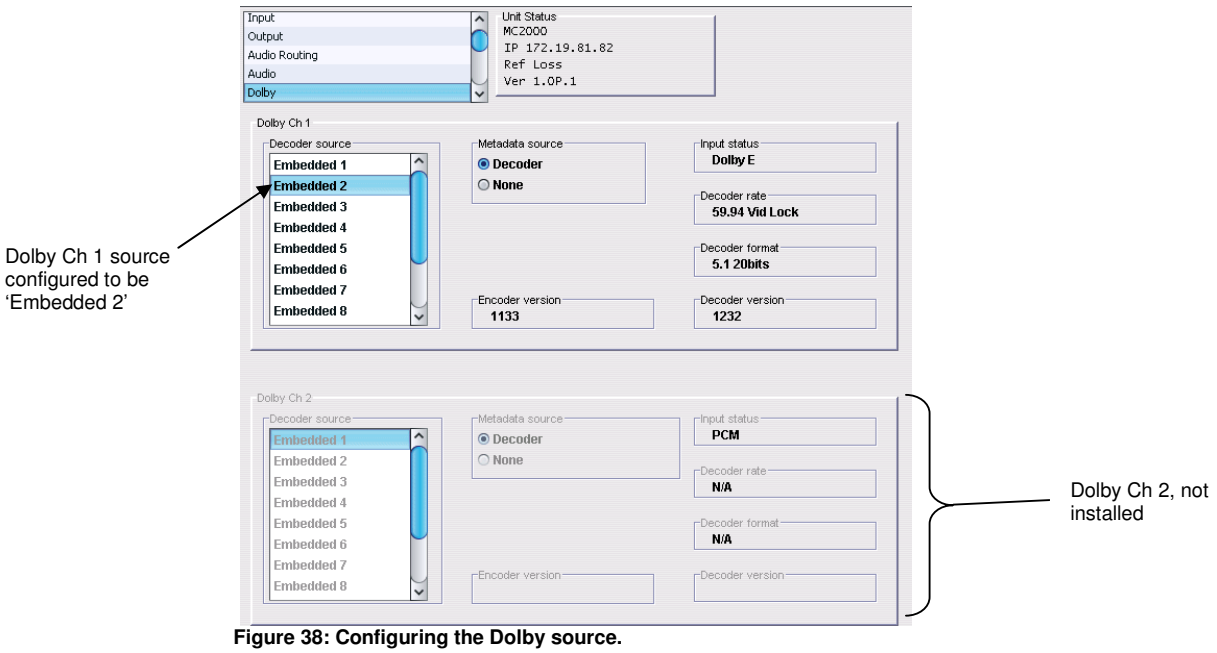



**Figure 38: Configuring the Dolby source.**

Now, configure the audio routing for channel 1

8. Select: Channel 1
9. Select: Audio Routing
10. Configure 'Out 2' to 'Dolby Encoder'

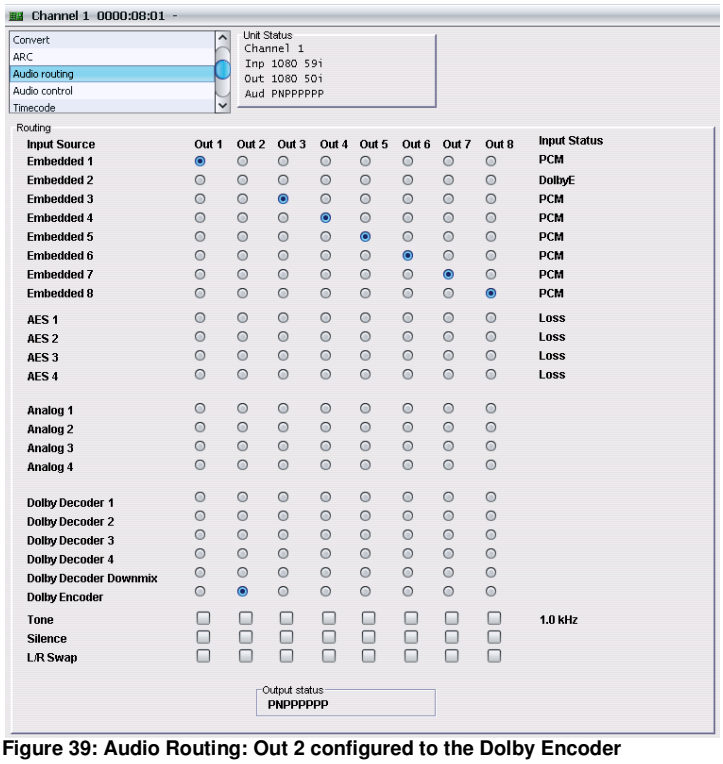



**Figure 39: Audio Routing: Out 2 configured to the Dolby Encoder**

To route the processed Dolby®E bitstream out of AES output 2

11. Select: System Menu
12. Select: Audio routing
13. Set AES Output ‘AES 2’ to: Ch1 pair 2

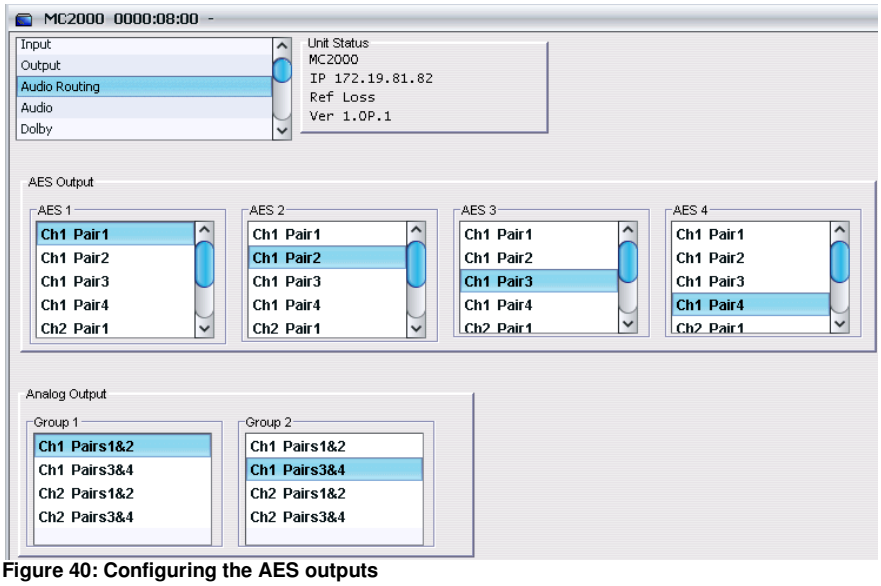



**Figure 40: Configuring the AES outputs**

The MC2000 is now configured for the requirement.

### Working Example 2: Dolby Decode as part of Conversion process

Consider the following requirement:

-To use an MC2000 to convert a 1080 59i source to 1080 50i.

-The MC2000 has a single channel Dolby option installed.

-The source stream has a single Dolby®E bitstream on EMB pair 2.

-The 1080 59i source is applied to input 'SDI in 1'.

-The Dolby source is correct with respect to Guard Band.

-The output requirement is to output 1080 50i.

-The Dolby decoded channels should be routed to Audio outputs 1, 2, 3 & 4.

-The Dolby decoded channels should be also routed to the AES outputs.

Referring to the block diagram of the MC2000:

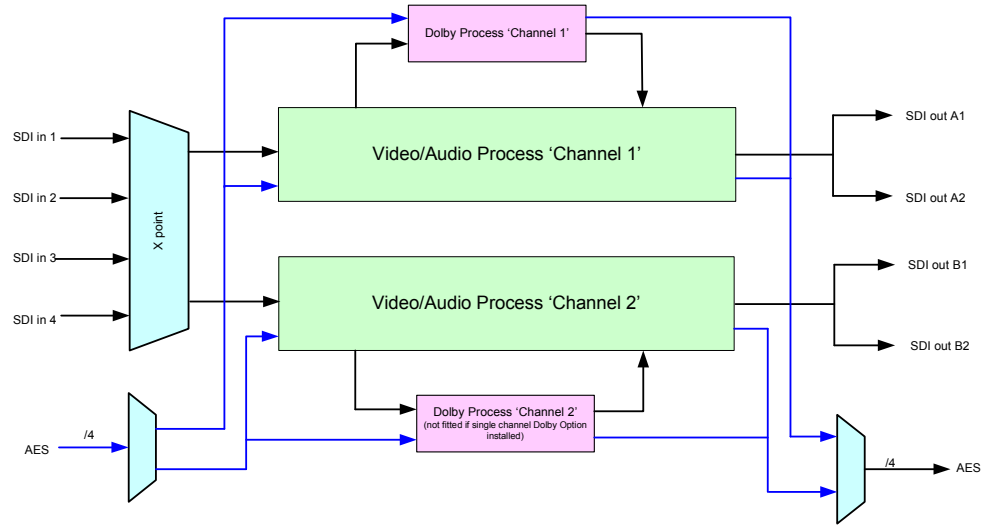



**Figure 41: MC2000 block diagram.**

It can be seen that since the MC2000, in this example, has only a single Dolby Processor installed, that the input SDI 1 must be routed to Video Processor 1, to make the required Dolby®E decode possible.

Video Processor 2 does not have a Dolby Processor associated with it, so it cannot perform the required Dolby®E decode.

The first requirement is to route the input applied to 'SDI in 1' to Video Process 'Channel 1'

1. Select: Channel 1
2. Select: Input
3. Configure the input to be 'SDI 1'

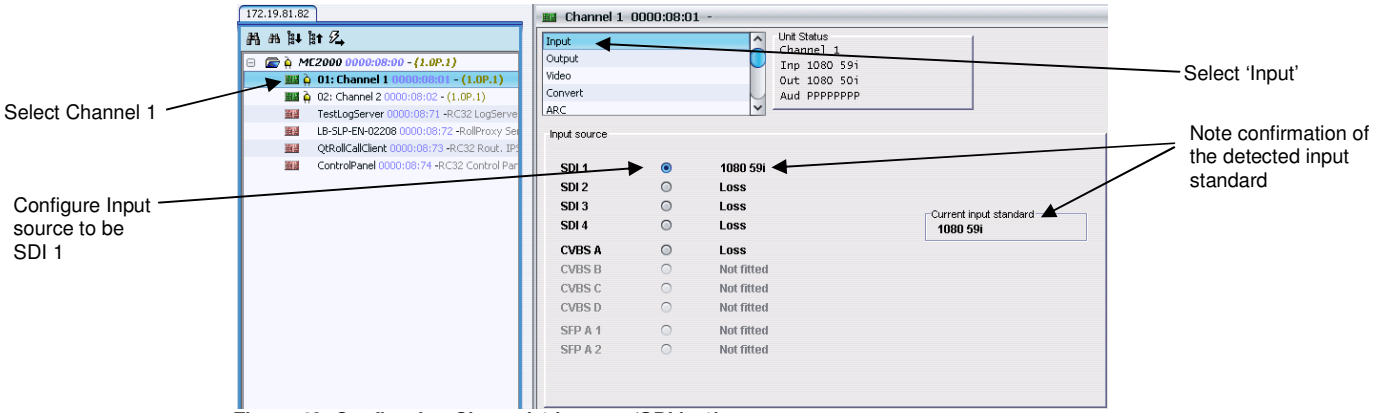



**Figure 42: Configuring Channel 1 input to 'SDI in 1'**

Configure the output standard of channel 1 to be 1080 50i

4. Select: Channel 1

5. Select: Output

6. Configure the output standard to be 1080 50i

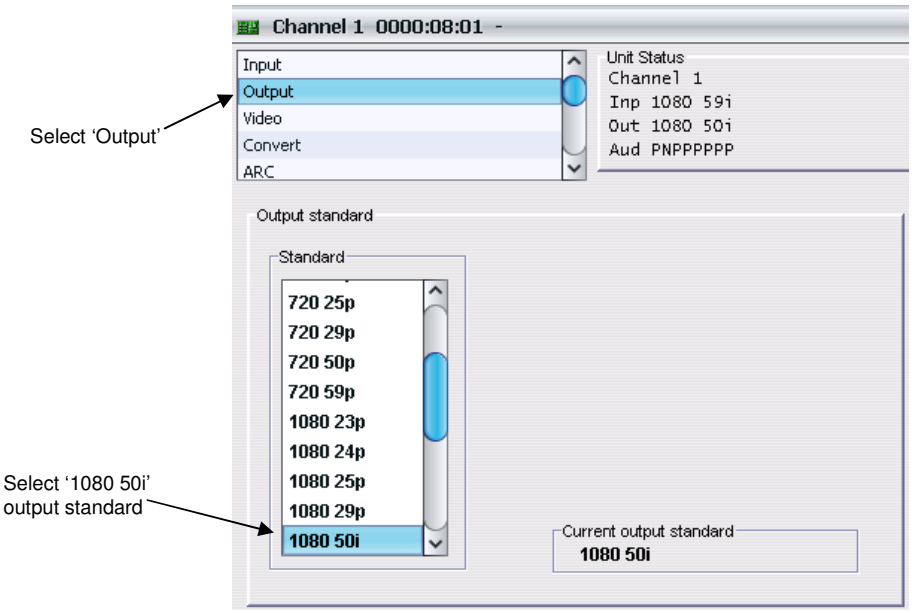



**Figure 43: Configure Channel 1 output standard**

Now configure the audio source to the Dolby Decoder.

7. In the System Menu, select 'Dolby'. This will bring up the Dolby Template. Within the template, menus will appear for both Dolby Decoders. However, since Dolby Process 'Channel 2' is not installed in this MC2000, the controls for 'Dolby Ch 2' are 'greyed' out and cannot be accessed.

   Set 'Dolby Ch 1' source to be 'Embedded 2'

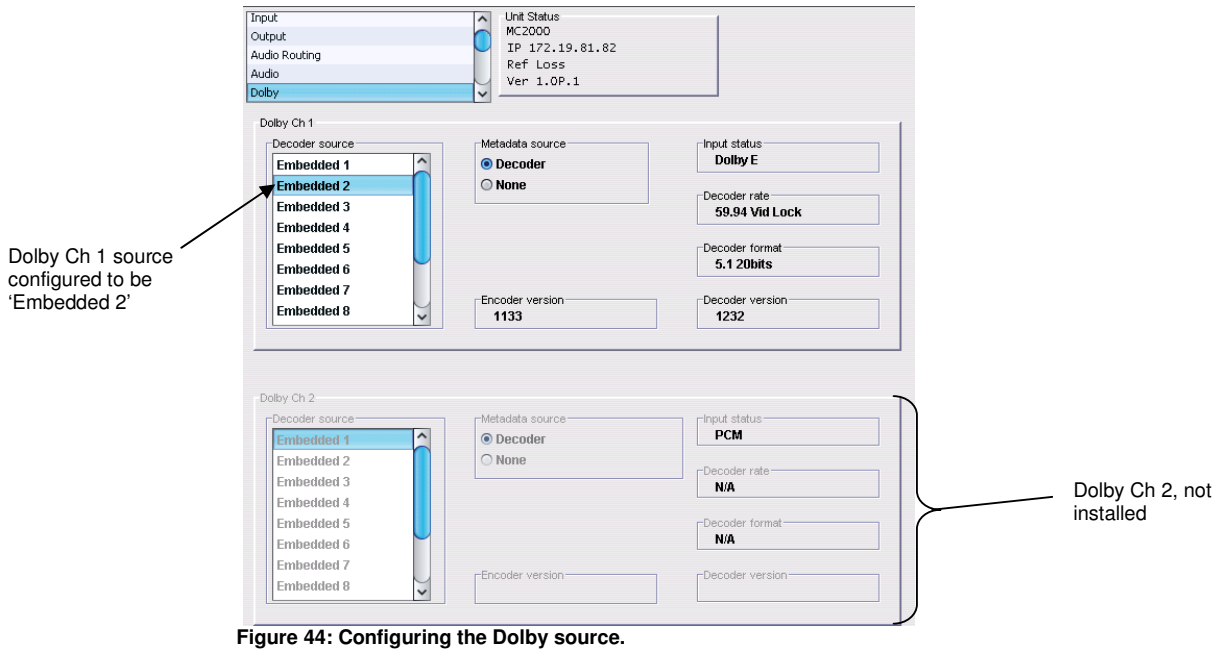



**Figure 44: Configuring the Dolby source.**

Configure the audio routing for channel 1:

8. Select: Channel 1

9. Select: Audio Routing

10. Now configure Audio Outputs 1 to 4 to be derived from the Dolby Decoder outputs, as shown below:

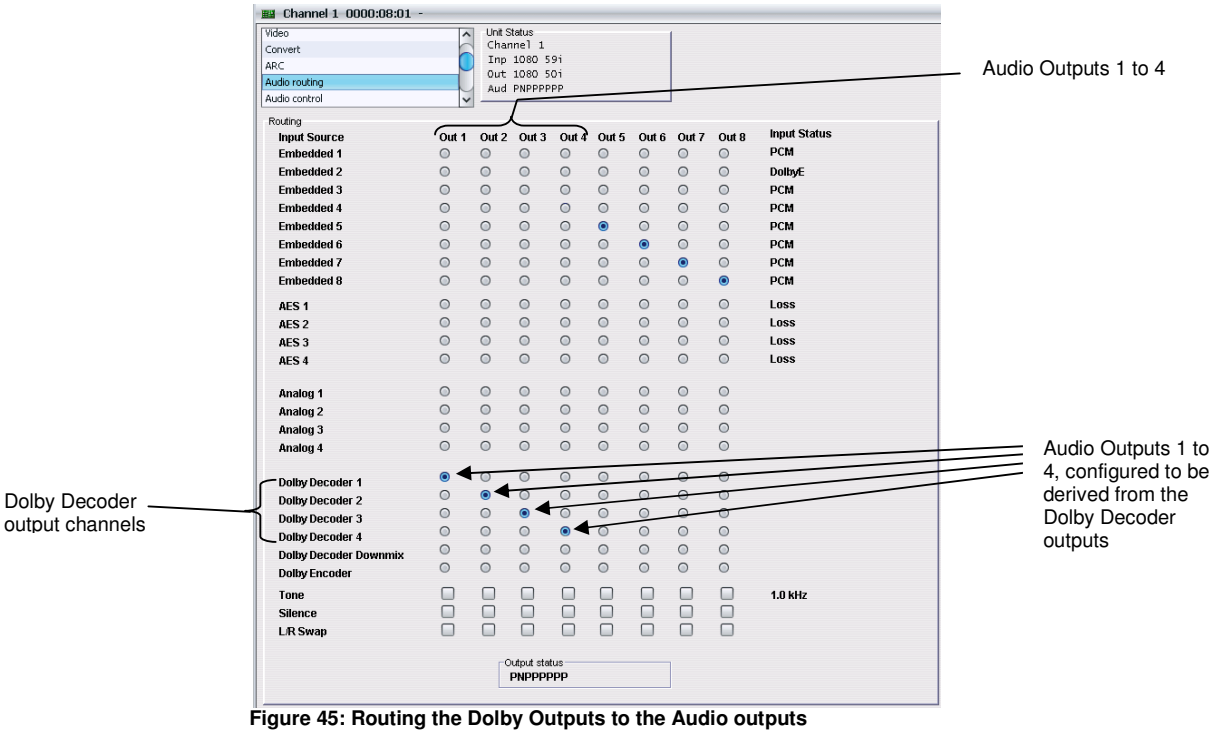



**Figure 45: Routing the Dolby Outputs to the Audio outputs**

Finally the AES outputs need to be configured

11. Select: System menu.

12. In the System Menu, select: Audio Routing

13. Set the following AES outputs:

    'AES 1' to 'Ch1 pair 1'
    'AES 2' to 'Ch1 pair 2'
    'AES 3' to 'Ch1 pair 3'
    'AES 4' to 'Ch1 pair 4'

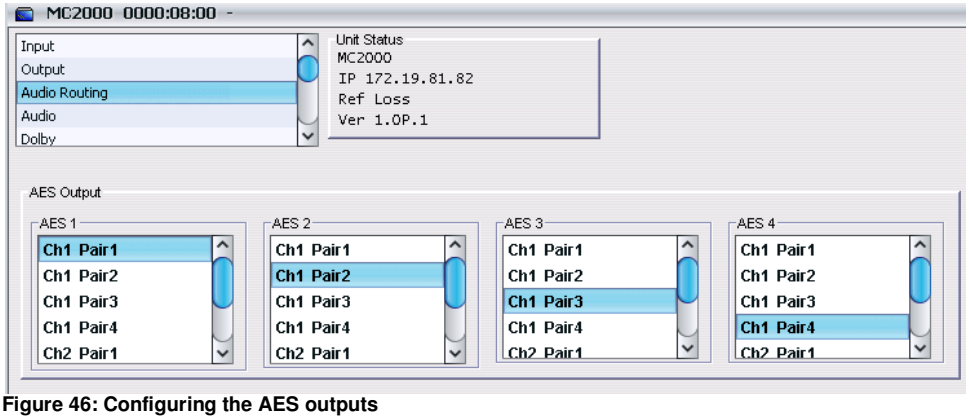



**Figure 46: Configuring the AES outputs**

Note that the AES channels are derived from the Embedded channels; in this particular example they are derived from 'Channel 1'. Since the Embedded channels 1, 2, 3 and 4 have already been configured to be routed from the Dolby Decoder, by selecting the AES outputs to be derived from these four Embedded channels, the AES outputs have effectively been configured to be derived from the Dolby Decoder.

The MC2000 is now configured for the requirement.

### Working Example 3: Dual Channel Dolby Transcode as part of a video conversion process

Consider the following requirement

-To use an MC2000 to convert a 1080 59i source to 1080 50i.

-The MC2000 has dual channel Dolby option installed.

-A 1080 59i source stream with a single Dolby®E bitstream on EMB pair 2 is applied to SDI in 1.

-A second 1080 59i source stream with a single Dolby®E bitstream on EMB pair 2 is applied to SDI in 2.

-Both Dolby sources are correct with respect to Guard Band.

-The SDI source on SDI in 1 is to be converted to 1080 50i, with a valid Dolby®E bitstream on EMB pair 2

-The SDI source on SDI in 2 is to be converted to 625 50i, with a valid Dolby®E bitstream on EMB pair 2.

Referring to the block diagram of the MC2000

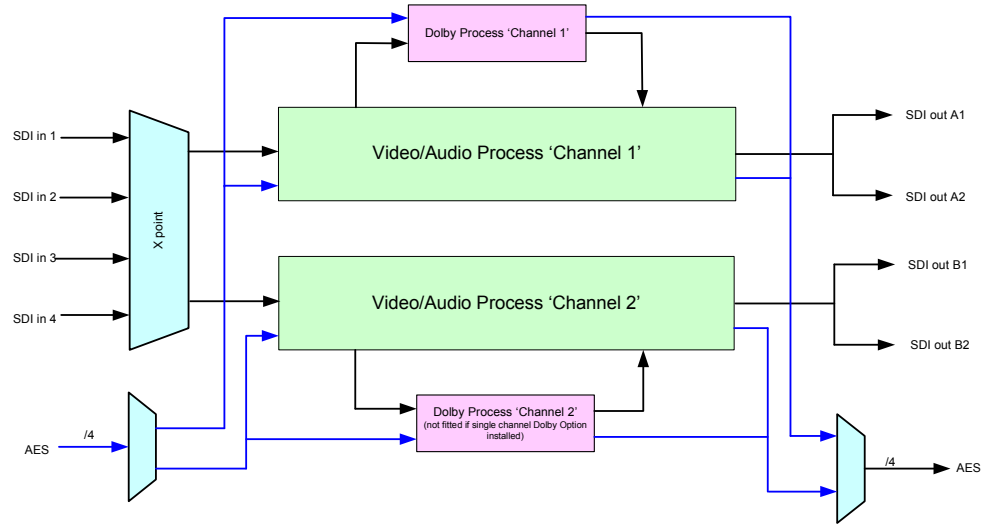



**Figure 47: MC2000 Block diagram.**

For this example, the SDI source on 'SDI in 1' will be routed through Video Processor 'Channel 1' and the source on 'SDI in 2' will be routed through Video Processor 'Channel 2'.

Note: it would be equally valid to process the SDI source on 'SDI in 1' through Video Processor 'Channel 2' and the source on 'SDI in 2' Video Processor 'Channel 1'.

Procedure

The first requirement is to route the input applied to 'SDI in 1' to Video Process 'Channel 1':

1. Select: Channel 1
2. Select: Input
3. Configure the input to be 'SDI 1'.

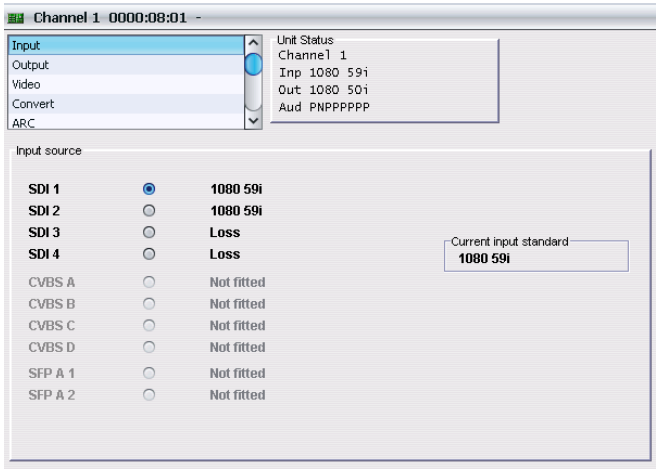



**Figure 48: Channel 1 input configuration**

Similarly, 'Channel 2' input is configured:

4. Select: Channel 2
5. Select: Input
6. Configure the input to be 'SDI 2'

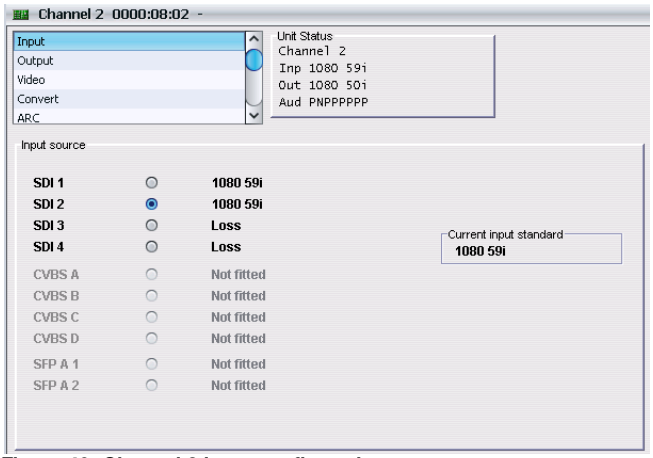



**Figure 49: Channel 2 input configuration**

Now the output standard of channel 1 is configured

7. Select: Channel 1
8. Select: Output
9. Configure output standard to be 1080 50i

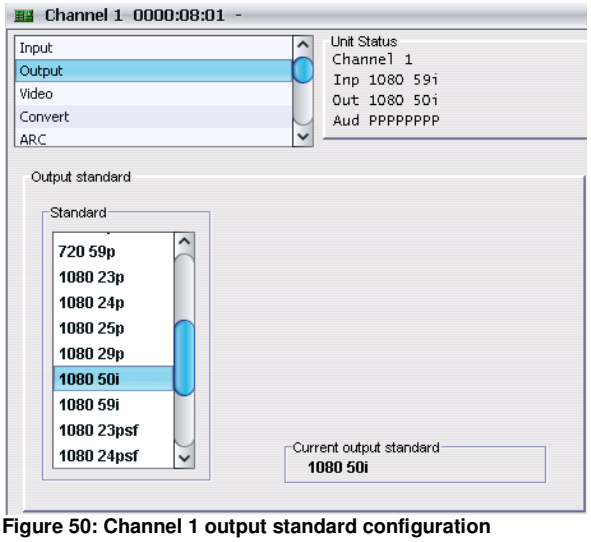



**Figure 50: Channel 1 output standard configuration**

Similarly, the output standard of channel 2 is configured

10. Select: Channel 2
11. Select: Output
12. Configure output standard to be 625 50i

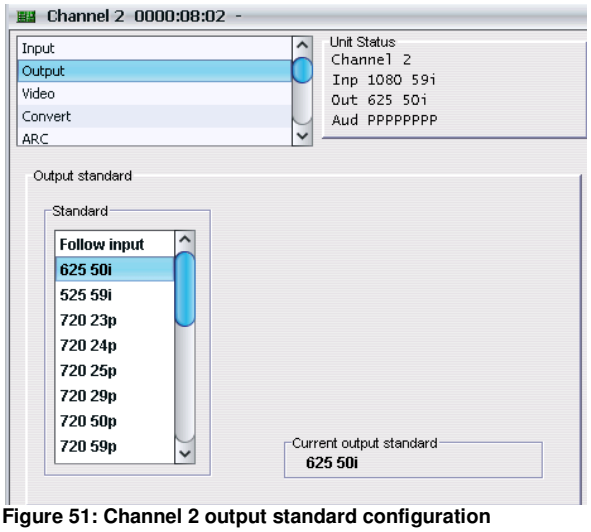



**Figure 51: Channel 2 output standard configuration**

Now the sources to the Dolby Decoders need to be configured

13. Open the System menu.
14. Open the Dolby Template.
15. Configure the Decoder Source for ‘Dolby Ch 1’ to be ‘Embedded 2’ and ‘Dolby Ch 2’ to be ‘Embedded 2’

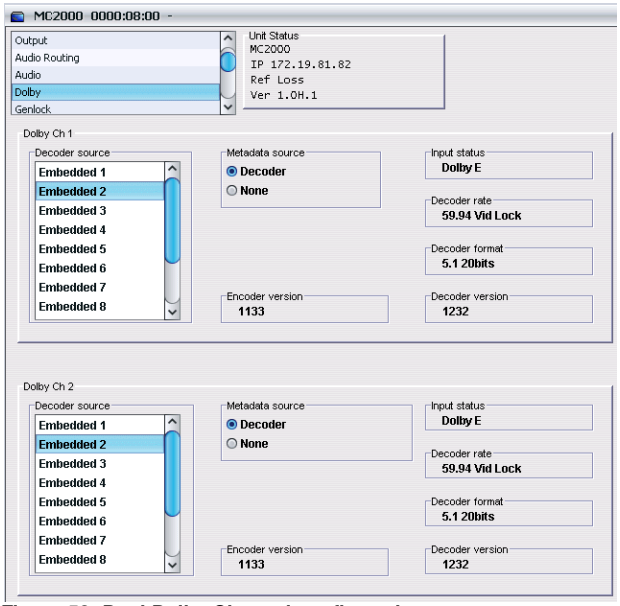



**Figure 52: Dual Dolby Channel configuration**

Finally, each Video Processor Channel requires audio routing to be configured

16. Select: Channel 1
17. Select: Audio Routing
18. Configure source for ‘Out 2’ to be the ‘Dolby Encoder’

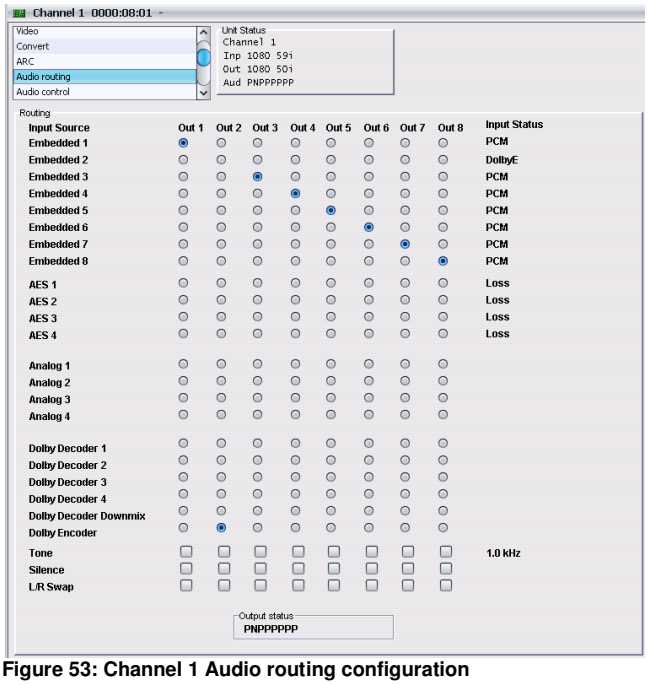



**Figure 53: Channel 1 Audio routing configuration**

19. Select: Channel 2
20. Select: Audio Routing

21. Configure source for ‘Out 2’ to be the ‘Dolby Encoder’

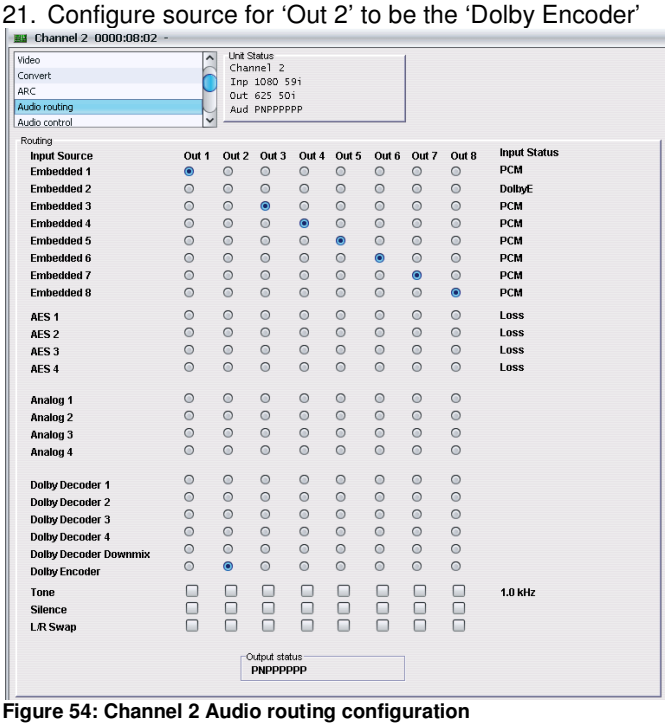



**Figure 54: Channel 2 Audio routing configuration**

The MC2000 is now configured to perform the required conversion process.

**Working example 4: Dual Channel Dolby Transcode as part of a video conversion process (LC4000)**

Consider the following requirement:

-To use an LC4000 to convert a 1080 59i source to 1080 50i.

-The LC4000 has dual channel Dolby option installed.

-A 1080 59i source with a single Dolby®E bitstream on EMB pair 2 is applied to SDI in 1.

-A second 1080 59i source with a single Dolby®E bitstream on EMB pair 2 is applied to SDI in 2.

-Both Dolby sources are correct with respect to Guard Band.

-The SDI source on SDI in 1 is to be converted to 1080 50i, with a valid Dolby®E bitstream on EMB pair 2

-The SDI source on SDI in 2 is to be converted to 625 50i, with a valid Dolby®E bitstream on EMB pair 2.

Referring to the block diagram of the LC4000

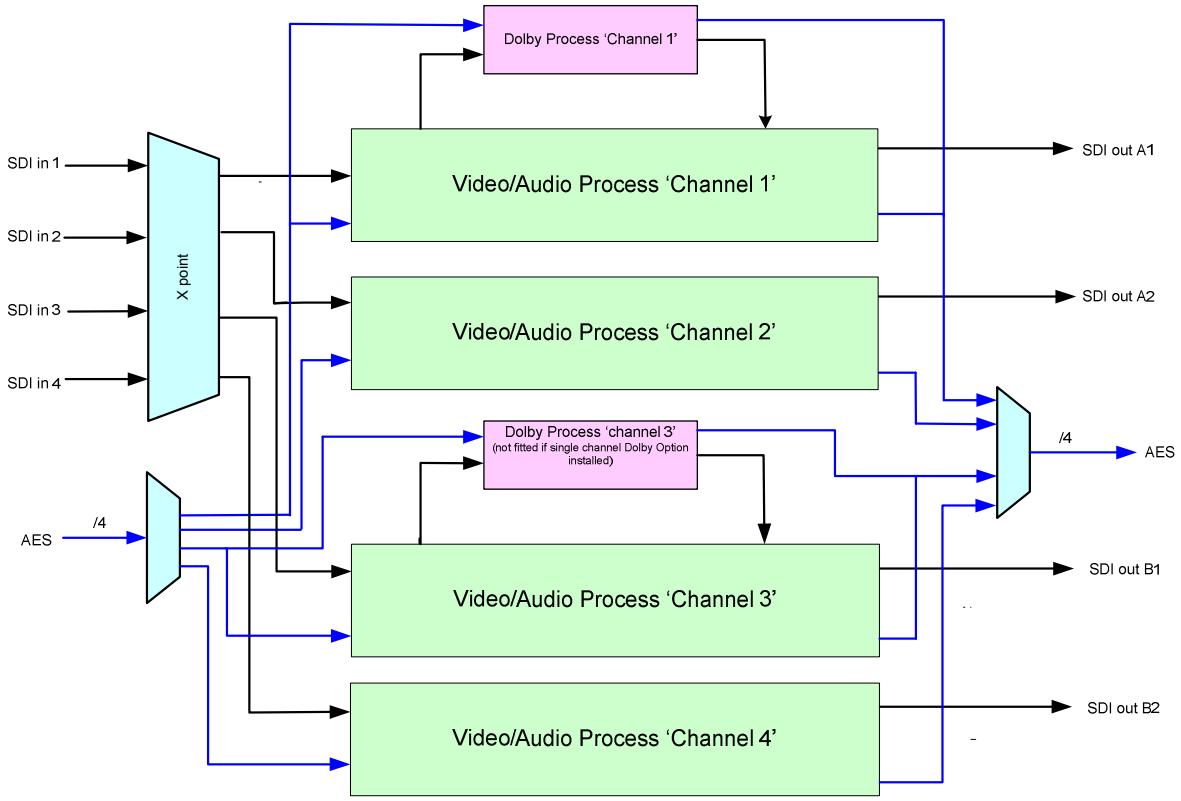



**Figure 55: LC4000 Block Diagram**

From the block diagram of the LC4000 it can be seen that the installed Dolby Processors are associated with Video Processor 'Channel 1 and Video Processor 'Channel 3'. Video Processor channels '2' and '4' cannot have Dolby Processors associated with them. This is a fundamental design feature and cannot be changed.

In this working example, to fulfil the requirement, it will be necessary to route one of the sources with associated Dolby®E bitstream, to Video Processor 'Channel 1' and the second source with associated Dolby®E bitstream, to Video Processor 'Channel 3'.

Procedure:

1. Select: Channel 1
2. Select: Input
3. Configure the input to be ‘SDI 1’.

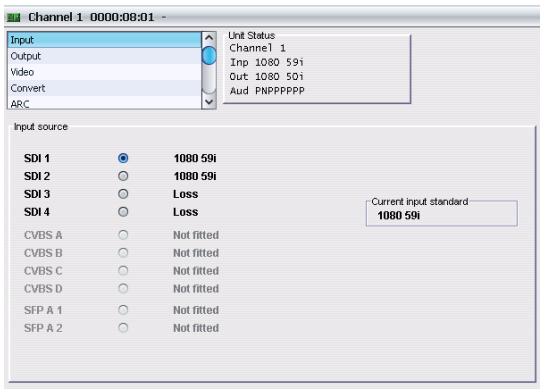



**Figure 56: Configuring Channel 1 input to ‘SDI in 1’**

Similarly, Channel 3’s input is configured

4. Select: Channel 3
5. Select: Input
6. Configure the input to be ‘SDI 2’

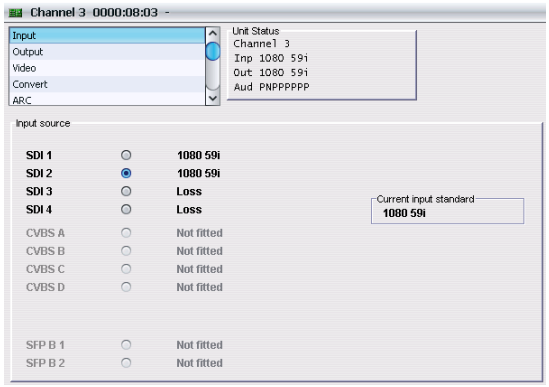



**Figure 57: Configuring Channel 3 input from ‘SDI in 1’**

Now the output standard of channel 1 is configured

7. Select: Channel 1
8. Select: Output
9. Configure output standard to be 1080 50i.

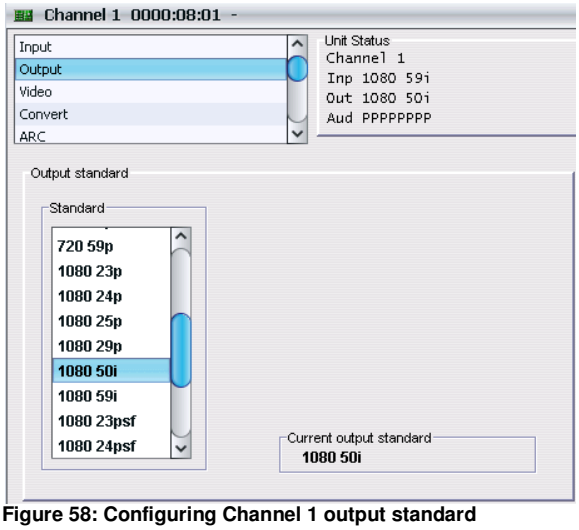



**Figure 58: Configuring Channel 1 output standard**

Similarly, the output standard of channel 3 is configured

10. Select: Channel 3
11. Select: Output
12. Configure output standard to be 625 50i

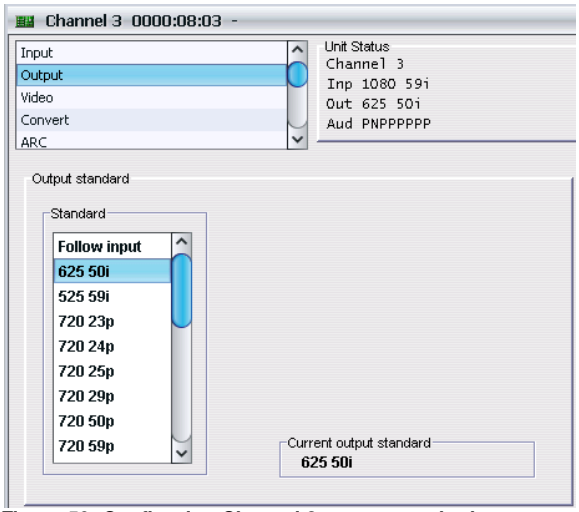



**Figure 59: Configuring Channel 2 output standard**

Now the sources to the Dolby Decoders need to be configured

13. Open the System menu.
14. Open the Dolby Template.
15. Configure the Decoder Source for ‘Dolby Ch 1’ to be ‘Embedded 2’ and ‘Dolby Ch 3’ to be ‘Embedded 2’

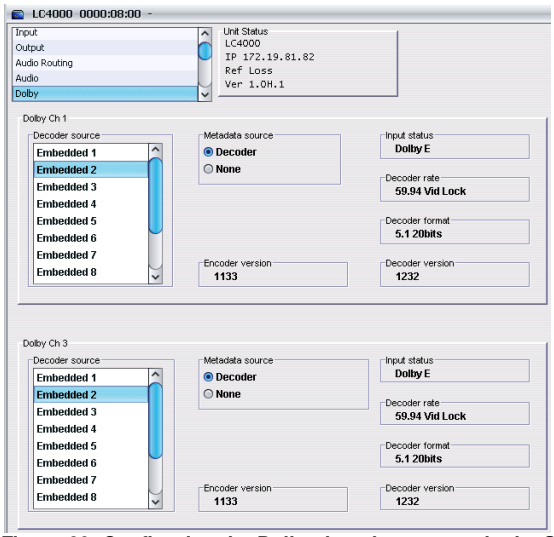



**Figure 60: Configuring the Dolby decoder sources in the System menu**

Finally, each video Processor requires ‘Audio routing’ to be configured

16. Select: Channel 1
17. Select: Audio Routing
18. Configure source for ‘Out 2’ to be the ‘Dolby Encoder’

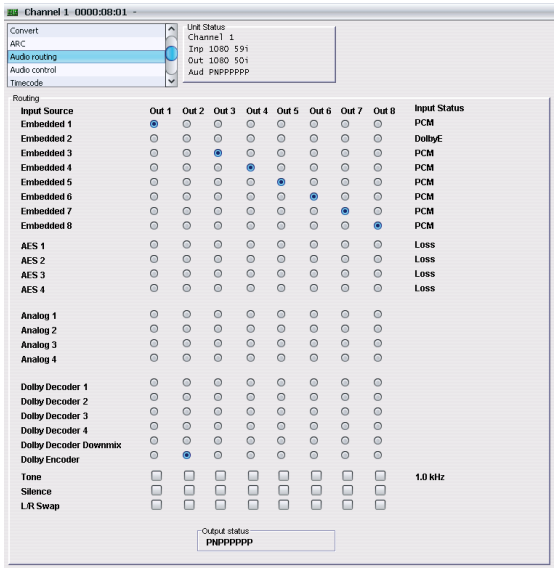



**Figure 61: Channel 1 Audio Routing**

19. Select: Channel 3
20. Select: Audio Routing
21. Configure source for ‘Out 2’ to be the ‘Dolby Encoder’

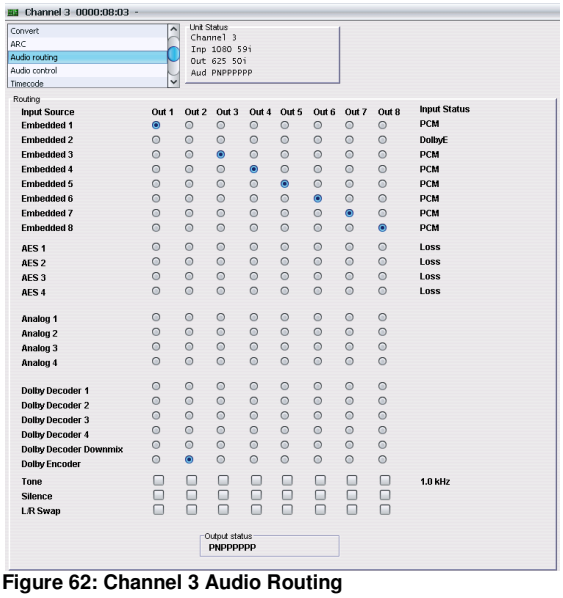



**Figure 62: Channel 3 Audio Routing**

The LC4000 is now configured to perform the required conversion process.

**Working example 5: Dolby®D pass-through, as part of a standards conversion process**

Consider the following requirement

- To use an MC2000 to convert a 1080 59i source to 1080 50i.
- The MC2000 does not have a Dolby license installed..
- A 1080 59i source stream with a single Dolby®D bitstream on EMB pair 2 is applied to SDI in 1.

The first requirement is to route the input applied to 'SDI in 1' to Video Process 'Channel 1'

1. Select: Channel 1
2. Select: Input
3. Configure the input to be 'SDI 1'

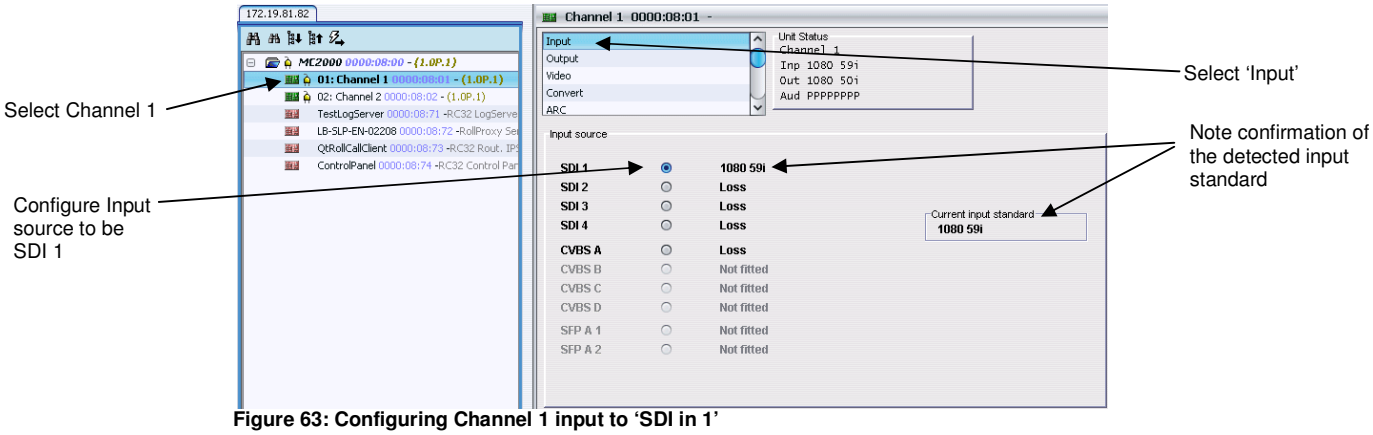



**Figure 63: Configuring Channel 1 input to 'SDI in 1'**

Configure the output standard of channel 1 to be 1080 50i

4. Select: Channel 1
5. Select: Output
6. Configure the output standard to be 1080 50i

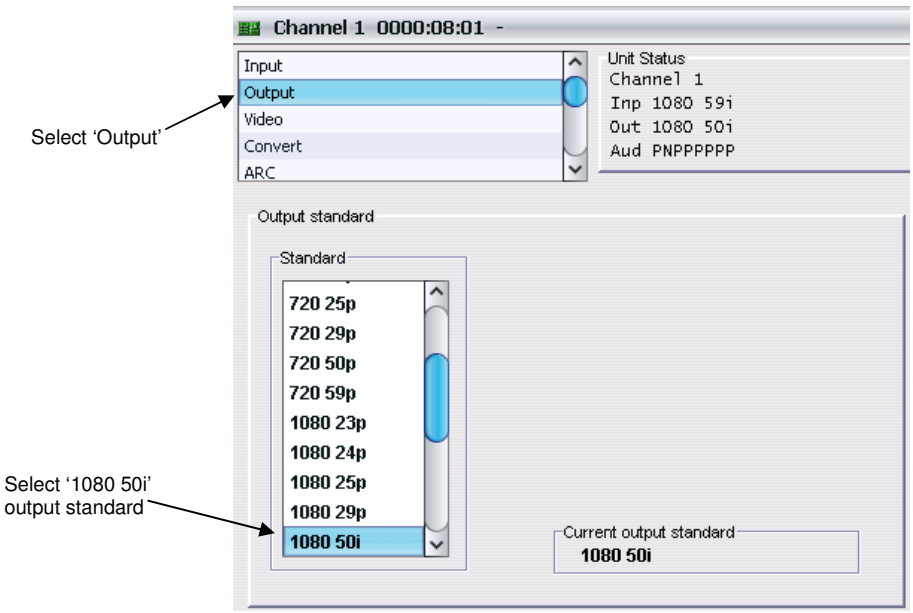



**Figure 64: Configure Channel 1 output standard**

Genlock Mode must to set to 'I/O lock'

7. In the 'System' menu, select Genlock. Set 'Source Ch 1' to 'Input':

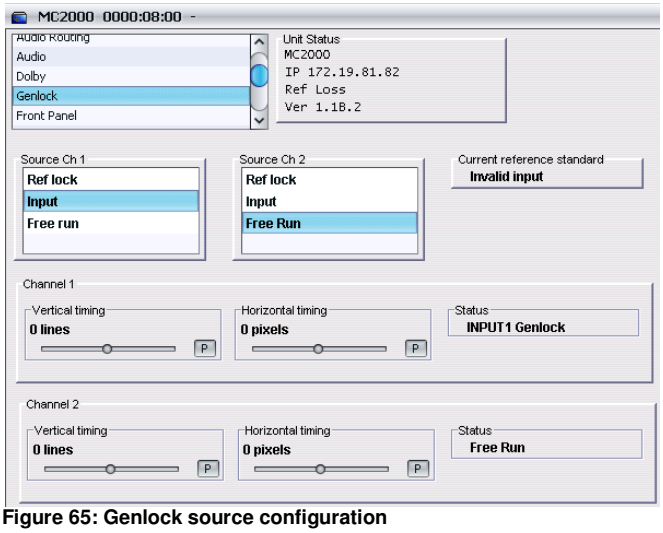



**Figure 65: Genlock source configuration**

Channel 1 Audio-Routing Configuration

8. Select: Channel 1
9. Select: Audio Routing
10. Configure source for 'Out 2' to be the 'Embedded 2'

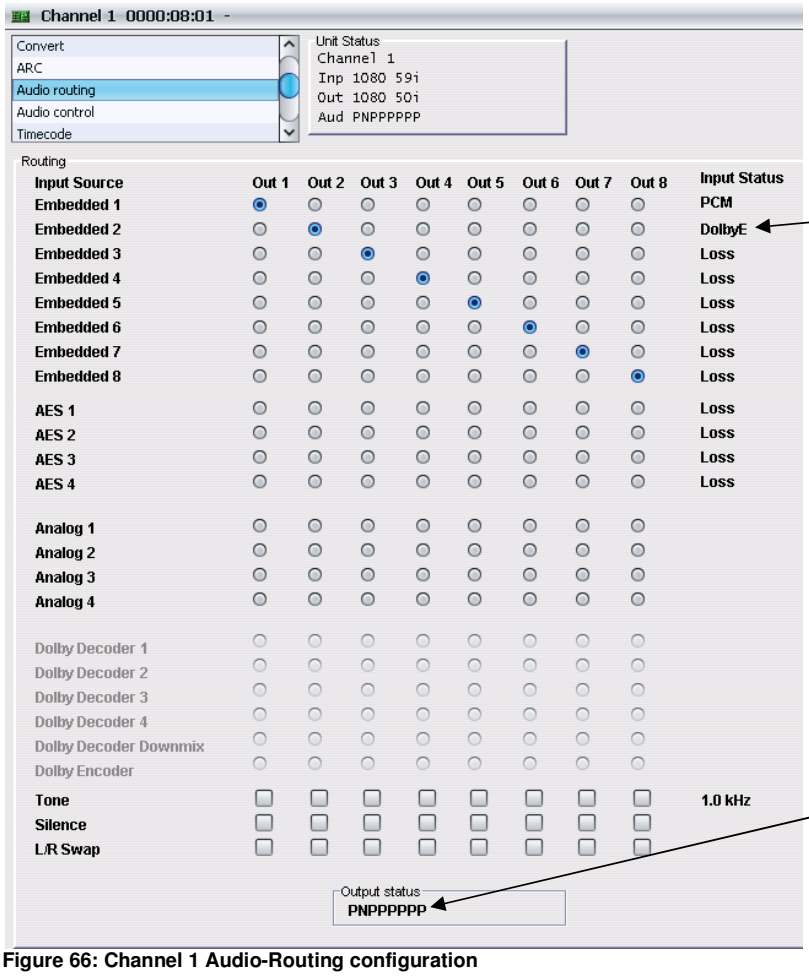



**Figure 66: Channel 1 Audio-Routing configuration**

The MC2000 is now configured for the requirement.

### Dolby Guard-band explanation

Dolby®E is constrained in that the audio data is carried in audio packets which must be correctly aligned to their associated video frames, as shown in Figure 67.

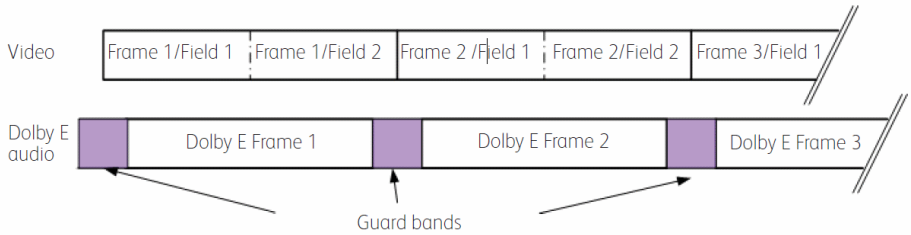



**Figure 67: Alignment of video and Dolby E audio**

The purpose of Dolby Guard-band is to allow video editing of the video content, without breaking the associated Dolby®E bitstream. Since editing will always occur on a Frame boundary, the editing point will occur during the Guard-band time period of the Dolby®E bitstream, hence no audio packet will be affected by the video edit.

If Guard-band alignment has not been maintained, as shown in Figure 68, it is possible that the video edit can break an audio packet that may occur at the same point in time as the video edit.

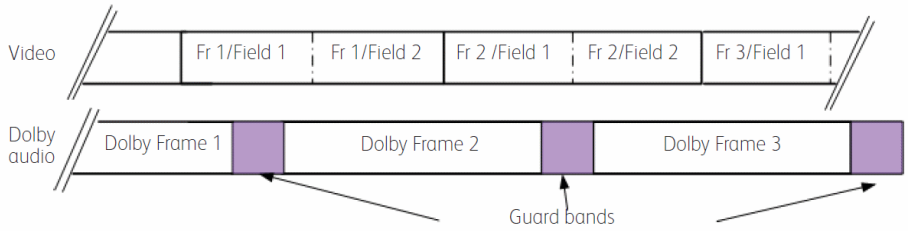



**Figure 68: Misalignment of video and Dolby E audio**

Consider an edit point executed between Frame 1 and Frame 2, as depicted in Figures 69 and 70 below:

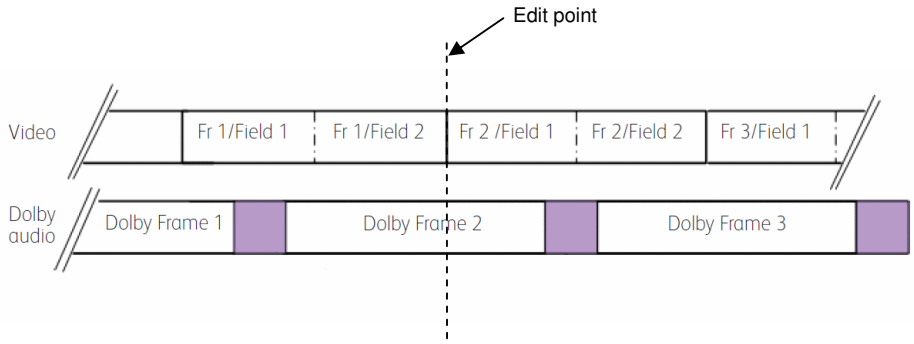



**Figure 69: Edit point breaking Dolby Bitstream 'Frame 2'**

Figure 69 depicts a video stream with mis-aligned Dolby®E audio. The cut between Frames 1 & 2 has cut Dolby 'frame 2' into two. An audio distortion would result.

Figure 70 below depicts the same cut, but this time the video stream has the correct alignment with respect to the associated Dolby®E bitstream:

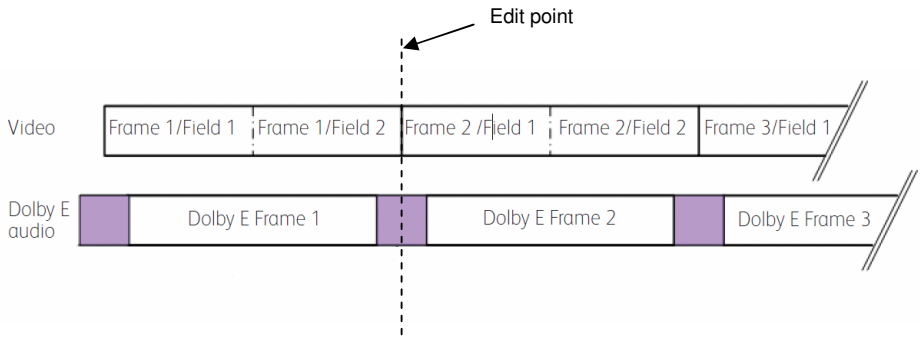



**Figure 70: Edit point performed on correctly aligned Dolby®E bitstream**

Note that the edit point is aligned with the Guard-band of the Dolby®E bitstream. The Dolby®E bitstream is not adversely affected by the edit point.