Figures

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REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.0	start	Jul 05

1. OVERVIEW

The 7737CE line of component serial digital to composite analog video converters are broadcast quality encoders with image enhancement processing to sharpen video images. An audio de-embedder with high quality audio digital to analog conversion can be purchased with the encoder to create a video/audio frame synchronizer/conversion package. In addition, Control of the module is via On-Screen-Display (OSD), or remotely via Vistalink™ SNMP.

The features of all 7737CE's are:

- One component serial digital input (525 or 625).
- One re-clocked component serial digital output.
- EDH analysis on SDI input.
- Four composite analog video outputs WITHOUT OSD text.
- Internal processing to maintain 10 bit digital video quality.
- 10 bit output video digital to analog conversion.
- One monitoring quality video output with OSD text.
- User adjustable output video processing functions: black level (brightness), gain (contrast), hue, and saturation.
- User selectable luminance and chrominance filters for different applications (i.e. broadcast vs. studio).
- User selectable horizontal blanking interval width: narrow, normal.
- One composite analog reference input (NTSC or PAL-B) on BNC. 75 Ohm or high-Z, jumper configurable input impedance.
- One frame video synchronizer (with +S option).
- Infinitely variable output phase.
- Freeze modes: black, freeze.
- Adjustable free running frequency.
- Built-in colour bar generator.
- A comprehensive on screen display is available to configure the various features of the module.

The Features of "-A4" option are:

- One group (4 channels) of synchronous 20-bit audio is de-multiplexed from the incoming digital video.
- 2 unbalanced (or balanced) AES audio inputs (up to 48kHz, 24 bits) on BNC (terminal strip).
- User selects EITHER the de-embedded audio or the input AES audio.
- The selected audio is delayed equivalently to the video delay with the +S option.
- 4 high quality 24 bit audio channels are output (analog) as balanced on 2 removable barrier strips.
- Low impedance outputs (66Ω).
- Analog audio output levels are adjustable.
- Additional audio delay of up to 5 seconds.
- Additional audio advance of up to 1 frame, depending on video delay.
- Loss of video modes: pass audio, mute audio.

1.1. FUNCTIONAL DESCRIPTION

270Mbps component SDI video is converted to 10 bit parallel data and encoded to high quality composite analog video. Various video processing functions (gain, saturation, black level, etc) are performed during the encoding process.

A re-clocked copy of the component SDI video is available on the “SDI OUT” BNC. This output will not be present if the card is unplugged or the power to the frame is turned off.

Digital audio is de-multiplexed from the incoming SDI video. External digital AES audio is also received via input BNC's (unbalanced) or removable terminal strip (balanced). The user can select either of these two sources for further processing. The selected digital audio is delayed (with +S option) to match the delay experienced by the video in the video synchronizer. In addition, the user can select additional audio delay. On the 7737CE-A4, the audio is converted to balanced analog audio through a high quality 24 bit D to A converter and delivered to the outside world via removable terminal strips.

This video goes out through two paths; a high quality component to composite converter (composite encoder) and a monitoring quality composite encoder with the OSD "burn-ins". The hardware mixes (keys) the on screen text control information onto the monitoring output video stream.

The CPU also gets pushbutton and toggle switch commands from the card edge controls and draws extensive menus for configuring the operation of the card.

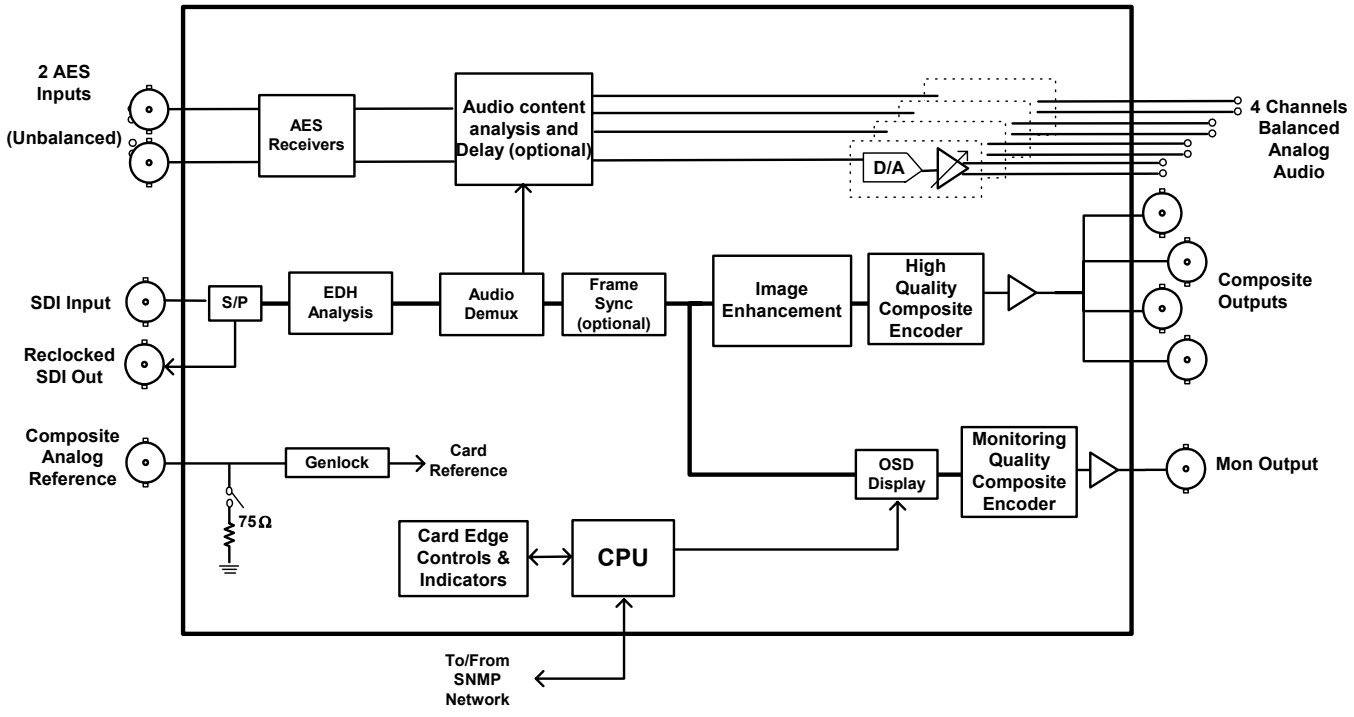

Figure 1: 7737CE-A4 Block Diagram

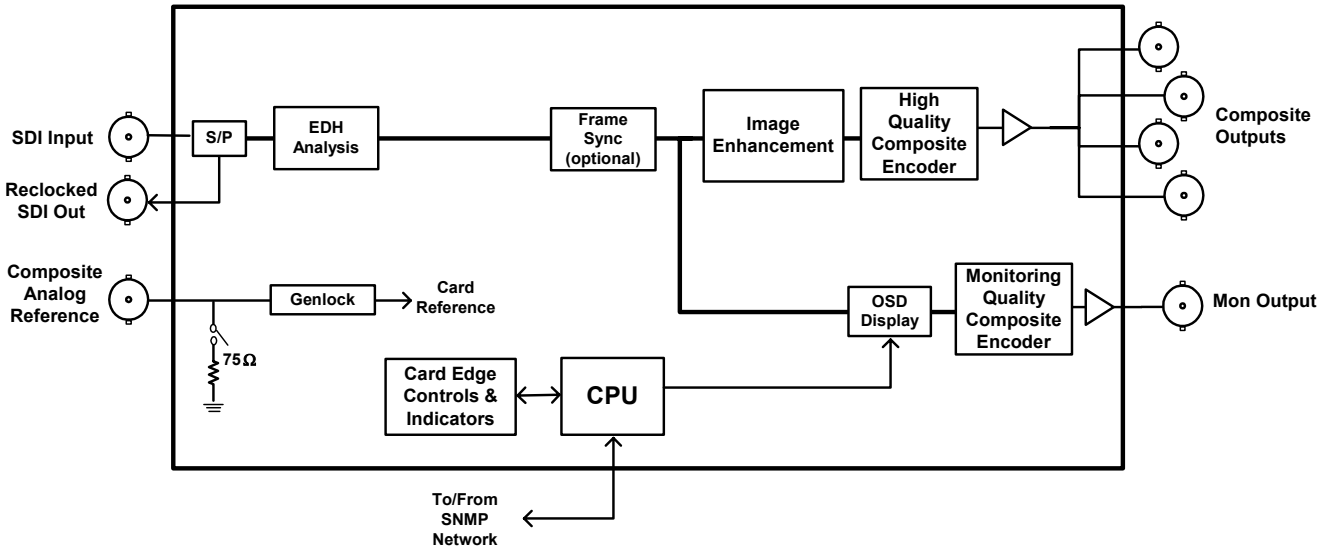

Figure 2: 7737CE Block Diagram

2. Installation

The 7737CE modules come with a companion rear plate and occupy one or two slots in the 7700FR frame.

Figure 3 shows a picture of each of the rear panels. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.

The 7737CE cards must be inserted into slots with the correct rear panel. Some cards have physical differences and some have functional differences and the associated labels will be misleading.

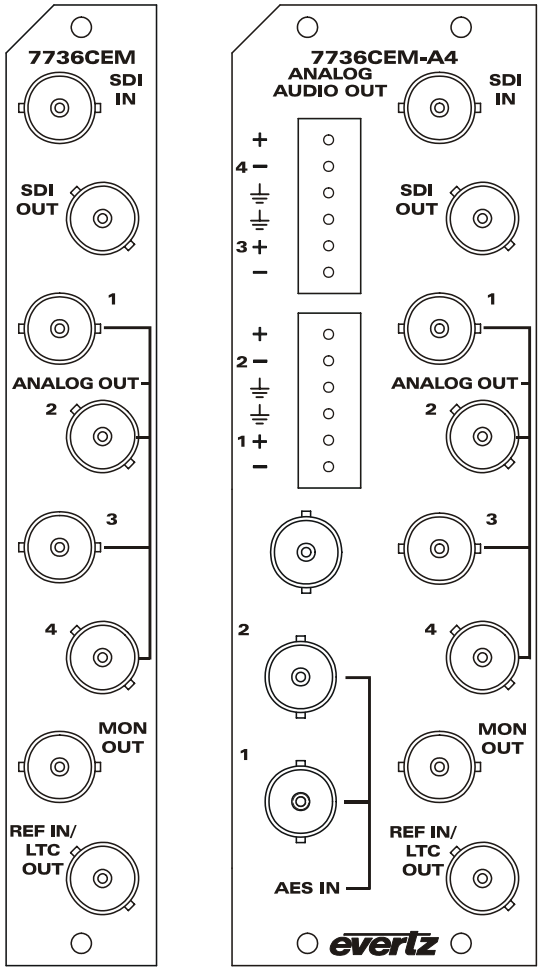

Figure 3: 7737CE Rear Panels

2.1. VIDEO IN AND OUT

Connect a source of component serial digital (525 or 625 line) video to the top BNC labeled SDI IN. A re-clocked version of the input video is available on the SDI OUT BNC. Connect a reference black signal to the REF IN BNC if frame synchronization is desired (+S only). Broadcast quality composite analog video is available on the ANALOG OUT BNCs. Monitoring quality video with text for card control and status information is available on the MON OUT output BNC. If the card is not present or the power is off, there will be nothing on any of the outputs.

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standard:	SMPTE 259M-C – 525 or 625 line component.
Number of Inputs:	1
Number of re-clocked outputs:	1
Connector:	BNC per IEC 169-8
Return Loss:	>15dB to 270MHz
Embedded Audio:	SMPTE 272M-A
Frequency Lock Range:	±75ppm from nominal
Lock up time on a hot switch:	TBD

3.2. ANALOG BROADCAST VIDEO OUTPUT

Standard:	NTSC, SMPTE 170M PAL, ITU624-4
Number of Inputs:	4
Connector:	BNC per IEC 169-8
Signal Level:	1V nominal
Output Impedance:	75 Ohm
DC Offset:	0V +/- 50mV
Return Loss:	>45dB to 10MHz
Frequency Response:	<+/- 0.1dB to 4 MHz (response will depend on selected filtering)
Differential Phase:	< 0.5° (< 0.3° typical)
Differential Gain:	< 0.5% (< 0.3% typical)
SNR:	>75dB (black video, 100kHz to 5MHz)
Output level control range:	±10%
Black level control range:	±7.5 IRE
Chroma level control range:	±10%
Hue control range:	±15 deg. (NTSC only)
Minimum Delay:	3 µs
Maximum Delay:	1 frame + 3 µs (+S option only)

3.3. REFERENCE VIDEO INPUT

Standard:	NTSC, SMPTE 170M PAL, ITU624-4
Number of Inputs:	1
Connector:	BNC per IEC 169-8
Signal Level:	1V nominal (0.5V to 1.5V)
Frequency Lock Range:	±75ppm from nominal
Input Impedance:	75 Ohm or High impedance (jumper selectable)
Return Loss:	>25dB to 10MHz
Max Subcarrier Jitter:	< 3 degrees
Free-Running Frequency Control Range:	> +/- 10ppm (> +/- 270Hz)

3.4. ANALOG MONITORING VIDEO OUTPUT

Standard:	NTSC, SMPTE 170M PAL, ITU624-4
Number of Outputs:	1
Connector:	BNC per IEC 169-8
Signal Level:	1V nominal
Output Impedance:	75 Ohm
Return Loss:	>35dB to 10MHz

3.5. ANALOG AUDIO OUTPUTS (-A4 only)

Number of Outputs:	4
Type:	Balanced analog audio
Connector:	Two 6 pin removable terminal strips
Output Impedance:	66Ω balanced
Sampling Frequency:	48kHz
Signal Level:	0dBFS => 12 to 25dBu (user settable)
Frequency Response:	<+/- 0.05dB (20Hz to 20kHz)
Dynamic range:	24 bits when AES inputs selected, 20 bits when embedded audio selected
THD+N:	<0.001% (>100dB) @ 1kHz, -1dBFS
Crosstalk:	<-105dB (20Hz to 20kHz)
DC Offset:	<+/- 30mV
SNR:	>110dB "A" Weighting
Inter-Channel Phase Error:	<+/-1° (20Hz to 20kHz)

3.6. UNBALANCED AES AUDIO INPUTS (-A4 only)

Number of Inputs:	2
Input Standard:	SMPTE 276M, single ended synchronous or asynchronous PCM AES
Connectors:	BNC per IEC 169-8
Resolution:	Up to 24 bits
Input Sampling Rate:	32kHz to 48 kHz
Minimum I/O Delay:	3.5msec

3.9. ELECTRICAL

Voltage:	+ 12VDC
Power:	9.25 Watts (7737CEM) 16.75 Watts (-A4 or –A4-B option)
EMI/RFI:	Complies with FCC Part 15, class A and EU EMC directive.

3.10. PHYSICAL

7700 frame mounting:

Number of slots:	1 for non-audio versions 2 for audio version (-A4)

4. STATUS LEDs

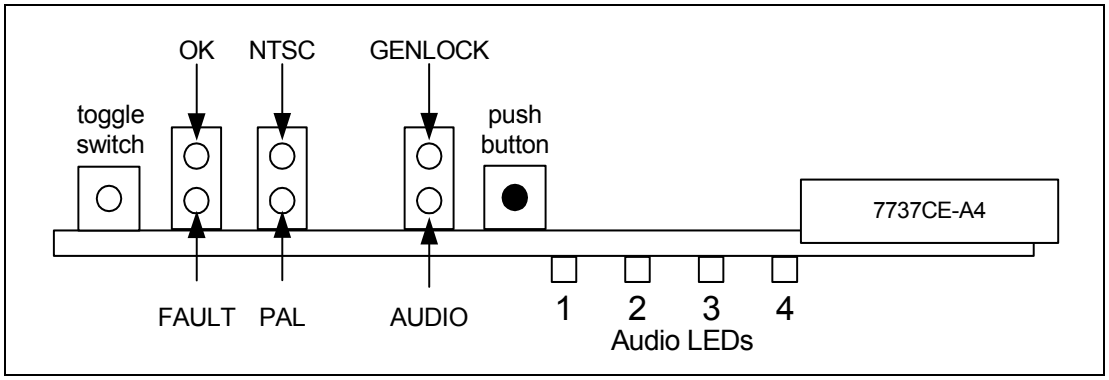

Figure 4: LED Locations

4.1. MODULE STATUS LEDS

MODULE OK: This Green LED will be on when the module is operating properly.

LOCAL FAULT: This Red LED makes it easy to identify one module in a frame that is missing an essential input or has another fault.

The LED will blink on and off if the microprocessor is not running.

The LED will be on when there is a fault in the module power supply or a user configurable error condition exists.

NTSC/PAL: The NTSC/PAL Green LEDs (NTSC on the top, away from the PCB and PAL on the bottom, closest to the PCB) will indicate the video standard of the SDI video input. If video is removed, both LEDs will go off. If the input standard is opposite to the user selected standard, the LED will flash.

GENLOCKED: This Green LED is on solid if the genlock source is present and the user has turned on genlocking.

It is flashing if the user has turned on genlocking and the genlock source is not present.

It will be off if the user has turned genlocking off.

AUDIO: This Green LED is on solid when the user selected audio is present. It will flash when some, but not all, of the audio channels are present. If no audio is present, it will be off.

For instance, if external AES audio is selected (via. the OSD menu) and only one of the two AES channels is present, then this LED will flash.

4.2. AUDIO STATUS LEDS

Four LEDs located on the lower end of the module (near the card extractor) indicate which audio channels are present. Audio channel 1 LED is located closest to the center of the module. Digital audio presence is determined by the AES receiver lock indicator (when AES input is selected). When embedded audio is selected, the channel must be present on the selected group for the LED to illuminate.

Audio LED	Colour	Audio Channel Status
1	Off	No channel 1 present.
	Green	Channel 1 present.
2	Off	No channel 2 present.
	Green	Channel 2 present.
3	Off	No channel 3 present.
	Green	Channel 3 present.
4	Off	No channel 4 present.
	Green	Channel 4 present.

Table 1: Audio Channel Status LEDs

5. AUDIO LEVELS, HEADROOM, AND CLIPPING

This section contains notes to understand how the 7737CE-A4 relates analog audio levels and digital audio levels.

Before you can calibrate the audio digital to analog converter, you must know a couple of system issues specific to your application. What is your analog reference level and how much headroom is there in the digital audio signal? By adding these two values together, you will get the analog output level that will just begin to saturate the digital word (This is the highest level that can be represented without distortion with the digital numbers). This level is called 0dB FS (FS stands for "full scale"). For instance, if your analog program reference level is 4dBu and you have 20dB of headroom in the "digital world", then 0dB FS will correspond to an analog level of 24dBu. Once the audio output level is calibrated, when you apply a digital level of –20dB FS, the analog output signal will be 4dBu .

When a full-scale digital signal is input, you will get a peak analog output signal level that is set by the *analog level* controls. The following relationship is always maintained:

PGM reference level + headroom = peak output level

6. ON SCREEN MENUS

6.1. NAGIVATING THE ON SCREEN MENU SYSTEM

A toggle switch and pushbutton allow card edge navigation of a set of on-screen menus used to configure the card.

To enter the on-screen menu system, press the pushbutton once. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub menus. An arrow

(>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit*. Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (>). Continue selecting and adjusting other parameters or use the BACK or EXIT commands.

6.2. CHANGING TEXT FIELDS

Some of the controls of the OSD menu allow you to adjust a text-based field. Editing a line of text can be a little tedious with a toggle switch and a pushbutton, but it can be done with the following procedure:

1. Select the text to edit by pressing the pushbutton when the menu item is selected. This will take you to a screen that has the label/name of the text being edited and a white box. The white box contains the text to change and is drawn to the maximum size of the text field.

```
SAMPLE TEXT
^
```

   Note the arrow (^) under the character. This indicates which character you will be changing with the toggle switch.

2. Use the toggle switch to change the first character of the text message.

3. Once you have selected the desired character, press the pushbutton. This will advance the arrow to the next character. Continue changing the remainder of the characters in the same way.

4. There are two special characters to help you enter the text: a backspace character (left pointing arrow), and an end of line character (stop sign):

Left Arrow: If you have accidentally advanced to the next character and want to go back, select the left arrow with the toggle switch. When you press the pushbutton, you will go back to the previous character. This will save you from having to complete the editing and re-edit it to change the mistake.

Stop sign: If you are done changing the text, and the new text is shorter than old text, you can terminate the line with a stop sign. When you use the pushbutton after selecting the stop sign, any remaining characters in the text field will be erased and you will return to the menu structure.

5. You are done editing when you reach the end of the field (maximum length), or you select the stop sign and press the pushbutton.

6.3. ON SCREEN DISPLAY – MAIN MENU

Audio	Configuration of the parameters associated with analog audio inputs and audio multiplexing
Video	Controls for the operation of video processing.
Utilities	Card preset management, data logging and various debug and maintenance features.

The OSD menu is arranged in a layered structure that groups similar configuration items together. The following section gives a brief description of the first level of menus that appear when you enter the OSD screens. Selecting one of these items will take you to the next menu level. The following sections provide detailed descriptions of each of the sub menus. The tables are arranged in an indented structure to indicate the path taken to reach the control. Menu items or parameters that are underlined indicate the factory default values.

6.4. CONFIGURING THE AUDIO CONTROLS (-A4)

The *Audio* menus are used to configure parameters associated with the analog audio outputs and the audio de-multiplexing. The chart below shows the items available in the *Audio* menu. Sections 6.4.2 to 6.4.5 give detailed information about each of the parameters. Many of the menu items are the same for the channel 1/2 and 3/4 channel pairs. For simplicity only the menu items for the channel 1/2 channel pair are shown in the manual.

Loss of video	Selects audio processing when video goes missing.
Audio Source	Selects the source of audio. It will either be the source group of embedded audio or external AES signals.
Audio Delay	Add/remove audio delay
Audio Buffer	Monitor audio delay buffer state
Ch1 adjust	Adjusts audio output level.
Ch2 adjust	Adjusts audio output level.
Ch3 adjust	Adjusts audio output level.
Ch4 adjust	Adjusts audio output level.
Ch 1 processing	Selects the audio processing.
Ch 2 processing	Selects the audio processing.
Ch 3 processing	Selects the audio processing.
Ch 4 processing	Selects the audio processing.

6.4.1. Loss of video

Audio	
Loss of video	
pass	
mute	

Two selectable actions can take place when input video is removed; pass and mute.

If it is desirable to maintain audio through the encoder (only valid with AES inputs), then set this control to *pass.* When set to *mute*, the audio will automatically be muted when video is removed.

6.4.2. Selecting the Audio Source

Audio	
Audio Source	
Group 1	
Group 2	
Group 3	
Group 4	
AES	

Up to 4 groups of audio may be embedded on SDI video. This control selects the group ID of the de-multiplexed audio. In addition, the external AES source may be selected.

6.4.3. Additional Audio Delay

Audio
Audio delay
0
-37ms to 5sec in 0.5ms increments

In addition to delaying the audio the same amount that the video is being delayed (in the video frame synchronizer), additional user requested delay may be added or removed with this control.

WARNING: It takes approximately 1 minute, 40 seconds to adjust the audio delay by one second. This is required by the buffer management algorithm when changing the audio buffer size at a 1% rate without muting the audio. This long buffer adjusting will happen on power-up or when a new user supplied value is set with this control. However, the audio is still usable while the buffer is being adjusted. This is good for "On-Air" adjustment of audio delays!

NOTE: Advancing audio can only happen when video is undergoing a delay that is greater than the audio! If the system configured video delay becomes too small, the audio buffer shrinks to it's smallest delay and stays at that value.

6.4.4. Monitoring the audio buffer tracking

Audio
Audio buffer

This item displays the status of the audio tracking buffer. It can be one of these states:

- Emptying (-1%)
- Emptying (-30 ppm)
- locked
- Filling (30 ppm)
- Filling (1%)

1% filling or emptying will have a slight pitch change that is near the edge of human perception for normal audio program material. This mode will be engaged when a large amount of delay needs to be changed quickly (video frame drops/repeats).

30ppm filling or emptying will be used to make minor delay buffer changes.

"Locked" will indicate that the video and audio buffers match.

The delay of the audio through the audio buffer always tracks the video except when the video frame synchronizer drops or repeats frames of video or the user supplies a different phase of input video. Unfortunately, at these boundary conditions, we can not simply drop or repeat sections of audio! A rate conversion process is used to fill or empty the buffer to the needed level. The process must be spread out over a period of time so that the action is not audible.

This indicator is mainly used at the Evertz factory and may also be useful to monitor to help in debugging system issues.

6.4.5. Setting the Analog Levels

There are 4 menu items to adjust the levels of each of the analog audio outputs. For simplicity only the menu for channel 1 will be shown in the manual.

Audio	
Ch1 adjust	
12 to 24	The channel output level is adjusted with this control. It has a range of approximately 12 dB with 1/10 dB resolution. The displayed value is the analog output level (dBu) corresponding to a 0dB FS digital input signal.
24	

6.4.6. Audio Channels Processing

There are 4 menu items to adjust the routing and processing of the audio outputs. For simplicity only the menu for channel 1 will be shown in the manual.

Audio	
Ch1 processing	
Ch1	Basic audio channel manipulation is possible with this control. Any input channel can be routed to any output channel. A mono mix of either L/R input pair can also be performed. Muting an output is also possible.
Ch2	
Ch3	
Ch4	
(Ch1+Ch2)/2	
(Ch3+Ch4)/2	
Mute	

6.5. CONFIGURING THE VIDEO CONTROLS

The *Video* menus are used to configure parameters associated with the video processing functions. The chart below shows the items available in the *Video* menu. Sections 6.5.1 to **Error! Reference source not found.** give detailed information about each of the parameters.

Video Processing	Selecting this item takes you into the Video Processing Menu
Detail Enhancement	Selecting this item takes you into the Detail Enhancement Menu
Video standard	Selects the input video standard
Loss of video	Selects the action to take when the input video is missing
Genlock source	Selects the source of genlock timing including free-running.
Free-run freq	Sets the VCXO free-running frequency
525 Fine phase	Sets the fine phase position of the output signal with respect to NTSC Genlock reference input.
625 Fine phase	Sets the fine phase position of the output signal with respect to PAL Genlock reference input.
525 H phase	Sets the horizontal phase of the output signal to the NTSC Genlock reference input.
625 H phase	Sets the horizontal phase of the output signal to the PAL-B Genlock reference input.
H Delay	Status display that shows the current horizontal input to output delay
525 V phase	Sets the vertical phase of the output signal to the NTSC Genlock reference input.
625 V phase	Sets the vertical phase of the output signal to the NTSC Genlock reference input.
V Delay	Status display that shows the current vertical input to output delay
NTSC Color Field Phase	Sets the color field phase of the NTSC output video
PAL-B Color Field Phase	Sets the color field phase of the PAL-B output video
Audio buffer	Status of audio delay buffer

6.5.1. Setting the Video Standard

Video	
Video standard	
	NTSC/525
	PAL-B/625
	Auto

The video standard is selected with this control.

Warning: If you power up the card in a standard opposite to the standard that is being applied as the genlock source, the OSD will not be readable to change the standard. You must remove the genlock signal change the standard, then re-apply the genlock.

6.5.2. Selects the Action to Take when Input Video Is Missing.

Video	
Loss of video	
	Freeze,
	Black

The user can either have the output video go to black or freeze the last good video picture at the input with this control.

6.5.3. Genlock Source Selection

Video	
Genlock source	
	Card ref,
	Ref. 1,
	Ref. 2,
	input video,
	none,
	not available

This control allows you to select the reference video for the frame synchronizer output timing. The reference may either be an externally supplied color black or you may use the input video as a reference. Optionally, the synchronizer can be free-run if the "*none*" option is selected.

If the card is installed in a 7700FR-G frame, two reference inputs are available on the frame that supply video to every card. Either of these two inputs may be selected as reference sources.

When genlocking to the input video, make sure to adjust the video H and V output phase controls to set the total processing delay. The *H* and *V Delay* indicators show you the time-of-flight of the video and audio through the frame synchronizer.

Not available will be displayed if the +S option was not purchased.

6.5.4. Setting the Free-Running Frequency

Video
Free-run freq
-256 to 256
0

This control allows you to calibrate the free-running frequency of the on-board Voltage Controlled crystal Oscillator (VCXO). This oscillator provides the time-base when either operating without a reference input (free-running) or when running with a reference and the reference video is removed.

To calibrate the free-running frequency, use this or a similar procedure:

- Turn off genlocking with the "Genlock source" control or remove reference video from the reference input. Wait for the VCXO to stabilize at it's free-running frequency.
- Apply the composite analog monitoring output video to a vector scope that is externally referenced to the signal (usually plant reference black) that you are trying to frequency match.
- Adjust this control until the vectors spin slowly.
- Turn genlocking back on or apply reference video.

6.5.5. Setting the Fine Phase of the Output Video – NTSC/525 Video

Video
525 fine phase
-128 to 127
0

With this control, you can set the horizontal fine phase timing of the output video with respect to the Genlock when operating in NTSC/525 video mode and locking to the reference input (this control is not available when locking to the input video). Increasing the value will delay the output video. There is approximately 250 ns range on this control.

Warning: For a set output horizontal phase, there are a few *fine phase/H phase* combinations that will achieve the same position. For best results, set this control to 0, set the H phase to get within 37ns of the desired position, then adjust this control to get closer.

6.5.6. Setting the Fine Phase of the Output Video – PAL-B/625 Video

Video
625 fine phase
-128 to 127
0

With this control, you can set the horizontal fine phase timing of the output video with respect to the Genlock when operating in PAL/625 video mode and locking to the reference input (this control is not available when locking to the input video). Increasing the value will delay the output video. There is approximately 250 ns range on this control.

Warning: For a set output horizontal phase, there are a few *fine phase/H phase* combinations that will achieve the same position. For best results, set this control to 0, set the H phase to get within 37ns of the desired position, then adjust this control to get closer.

6.5.7. Setting the Horizontal Phase of the Output Video – NTSC/525 Video

Video
525 H phase
0 to 1715 0

With this control, you can set the horizontal timing of the output video with respect to the Genlock reference input when operating in NTSC/525 video mode. Increasing the value will delay the output video in one-sample increments.

Warning: For a set output horizontal phase, there are a few *fine phase/H phase* combinations that will achieve the same position. For best results, set the fine phase control to 0, set this control to get within 37ns of the desired position, then adjust the fine phase control to get closer.

6.5.8. Setting the Horizontal Phase of the Output Video – PAL-B/625 Video

Video
625 H phase
0 to 1727 0

With this control, you can set the horizontal timing of the output video with respect to the Genlock reference input when operating in PAL/625 video mode. Increasing the value will delay the output video in one-sample increments.

Warning: For a set output horizontal phase, there are a few *fine phase/H phase* combinations that will achieve the same position. For best results, set the fine phase control to 0, set this control to get within 37ns of the desired position, then adjust the fine phase control to get closer.

6.5.9. Monitoring the Horizontal Delay between the Input and Output Video

Video
H Delay

This item displays the horizontal delay between the input and output video. This value is useful to monitor while you are adjusting the H phase parameters and debugging system issues. One count is equivalent to 8 clocks of 27Mhz video.

6.5.10. Setting the Vertical Phase of the Output Video – NTSC/525 Video

Video
525 V phase
0 to 524 0

With this control, you can set the vertical timing of the output video with respect to the Genlock reference input when operating in 525 video mode. Increasing the value will delay the output video in one-line increments.

6.5.11. Setting the Vertical Phase of the Output Video – PAL-B/625 Video

Video
625 V phase
0 to 624 0

With this control, you can set the vertical timing of the output video with respect to the Genlock reference input when operating in 625 video mode. Increasing the value will delay the output video in one-line increments.

6.5.12. Monitoring the Vertical Delay between the Input and Output Video

Video
V Delay

This item displays the vertical delay between the input and output video. This value is useful to monitor while you are adjusting the V phase parameters and debugging system issues.

6.5.13. Setting the Color Field Phase of the Output Video – NTSC Video

Video
NTSC C phase
0 to 1
0

With this control, you can set the color field phase of the output video with respect to the Genlock reference input when operating in NTSC/525 video mode.

The correct value for this register will depend on the reference to output video phase. If the output video is later than the reference video, but less than one field, then setting this control to "0" will make the output video have the same color field relationship to the genlock.

6.5.14. Setting the Color Field Phase of the Output Video – PAL-B Video

Video
PAL-B C phase
0 to 3
0

With this control, you can set the color field phase of the output video with respect to the Genlock reference input when operating in PAL-B/625 video mode.

The correct value for this register will depend on the reference to output video phase. If the output video is later than the reference video, but less than one field, then setting this control to "0" will make the output video have the same color field relationship to the genlock.

6.5.15. Monitoring the audio buffer tracking (-A4)

Video
Audio buffer

This item displays the status of the audio tracking buffer. It can be one of these states:

- Emptying (-1%)
- Emptying (-30 ppm)
- locked
- Filling (30 ppm)
- Filling (1%)

1% filling or emptying will have a slight pitch change that is near the edge of human perception for normal audio program material. This mode will be engaged when a large amount of delay needs to be changed quickly (video frame drops/repeats).

30ppm filling or emptying will be used to make minor delay buffer changes.

"Locked" will indicate that the video and audio buffers match.

The delay of the audio through the audio buffer always tracks the video except when the video frame synchronizer drops or repeats frames of video or the user supplies a different phase of input video. Unfortunately, at these boundary conditions, we can not simply drop or repeat sections of audio! A rate conversion process is used to fill or empty the buffer to the needed level. The process must be spread out over a period of time so that the action is not audible.

This indicator is mainly used at the Evertz factory and may also be useful to monitor to help in debugging system issues.

6.6. CONFIGURING THE VIDEO PROCESSING CONTROLS

The *Video Processing* menu is used to configure parameters associated with the composite encoder video processing. The chart below shows the items available in the *Video Processing* menu.

NTSC setup pedestal	Selects whether the NTSC 7.5 IRE pedestal will be added to the composite analog output video
Line 21 setup	Controls line 21 processing
Colour Bars	Turn on internally generated colour bar test signal
Composite display mode	Selection of colour or B/W modes
Video level	Controls the output video level
Hue	Controls the output video hue
Saturation	Controls the output video saturation
Contrast	Controls the output video white level
Brightness	Controls the output video black level
H blanking	Controls the width of horizontal blanking
VBI processing	Either pass or blank the vertical blanking interval lines
Y Filter Selection	Standard composite filtering or adjustable filtering is selectable
Wideband Y Freq. Resp.	Controls the frequency response with the wideband filter selected
Chroma Filter Selection	Various chroma bandwidths are available with this control

6.6.1. Adding the NTSC Setup Pedestal

- *Video*
  - *Video Processing*
    - *NTSC setup pedestal*
      - *Off*
      - *On*

Composite NTSC analog video may have a 7.5 IRE pedestal while 4:2:2 SDI video does not. This control, when set to *On*, will add the pedestal and re-scale the video accordingly. The setup pedestal should not be present on composite video when operating in Japan.

6.6.2. Line 21 Processing

- *Video*
  - *Video Processing*
    - *Line 21 setup*
      - *Off,*
      - *On,*
      - *Blank*

Closed captioning has been defined to NOT have a 7.5 IRE pedestal, but it is placed on the first active line of video where there may be a pedestal. The upstream closed captioning encoder should not have generated a setup pedestal. When encoding composite video with properly keyed captioning, a pedestal must not be generated.

This control, when set to *Off*, will not create the 7.5 IRE pedestal on line 21. This is the default state for properly generated captioning.

When set to *On*, the 7.5 IRE pedestal will be generated on line 21. Use this state when there are no input captions.

Note: The *On* condition will only take effect if the *NTSC Setup Pedestal* control is set to *On*.

Blank is used to remove captioning from line 21.

Note: The captions are *Blank*ed from the main, high quality, output only. This will allow the monitoring of upstream captioning on the *monitoring output* even when it is not desirable to have them passed downstream on the program video.

6.6.3. Colour Bars

- *Video*
  - *Video Processing*
    - *Colour bars*
      - *On,*
      - *Off*

Internally generated colour bars may be turned on to aid in monitor calibration. To make sure that this control is not left on accidentally, this parameter is not included in the preset management.

Warning: You can not change the output phasing when the colour bars are turned on. Be careful when adjusting genlock references when this is turned on.

6.6.4. Setting the Composite Display Mode – Colour or Monochrome

- *Video*
  - *Video Processing*
    - *Composite display mode*
      - *Colour*
      - *B/W*

If monochrome operation is desired on the composite output, colour may be turned off with this control.

6.6.5. Video Level

Video	Video Processing	Video level	-150 to 50, 0

This control allows the user to adjust the output level of the analog video (including sync). When set to 0, the nominal output video level will be 140 IRE.

Warning: The brightness and contrast controls will also affect video level. Set this control by measuring sync level rather than video level. After calibrating the brightness and contrast, come back to this control and verify the video level.

6.6.6. Setting the Hue

Video	Video Processing	Hue	-22.5 to 22.5 0.0

This control allows the user to adjust the Hue of the analog video in steps of 0.175 degrees.

6.6.7. Setting the Saturation

Video	Video Processing	Saturation	-64 to 63 0

This control allows the user to adjust the saturation level of the analog video.

6.6.8. Setting the Contrast

Video	Video Processing	Contrast	-64 to 63 0

This control allows the user to adjust the contrast (white level) of the analog video. There is a +/- 10% range on this control.

6.6.9. Setting the Brightness

- *Video*
  - *Video Processing*
    - *Brightness*
      - *-32 to 31*
      - *0*

This control allows the user to adjust the brightness (black level) of the analog video. There is a +/- 15 IRE range on this control.

6.6.10. H Blanking

- *Video*
  - *Video Processing*
    - *H Blanking*
      - *Wide,*
      - *Narrow*

When set to *Narrow*, the H blanking will be 10.7µsec wide. When set to Wide, the H blanking will be 11.2µsec.

6.6.11. VBI Processing

- *Video*
  - *Video Processing*
    - VBI Processing
      - *Blank,*
      - *Pass*

The Vertical Blanking Interval may be passed to the component outputs or may be blanked (removed) to not interfere with display of the image.

6.6.12. Y Filter Selection

- *Video*
  - *Video Processing*
    - Y Filter Selection
      - *Wide bandwidth,*
      - *Composite*

The Y channel may be filtered with a standard composite filter or may be wideband. When *Wide bandwidth* is selected, the following control allows the frequency response to be adjusted.

6.6.13. Wideband Y Frequency Response

- *Video*
  - *Video Processing*
    - *Wideband Y Freq. Resp.*
      - *-6 to 6*
      - *0*

When the above parameter is set to *Wide bandwidth*, this controls a set of high frequency response curves with +/- 4dB range.

Note: If you want to observe the filtering, supply a component multiburst or H sweep test signal.

6.6.14. Chroma Filter Selection

Video	
Video Processing	
Chroma Filter Selection	
650kHz, 1.0Mhz, 1.3MHz, 2.0MHz, 3.0MHz	

The Cb and Cr channels may be filtered with any of these bandwidths.

Note: If you want to observe the filtering, supply a component multiburst or H sweep test signal.

6.7. CONFIGURING THE DETAIL ENHANCEMENT CONTROLS

The *Detail Enhancement* menu is used to configure parameters associated with the detail enhancement video processing. The chart below shows the items available in the *Detail Enhancement* menu.

Detail Gain	Controls the amount of enhancement
Luma Floor	Selects the minimum Luma value that will be enhanced
Detail Noise Floor	Selects the level of detail that will be enhanced
Enhancement Limit	Selects the largest amount of enhancement to perform
Horizontal Band	Selects the horizontal frequency band to be enhanced
Vertical Intensity	Selects the vertical frequency band to be enhanced

6.7.1. Setting the Detail Gain

Video	
Detail Enhancement	
Detail Gain	
0 to 127	

With this control the user can adjust the amount of detail enhancement. This can be adjusted in steps of 1 from 0 to 127.

6.7.2. Setting the Luma Floor

Video	
Detail Enhancement	
Luma Floor	
0 to 15	

Selects the minimum Luma value that will be enhanced. Pixels with a luma value below this floor will be left untouched.

This control stops low level noise on black video from being amplified.

6.7.3. Setting the Detail Noise Floor

Video
Detail Enhancement
Detail Noise Floor
0 to 15

When the enhanced image detail has a value that is below this floor it will be deemed to consist mostly of noise. As such, the pixel associated with that detail level will be left untouched (not enhanced).

6.7.4. Setting the Enhancement Limit

Video
Detail Enhancement
Enhancement Limit
0 to 63

Selects the largest detail value to be added back into the signal. Detail that has a value larger than this value will be clipped.

6.7.5. Setting the Horizontal Band

Video
Detail Enhancement
Horizontal Band
0, 5, 10, 15, 20

Selects the Horizontal frequency band to be enhanced.

Where 0 selects the lowest frequency band available and 20 the highest.

6.7.6. Setting the V Enhancement

Video
Detail Enhancement
Vertical Intensity
0 to 100%

Selects the intensity of the vertical enhancement process, as a ratio of the Horizontal enhancement.

The range is 0 to 100% in steps of 25%.
Where 0% refers to no Vertical enhancement and 100% provides a Vertical intensity that is equivalent to the Horizontal.

6.8. THE ON-SCREEN DISPLAY STATUS

The purpose of the Video/Audio status screen is to show as much status information about the video and audio as possible in a small, concise table. Table 2 shows each item that may appear in the status screen. The Status window is always displayed on the 7737CE(-A4) when not in the setup menus.

Item	*Value(s)*	*Description*
Video	525/625/not present/ 525 (wrong std)/625 (wrong std)	Input video standard detected. If the card is a different standard than what is on the input, *(wrong std)* will be displayed.
Genlock	present/not present/off	Genlock presence detected. If genlock is turned on and video of the correct standard is applied, *present* will be displayed. If a *genlock source* of *off* is selected, *off* will be displayed.
Audio Groups	None, 1, 2, 3, 4	Displays the embedded audio groups present on the incoming video.
Sel. Aud Src Ch	None, 1, 2, 3, 4	Displays the audio channels present on the selected audio source (selected group or externally supplied AES).
Product Type	7737CE, 7737CE-A4	Displays the card product type.

Table 2: Video/Audio Status Screen Items

6.9. UTILITIES

6.9.1. Accessing Information About this Module and its Firmware

Utilities
About…

This menu item list the particulars about this module and the firmware residing within it. It gives quick access to information about revisions that can be used to determine when upgrades are required.

6.9.2. Saving And Recalling Configurations

The module provide two user preset areas to save the complete set of control from the on screen menu. The *Store preset* and *Recall preset* menu items are used to save and recall these configurations.

For simplicity the following sections of the manual show how to store and recall from Preset 1 only.

6.9.2.1. Storing Configurations to the User Presets

Utilities
Store preset 1
Store
Cancel

This control is used to initiate a store of the current card configuration into one of the user presets

After selecting the store preset operation, you must change the command to *Store* and press the pushbutton before the store will take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

6.9.2.2. Recall Configurations from the User Presets

Utilities
Recall preset 1
Recall,
Cancel

This control is used to initiate a recall of the current card configuration from one of the user presets

After selecting the recall preset operation, you must change the command to *Recall* and press the pushbutton before the store will take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

Warning: there will be a slight disturbance in the operation of the card and the on-screen display while the new preset is being recalled.

Warning: the current state of the card will be forgotten if it has not been saved to a preset before a recall is performed.

6.9.3. Initiating a Software Upgrade

Utilities
Upgrade
Yes
Cancel

This menu item is used to initiate an upgrade of the module software.

In addition to the software upgrade support detailed in this manual (See the *Upgrading Firmware* section of this manual for more information), you can initiate an upgrade with this command. This will allow you to upgrade the software without unplugging the card and changing the upgrade jumper.

After selecting the upgrade operation, you must change the command to *Yes* and press the pushbutton before the upgrade can take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

After the upgrade has finished, the unit will automatically restart and run in normal operating mode.

6.9.4. Restoring the CE to its Factory Default Configuration

Utilities
Factory reset
Yes
Cancel

This menu item is used to restore all controls back to their factory defaults.

After selecting the reset operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all parameters will be set to their factory default. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

7. JUMPERS

Figure 5 : Location of Jumpers on 7736CE Boards

7.1. TERMINATION JUMPERS

REF TERM The REF TERM jumper J22 located on the rear of the card near the white multi-pin connectors, selects the reference video termination impedance. Either 75Ω or a high-Z (27kΩ) termination impedance can be selected by placing the jumper in the "75" (top justified) or "HI-Z" (bottom justified) positions, respectively.

7.2. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS The FRAME STATUS jumper J3 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the ON position. (Default) When this jumper is moved to the OFF position, local faults on this module will not be monitored.

7.3. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

The following method can be used to upgrade the firmware in the CE card. You can also use the *UPGRADE* menu item located on the *UTILITIES* menu to upgrade the firmware.

UPGRADE

The UPGRADE jumper J2, is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* chapter in the front of the binder for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J2 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J1 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* chapter in the front of the binder. Once the upgrade is completed, remove the module from the frame, move J2 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

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