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REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary version.	Oct 05
1.0	First release version.	Jan 06

1. OVERVIEW

The 7710NR-HD Noise Reducer with Image Enhancement provides high quality and cost effective noise reduction for HD or SD video signals. The 7710NR-HD is ideal for use in television production facilities; mobile broadcast vehicles, production and post-production facilities.

The 7710NR-HD allows the user to remove random Gaussian noise, impulsive noise, and other temporal varying artifacts. The 7710NR-HD uses proprietary noise reduction processing that consists of five distinct filters and a complex motion adaptive algorithm to combine and control the filtered results based on two motion sensors. The module also provides user adjustable image enhancements to sharpen image details.

The 7710NR-HD occupies two card slots in the 3RU frame (7700FR-C), which will hold up to 15 1-slot modules or one slot in the 1RU frame (7701FR), which will hold up to three modules. The 7710NR-HD modules may also be used in a standalone unit (S7701FR).

The units also provide card edge LEDs to indicate signal present, genlock present and audio groups present.

Features:

- One 1.5 Gb/s HD input (per SMPTE 292M) or 270 Mb/s SD input (per SMTPE 259M) auto sensing
- Three 1.5 Gb/s HD or 270 Mb/s SD outputs
- Full 10-bit I/O processing
- Gaussian, impulsive and temporal artifact noise reduction
- Image enhancements – user adjustable
- User presets to store noise reducer and image enhancement settings
- Split Screen comparison mode
- Full video processing functions, GBR gain YCrCb gain and offset, hue adjustment and RGB colour limiter.
- De-embeds Audio from HD video input and embeds into HD video output (2 groups).
- Moves VITC time code and Line 21 captions from the SD video into the SD video output.
- Moves RP-188 VITC from HD input to HD output, recalculated for frame rate changes.
- Moves HD closed captions from HD input to HD output.
- On screen display for card configuration
- Card edge control and LEDs for video and audio presence and module status
- VistaLINK® - enabled offering remote control and configuration capabilities via SNMP (using VistaLINK® PRO, 9000NCP, or 9000NCP2 Network Control Panel) is available when modules are used with the 3RU 7700FR-C frame and a 7700FC VistaLINK® Frame Controller module in slot 1 of the frame.

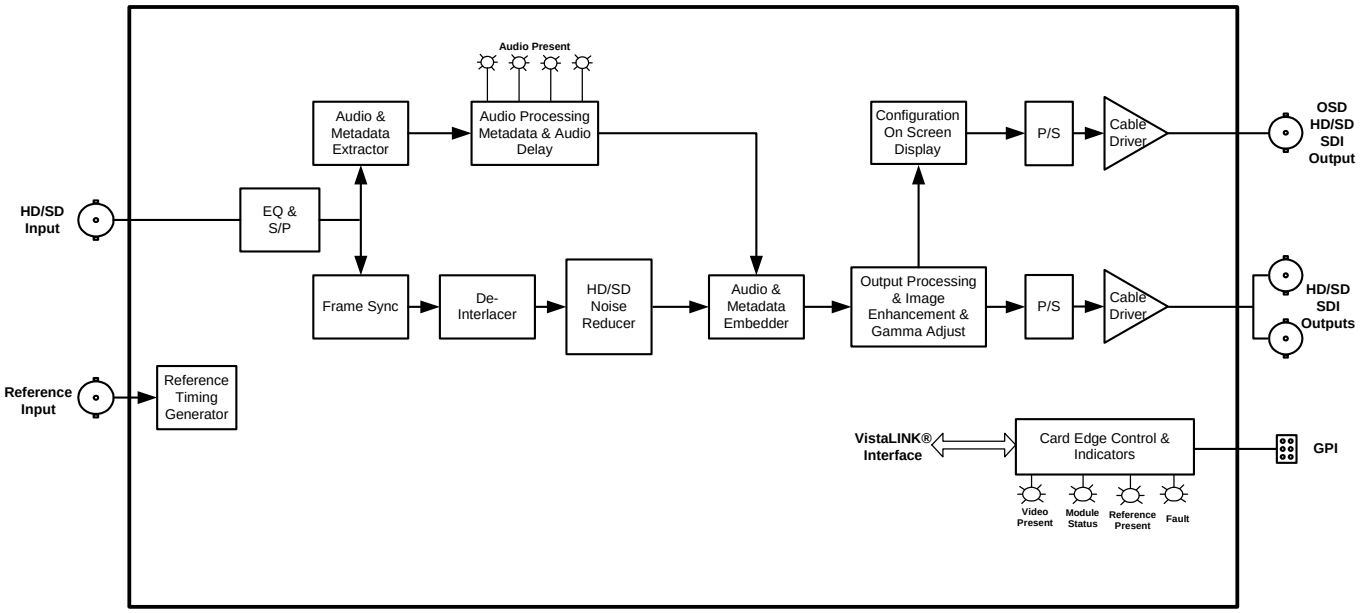


Figure 1: 7710NR-HD Block Diagram

2. INSTALLATION

The 7710NR-HD comes with a companion rear plate that occupies two slots in the frame. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.

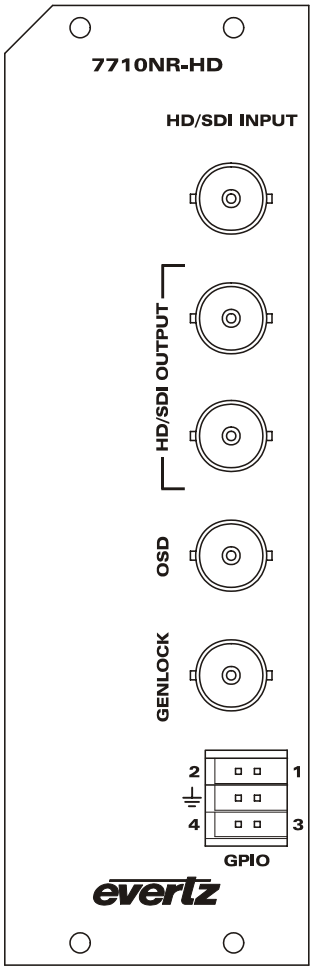


Figure 2: Rear Panel

2.1. VIDEO CONNECTIONS

HD/SDI INPUT The input BNC connector for 10-bit serial digital video signals compatible with the SMPTE 292M or SMPTE 259M-C standard. The module can be set to a specific video standard or set to automatically detect.

HD/SDI OUTPUT These BNC connectors are used to output the noise reduced video as serial component video, in the same standard as the input video.

OSD This BNC connector is used to output the noise reduced video as serial component video in the same standard as the input video and has on screen display menus (OSD) superimposed over the video.

2.2. GENLOCK REFERENCE

For proper synchronization of the output video, the Noise Reducer must be locked to a genlock signal of the output video format.

GENLOCK This BNC is for connecting a video or tri-level sync reference and is auto-detected by the module. Jumper J21 selects whether the reference input is terminated to 75 ohms or high impedance (default). (See section 7.3). The *Reference* menu item is used to select the correct type of video reference being used. The output video can be timed with respect to the genlock video using the *H Phase Offset* and *V Phase Offset* menu items. (See section 6.3.1) When no Genlock is provided, the output video is timed with respect to the input video.

2.3. GENERAL PURPOSE INPUTS

On the 7710NR-HD a 6-pin connector labeled **GPIO** contains 4 GPI inputs.

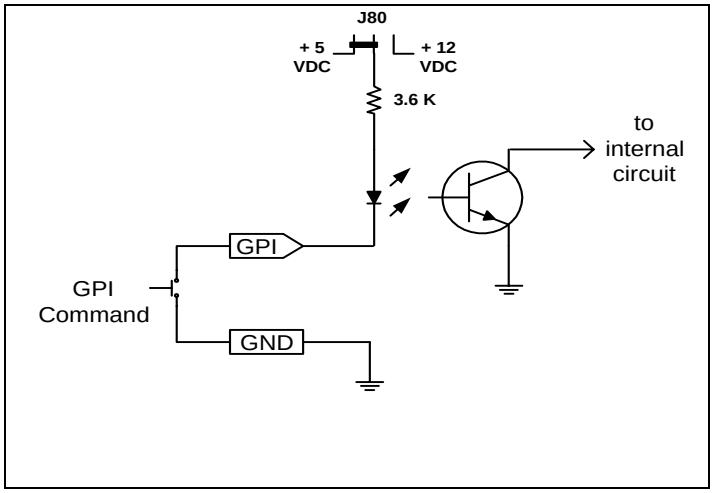


Figure 3: GPI Input Circuitry

3. SPECIFICATIONS

3.1. SERIAL DIGITAL VIDEO INPUTS

Standards:	Auto detect or menu selectable SMPTE 292M (1.5Gb/s) 1080i/60, 1080i/59.94, 1080i/50, 720p/60, 720p/59.94 and 720p/50, 1035i/59.94, 480p/59.94 SMPTE 259M-C (270 Mb/s) 525i/59.94 or 625i/50
Number of Inputs:	1
Connector:	BNC per IEC 60169-8 Amendment 2
Input Equalization:	Automatic to 100m @ 1.5Gb/s with Belden 1694 or equivalent cable.
Return Loss:	
SD Standards:	>15 dB up to 540Mb/s
HD Standards:	>15 dB up to 1. 5Gb/s

3.1. SERIAL DIGITAL VIDEO OUTPUTS

Standard: same as input
Number of Outputs: 3 Per Card (including 1 for On Screen Display)
Connector: BNC per IEC 60169-8 Amendment 2
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time:
SD Standards: 740ps nominal
HD Standards: 200ps nominal
Overshoot: <10% of amplitude
Return Loss:
SD Standards: > 15 dB at 540MHz
HD Standards: > 15 dB at 1.5 GHz

3.2. GENLOCK INPUT

Type: HD Tri-Level sync, NTSC or PAL Colour Black 1 V p-p
Connector: BNC per IEC 60169-8 Amendment 2
Termination: 75 ohm (jumper selectable)

3.3. GENERAL PURPOSE INPUTS

Number: 4 (configurable as inputs)
Type: Opto-isolated, active low with internal pull-ups to +5 or +12V (jumper settable)
Connector: 6 pin removable terminal block
Signal Level: closure to ground
Function:
Inputs: User Preset select

3.4. ELECTRICAL

Voltage: +12VDC
Power: 25 Watts. (7710NR-HD)
EMI/RFI: Complies with FCC regulations for class A devices.
Complies with EU EMC directive.

3.5. PHYSICAL

Number of slots:
7700 frame mounting: 2
7701 frame mounting: 1

4. STATUS INDICATORS

The 7710NR-HD series modules have 3 LED Status indicators on the main circuit board front card edge to show operational status of the card at a glance. Figure 4 shows the location of the LEDs and card edge controls.

Two large LEDS on the front of the main board indicate the general health of the module

LOCAL FAULT: This Red LED indicates poor module health and will be ON during the absence of a valid input signal or if a local input power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be ON when a valid input signal is present, and the board power is good.

VIDEO PRESENT This Green LED will be ON when there is a valid video signal present at the module input.

GENLOCK This Green LED will be ON when there is a signal present at the module genlock input. This LED will blink to indicate that an incorrect signal appropriate for the current video format is present.

The large LEDs on the sub board of the module do not indicate any functionality and will always be Green.

4.1. AUDIO STATUS LEDS

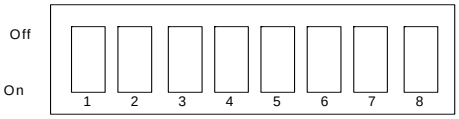
Four LEDs located on the main board on the lower end of the module (near the card extractor) indicate which audio groups are present in the input video. Audio group LED 1 is located closest to the center of the module.

Audio Group LED	Colour	Audio Group Status
1	Off	No group 1 present on input video.
	Green	Group 1 present on input video.
2	Off	No group 2 present on input video.
	Green	Group 2 present on input video.
3	Off	No group 3 present on input video.
	Green	Group 3 present on input video.
4	Off	No group 4 present on input video.
	Green	Group 4 present on input video.

Table 1: Audio Group Status LEDs

5. CARD EDGE CONTROLS

The 7710NR-HD series modules are equipped with an 8 position DIP switch to allow the user to select various functions. All positions are assigned sequentially such that the DIP switch 1 is located at the top of the DIP switch (farthest from the card ejector). Table 2 gives an overview of the DIP switch functions. Sections 5.1 to 5.3 describe the DIP switch functions. The On (closed) position is down, or closest to the printed circuit board. The Off (open) position is up, or farthest from the printed circuit board. There is also a toggle switch and pushbutton which are used to navigate the on screen menu. (See section 6)



DIP Switch	Function
1	Video Standard
2	
3	
4	
5	
6	Frame Rate Divisor Selection
7	
8	VistaLINK® Control Enable

Table 2: Overview of DIP Switch Functions

5.1. SETTING THE VIDEO FRAME RATE

DIP switches 6 and 7 are used to set the frame rate frequency of operation.

DIP 6	DIP 7	FRAME RATES
Off	Off	Set by Menu or VistaLINK®
On	Off	59.94/29.97/23.98
Off	On	50/25

Table 3: Frame Rate Divisor DIP Switch Settings

When DIP switches 6 and 7 are both OFF, the frame rate and video standard can be set by either the menu system or VistaLINK® only (they cannot be set by the DIP switches). The other two settings of DIP switches 6 and 7 allow setting of the frame rate and video standard manually using the DIP switches only (they cannot be set by the menu system or VistaLINK®).

5.2. SETTING THE INPUT VIDEO STANDARD

DIP switches 1 to 5 set the video standard. DIP switches 6 and 7 set the exact frame rate divisor. For example to select 1080i/59.94 as the format, set switches 6 and 7 to the On and Off position (select 59.94) and set switches 1 to 5 to the Off position. Interlaced video formats are shown with the number of fields per second. Progressive formats are shown with the number of framers per second.

#	DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	VIDEO FORMAT
0	Off	Off	Off	Off	Off	1080i/59.94
1	On	Off	Off	Off	Off	Future Use
2	Off	On	Off	Off	Off	Future Use
3	On	On	Off	Off	Off	Future Use
4	Off	Off	On	Off	Off	Future Use
5	On	Off	On	Off	Off	1035i/59.94
6	Off	On	On	Off	Off	720p/59.94
7	On	On	On	Off	Off	720p/29.97
8	Off	Off	Off	On	Off	Future Use
9	On	Off	Off	On	Off	525i/59.94
10	Off	On	Off	On	Off	1080p/25
11	On	On	Off	On	Off	1080p/25sF
12	Off	Off	On	On	Off	1080i/50
13	On	Off	On	On	Off	720p/50
14	Off	On	On	On	Off	625i/50

Table 4: Output Video Switch Settings

Note other DIP switch combinations are reserved for future use.

5.3. SELECTING WHETHER MODULE WILL BE CONTROLLED FROM THE LOCAL CONTROLS OR THROUGH THE *VISTA*LINK™ INTERFACE

DIP switch 8 selects whether the module will be controlled from the local user controls or through the VistaLINK® interface.

DIP 8	VistaLINK® CONTROL
Off	The card functions are controlled through the local menus and DIP switches only
On	The card functions are controlled through the VistaLINK® interface (see section 8), the local menus and DIP switches

Table 5: VistaLINK® Control Switch Settings

6. ON SCREEN MENUS

6.1. NAVIGATING 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. 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.

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. ON SCREEN DISPLAY – MAIN MENU

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. Sections 6.3 to 6.9provide detailed descriptions of each of the sub menus. The tables in sections 6.3 to 6.9are 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. The menu item *BACK*, will return the user to the previous menu and the menu item *EXIT* will exit the menu system.

Video	Sets the frame rate, video standard. Caption blanking, action on loss of input, timing reference select and timing offset for the video output
Proc Func	Control the main video proc. amp functions
Noise Reducer	Control application of the noise reducer
Audio	Sets the main audio groups and delay
Audio Process	Controls the audio processing
Closed Captioning	Controls the closed captioning of the HD signal
Utilities	Card preset management and various debug and maintenance features.

6.3. CONFIGURING THE VIDEO CONTROLS

The *Video* menus are used to configure parameters associated with the video and output video timing. The chart below shows the items available in the *Video* menu. Sections 6.3.1 to 6.3.8 give detailed information about each of the menu items.

Frame Rate	Select the video input frame rate
Video Input	Selects the video standard.
SD Blanking	Selects upper lines as video or blank. SD input only.
VITC Read Select	Select line for VITC reader - SD input formats only
VITC Write Select	Select line for VITC generator. SD output formats only
Loss of Video	Selects the action to take when the input video is missing
Force Minimum Delay	Set the H and V phase such that the path delay in minimized
Reference Select	Selects internal or video and locking reference
V Phase Offset	Sets the vertical phase of the output signal to the genlock reference input
H Phase Offset	Sets the horizontal phase of the output signal to the genlock reference input

6.3.1. Setting the Video Frame rate

Video
Frame Rate
59.94/29.97/23.98
50/25

This control selects the group of frame rates that are available on the *Video Standard* menu item.

6.3.2. Setting the Video Standard

Video
Video Input
Auto
1080i/59.94/60
1080p/29.97/30
1080p/29.97/30sF
1080p/23.98/24
1080p23.98/24sF
1035i/59.94/60
720p/59.94/60
720p/29.97/30
525i/59.94/60
1080p25sF
1080/i50
720p/50
1080p/25
625i/50

This control selects the video standard being used. The choice of standards available is dependent upon the *Frame Rate* menu setting. For example to select 1080i/59.94 as the output format set the *Frame Rate* menu to *59.94/29.97/23.98* and set this menu item to *1080i59.94*. Interlaced video formats are shown with the number of fields per second. Progressive formats are shown with the number of framers per second.

6.3.3. Blanking Line 21 Captions for SD Video Inputs

Video
SD Blanking
21
19-23

With this control, you can adjust which standard definition lines will be blanked. Normally line 21 where closed caption information may be present is blanked.

Captioning will still be processed normally. This control prevents caption waveforms from being processed as video.

6.3.4. Setting the VITC Reader Line for SD Video Inputs

Video
VITC Read Select
14 for 525
19 for 625

With this control, you can select the line number where VITC will be read on the standard definition input video. The valid range is *10 to 20 for 525i/59.94* inputs*, 6 to 21 for 625i/50* inputs*.*

6.3.5. Setting the VITC Writer Line for SD Video Inputs

Video
VITC Write Select
14 for 525
19 for 625

With this control, you can select the line number where VITC will be written on standard definition output video. The valid range is *10 to 20 for 525i/59.94* inputs*, 6 to 21 for 625i/50* inputs*.*

6.3.6. Setting the Action to Take when Input Video Is Missing.

Video
Loss of Video
Black
Blue
Pass

The user can set the output to go to black, go to blue or pass the input with this control.

When set to *Pass,* the output video will be incoherent when the video input is missing.

6.3.7. Calculating the Delay through the Noise Reducer.

The delay through the Noise Reducer is dependent on the video format, the Noise Reducer processing mode and the *V Phase Offset* and *H Phase Offset* settings. There are separate settings of *H and V phase* offset for each output video type.

To achieve the minimum delay use the control *Force Minimum Delay*. Otherwise the status screen will report the current true delay of the system.

The delay is counted in the lines and pixels of the output standard and is calculated from input field 0 start to output field 0 start.

6.3.7.1. Force Minimum Delay.

Video
Force Minimum Delay

This control sets the *H Phase Offset* and *V Phase Offset* menu settings such that the card has the minimum possible input to output delay.

6.3.8. Setting up the Video Output Timing

The output stage of the Noise Reducer contains a frame buffer so that the output video can be timed with respect to the reference applied to the **GENLOCK** input when the *Reference Select* menu item is set to *External*. In the absence of a genlock signal, or when the *Reference Select* menu item is set to *Video* the output video will be timed with respect to the incoming Video.

The *V Phase Offset* and *H Phase Offset* adjustments are REAL TIME ADJUSTMENTS and will affect the output video timing immediately. These settings should not be adjusted when the output video is in the broadcast chain.

6.3.8.1. Selecting the Video Reference Source

Video
Reference Select
Video
External

With this control the reference source of video locking is set.

Select *External* to lock the output video to the reference video applied to the **GENLOCK** BNC. If the genlock reference disappears or is not valid, the card will lock to incoming video.

Select *Video* to will lock the output video to the input video. When there is no input video the output video will free run.

6.3.8.2. Setting the Vertical Phase of the Output Video

Video
V Phase Offset
0 to Max Lines
0

With this control, you can set the vertical timing of the output video with respect to the reference input set by the *Reference Select* menu item. There are separate settings of *V phase offset* for each output video type. Setting this control to 0 keeps the output video frame aligned with the Genlock reference or incoming video if genlock is missing.

Increasing the value will delay the output video in one-line increments. In order to advance the vertical timing of the output video with respect to the genlock video, set the control to the maximum total number of lines of the output video minus the number of lines that you wish to advance the output video. (E.g. for 1080i/59.94 output video the total number of lines is 1125, so to advance the output video 5 lines set the value to 1120.) When increasing the *V Phase Offset* value causes it to go beyond the limit of the frame buffer, the *V Phase Offset* will wrap to the beginning of the frame buffer, resulting in a change of one frame of throughput delay between the HD/SD input and the video output.

6.3.8.3. Setting the Horizontal Phase of the Output Video

Video
H Phase Offset
0 to Max samples
0

With this control, you can set the horizontal timing of the output video with respect to the reference input set by the *Reference Select* menu item. There are separate settings of V phase offset for each video type. Setting this control to 0 keeps the output video line aligned with the Genlock reference.

Increasing the value will delay the output video in one-sample increments. In order to advance the horizontal timing of the output video with respect to the genlock video, set the control to the maximum number of samples per line for the output video standard minus the number of samples that you wish to advance the output video. (E.g. for 1080i/59.94 input video the total number of samples per line is 2200, so to advance the output video 5 samples set the value to 2195.)

6.4. CONFIGURING THE VIDEO PROCESSING FUNCTIONS

The *Proc Func* menus are used to configure parameters associated with the video processing functions of the cross converter. The chart below shows the items available in the *Proc Func* menu. Sections 6.4.1 to 6.4.13 give detailed information about each of the menu items.

ALL of these parameters affect the video in real time. H&V frequency bands will cause hits to the video while a new filter is loaded.

RGB Clip	Enables RGB Clipping
Gamma Adjust	Enables Gamma Adjust
Y Gain	Sets the Source Y Gain
Y Offset	Sets the Source Y Offset
Cr Gain	Sets the Source Cr Gain
Cr Offset	Sets the Source Cr Offset
Cb Gain	Sets the Source Cb Gain
Cb Offset	Sets the Source Cb Offset
Hue	+/- 10 degrees 0.1 degree steps
R Gain	Sets the Gain in RGB Domain
G Gain	Sets the Gain in RGB Domain
B Gain	Sets the Gain in RGB Domain
Gamma Level	Sets the gamma correction factor
Image Enhancement Enable	Enables Image Enhancement.
Luma Floor	Sets the darkest luma value that will be enhanced.
Detail Noise Floor	Sets the minimum level of detail required before the enhancer is enabled.
Enhancement Limit	Sets the maximum enhancement allowed.
Horizontal Band	Sets the horizontal frequency band.
Vertical Intensity	Sets the intensity of the vertical enhancement process.
Detail Gain	Sets the gain for detail

6.4.1. Enabling RGB Clipper

Proc Func
RGB Clip
Disable
Enable

This enables the RGB clipper. When enabled, the module will clip any illegal levels of R, G, and B (individually) to Black and White Levels. If disabled, then the illegal values are passed unmodified.

This control is normally set to *Disable* in order to allow for Super Black or other test patterns to pass through the module.

6.4.2. Enabling Gamma Adjust

Proc Func
Gamma Adjust
Disable
Enable

This enables the Gamma Adjust. When enabled, the module will allow the user to adjust the gamma level (see section 6.4.6). If disabled, then the gamma level is set to 0.

6.4.3. Setting the Gain Levels

There are six controls that set the gain of the video. For simplicity, only one control will be shown in the manual.

Proc Func
Y Gain
+/- 10%

With these controls the user can adjust the gain of the 3 components in either the Y Cr Cb domain or the R G B domain over a range of +/-10% in 0.1% steps.

Gain adjustments in the Y, Cb, Cr domain are made first, then gain adjustments in the RGB domain. Illegal values are clipped after gain adjustments.

6.4.4. Setting the DC Offset

There are three controls that set the DC Offset of each component of the video. For simplicity, only one control will be shown in the manual.

Proc Func
Y Offset
+/- 100

With these controls the user can adjust the DC offset of the 3 components in the Y Cr Cb domain in +/- 100 quantization levels.

6.4.5. Setting the Hue

Proc Func
Hue
+/- 30

With this control the user can adjust the Hue or color of components +/- 30 degrees in 0.1 degree steps.

6.4.6. Setting the Gamma Level

Proc Func
Gamma Level
+/- 128

With this control the user can adjust the Gamma correction factor by +/- 128 in steps of 1.

6.4.7. Enabling Image Enhancement

Proc Func
Image Enhancement Enable
Disable
Enable

This enables the Image Enhancement feature. When enabled, the parameters configured in sections 6.4.8 to 6.4.13 will be applied to the incoming video signal.

When disabled, the parameters are ignored and the incoming video remains unmodified.

6.4.8. Setting the Luma Floor

Proc Func
Luma Floor
0 to 15

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

6.4.9. Setting the Detail Noise Floor

Proc Func
Detail Noise Floor
0 to 15

When the 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 would be left untouched.

6.4.10. Setting the Enhancement Limit

Proc Func
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.

6.4.11. Setting the Horizontal Band

Proc Func
Horizontal Band
0 to 20

Selects the Horizontal frequency band to be enhanced.

The horizontal band is adjusted in increments of 5, where 0 selects the lowest frequency band available and 20 the highest.

6.4.12. Setting the Vertical Intensity

Proc Func *Vertical Intensity* *0-100%*	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.

6.4.13. Setting the Detail Gain

Proc Func *Detail Gain* *0-127*	Selects the level of the detail gain. The range is 0 to 127 Where 0 refers to no increase in detail gain.

6.5. CONFIGURING THE VIDEO NOISE REDUCER

The *Noise Reducer* menus are used to configure parameters associated with the video noise reduction processing. The noise reduction processing consists of five distinct filters and a complex adaptive algorithm to combine and control the filtered results based on two motion sensors. It is designed to remove random “Gaussian” (or similar band-limited) noise, impulsive “salt & pepper” noise and other temporal varying artifacts like low level “piano-keying”. The motion sensors are used to seamlessly vary between the different filters. Simple user controls allow customization of the amount of expected noise and sensitivity of the motion detectors.

The chart below shows the items available in the *Noise Reducer* menu. Sections 6.5.1 to 6.5.2 give detailed information about each of the menu items.

Noise Reduction	Sets the level of noise reduction to apply based on expected noise.
Side-by-side	Turns on side-by-side comparison mode.

Turning the noise reducer Off removes it from the video-processing path. There will be a momentary interruption to the output video signal.

6.5.1. Turning on the Noise Reduction

- *Noise Reducer*
  - *Noise Reduction*
    - *Off*
    - *Light*
    - *Medium*
    - *Heavy*

This control controls the various levels of noise reduction to apply to the video signal. The different levels will set the motion detection threshold and the aggressiveness of the filters to remove noise.

When the control is set to *Off*, then there is no noise reduction. The output video is left untouched.

When the control is set to *Light*, the noise reducer will have a lower motion detection threshold and less aggressive filter. This level of noise reduction is used for video that has low random noise, where removal of low-level details is minimized.

When the control is set to *Medium*, the noise reducer will have an average threshold set for the motion detection threshold and aggressive filters. This level of noise reduction is used for video that has typical amounts random noise, where the module will remove random noise and affect low-level details, more so than a *Light* setting.

When the control is set to *Heavy*, the noise reducer will have a high motion detection threshold and very aggressive filter. This level of noise reduction is used for video that has high level of random noise, where the filters will remove the random noise, but will soften the low-level details.

Note: Setting the value higher than needed to remove the noise present, will over soften areas of low amplitude, fine details.

Note: Setting the value too low may cause the circuitry to leave random noise that it could remove. However, removal of low-level details will be minimized

6.5.2. Turning on the Side-by-Side Comparison Window

- *Noise Reducer*
  - *Side-by-side*
    - *On*
    - *Off*

This control allows the user to compare the input video before noise reduction (left hand side) and after noise reduction (right hand side).

The separation line for the side-by-side comparison will also appear on the active output video. This setting should be used with care and only during the setup process and not during a live broadcast.

6.6. CONFIGURING THE AUDIO SETTINGS

The SMPTE 272M and 299M standards permit up to 4 groups of 4 audio channels to be embedded into the serial digital video bitstream. The noise reducer card de-embeds two groups of audio from the serial digital input video that are the source for re-embedding on the serial digital output video. The *Audio* menu items are used to configure the de-embedder and embedder groups, sample rate converters and to adjust the audio throughput delay. The chart below shows the items available in the *Audio* menu. Sections 6.6.1 to 6.6.4 give detailed information about each of the menu items.

De-embedder A	Sets the audio group destined for de-embedder A
De-embedder B	Sets the audio group destined for de-embedder B
Embedder A	Sets the audio group destination for embedder A
Embedder B	Sets the audio group destination for embedder B
Audio Delay	Adjusts the audio delay from the nominal video delay
SRC Mode	Adjusts the mode for the audio sample rate converters

Any changes to the audio settings will cause a momentary interruption on the output audio.

6.6.1. Selecting The Audio Groups Destined for the De-embedders

The module has two de-embedders that will de-embed one group of audio from the serial digital video input. There one set of controls for each de-embedder. For simplicity, only one control will be shown in the manual.

Audio *De-embedder A* *Group 1* *Group 2* *Group 3* *Group 4*	Under normal conditions the settings for de-embedder A and B should be different otherwise the audio will be repeated from the video input. The default for both de-embedders is group 1.

6.6.2. Selecting The Audio Groups That Will Be Embedded

The module has two embedders that each inserts one group of audio on the serial digital video output. There are two controls that set the audio groups where the embedders will put the audio on the serial digital output. For simplicity, only one control will be shown in the manual.

- *Audio*
  - *Embedder A*
    - *Off*
    - *Group 1*
    - *Group 2*
    - *Group 3*
    - *Group 4*

With these controls, you can set the destination group for Embedder A and B.

When set to *Off*, the embedder will be disabled.

Otherwise the embedder destination can be set to a specific group.

The group for Embedder A must be different from Embedder B. If the user sets them the same then the next higher group number will be used for Embedder B.

6.6.3. Selecting The Audio Delay

- *Audio*
  - *Audio Delay*
    - *+/- 100*

This control adjusts the audio delay +/- 100 msecs from the nominal delay necessary to match the card's video processing delay.

Note: Negative values are limited to the amount that cause the delay to be only the audio processing delay, the card does not have negative delay ability.

6.6.4. Configuring the SRC Mode

- *Audio Settings*
  - *SRC Mode*
    - *Enable*
    - *Bypass*
    - *Auto*

This control allows the user to adjust the mode for the sample rate converters.

Enable – Enables the SRC for PCM audio.
Bypass – Bypass the SRC. Should be used for non-PCM audio.
Auto – The module will automatically select enable or bypass on a per stereo pair basis.

6.7. CONFIGURING THE AUDIO PROCESSING FUNCTIONS

The *Audio Proc Embedded* menu is used to configure parameters associated with the audio processing functions of the noise reducer. The chart below shows the items available in the *Audio Proc* menus. Sections 6.7.1 to 6.7.2 give detailed information about each of the menu items.

Output Channel 1	Sets the source of audio that will be output on channel 1
Output Channel 2	Sets the source of audio that will be output on channel 2
Output Channel 3	Sets the source of audio that will be output on channel 3
Output Channel 4	Sets the source of audio that will be output on channel 4
Output Channel 5	Sets the source of audio that will be output on channel 5
Output Channel 6	Sets the source of audio that will be output on channel 6
Output Channel 7	Sets the source of audio that will be output on channel 7
Output Channel 8	Sets the source of audio that will be output on channel 8
Input Channel 1 Gain	Sets the gain of input channel 1
Input Channel 2 Gain	Sets the gain of input channel 2
Input Channel 3 Gain	Sets the gain of input channel 3
Input Channel 4 Gain	Sets the gain of input channel 4
Input Channel 5 Gain	Sets the gain of input channel 5
Input Channel 6 Gain	Sets the gain of input channel 6
Input Channel 7 Gain	Sets the gain of input channel 7
Input Channel 8 Gain	Sets the gain of input channel 8

6.7.1. Configuring the Output Audio Channel Sources

There are eight controls that select the source of the eight audio channels being processed. For simplicity, only the selection control for channel 1 will be shown in the manual.

Audio Proc *Channel A1 sel* *Channel 1* *Channel 2* *Channel 3* *Channel 4* *Channel 5* *Channel 6* *Channel 7* *Channel 8* *Mono mix 1 & 2* *Mono mix 3 & 4* *Mono mix 5 & 6* *Mono mix 7 & 8* *Mute*	This control selects the source of audio for the output channel 1. The output can be taken from any of the input channels or a mono mix of pairs. The output can also be muted. The default is that the input channel will be the same as the output channel (i.e. output channel 1 will come from input channel 1)

6.7.2. Setting Gain for Each Audio Channel

There are eight controls that set the gain of the eight audio channels being processed. For simplicity, only the gain control for input channel 1 will be shown in the manual.

Audio Proc *Input Channel 1 Gain* *0 dB* *+/- 24 dB*	The audio gain controls are used to adjust the level of the respective output audio channel. The gain controls have a range of +/-24 dB with 1/10 dB resolution. The displayed value is the amount of gain (+ve), or attenuation (-ve), in decibels, where 0dB corresponds to unity gain

6.8. CONFIGURING CLOSED CAPTIONING

The 7710NR-HD handles closed captioning transparently. The *Closed Captioning* menus are used to configure parameters associated with the closed caption handling. The chart below shows the items available in the *Closed Captioning* menu. Sections 6.8.1 to 6.8.2 give detailed information about each of the parameters.

Main Captions	Turns closed caption handling on or off
HD Write Line	Selects the HD line number where the HD VANC captions are inserted on the output video.

Any changes to the closed captioning settings can cause a momentary interruption.

6.8.1. Enabling Closed Captioning

Closed Captioning *Main Caption* *Off* *On*	This parameter will enable closed caption handling for the module. When turned on, any closed captioning will be mapped to the designated HD write line (see 6.8.2) if the output video is HD. When turned off, no closed captioning is encoded in the VANC of the output video.

6.8.2. Setting the HD Write Line

Closed Captioning *HD Write Line* *7 to 24*	This parameter will set the HD line where the HD VANC captions are inserted on the output HD video as per SMPTE 334M.

When setting the HD Write Line be aware of the Start of Active Video Line in 1080i and 720p. If HD VANC captions are inserted past Start of Active Video, most HD devices will drop the HD captions.

6.9. UTILITIES

The *Utilities* menus are used to list the module firmware version, upgrade the firmware, and manage the user presets. The chart below shows the items available in the *Utilities* menu. Sections 6.9.1 to 6.9.6 give detailed information about each of the parameters.

Load Preset	Used to recall the current module configuration from one of the user presets or to reset the module to its factory-preset condition.
Store Preset	Used to store the current module configuration to one of the user presets.
Status Window	Enable or Disable display of the status screen
Upgrade	Used to upgrade the firmware in the module.
Auto Recall Presets	Used to enable or disable the default parameter recall
GPI 1	Selects the function of GPI1 - Recall Preset 1-10/OFF
GPI 2	Selects the function of GPI2 - Recall Preset 1-10/OFF
GPI 3	Selects the function of GPI3 - Recall Preset 1-10/OFF
GPI 4	Selects the function of GPI4 - Recall Preset 1-10/OFF
About…	Shows the firmware version of the module.

6.9.1. Storing and Recalling Configurations to the User Presets or the Factory Preset

The converter modules provide ten user preset areas to store the complete set of controls from the on screen menu.

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

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

6.9.1.1. Recalling Configurations from the User Presets

Utilities
- *Load Preset*
  - *None*
  - *Default*
  - *User1 to 10*

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

Use the toggle switch to select the preset location where you want to recall the module configuration. After selecting the preset, you must press the pushbutton before the store will take place. You can abort the operation by pressing the pushbutton when *None* is displayed.

If DIP switches 6 and 7 are set to non-default values (default setting is both are OFF, see section 5.1), the user will see an error message "Recall Presets operation has failed. DIP switches are active."

In order to recall Presets, the two DIP switches SHOULD be set to OFF.

6.9.1.2. Storing Configurations from the User Presets

Utilities
- *Store Preset*
  - *None*
  - *1 to 10*

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

Use the toggle switch to select the preset location where you want to store the module configuration. After selecting the preset, you must press the pushbutton before the store will take place. You can abort the operation by pressing the pushbutton when *None* is displayed.

The user will need to wait about 30 seconds for the configuration to be saved to a User Preset.

6.9.2. Displaying the Status Window on the OSD Output

Utilities
- *Status Window*
  - *Disable*
  - *Enable*

This control is used enable the active display of various video parameters on the OSD output when the menus are not being displayed.

6.9.3. Initiating a Software Upgrade

Utilities
- *Upgrade*
  - *Cancel*
  - *Upgrade*

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

In addition to the software upgrade support detailed in the *Upgrading Firmware* chapter in the front of the binder, you can initiate an upgrade with this control. 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 *Upgrade* and press the pushbutton before the upgrade can take place. Follow the remainder of the instructions in the *Upgrading Firmware* chapter. 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.

The Upgrade baud rate for the 7710NR-HD series modules is 115,200 baud.

6.9.4. Auto Preset Recall when the Video Standards or Format Changes

Utilities
- *Auto Recall Presets*
  - *Enable*
  - *Disable*

This control is used to enable or disable the automatic recall of parameters with each video standard/format. Each video format has storage for all the card parameters. During any standard/format change the set is recalled.

6.9.5. Recall presets via GPIs

The converter modules provide ten user preset areas, which can be recalled via external GPI inputs. There are four controls that are used to set functions of the GPI inputs. For simplicity, only one control will be shown in the manual.

Utilities
- *GPI 1*
  - *OFF*
  - *Recall User Preset 1*
  - *Recall User Preset 2*
  - *Recall User Preset 3*
  - *Recall User Preset 4*
  - *Recall User Preset 5*
  - *Recall User Preset 6*
  - *Recall User Preset 7*
  - *Recall User Preset 8*
  - *Recall User Preset 9*
  - *Recall User Preset 10*

This control is used to set which preset will be recalled by the respective GPI input is closed to ground. To disable a GPI input set it to *Off.*

GPI settings are also stored in the User Presets in addition to the other settings. If the GPI settings are not the same for each video input and output combination, unexpected results may occur. In other words, make sure your GPI settings are the same for each User Preset.

6.9.6. Accessing Information About this Module and its Firmware

Utilities
About…

This control lists 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.

7. JUMPERS

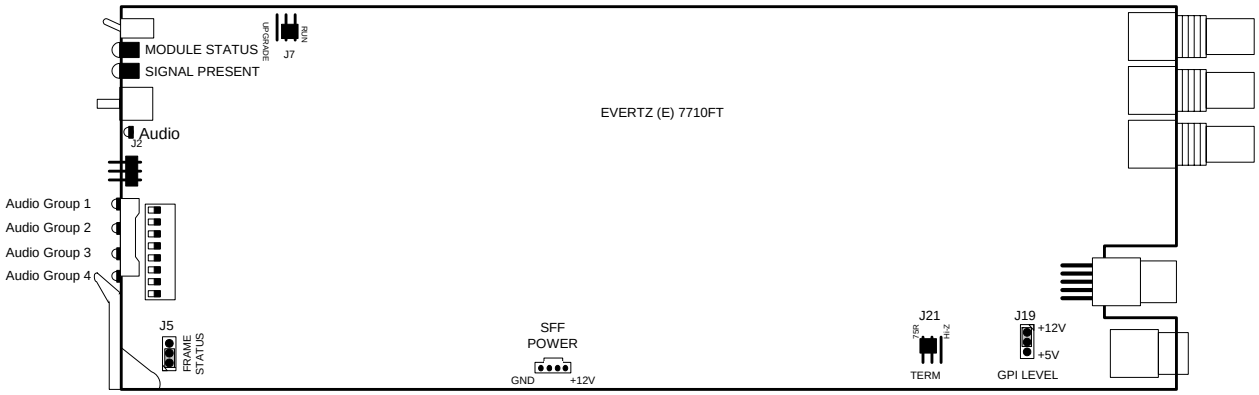


Figure 4: Location of Jumpers – Rev E Main Module

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

FRAME STATUS The FRAME STATUS jumper J5 located at the front of the main 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 installed in the Off position, local faults on this module will not be monitored.

7.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

Firmware updates can be performed using the *Upgrade* menu item on the *Utilities* menu (see section 0) or using the **UPGRADE** jumper.

UPGRADE The UPGRADE switch is located on the back side of the main module (On the rear of the J7 jumper location near the front card edge) and is used when firmware upgrades are being done to the module. For normal operation it should be switched to the *RUN* position as

shown in the diagrams above. See the *Upgrading Firmware* chapter in the front of the binder for more information.

The silkscreen on the front side of the board for J7 is incorrect. The correct orientation of the switch is shown in Figure 4

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J7 into the *UPGRADE* position. (Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J2 at the card edge. Re-install the module into the frame. Run the upgrade as described in *Upgrading Firmware* chapter. Once the upgrade is completed, remove the module from the frame, move J7 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

The Upgrade baud rate for the 7710NR-HD series modules is 115,200 baud.

7.3. SELECTING WHETHER THE GENLOCK REFERENCE INPUT IS TERMINATED

TERM The TERM jumper J21 located at the rear of the module is used to terminate the genlock loop input. Then it is in the 75R position a 75 ohm terminating resistor will connect the input to ground. When it is in the HI-Z position the genlock input will be high impedance.

7.4. SELECTING THE GPI PULLUP VOLTAGE

The GPI jumper J19, located near the rear of the module, selects whether the general-purpose inputs will be pulled up to +5 volts or +12 Volts. Figure 5 shows the jumper configuration and the GPI input schematic.

GPI LEVEL To set the pull-up voltage to +5 volts set the jumper to the +5V position,

To set the pull-up voltage to +12 volts set the jumper to the +12V position,

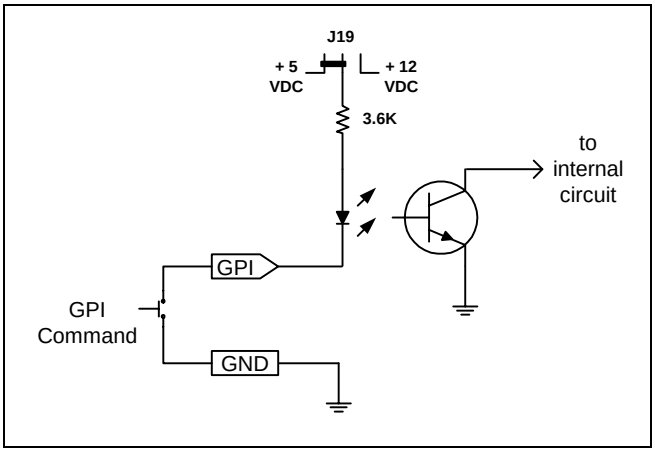


Figure 5: Setting the GPI Input Pullup Voltage

8. VISTALINK® REMOTE MONITORING/CONTROL

8.1. WHAT IS VISTALINK®

VistaLINK® is Evertz' remote monitoring and control capability over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. For monitoring there needs to be a detecting device that automatically reports all errors to a central alarm and error logging station. We also need to be able to interrogate individual detector devices from the central station to determine the status of individual channels. Finally, we need to be able to configure devices in the network from the central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. A SNMP manager also known as a Network Management System (NMS) is a computer running special software that communicates with the devices in the network. Evertz VistaLINK® Pro Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz VistaLINK® enabled fiber optic products.

2. Managed devices (such as 7710NR-HD), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz VistaLINK® enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC VistaLINK® frame controller module, which serves as the Agent.

3. A virtual database known as the Management Information Base (MIB) lists all the variables being monitored and which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the VistaLINK® network, see the 7700FC Frame Controller chapter.

8.2. VISTALINK® MONITORED PARAMETERS

The following parameters can be remotely monitored through the VistaLINK® interface.

Parameter	Description
Input Video Present	Indicates the presence of a valid video input signal. (the state of the VIDEO PRESENT LED)
Input Video Standard	Indicates video standard of input signal
Gen Lock Present	Indicates the presence of a valid genlock reference signal. (the state of the GENLOCK LED)
Gen Lock Standard	Indicates video standard of genlock reference signal
GPI1 State	Indicates the state of the GPI1 input
GPI2 State	Indicates the state of the GPI2 input
GPI3 State	Indicates the state of the GPI1 input
GPI4 State	Indicates the state of the GPI2 input

Audio Group 1 Present	Indicates the presence of embedded audio in group 1. (the state of the Group 1 present LED)
Audio Group 2 Present	Indicates the presence of embedded audio in group 2. (the state of the Group 2 present LED)
Audio Group 3 Present	Indicates the presence of embedded audio in group 3. (the state of the Group 3 present LED)
Audio Group 4 Present	Indicates the presence of embedded audio in group 4. (the state of the Group 4 present LED)
Closed Captions Present	Indicates the presence of EIA-608 closed captions on the input video
Delay Audio	Audio Delay
Video Delay	Video Delay
Local Remote Mode	Indicates the whether the 7710NR-HD is under local control or VistaLINK® control (. (the state of DIP switch 8)

Table 6: VistaLINK® Monitored Parameters

8.3. VISTALINK® CONTROLLED PARAMETERS

Parameter	Description
Video Frame Rate	Select the video input frame rate
Video Input Standard	Selects the video input standard.
SD Blanking	Last line of blanking in SD. SD input only.
VITC Read Select	Select decode line for VITC. SD input only
VITC Write Select	Select line for VITC insert. SD output only
Loss of Video	Selects the action to take when the input video is missing
Reference Select	Set video or external genlock for card locking
Force Minimum Delay	Set the H and V phase such that the path delay in minimized
V Phase Offset	Sets the vertical phase
H Phase Offset	Sets the horizontal phase
RGB Clip	Enable RGB clipper
Gamma Adjust	Enable gamma adjust
Y Gain	Varies the Source Y
Y Offset	Varies the Source Y
Cr Gain	Varies the Source Cr
Cr Offset	Varies the Source Cr
Cb Gain	Varies the Source Cb
Cb Offset	Varies the Source Cb
Hue	+/- 10 degrees 0.1 degree steps
R Gain	Varies the Gain in RGB Domain
G Gain	Varies the Gain in RGB Domain
B Gain	Varies the Gain in RGB Domain
Gamma Level	Sets the gamma correction level
Image Enhancement Enable	Enables Image Enhancement
Luma Floor	Sets the gamma correction factor
Detail Noise Floor	Sets the minimum level of detail required before the enhancer is enabled.
Enhancement Limit	Sets the maximum enhancement allowed.
Horizontal Band	Sets the horizontal frequency band.

Parameter	Description
Vertical Intensity	Sets the intensity of vertical enhancement.
Detail Gain	Sets the level for the detail gain.
Noise Reduction	Sets the level of noise reduction to apply.
Side-by-side	Turns on side-by-side window comparison.
De-embedder A	Sets the audio group source for de-embedder A
De-embedder B	Sets the audio group source for de-embedder B
Embedder A	Sets the audio group destination for embedder A
Embedder B	Sets the audio group destination for embedder B
Audio Delay	Adjusts the audio delay from the card nominal
SRC Mode	Sets mode of sample rate converter.
Output Ch1	Sets the source of audio that will be output on channel 1
Output Ch2	Sets the source of audio that will be output on channel 2
Output Ch3	Sets the source of audio that will be output on channel 3
Output Ch4	Sets the source of audio that will be output on channel 4
Output Ch5	Sets the source of audio that will be output on channel 5
Output Ch6	Sets the source of audio that will be output on channel 6
Output Ch7	Sets the source of audio that will be output on channel 7
Output Ch8	Sets the source of audio that will be output on channel 8
Input Ch1 gain	Sets the gain of input channel 1
Input Ch2 gain	Sets the gain of input channel 2
Input Ch3 gain	Sets the gain of input channel 3
Input Ch4 gain	Sets the gain of input channel 4
Input Ch5 gain	Sets the gain of input channel 5
Input Ch6 gain	Sets the gain of input channel 6
Input Ch7 gain	Sets the gain of input channel 7
Input Ch8 gain	Sets the gain of input channel 8
Captions	Enables closed captioning handling
HD Write Line	Selects the HD line number for HD VANC captions
Load Preset	Used to recall the current module configuration.
Store Preset	Used to store the current module configuration
Auto Recall Presets	Enables automatic preset recall when input or output changes
GPI 1	Selects the function of GPIO1
GPI 2	Selects the function of GPIO2
GPI 3	Selects the function of GPIO3
GPI 4	Selects the function of GPIO4

Table 7: VistaLINK® Controlled Parameters

8.4. VISTALINK® TRAPS

The 7710NR-HD will raise a VistaLINK® trap if the temperature of the main card rises above 100 °F.

9. MENU QUICK REFERENCE

Video
- Frame Rate
- Video Input
- SD Blanking
- VITC Read Select
- VITC Write Select
- Loss of Video
- Force Minimum Delay
- Reference Select
- V Phase Offset
- H Phase Offset

Video Proc
- RGB clip
- Gamma adjust
- Y Gain
- Y Offset
- Cr Gain
- Cr Offset
- Cb Gain
- Cb Offset
- Hue
- R Gain
- G Gain
- B Gain
- Gamma Level
- Image Enhancement Enable
- Luma Floor
- Detail Noise Floor
- Enhancement Limit
- Horizontal Band
- Vertical Intensity
- Detail Gain

Noise Reduction
- Noise Reduction
- Side-by-side

Audio Settings
- De-embedder A
- De-embedder B
- Embedder A
- Embedder B
- Audio Delay
- SRC Mode

Closed Captioning
- Captions
- HD Write Line

Audio Proc Embedded
- Output Ch1
  . . .
- Output Ch8
- Input Ch1 gain
  . . .
- Input Ch8 gain

Utilities
- Load Preset
- Store Preset
- Status WIndow
- Upgrade
- Auto Recall Presets
- GPI 1
- GPI 2
- GPI 3
- GPI 4
- About…