TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary: Work in progress	July 09
1.0	First release. Items not implemented, supported or tested: • 60Hz genlocking • Tri-level sync genlocking • 2048x1080 and 1920x1035 standards • Most 23.98Hz, 24Hz, 25Hz, 29.97Hz and 30Hz frame rates • GBR, 12 bit, and 4:4:4:4 video formats • VistaLINK® support • Audio embedding in 3G Level A link formats	Sept 09

NOTE: *At the time of writing this manual, many of the intended features were not implemented. Some of these features, however, were documented in the manual. These features are indicated in text with a grey background.*

1. OVERVIEW

The 7851TG2-3G Test Signal Generator provides a cost-effective method of generating 3Gb/s and 1.5Gb/s HD-SDI test signals. The 7851TG2-3G is ideal for checking signal path integrity, signal path video processing, or to determine system performance over varying cable lengths. The 7851TG2-3G generates test signals in a wide variety of SMPTE 424M and SMPTE 292M video formats. These formats include SMPTE 274M (1920x1080), SMPTE 296M (720p), SMPTE 372M (Dual Link HD), and SMPTE 425M level A and level B. This also includes 4:2:2/4:4:4 sample structure, YCbCr and RGB colour space and definitions for 10/12 bit depths.

The 7851TG2-3G is VistaLINK®-capable, offering remote monitoring, control and configuration capabilities via Simple Network Management Protocol (SNMP) giving the flexibility to manage operations, including signal monitoring and module configuration from SNMP capable control systems (Manager or NMS).

Features:

- 2 independent test signal generators that share genlock reference and clock generation circuitry
- Level A and Level B 3Gb/s full field test signals
- Dual and single link 1.5Gb/s test signals
- Wide variety of image formats including 1080p, 1080i, 1035i, and 720p
- Wide variety of frame rates including 23.98, 24, 25, 29.97, 30, 50, 59.94 and 60 frames per second
- Selectable genlock input format - bi-level or tri-level sync
- Audio test tone generation and embedding
- Payload ID inserter required for all SMPTE 425M and 372M signals
- In the future, onboard VANC packet inserter for AFD, Dolby Metadata and Closed Caption test messages may be included
- In the future, VITC inserter, read from genlock input may be included
- Card edge status LEDs (usage is currently undefined)
- VistaLINK®-capable offering remote control and configuration capabilities via SNMP

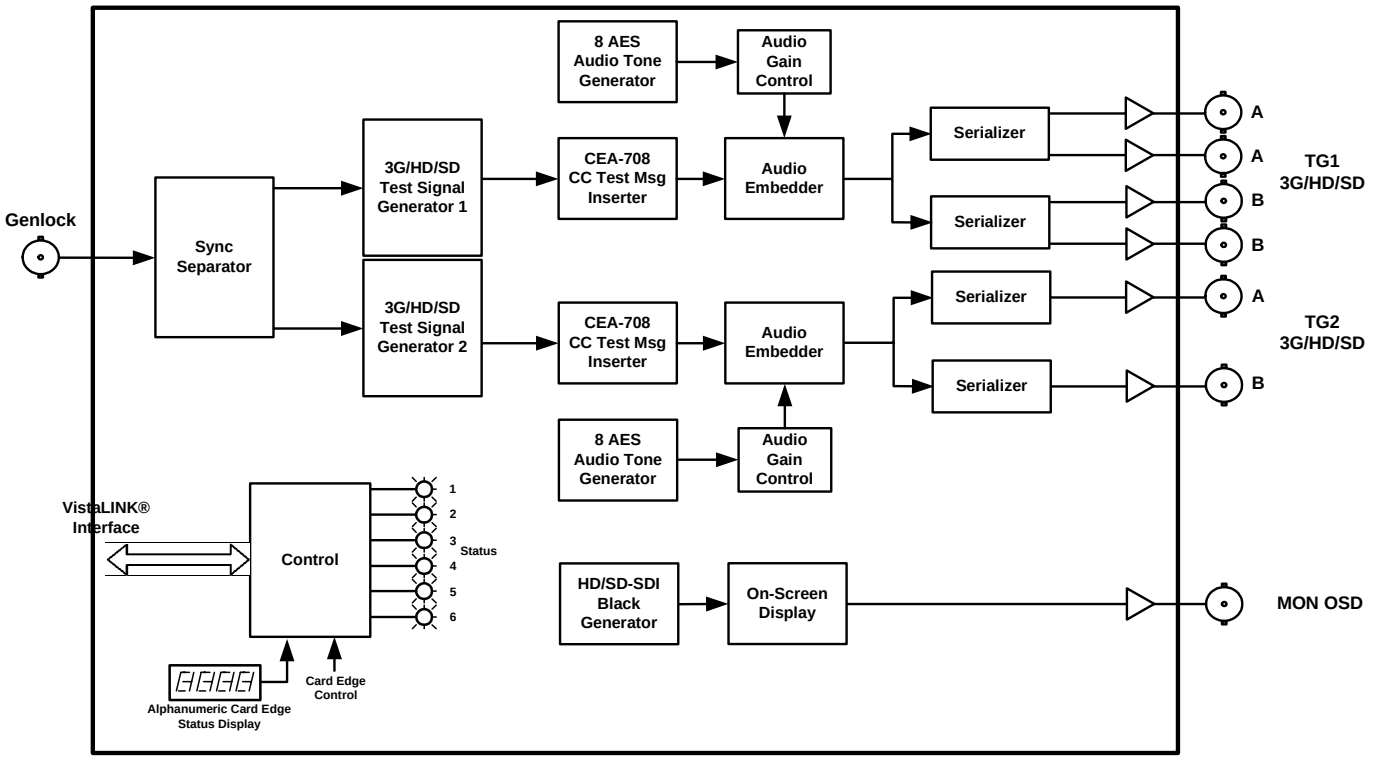

Figure 1-1: 7851TG2-3G Diagram

1.1. DESCRIPTION OF LINK FORMATS

With the invention of Dual Link and 3Gb/s (Gigabit per second) Serial Digital video Interfaces (SDI), also comes a myriad of new link, image formats and standards. Now there is the challenge of using 1080p images over single 3Gb/s and dual 1.5Gb/s SDI interfaces. There are also formats that support different sample structures (4:4:4), colour spaces (GBR) and bit depths (12 bits). These interfaces can be described with two terms; link format and image format. Link format describes the physical and low-level data framing and synchronizing structure of the transport of data between two locations. Image format describes the video payload structure. Fortunately, the industry will end up using a sub-set of all possible format variations. The new link formats are:

1 Dual Link Dual conductor interface of traditional 1.5Gb/s HD SDI
2 3G Level B Single 3Gb/s transport of above Dual Link signal
3 3G Level A Single 3Gb/s direct image mapping

1.1.1. Dual Link

Dual Link is specified in SMPTE372M and it describes how to transport video over two HD SDI (SMPTE292M) interfaces. The format deals only with 1125 line video and there are 4 ways of mapping video into the Dual Link:

1. 10-bit 4:2:2 Y,Cb,Cr at progressive frame rates of 50, 60, 60/1.001
2. 10-bit 4:4:4(:4) at interlaced, progressive and progressive segmented frames (PsF) at frames rates under 50Hz
3. 12-bit 4:4:4 at interlaced, progressive and PsF at frame rates under 50Hz
4. 12-bit 4:2:2 Y,Cb,Cr at interlaced, progressive and PsF at frames rates under 50Hz

Methods 2 through 4 identify ways of increasing image information of the existing HD SDI video structures while method 1 covers 1080p at the higher frames rates (50, 59.94 and 60 Hz).

Method 1 maps even lines of a 1080p image into one link and the odd lines into the other. The advantage to this feature is being able to observe one of the links and see a video because it is in HD SDI 10-bit 4:2:2 Y,Cb,Cr format.

Methods 2 through 4 increase the amount of data per pixel and spread the data over the two links.

1.1.2. 3G Level B

The 3G Level B link format is a method of taking a Dual Link (SMPTE372M) and mapping it into a single 3Gb/s stream. The method for mapping video into this transport is specified in SMPTE425M and can be referred to as SMPTE425M-B or 3G level B. It involves word aligning the two links of the Dual Link signal and word-by-word multiplexing of the two links into one before serializing.

The physical description of transporting video data at 3Gb/s (both level A and level B) is specified in SMPTE424M and has a direct parallel to SMPTE292M.

1.1.3. 3G Level A

The 3G Level A format is called “direct image mapping” and has 4 mappings, as listed below:

1. 10-bit 4:2:2 Y,Cb,Cr at progressive frame rates of 50, 60, 60/1.001
2. 10-bit 4:4:4(:4) at interlaced, progressive and progressive segmented frames (PsF) at frames rates under 50Hz
3. 12-bit 4:4:4 at interlaced, progressive and PsF at frames rates under 50Hz
4. 12-bit 4:2:2 Y,Cb,Cr at interlaced, progressive and PsF at frames rates under 50Hz

Method 1 can be applied to the 1080p/50/59.95/60 SMPTE274M systems 1 to 3. Methods 2 to 4 can be applied to HD SDI (SMPTE274M systems 4 to 11). Method 2, also specifies how to map 10 bit 4:4:4(:4) 720p (SMPTE296M) video into 3G SDI. Unfortunately, these mappings do not have any relationship or commonality to the similar ones in Dual Link.

The physical description of transporting video data at 3Gb/s (both level A and level B) is specified in SMPTE424M and has a direct parallel to SMPTE292M.

1.2. DESCRIPTION OF IMAGE FORMATS

As mentioned in the sections above, the 3G interfaces can support more than the typical 10-bit 4:2:2 Y,Cb,Cr video. The new image formats are designed for production, post-production, high quality distribution and contribution quality applications. They increase frame rates, bit depths, and sampling structure resolutions:

1. 1080p at 50, 59.94 and 60 frame rates
2. GBR at 4:4:4 sampling
3. Bit depths of 12 bits

Some popular 3G image formats are, but not limited to, as follows:

- 1920x1080P/50 10 bit 4:2:2 YCbCr
- 1920x1080P/59.94 10 bit 4:2:2 YCbCr
- 1920x1080PsF/23.98 12 bit 4:4:4 GBR
- 1920x1080PsF/25 12 bit 4:4:4 GBR
- 2048x1080PsF/23.98 12 bit 4:4:4 GBR
- 2048x1080PsF/25 12 bit 4:4:4 GBR
- 2048x1080P/23.98 12 bit 4:4:4 GBR
- 2048x1080P/25 12 bit 4:4:4 GBR

2. INSTALLATION

The 7851TG2-3G module comes with a companion rear plate that has 8 BNC connectors, as shown in Figure 2-1. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

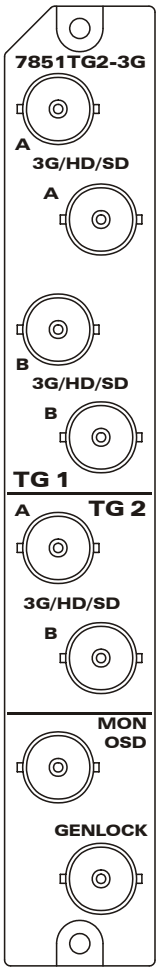

Figure 2-1: 7851TG2-3G Rear Plate

TG1 BNCs: The upper 4 BNCs provide the output signals for TG1. The signal will be 3G, HD SDI or SD SDI depending on the configured standard. At the time of writing, SD SDI is NOT supported. In Dual Link mode, the BNCs marked with an "A" will output link A while "B" will have link B.

TG2 BNCs: The middle 2 BNCs provide the output signals for TG2. The signal will be 3G, HD SDI or SD SDI depending on the configured standard. At the time of writing, SD SDI is NOT supported. In Dual Link mode, the BNC marked with an "A" will output link A while "B" will have link B.

MON OSD: The HD SDI output has an on-screen-display with a menu system, which is used with the rotary knob, for controlling the card.

GENLOCK: Input BNC connector for analog genlock reference. The genlock signal may be a HD tri-level sync, a standard definition colour black video or 0.3 V bi-level sync. The *Genlock Setup* On Screen menu is used to configure the genlock type and to set up the timing of the output signal with respect to the reference input.

TECHNICAL SPECIFICATIONS

2.1. GENLOCK INPUT

Type: Menu selectable - HD Tri-level Sync, NTSC or PAL Colour Black
286/300 mV Composite Bi-level sync (525i or 625i)
Connector: BNC per IEC 61169-8 Annex A
Termination: 75Ω (jumper selectable)

2.2. SERIAL VIDEO OUTPUTS

Standard: 3Gb/s: SMPTE 424M
1.5Gb/s: SMPTE 292M
Number of Outputs: Dual independent test signal generators
TSG 1: 4 Outputs (2xDual Link HD or 4xSDI)
TSG 2: 2 Outputs (1xDual Link HD or 2xSDI)

Embedded Audio: Up to 4 groups of audio (4 channels in one audio group) as specified in SMPTE 299M. Selectable tone frequencies (from 20Hz to 20kHz) and audio level control.
Connectors: BNC per IEC 61169-8 Annex A
Signal Level: 800mV nominal
V Phasing: Infinite lines
H Phasing: Infinite samples
DC Offset: 0V ± 0.5V
Rise & Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.2 UI

2.3. ELECTRICAL

Voltage: +12V DC
Power: (TBD)W
EMI/RFI: Complies with FCC Part 15, Class A
EU EMC Directive

2.4. PHYSICAL

7700 or 7701 frame mounting:
Number of slots: 2

7800 or 7801 frame mounting:
Number of slots: 1

3. CONTROL

Control and configuration of this card can be done either with VistaLINK® or via a card edge rotary knob and an On-Screen Display (OSD) that is keyed over video on the monitoring output BNC. The following sections detail how to control the card from the card edge and OSD.

NOTE: *At the time of writing this manual, the module start-up time was a little prolonged and the On-Screen Display did not communicate the loading process. Please be patient and wait for the test signals to load into play-out memory before trying to access and/or change signals or modes.*

3.1. CARD EDGE CONTROL

The card edge control consists of a rotary knob with pushbutton action (press towards the edge of the printed circuit board) and a four-character segmented display.

Not all monitors can display all types of HD and 3G video. We have provided a way to set the monitoring On-Screen Display (MON OSD) output standard without any complex computer hookup. The four-character display shows some limited card status information designed to help you get the card into a state that will allow you to use it with the OSD output. To configure the OSD standard with just the card edge controls:

1. Power up the card and wait for it to initialize
2. With TG1 or TG2 on the display, press and hold the rotary knob
3. Rotate it counter clockwise until “OSD” is displayed on the four character display
4. Let go of the knob
5. Rotate the knob to select your desired MON OSD standard:

   7P50 = 720p/50
   7P60 = 720p/60
   7P59 = 720p/59.94
   1i50 = 1080i/50
   1i60 = 1080i/60
   1i59 = 1080i/59.94
   CNCL = Cancel operation

6. Hook up a monitor to the monitoring output (MON OSD).
7. Continue to configure the card using the shaft encoder and the OSD.

If you push the button and release it without rotating it, you will enter the menu system. *MENU* will be displayed on the four-character display. The remainder of the card configuration and control is done via the menu system on the On-Screen Display of this monitoring output.

There are a number of LED indicators on the card edge, which are reserved for future use.

3.2. SELECTING THE TEST SIGNAL

There are three ways of selecting the test signal:

1. From VistaLINK®
2. Via a signal selection item in the OSD menu system.
3. Via the card edge rotary knob when displaying the status screen on the OSD output.

The first two are covered in other sections of the manual.

When the OSD output is displaying a status screen, the four-character display is showing the active test signal generator. When TG1 is displayed on the four-character display, you can change the signal on test signal generator 1 by rotating the rotary knob either clockwise or counter clockwise. When TG2 is displayed on the four-character display, you can change the signal on test signal generator 2 by rotating the rotary knob either clockwise or counter clockwise. To toggle between selecting TG1 and TG2, press in on the rotary knob and, simultaneously, rotate it clockwise. When you let go, the opposite test signal generator will be selected.

The name and a short description of the active test signals on TG1 and TG2 are available on the status screen of the MON OSD output. Most of the test signals are industry standard signals. The following section describes the unique signals.

Not all test signals are available on all video formats.

Test Signal Name		Test Signal Name
Y Multipulse (5, 10, 15, 20, 25 MHz)		5 Step Staircase
Component Multipulse (5, 10, 15, 20, 25 MHz)		Valid 5 Step
100% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)		Valid Ramp
100% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)		Clean Aperture with Graticule
100% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)		Circle with Centre Cross
60% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)		Clean Aperture with Centre
60% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)		Clean Aperture
60% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)		Production Aperture
100% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)		12% White Window
100% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)		20% White Window
100% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)		50% White Window
60% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)		80% White Window
60% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)		100% White Window
60% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)		Full Field Pluge
60% Y Line Sweep (15-30 MHz) with 2 MHz Markers		75% Split Field Reverse Bars With Pluge
60% Y Line Sweep (1-30 MHz) with 5 MHz Markers		SMPTE Colour Bars
60% Component Sweep (15-30 MHz) with 2 MHz Markers		75% Colour bars with Pluge
60% Component Sweep (1-30 MHz) with 5 MHz Markers		100% Colour bars with Pluge
Grey		4x3 SMPTE bars
Grey (all data bits active)		RP219 Colour bars
SDI Checkfield		75% BARS, 100% WHITE

Bouncing Box		75% Colour bars
24P(sF), 4 frame sequence		100% Colour bars
24P, 4 frame sequence		White Field
1 second and 5 second 30 Fps ID		Black
5 Frame sequence		480P Black/White Frames
4 Frame sequence		480P White Frame
Field ID		480P Production Aperture
Frame ID		480P SMPTE Colour Bars
Bowtie		

Table 3-1: Test Signal Selection

Test Signal Name		Test Signal Name
FS RP219 Colourbars 1		FS 12% White Window
FS Bars with 2 scalings		FS 20% White Window
FS 75% Colour bars		FS 50% White Window
FS 100% Colour bars		FS 80% White Window
FS Y Multipulse		FS 100% White Window
FS 60% Y Line Sweep (15-30 MHz) with 2 MHz Markers		FS 10 Step B & W Pluge
FS 60% Y Line Sweep to 30 MHz		FS 7 Step B & W Pluge
FS Clean Apertue with Graticule		FS White
FS Circle with centre cross		FS Black
FS Clean Apertue with Graticule		
FS Clean Aperture with Centre		

Table 3-2: Additional 4:4:4 Full Scale RGB Test Signals

3.2.1. Description of Unique Test Signals

This section describes features of some of the more unique test signals.

3.2.1.1. Clean Aperture with Graticule

This signal contains a number of key physical dimensions of the HDTV active picture area. It divides the 16x9 aspect ratio clean aperture area into an 8x6 graticule grid. The centre 6x6 grid corresponds to a 4x3 aspect ratio rectangle that is concentric with the 16x9 clean aperture. The edges of the 4x3 area have different line patterns to help in identifying it. The clean aperture markers are placed so that the centre of the lines is at the clean aperture. The production aperture markers are placed so that the outsides of the lines are at the production aperture (the extent of the total image). A centre cross marker is also included to mark the middle of the image.

3.2.1.2. Production Aperture

Single horizontal lines and single pixel vertical borders around the active picture mark the production aperture. Single pixels and single horizontal lines are not legal for normal pictures but this test signal is designed to test equipment to make sure it is processing/passing the whole image area. If any side of the box is missing, then the device under test is not passing the whole production aperture.

3.2.1.3. Grey Signals

These signals can be used as a 50% full field grey, and they are also designed to provide a best case and a worse case toggle rate on the test signal data bits. The regular *Grey* signal has both the luminance and the chrominance values set to 200hex, while the *Grey with all data bits active* signal has both the luminance and the chrominance bits alternating between 200hex and 1FFhex. The latter signal has every data bit toggling every video sample.

Most current digital logic designs use CMOS technology, where the power consumed and the heat produced are proportional to the average toggle rate of all of the flip flops in the product. If a product performs a large amount of video processing (in proportion to all processing), then there will be a power consumption difference between a “quiet” signal and a “very active” signal. The grey signals can be used as a best case and a worst case condition for checking such conditions.

3.2.1.4. 4x3 Colour Bars

SMPTE RP219 colour bars have a feature that allows the signal to be down converted to standard definition while the signal is still usable. A down converter when in “4x3 side crop” mode will pull out the centre 4x3 picture area of the HD 16x9 image creating a meaningful picture. Also, the signal edge rise and fall times have been reduced to allow proper frequency scaling when decimating to standard definition bandwidths. This will reduce the amount of ringing and overshoot on the signal edges. This same concept has been incorporated in a couple more “4x3” colour bar signals.

3.2.1.5. Long Sequence Signals

Five second long signals have been included to aid in troubleshooting delays through equipment. Because memory is cheap and processing delays have grown, these signals may help in timing up long video paths. For instance, apply this signal to two different paths, and then compare the signals at the outputs with two side-by-side monitors. Even a single frame difference will be observable. The five-second-sequence signal also has single frame flashes each second.

3.2.1.6. Bouncing Box

A slow moving up and down square box has been included to catch frame grabs and/or repeats. It will also help show improper field interlace/de-interlace sequencing issues. The motion is frame based not field based, so it should pass through any processing equipment without distortion.

3.2.1.7. Four Frame 24P and 24PsF Signals

The 24 frames per second (fps) digital HD signals are becoming more common in the signal acquisition and editing environment. Conversion from 24fps to 30fps requires a “3:2 pulldown” where 4 frames of 24fps video are mapped to 5 frames of 30fps video. These signals are designed to allow the user to observe the “pulldown” sequence. In the 24P signals, a sequence of 4 unique frames is generated. After passing through a device that generates 30fps video, you can observe how each of the 5 output frames is generated from the 4 input frames. Also, the 24P segmented frame (sF) signals uniquely tag the even and the odd lines of the frame to make sure that the processing gear is associating the correct two segments to create one 24P frame.

3.2.2. Description of Unique 4:4:4 GBRA Test Signals

In normal high definition video GBRA colour space (also known as RGB), the three primary colour signals: red, green, and blue (RGB) that together convey all necessary picture information are scaled such that the extreme values are code words 040_h (64) and $3AC_h$ (940) in a 10-bit representation. In Full scale RGB, also known as *extended range RGB*, the three primary components are scaled such that the extreme values are code words 04_h (4) and $3FB_h$ (1019) in a 10-bit representation. The Full scale RGB video format is generally used in post production situations where you want to maintain the maximum resolution of the colour components to achieve a larger range of colours for theatrical release on film.

In addition to the normal complement of test signals available in the 4:2:2 and 4:4:4 YCrCb video formats, there are a special group of Full Scale RGB test signals listed in Table 3-2 that are designed specifically for these situations using the Full Scale GBRA video format. Most of these test signals are similar to the normal test signals, except that they have been appropriately scaled to use the full scale minimum and maximum coding values. There are three signals that are unique to the Full scale format.

3.2.2.1. FS Bars with 2 Scalings

The top half of this signal is 100% colour bars with the Full Scale RGB coding values. The bottom half of this signal is 100% Colour bars with the normal RGB code values. This signal is useful in testing the conversions in devices that will scale down the Full scale signal to a normal video RGB colour space.

3.2.2.2. FS 10 Step B & W Pluge

This signal is a 10 step black and white staircase with each step calibrated to line up with the millivolt scale on a waveform monitor. The 50% step is wider so that it can more easily be identified. Inserted in the black and white steps is a Pluge signal that is 1% and 2% above black and below white to aid in calibrating video projectors and other monitoring devices.

3.2.2.3. FS 7 Step B & W Pluge

This signal is a 7 step black and white staircase with each step calibrated to line up with the IRE scale on a waveform monitor. Inserted in the black and white steps is a Pluge signal that is 1% and 2% above black and below white to aid in calibrating video projectors and other monitoring devices.

3.3. ON-SCREEN DISPLAY

The On-Screen Display (OSD) is divided into two modes; a **Status Screen** and a **Menu System** for configuring and controlling the test generators. The status screen will be displayed when the user is not accessing the menu system. The four-character display will display TG1 or TG2 when in the status screen and MENU when in the menu system. Leaving the menu system can be accomplished by backing out of the menu hierarchy or by selecting the EXIT commands within any menu.

3.4. STATUS SCREEN

The status screen is displayed when the menu is not being accessed. TG1 or TG2 will be displayed on the four-character display. The items provide the user with information about the status of the card. The screen is summarized as follows:

MONITORING ITEM	DESCRIPTION
Genlock Input:	Status of signal applied as genlock source
Genlock Status:	Status of genlock source with respect to TG operating mode
Compact Flash:	State of card edge compact flash card
TG1 Signal Name:	Test signal name
Time Code:	Running time code value embedded on TG
Captions:	Caption text string that is embedded on TG
Link:	Link operating mode
Signal Type:	Test signal type
Signal Description:	Test signal description
TG2 Signal Name:	Test signal name
Time Code:	Running time code value embedded on TG
Captions:	Caption text string that is embedded on TG
Link:	Link operating mode
Signal Type:	Test signal type
Signal Description:	Test signal description

Table 3-3: Status Screen Items

The lines of the above status screen are summarized below. There are two logical test signal generators. TGx is used to reference either:

3.4.1. Monitoring the Genlock Input

Genlock Input	
Not Present *NTSC* *PAL-B* *720p/50…*	This is the standard of the analog signal that has been selected as the genlock source for the card. This signal is the reference for both TGs.

3.4.2. Monitoring the Genlock Status

Genlock Status
Un-locked *Locked* *Free-running* *Not compatible*

The genlock signal may or may not be compatible with the operating mode of the TGs.

3.4.3. Viewing the Signal Name

TGx Signal Name
Name

The Name of the signal is displayed here.

If there are no signals available, “No test signals found” will be displayed. This can happen if the user test signal selection criterion is too stringent and does not match any signals in the test signal file. Alternatively, the test signal file on the Flash card could be an old version or could be missing.

If the test signals are being loaded into local memory, “Loading test signal file …” will be displayed.

3.4.4. Monitoring the Time Code

TGX Time Code
Running Value

This time code value is the actual value being inserted in the output video.

3.4.5. Monitoring the TGx Captions

TGx Captions
None *“Caption Text String”*

The caption test message that is being inserted in the actual output video is displayed here. If there are no captions inserted, *None* will be displayed.

3.4.6. Monitoring the TGx Link

TGx Link
HD:274M *3G Level A: 425M-A* *3G Level B: 425M-B* *Dual Link: 372M*

The output format can be a 1.5GHz, 3GHz or dual 1.5GHz link.

3.4.7. Monitoring the TGx Signal Description

TGx Signal Description
DESC.

This field provides a short description of the signal that is displayed.

3.4.8. Monitoring the TGx Signal Type

TGx Signal Type	Due to the large number of possible signal formats/types, test signal types are described using the following format.
Specialized Description	

ApH	X	ApV	Ps	/	Pr	/	Ss	/	Cs	/	Bd	'Bit'	Dr	Comp

Where:

ApH	=	Active picture H size (container dimension)
ApV	=	Active picture V size (container dimension)
Pr	=	Picture rate (field rate if interlaced, frame rate if progressive)
Ps	=	Picture structure
Ss	=	Sample structure
Cs	=	Colour space
Bd	=	Bit Depth
Dr	=	Dynamic range
Comp	=	Companding

For example, a 12 bit 1080p/24 4:4:4 full scale RGB signal would be described as:

1920 x 1080 P / 24 / 4:4:4 / RGB / 12 bit Full-scale Linear

The various fields of the description could have, but are not limited to the following:

ApH	x	ApV	Ps	/	Pr	/	Ss	/	Cs	/	Bd	Bit	Dr	Comp
720		480	P		23.98		4:2:2		RGB		8		Normal	Linear
1280		576	I		24		4:4:4		YCbCr		10		FullScale	Dneg
1920		720	SF		25		4:4:4:4		XYZ		12		Companded	
2048		1035			29.97									
		1080			30									
					50									
					59.94									
					60									

3.5. TOP LEVEL MENU STRUCTURE

The following chart outlines the top menu items of the test generator. From here the user will traverse into the sub-menus. If the shaft encoder knob is not touched for 30 seconds, this menu will be removed and replaced with the status screen.

Exit	Selecting this item will exit the menu system and display the status screen.
Monitor Output Standard	This menu item selects the output standard for the monitoring (On-Screen Display) output.
TG 1	Selecting this menu item will enable the user to configure the primary TG.
TG 2	Selecting this menu item will enable the user to configure the secondary TG.
Genlock	Selecting this item will enable the user to configure the genlock, which is shared between both Test Generators.
Misc Utilities	Selecting this item will reveal the miscellaneous house keeping functions including preset management.

3.5.1. Setting the OSD Monitor Output Standard

Use this control to configure the video standard for the monitoring output BNC that has the menu On-Screen Display.

Monitor Output Standard	From the list, select the desired video standard for your monitoring gear.
1080i/59.94, *1080i/50*, *720p/59.94*, *720p/50*, *1080i/60*, *720p/60* *Cancel*	*Cancel* will abort any change of the video standard. **Note:** Selecting the video standard with this control will also set the frame rate frequency group for both TGs. This is due to the sharing of the genlock and clock generation circuitry. For example, if the TGs were generating 25Hz or 50Hz video and the user would set this control to one of the 59.95Hz videos, the TGs will be re-configured to output 23.98Hz, 29.97Hz or 59.94Hz video.

3.5.2. Genlock

The genlock reference and clock generation is shared between both TGs. This means that both TGs can only produce video that have the same, or compatible, frame rates as the reference video. This menu is used to select and configure the reference and clock generation.

Back	Selecting this item will move the user up one menu level.
Exit	Selecting this item will exit the user out of the menu system and display the status screen.
Source	Select the source of the reference going into the card.
Frame Rates	Select the frame rate group for both TGs.
Free-Run Freq.	Set the free-running frequency when not genlocked.
Genlock Input	Identifies the reported standard detected from the selected source.

3.5.2.1. Selecting the Genlock Source

The card has three sources of genlock. Use this control to select the desired input.

Genlock
- *Source*
  - *Card Ref,*
  - *Frame Ref 1,*
  - *Frame Ref 2,*
  - *Free Run,*

Card Ref will select the bottom BNC at the rear of the module while *Frame Ref 1* and *2* will select one of the frame-mounted reference BNCs.

Alternatively, you can have the two test signal generators *Free Run*. When the card is free running, the shared Voltage Controlled Crystal Oscillator (VCXO) is not locked to anything. This means that both TGs will be running at the same frequency, but the horizontal and vertical alignment of the two will not match.

3.5.2.2. Selecting the Frame Rate Group

Because the two TGs share the same genlock input and Voltage Controlled Crystal Oscillator (VCXO), there are restrictions on what video formats the TGs can produce. The restrictions are based on genlock frame rate and VCXO frequency. For instance, if NTSC is applied as reference, the TGs can produce videos with frame rates of 23.98Hz, 29.97Hz or 59.94Hz while 50Hz and 60Hz cannot be created.

Genlock
- *Frame Rates*
  - *23.98/29.97/59.94,*
  - *25/50,*
  - *24/30/60*

Select the frame rate group for the two TGs. Both TGs can produce frame rates within the selected group. For example, if 23.98/29.97/59.94 is selected, one TG can produce 23.98Hz video while the other can produce 59.94Hz video.

The supplied input reference video must be compatible with this frame rate group. Changing this frame rate group will also dictate the OSD monitor output frame rate.

Note: 24, 30 and 60 Hz frame rates are rarely used.

3.5.2.3. Setting the Free Run Frequency

When the card is not genlocked, you can set the free-running frequency.

Genlock
FreeRun Freq.
-128
…
0
…
127

The free running frequency of the VCXO is set with this control. It has an approximate range of +/- XXXppm in between the –128 to 127 control values.

This control sets the frequency when the card is not genlocked. The card will not be genlocked when either of the following three conditions exist:

1. Genlock *Source* is set to *Free Run*
2. Genlock *Source* is set to an input and there is no input applied
3. Genlock *Source* is set to an input and an incompatible video source is applied

Adjusting this value will not have any affect while the card is genlocked. It will be applied the next time the card is not genlocked.

3.5.2.4. Monitoring the Genlock Video Standard

This status line assists when selecting the genlock *Source* and configuring the *Frame Rates*.

Genlock
Input Type
Not Present,
NTSC,
PAL-B,
720p/50,
1080i/25,
720p/59.94,
1080i/59.94,
…

This control sets the standard of the analog video being applied to the selected reference input of the card. This status is beneficial when configuring genlock controls or determining if the supplied genlock reference should be used.

Not Present is displayed if no video is found on the selected input.

3.5.3. Configuring the Test Generators

There are two logical test signal generators that share the common reference video input and clock generator. The test generators are identical except TG1 has an extra 2 outputs. These outputs provide other copies of the selected test signal.

The menu structure for both Test Generators is identical and is summarized below:

Back	Selecting this item will move the user up one menu level.
Exit	Selecting this item will exit the user out of the menu system and display the status screen.
Signal Format	Selecting this item reveals another sub-menu which enables the user to select a video format and a specific signal.
H phase	Control the output horizontal phase of the generator.
V phase	Control the output vertical phase of the generator.
Group 1 Audio	Selecting this item reveals another sub-menu which enables the user to select audio signals and configure the group 1 audio embedder.
Group 2 Audio	Selecting this item reveals another sub-menu which enables the user to select audio signals and configure the group 2 audio embedder.
Group 3 Audio	Selecting this item reveals another sub-menu which enables the user to select audio signals and configure the group 3 audio embedder.
Group 4 Audio	Selecting this item reveals another sub-menu which enables the user to select audio signals and configure the group 4 audio embedder.

3.5.3.1. Setting the Timing of the Output Video w.r.t. Genlock Input

The *V Phase* and *H Phase* parameters allow the user to control the timing of the output video with respect to the beginning of the frame on the genlock reference input. Phasing of the output is only possible when the frame rate of the genlock reference is the same as the frame rate of the output video format. An internally generated digital video sync structure, locked to the analog genlock reference signal (0_H time of line 1 field 1 for PAL or HD Tri-level references or 0_H time of line 4 field 1 for NTSC references) is used to genlock the test signal generator. The EAV of line 1 of this digital reference sync is the point to which all the reference phasing adjustments are made. The default timing relationship of the analog tri-level and bi-level inputs to the digital reference sync frame (when the *V Phase* and *H Phase* parameters are set to zero) are set according to SMPTE Recommended Practice RP168-2002 and are shown in Figure 3-1 and Figure 3-2.

The V parameter provides a coarse adjustment of timing and sets the delay in lines of line 1 of the test signal frame with respect to the beginning of the genlock reference frame. The H parameter provides a fine adjustment of timing and sets the delay in pixels of the 0_H time of line 1 of the test signal frame with respect to the 0_H time of the beginning of the reference frame.

The factory default is to align the 0_H time of Line 1 of the output video with the beginning of the genlock reference frame (0_H time of line 1 field 1 for PAL or HD Tri-level references or 0_H time of line 4 field 1 for NTSC references) according to SMPTE Recommended Practice RP168-2002. For example, in 59.94Hz frame rate systems, the horizontal reference points of Line 1 of 1125 line, Line 1 of 750 line and Line 4 of 525 line signals shall be coincident (see Figure 3-3). In 50Hz frame rate systems, the horizontal reference points of Line 1 of 1125 line, Line 1 of 750 line and Line 1 of 625 line signals shall be coincident (see Figure 3-4).

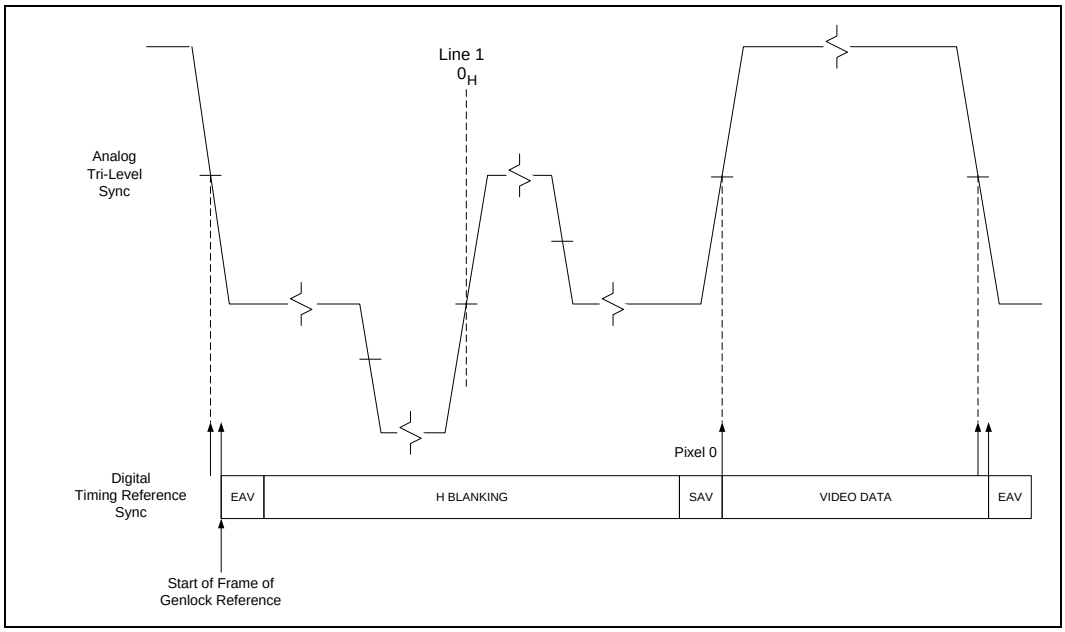

Figure 3-1: Default Tri-Level Genlock Reference Timing

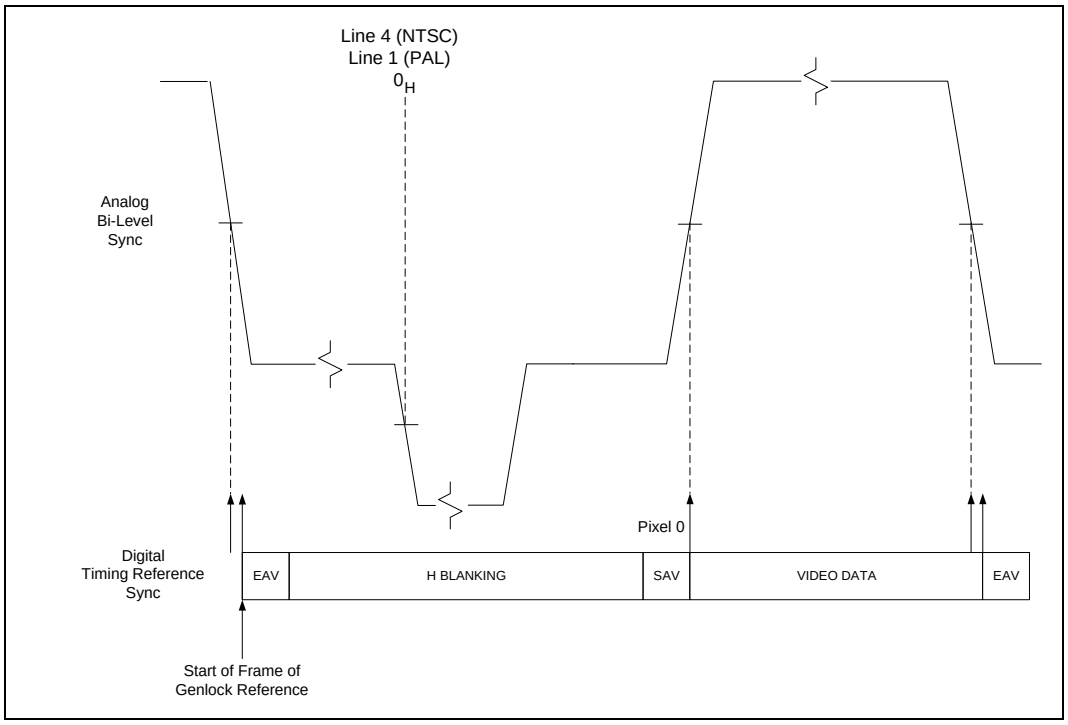

Figure 3-2: Default Bi-Level Genlock Reference Timing

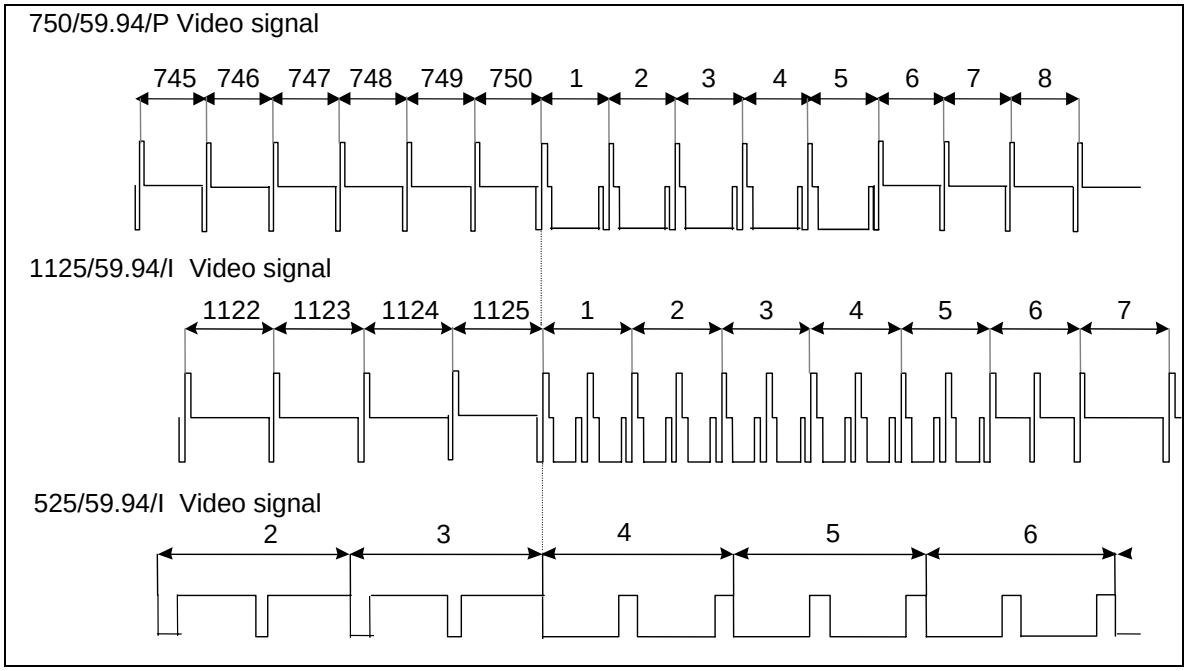

Figure 3-3: Default Signal Alignment in 59.94 Hz Field Rate Systems

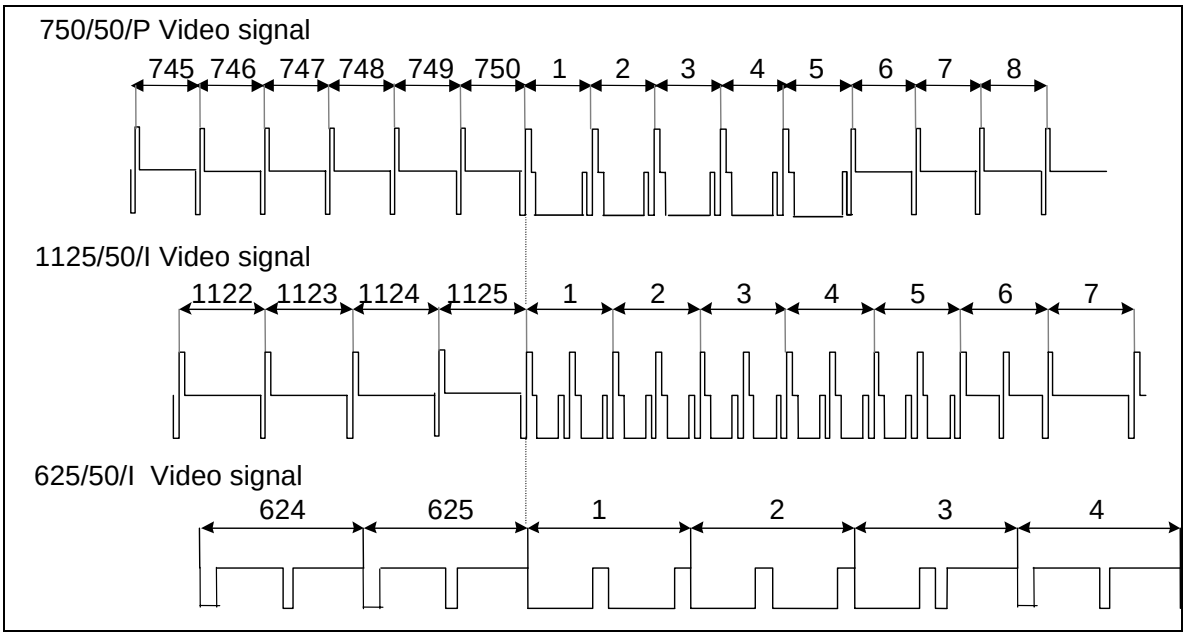

Figure 3-4: Default Signal Alignment in 50 Hz Field Rate Systems

3.5.3.2. Adjusting Horizontal Phase with Respect to the Reference Input

When the test signal generator (TG) is genlocked to a supplied reference, this control adjusts the horizontal phase of the output signal relative to the reference input.

TGx *H Phase* *0* *to* *# samples per line –1*	Larger H phase numbers will move the TG video later in time with respect to the reference input. 0 sets the phase as defined above.

3.5.3.3. Adjusting Vertical Phase with Respect to the Reference Input

When the test signal generator (TG) is genlocked to a supplied reference, this control adjusts the vertical phase of the output signal relative to the reference input.

TGx *V Phase* *0* *to* *# lines per frame -1*	Larger V phase numbers will move the TG video later in time with respect to the reference input. 0 sets the phase as defined above.

3.5.3.4. Selecting the Signal Format

The advent of the dual link (SMPTE372M) and 3G (SMPTE425M) standards has also brought an abundance of image formats, sampling structures and link formats, making selecting the desired signal a bit confusing. This menu allows the user to filter the available signals, which will aid in selecting the correct one. By selecting items in this list, the user will be narrowing down the selection criteria so that the number of signals to select gets smaller. To create a larger list select "*any*" in some of the selections.

Back	Selecting this item will move the user up one menu level.
Exit	Selecting this item will exit the user out of the menu system and display the status screen.
Link Format	Select the main operating format.
Image Format	Select the H by V structure.
Sample Structure	Select the structure of pixel data.
Signal	Select the signal from a list that matches the above criteria.
Description	The description item provides information to help identify the selected signal.

3.5.3.4.1. Selecting the Link Format

The physical interface can either be a single coaxial cable (single link) or two coaxial cables (dual link). A single link can support three modes; HD, 3G Level A and 3G Level B. SMPTE425M covers the 3G types or "levels" of operation. "Level B" is used to carry dual link signals over a single cable. This is done by time multiplexing (or interleaving) the dual link signals. "Level A" operation is a single link with a direct image format or traditional HD video structure.

TGx
- *Signal Format*
  - *Link Format*
    - *HD,*
      3G Level A,
      3G Level B,
      Dual

HD will configure the generator to output signals over one coaxial signal conductor (SMPTE292M). This includes signal formats described by SMPTE274M systems 4 to 11.

3G Level A will configure the generator to output signals over one coaxial signal conductor (SMPTE424M-A). This includes signal formats described by SMPTE274M systems 1 to 3, and direct image format mapping of SMPTE425M called level A operation.

3G Level B will configure the generator to output signals over one coaxial signal conductor (SMPTE424M-B). This includes signal formats described by SMPTE372M and 2 x SPMPTE 292M HD SDI mapping, called level B operation.

Dual will configure the generator to output signals over two coaxial signal conductors (SMPTE292M). This includes signal formats described by SMPTE372M.

3.5.3.4.2. Selecting the Image Format

The first process in selecting a test signal is to set the horizontal and vertical shape of the raster (A.K.A the "container") that will contain the video data. This is not necessarily the actual shape of the video. For instance, the video could be 4x3 content, but carried in a 720p signal "container". The interlace structure and frame rate are also included for selection.

TGx
Signal Format
Image Format
1920x1080I/59.94,
1920x1080P/23.98,
1920x1080P/29.97,
1920x1080P/59.94,
1920x1080PsF/23.98,
1920x1080PsF/29.97,
2048x1080P/23.98,
2048x1080PsF/23.98,
1280x720P/59.94,
1920x1035I/59.94

This is the list of supported HxV formats or "containers" and frame rates that can carry video images.

Note: This list is for the NTSC compatible group. The list is context sensitive to *genlock frame rate* group, meaning, that it will change based on the defined reference. In addition, there are 25Hz and 50Hz formats as well as 24Hz, 30Hz and 60Hz.

3.5.3.4.3. Select the Sample Structure

Now that the basic configuration of the video carrying structure has been defined using the above controls, the remaining controls are used to refine your selection criteria.

TGx
Signal Format
Sample Structure
4:2:2/10,
4:4:4(:4)/10,
4:4:4/12,
4:2:2/12

This is the list of supported sampling structures and bit depths.

Most broadcast applications use 10 bit 4:2:2 Y,Cb,Cr.

Post production applications use 10 and 12 bit 4:4:4 GBR.

If you are looking for a signal with a key channel (4:4:4:4), select 4:4:4(:4)/10. This is a rarely used feature and has limited applicability in a test signal generator.

Note: 4:2:2 implies Y, Cb, Cr colour space because 4:2:2 RGB signals are non-existent.

3.5.3.4.4. Selecting the Signal

This menu item has a scrollable list of test signals that match the above set criteria. Alternatively, rotating the shaft encoder knob when the OSD is displaying the status screen will advance signals on TG1 or TG2 depending on the selection mode.

TGx
Signal Format
Signal
[Signal Name]

The name of the signal is displayed on this menu item and the following menu item has a short description.

"No test signals found" will be displayed if there are no signals matching the selection criteria. This can happen if the user test signal selection criterion is too stringent and does not match any signals in the test signal file. Alternatively, the test signal file on the Flash card could be an old version or could be missing.

If the test signals are being loaded into local memory, "Loading test signal file …" will be displayed.

3.5.3.4.5. Description of the Selected Signal

This menu item is a read only description of test signals that have been selected with the above menu item.

TGx
Signal Format
Signal Description
[Signal Description]

This is a sentence describing the signal selected with the *Signal* menu item.

3.5.3.5. Configuring the Audio Generators

This menu is used to configure the audio tone generators and audio embedders. There are 4 tone generators per embedded group and up to four groups can be enabled per TG. For clarity, only one group is included in the manual.

Back	Selecting this item will move the user up one menu level.
Exit	Selecting this item will exit the user out of the menu system and display the status screen.
Embedder	Turn the embedder on and off.
Tone 1 Frequency	Select the frequency of audio tone generator # 1.
Tone 1 Level	Select the audio tone level for generator # 1.
Tone 2 Frequency	Select the frequency of audio tone generator # 2.
Tone 2 Level	Select the audio tone level for generator # 2.
Tone 3 Frequency	Select the frequency of audio tone generator # 3.
Tone 3 Level	Select the audio tone level for generator # 3.
Tone 4 Frequency	Select the frequency of audio tone generator # 4.
Tone 4 Level	Select the audio tone level for generator # 4.

3.5.3.5.1. Enabling the Audio Embedders

The single link, HD and 3G Level A, physical interfaces can support up to four groups (16 channels) of embedded audio. The dual link (two coaxial cables) and single link 3G Level B can carry four groups on each link, however, this generator (at the time of writing this manual) only supports embedded audio on Link A.

TGx *Group x* *Embedder* *On,* *Off*	Setting the *Embedder* to *on* will enable the group of 4 channels of audio. If the *Link Format* is *Dual* or *3G Level B*, Link A will contain the audio.

3.5.3.5.2. Selecting the Audio Frequency

One group of audio supports four channels of embedded audio (2 AES pair). For clarity, only one tone frequency is described.

TGx
- *Group x*
  - *Tone x Frequency*
    - *20Hz,*
    - *40Hz,*
    - *60Hz,*
    - *80Hz,*
    - *100Hz,*
    - *200Hz,*
    - *400Hz,*
    - *440Hz,*
    - *1kHz,*
    - *2kHz,*
    - *4kHz,*
    - *8kHz,*
    - *10kHz,*
    - *20kHz*

Select the appropriate frequency for the embedded channel.

3.5.3.5.3. Selecting the Audio Level

One group of audio supports four channels of embedded audio (2 AES pair). For clarity, only one tone level is described.

TGx
- *Group x*
  - *Tone x Level*
    - *Mute,*
    - *-40dB FS,*
    - *-30dB FS,*
    - *-29dB FS,*
    - *-28dB FS,*
    - *…*
    - *-2dB FS,*
    - *-1dB FS,*
    - *0dB FS*

By default, the tone will be muted. Select the appropriate level for the embedded channel.

This value is in dB Full Scale. 0dB FS is the largest, undistorted, amplitude tone that can be generated in this digital interface. SMPTE specifies –20dB FS as the reference level for channel level alignment.

3.5.4. Misc. Utilities

These utilities provide information about the product, aid in updating firmware and help maintain user presets.

Back	Selecting this item will move the user up one menu level.
Exit	Selecting this item will exit the user out of the menu system and display the status screen.
About …	This field provides information about the type and version of software loaded.
Load Preset	This function reads the card configuration from a non-volatile preset in Flash.
Store Preset	This function writes the card configuration to a non-volatile preset in Flash.
Upgrade	Puts the unit into upgrade mode when this item is selected.

3.5.4.1. Accessing Information About this Module and its Firmware

Utilities
- *About…*

This menu item provides general information about the 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.

3.5.4.2. Recall Configurations from the User Presets

The *Recall Preset* menu item is used to recall configurations. The *Recall Preset* menu item can also be used to restore the factory default configuration.

Utilities
- *Load preset 1*
  - *User Preset 1, User Preset 2, Default, Cancel*

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

After selecting the recall preset operation, you must change the command to *User Preset #* and press the pushbutton before the recall will take place.

Selecting *Default* will recall the factory set values.

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.

3.5.4.3. Storing Configurations to the User Presets

The TG provides two user preset areas to save the complete set of control from the on screen menu. The *Store Preset* menu item is used to save these configurations.

- *Utilities*
  - *Store Preset*
    - *User Preset 1,*
    - *User Preset 2,*
    - *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 *User Preset #* and press the pushbutton before the store will take place. The user can abort the operation by pressing the pushbutton when *Cancel* is displayed.

3.5.4.4. 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.

4. VistaLINK® REMOTE MONITORING/CONTROL

4.1. WHAT IS VISTALINK®?

VistaLINK® is Evertz's remote monitoring and configuration platform which operates 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. VistaLINK® provides centralized alarm management, which monitors, reports, and logs all incoming alarm events and dispatches alerts to all the VLPro Clients connected to the server. Card configuration through VistaLINK® PRO can be performed on an individual or multi-card basis using simple copy and paste routines, which reduces the time to configure each module separately. Finally, VistaLINK® enables the user to configure devices in the network from a central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An 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 products.

2. Managed devices (such as 7700R2X2-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, 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.