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REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary: Work in progress	July 2009
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	Aug 2009
2.0	Second major release. Features added: • 2048x1080p/PsF added at 23.98, 24 and 25Hz frame rates • GBR, 12 bit and 4:4:4:4 video formats • VistaLINK® support • Audio embedding in 3G Level A link formats • SD SDI support added (new board build required) • User defined text window added to signal outputs • Signals added	Nov 2010
2.1	Minor release: • Sample structure selection menu item added • Tri-level sync support added	Jan 2011
2.2	Features added: • Compact FLASH card file naming convention added • "Play Special and Overlay" menus added	Jan 2013
2.3	Features added: • Custom bitmap support added • Custom wave file support added	Feb 2014

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 gray background.

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1. OVERVIEW

The 7851TG2-3G Test Signal Generator provides a cost-effective method of generating 3Gb/s and 1.5Gb/s HD-SDI, as well as SD-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 SMPTE259M, 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 color space and definitions for 10/12 bit depths.

An included linear mixer can be used to key full frame overlays or specialized video elements. User supplied full frame bitmaps and stereo wave files can be played out for trouble slides, link identification or specialized test signals. Stereoscopic 3D video test signals are included.

The 7851TG2-3G can be configured via dedicated on-screen menu and is also 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
- SD 270Mb/s test signals (rev 2 board build and greater)
- Wide variety of image formats including 1080p, 1080i, 2048p, 2048i, 720p, 625i and 525i
- Wide variety of frame rates including 23.98, 24, 25, 29.97, 30, 50, 59.94 and 60 frames per second
- Automatic selection of 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
- Linear keyer to allow full frame overlays and specialized video items (sweep and beeps, etc.)
- User supplied full frame bitmap (.BMP) support
- User supplied stereo audio wave file (.WAV) support
- Dedicated monitoring output for on screen display configuration
- Card edge status LEDs (usage is currently undefined)
- VistaLINK®-capable offering remote control and configuration capabilities via SNMP
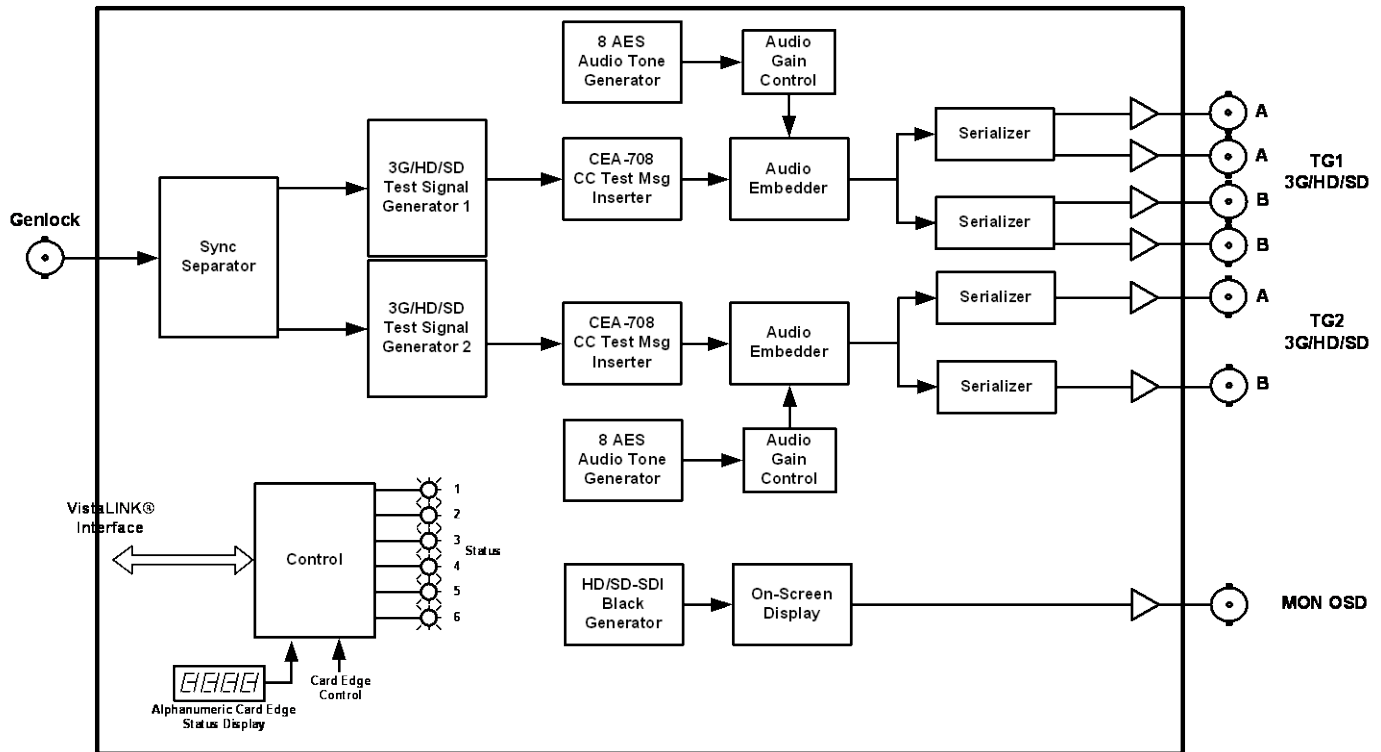
Figure 1-1: 7851TG2-3G Diagram

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), color 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 frame 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 frame rates under 50Hz

Methods 2 through 4 identify ways of increasing image information of existing HD SDI video structures while method 1 covers 1080p at the higher frame 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.

Stereoscopic 3D (separate left and right eye video streams) can be carried over a 3G level B link by mapping each of the eyes to corresponding links.

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 frame 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 frame rates under 50Hz

Method 1 can be applied to the 1080p/50/59.94/60 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 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

1.2.1. Valid Link, Image and Sample Structures

Not all image formats can be transported on all link formats. For instance there is too much data in a 4:4:4 GBR sample structure to transmit a 10 bit 1920x1080 image over a 1.5Gbps (HD) link at 29.97 frames per second.

Also, there are many combinations of link, image formats, frame rates and sample structures that do not make sense. For instance, 4:2:2 sampling of RGB signals is a non-starter.

In addition, the industry ends up accepting formats that offer the most performance for the bandwidth. Why would anyone adopt 720p/23.98 when they can get 1080p/23.98 on the same 1.5Gbps link? Sometimes the industry adopts versions before they become standard (i.e. Progressive, Segmented Frame: PsF).

As a testing tool, this TG attempts to generate as many formats as possible, even ones that don't make much sense! Some formats are generated because it was easy to do and it was a simple parallel from other formats. Other formats may have been over-looked, were not specified by SMPTE or were not developed at design time. Please contact the factory if other formats are needed.

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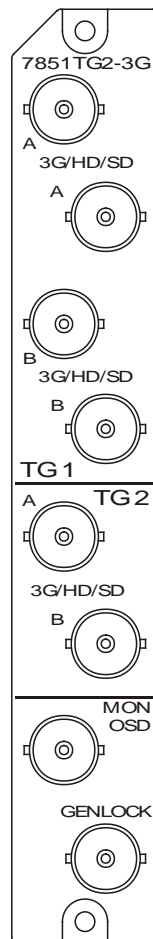
Figure 2-1: 7851TG2-3G Rear Plate

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. 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. 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 color 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.

2.1.   COMPACT FLASH

All test signals and content is stored on the Compact FLASH card that is accessible via the card edge. If this card is not installed, or there are no valid test signals on the card, The TG will output TRS ID with no video data. Also, the MON OSD output status screen will show an appropriate status message.

When a test signal generator is configured for a specific format (link format, image format, sample structure, etc.), it will go to the Compact FLASH memory card for the test signal file. It will be looking for a specific filename in a specific directory.

The test signal files are as follows:

7851TG2-3G for software up to, but not including, version 1.05 b89:

\ts525s.evt	SD 525 signals: SMPTE259M (720x487)
\ts625s.evt	SD 625 signals: SMPTE259M (720x576)
\ts1280s.evt	HD 720p signals: SMPTE296M (1280x720)
\ts1280l.evt	Obsolete. Not required
\ts1920s.evt	1920x1080 signals: SMPTE274M, SMPTE425M Level A and Level B, SMPTE372M Dual Link (i/p/psf)
\ts1920l.evt	Obsolete. Not required
\ts2048s.evt	2048x1080 signals: SMPTE2048 HD, SMPTE425M Level A and Level B, SMPTE372M Dual Link (i/p/psf)
\ts2048l.evt	Obsolete. Not required

7851TG2-3G for software at, or beyond, version 1.05 b89:

\ts525stg.evt	SD 525 signals: SMTPE ST259 Level C (270Mb/s)
\ts625stg.evt	SD 625 signals: ITU-R BT.656 (270Mb/s)
\ts1280stgHD.evt	HD 720p signals: SMPTE ST296 (720p)
\ts1280stg3G.evt	Stereo 720p signals: SMPTE ST425-2 Level B-DS, SMPTE ST292-2 Stereo 1.5Gb/s (1280x720)
\ts1920stgHD.evt	1920x1080 signals: HD SMPTE ST274, 3G SMPTE ST425-1 Level A (direct mapping)

\ts1920stg3G.evt   3G 1920x1080 signals:
SMPTE ST425-1 Level B (Dual Link and Dual Stream),
SMPTE ST425-2 Stereo,
SMPTE ST372 Dual Link,
SMPTE ST292-2 Stereo 1.5Gb/s

\ts2048stgHD.evt   2048x1080 signals:
SMPTE ST2048-2,
SMPTE ST425 Level A (direct mapping),
SMPTE ST292-1 1.5Gb/s

\ts2048stg3G.evt   2048x1080 signals:
SMPTE ST425-1 Level B (Dual Link and Dual Stream),
SMPTE ST425-2 Stereo,
SMPTE ST372 Dual Link,
SMPTE ST292-2 Stereo 1.5Gb/s

\overlay   This directory has overlays and masks that can be applied over
test signals

\special   This directory has other special, keyable items that can be
applied over test signals. Audio signals can also be included
that can replace the generated tones.

\custom   This directory has custom, customer supplied, bitmap and wave
files that can replace test signal data.

Test signal files are picked up from the Compact FLASH card based on this filename convention, case insensitive. Any other name than a direct match will be ignored. When new versions of test signal files are issued, there will be a version number appended to the filename. Remove this version number when you put it on the Compact FLASH card.

Note: To keep track of file versions, it's best to maintain the files on a computer and only change the filename when you copy them to the Compact FLASH card.

3.   TECHNICAL SPECIFICATIONS

3.1.   GENLOCK INPUT

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

3.2.   SERIAL VIDEO OUTPUTS

Standard: 3Gb/s: SMPTE 424M
                              1.5Gb/s: SMPTE 292M
                              270Mb/s: SMPTE 259M
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

3.3.   ELECTRICAL

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

3.4.   PHYSICAL

7700 or 7701 frame mounting:
Number of slots: 2

7800 or 7801 frame mounting:
Number of slots: 1

4. 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.

> **NOTE: Not all controls are available via the card edge and OSD. Installation of a frame controller card and VistaLINK® may be needed.**

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 bit long 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.**

4.1. CARD EDGE CONTROL

The card edge control consists of a rotary knob with push button 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) output.
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.

4.2. 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 signals are stored on the Compact FLASH card that is accessible via the card edge. The available signals will depend on the version of the files on the FLASH card.**

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 Color Bars
60% Component Sweep (15-30 MHz) with 2 MHz Markers	75% Color bars with Pluge

60% Component Sweep (1-30 MHz) with 5 MHz Markers	100% Color bars with Pluge
Grey	4x3 SMPTE bars
Grey (all data bits active)	RP219 Color bars
SDI Checkfield	75% BARS, 100% WHITE
Bouncing Box	75% Color bars
24P(sF), 4 frame sequence	100% Color 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 Color Bars
Bowtie	

Table 4-1: Test Signal Selection

4.2.1. Description of Unique Test Signals

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

4.2.1.1. 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.

4.2.1.2. 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.

4.2.1.3. 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.

4.2.1.4. 4x3 Color Bars

SMPTE RP219 color bars have a feature that allows the signal to be down converted to standard definition and 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" color bar signals.

4.2.1.5. 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. The 10 frame sequence has a shorter sequence and can illuminate missing or repeating frames without having to compare it to a reference signal.

4.2.1.6. 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, so it should pass through any processing equipment without distortion.

4.2.1.7. Lab Bars with Bouncing Box

This specialized color bar signal has a number of features designed for the broadcast environment that has to deal with image manipulation, including down conversion.

A down converter when in "4x3 side crop" mode will pull out the centre 4x3 picture area of the HD 16x9 image creating SD SMPTE bars (well almost). For the defined use/purpose, see the documentation for SMPTE bars.
Outside of the centre 4x3 area, there are 100% bars in a vertical arrangement. There is 100% white on the left of the 75% SMPTE bars section and black on the right hand side. Opposite of the reverse bars, there are 6 regions with the 100% saturation bars.

The white bar in the pluge section has two sections; a 100% white region and a "white hat" region that exercises the dynamic range between 100% white and max white. This is used to make sure processing gear is passing the white head-room of SD and HD SDI video.

A white, 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, so it should pass through any processing equipment without distortion.

4.2.1.8. 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 you 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.

4.2.1.9. Full Amplitude, Fast Edge Transitions

Fast (infinite rise time), full scale, transitions are available for checking processing gear for how they handle these type of edges. The signal has a Y only, Cb only, and Cr only sections as well as a section with all 3 channels transitioning at the same time.

4.2.2. Description of Other Test Signals

The 3Gb/s capability of the test signal generator brings with it a number of other applications. These include, but are not limited to, D-Cinema, 3D video, higher bit depths and different frame rates. Included here are a few signals and their intended use.

4.2.2.1. 2048x1080 Signals Including D-Cinema

SMPTE428M signals with Digital Cinema Distribution Master (DCDM) X'Y'Z' color space are available, however, at the time of writing, their accuracy has not been verified.

4.2.2.2. Link Identification

Simple white and black signals are used to identify Link A (black) and Link B (white) of a multi-link (dual-link or Level-B) signal. These can be used to make sure processing gear identify the payload ID properly and don't swap channels through a processing chain.

4.2.2.3. Ramps at Varying Bit Depths

R, G, B, Y, Cb and Cr ramp signals are useful to checking processing gear handling of the least significant bits in the color space gamut. These signals are divided into sections with different ramp bit depth counting sequences from low to high. The top section counts with all 10 bits. The second with the upper 9 bits. The third with 8, etc. The bottom counts with 6 bits. By comparing these ramps before and after passing through a processing chain, you can get an idea of how many effective bits the processing path has removed from the source. You can even get a good idea by looking at this signal on a picture monitor to determine the systems (including the monitor!) effective number of bits. If the width of the quantizing steps vary in size, you can get an idea of the amount of differential non-linearity on the system.

4.2.2.4. Color Wheel with Ramps

The "Color Wheel With Ramps" signal has a centre region with a horizontal Cb ramp, vertical Cr ramp and a Y cone that is bright in the middle. This combination creates a smoothly transitioning color wheel with a white centre. The right side has a shallow Y ramp in the vertical dimension. The left side has a shallow Y ramp that varies in both the H and V dimension. Dynamic range reducing devices, like 8 bit MPEG codecs, will create circular patterns on the color circle and banded regions on the ramps that are clearly visible on a quality monitor.

4.2.2.5. Dual Link and Level B SDI Checkfield

Dual Link signals are simply two HD SDI signals carrying data for a combined image (or stereo 3D images). The SDI checkfield signals to stress the physical transport is identical to HD SDI. However, when two links are combined (multiplexed) to create a Level B signal, the HD SDI checkfield signal no longer stress' the physical link. A different, Level B SDI checkfield was created such that when combined stress' the physical link.

4.2.3. 3D Signals

Many 1.5Gb/s and 3Gb/s formats can support stereoscopic 3D video. There are a number of ways to pack left and right eye pictures into these video formats. These include, but are not limited to, top-bottom, left-right, line-by-line interleave, and two separate streams. A number of test signals are included as a starting point for testing a 3D infrastructure.

4.2.3.1. 3D Safe Area and Title

SMPTE RP218 specifies the safe area and safe title of on-screen captioning text. This signal has these boundaries, a centre cross hair, 4x3 marker lines and a graticule. These features are all on the convergence plane. In addition, there are left eye and right eye markers in the upper left and right corners, respectively. Also, a number of white squares are positioned within the graticule at varying screen depths. As you go down the screen, these squares go from behind the convergence plane to in front. This signal is available in a number of stereo 3D formats.

4.2.3.2. Inter-Ocular Crosstalk Bands

When video for one eye (intended eye) leaks into the other eye (unintended eye), this is called "inter-ocular crosstalk". To measure the amount of inter-ocular crosstalk we present a band of white across the width of the picture that is only present in one eye. If you close that eye and look with the other, you should not see anything (with glasses on, of course). What you do see is the inter-ocular crosstalk. To help quantify this amount, grey patches between 1% and 15% are presented adjacent to the mono eye bands. There are both left eye and right eye regions. You can also notice how the cross talk changes color, indicating uneven spectral attenuation. By rotating you head about your nose, you can also see how off angle changes affect crosstalk (with polarizing glasses).

4.2.3.3. Rolling Stereo 3D Box's

To make sure a stereoscopic 3D system doesn't delay one eye more than the other, a few test signals have been designed to measure the delay difference by simply looking at a picture monitor. These signals have a multi-frame sequence of colored box's rolling from top to bottom. The left eye and right eye signals are colored differently such that, if the left and right eyes are in time, a third color is generated on a display. Grid lines demark where the box's will appear making it easier to count the delay difference. Also, if the delay difference is greater than the sequence, from top to bottom, you can detect this by looking at a separate box that flashes once every second pass through the sequence. For instance, if the test signal has an 11 frame duration, you can measure up to a +/- 5 frame difference. A -6 frame difference will look like a +5 frame without the help of this separate box.

A few versions have been created with different types of motion. There is field based, frame based and film based (with 3:2 pull-down applied).

4.2.3.4. 3D Alignment Signal

One signal combines a number of features to make sure the processing of the left and right eyes match. This signal has the following features:

FEATURE	PURPOSE
Color bars:	Make sure colorimetery of the two eyes are match.
Frequency sweep:	Make sure frequency response of the two eyes are match.
Y multipulse:	Make sure the phase response of the Y channel of the two eyes match.
White bar and pluge:	Make sure the dynamic range processing of the two eyes match. There is a tent, or hat on the white square to check the region above white. Pluge can check the region below black.
Interocular crosstalk:	Measure left to right and right to left crosstalk (monitor measurement).
Channel ident. squares:	Red (left) and green (right) squares make sure the eyes have not been swapped.
Alignment fudicial:	Red (left) and green (right) fudicial make sure H and V alignment of the two eyes match by simple picture monitor observation.
Rolling stereo squares:	Verify time alignment of left and right eyes. See above *Rolling Stereo 3D Box's*

Table 4-2: 3D Alignment Signal Features

4.3. 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.

4.4.   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 in Table 4-3 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:	Status of card edge compact flash card
TG1 Fmt:	Test generator link, image and sample structure format
Signal:	Test signal name
	Test signal description
Time Code:	Running time code value embedded on TG
Captions:	Caption text string that is embedded on TG
TG2 Fmt:	Test generator link, image and sample structure format
Signal:	Test signal name
	Test signal description
Time Code:	Running time code value embedded on TG
Captions:	Caption text string that is embedded on TG

Table 4-3: 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:

4.4.1.   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 (there are three input sources of reference) as the genlock source for the card. This signal is the reference for both TGs.

4.4.2.   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.

4.4.3.   Monitoring the TGx Format

TGx Fmt
See below

The physical link format, the raster structure, frame rate, and sample structure is presented for easy identification of the generator.

Due to the large number of possible signal formats/types, test signal types are described with the following format.

TGx Fmt =	Link Format	Image Format	Image Structure	Frame Rate	Sample Structure	/	Bit Depth	Color Space

Where:

Link Format	=	SD	SMPTE259M
		HD	SMPTE292M
		DL	SMPTE372M
		3GA	SMPTE425M-Level A
		3GB-DL	SMPTE425M-Level B Dual Link
		3GB-DS	SMPTE425M-Level B Dual Stream

Image Format	=	525	720 x 480ish
		625	720 x 576
		720	1280 x 720
		1080	1920 x 1080
		2048	2048 x 1080

Image Structure	=	i	Interlace
		P	Progressive
		PsF	Progressive, segmented Frame

Frame Rate	=	23.98	Nomenclature picture rate
		24	
		25	
		29.97	
		30	
		50	
		59.94	
		60	

Sample Structure	=	422	4:2:2 sampling
		444	4:4:4 sampling
		4444	4:4:4 sampling with optional key

Bit Depth	=	8	8 bit quantizing
		10	10 bit quantizing
		12	12 bit quantizing

Color Space	=	YCbCr	YCbCr color space
		RGB	RGB color space
		XYZ	XYZ color space

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

TGx Fmt = 3GA 1080P 24 444/12RGB

4.4.4. Viewing the Signal Name

TGx Signal
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 missing or an old version.

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

4.4.5. Monitoring the TGx Signal Description

TGx Signal
DESC.

This field, below the test signal name, provides a short description of the signal that is displayed.

4.4.6. Monitoring the Time Code

TGX Time Code
Running Value

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

4.4.7. 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.

4.5.   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 take you to configure the primary TG.
TG 2	Selecting this menu item will take you to configure the secondary TG.
Genlock	Selecting this item will take you to configure the genlock, which is shared between both Test Generators.
Misc Utilities	Selecting this item will take you to miscellaneous house keeping functions including preset management.

4.5.1.   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 *1080i/59.94,* *1080i/50,* *720p/59.94,* *720p/50,* *1080i/60,* *720p/60* *Cancel*	From the list, select the desired video standard for your monitoring gear. *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 59.94Hz videos, the TGs will be re-configured to output 23.98Hz, 29.97Hz or 59.94Hz video.

4.5.2. 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.

4.5.2.1.   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.

4.5.2.2.   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.

4.5.2.3. 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.

4.5.2.4. 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 is 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.

4.5.3. 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 extra 2 outputs. These outputs provide other copies of the selected test signal.

The menu structure for both Test Generators is the same 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.
Play Special Menu	Selecting this item reveals another sub-menu which enables the user to select additional video pattern files that can be overlaid or keyed over the selected test signal. Also, additional audio items can be selected to replace the generated tones.

4.5.3.1. 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 4-1 and Figure 4-2.

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 4-3). 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 4-4).
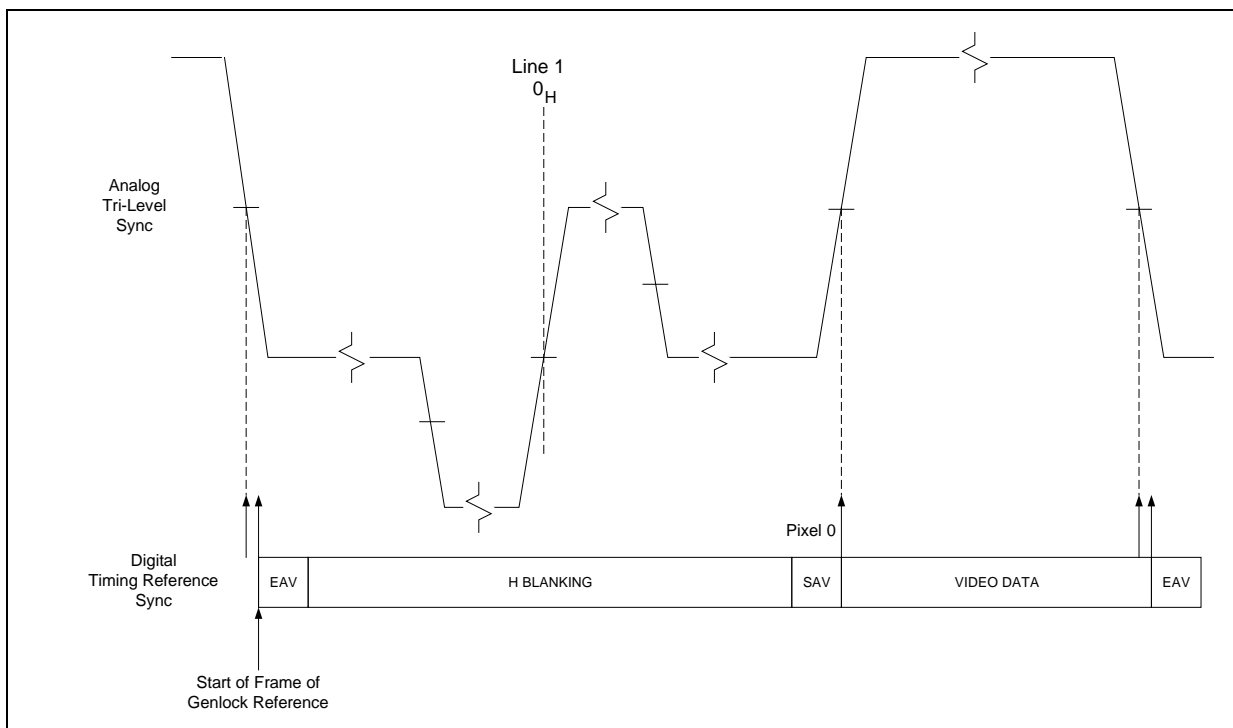

Figure 4-1: Default Tri-Level Genlock Reference Timing
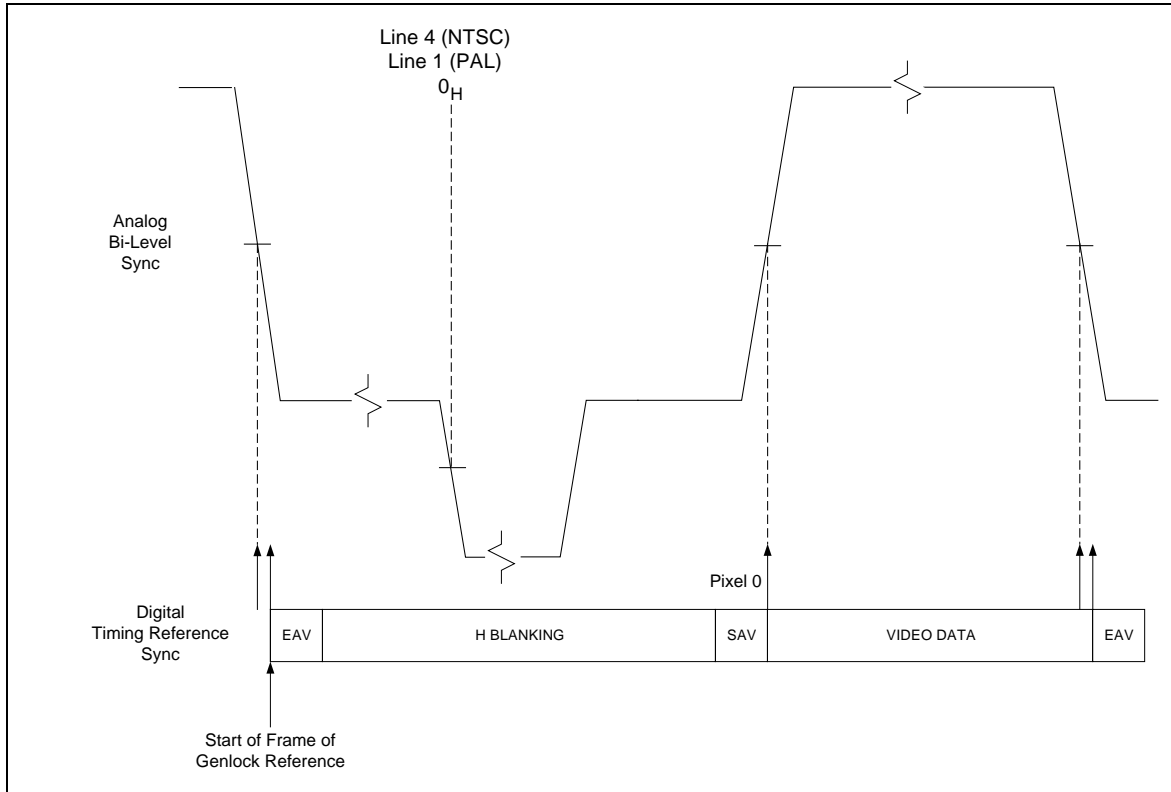
Figure 4-2: Default Bi-Level Genlock Reference Timing
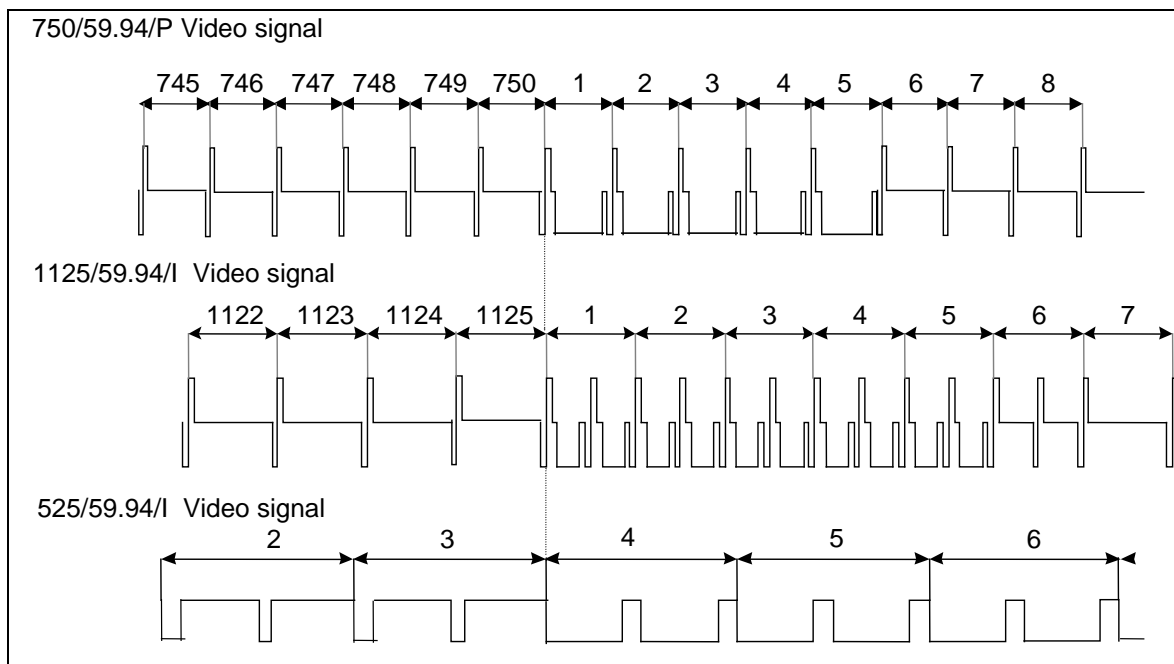
Figure 4-3: Default Signal Alignment in 59.94 Hz Field Rate Systems
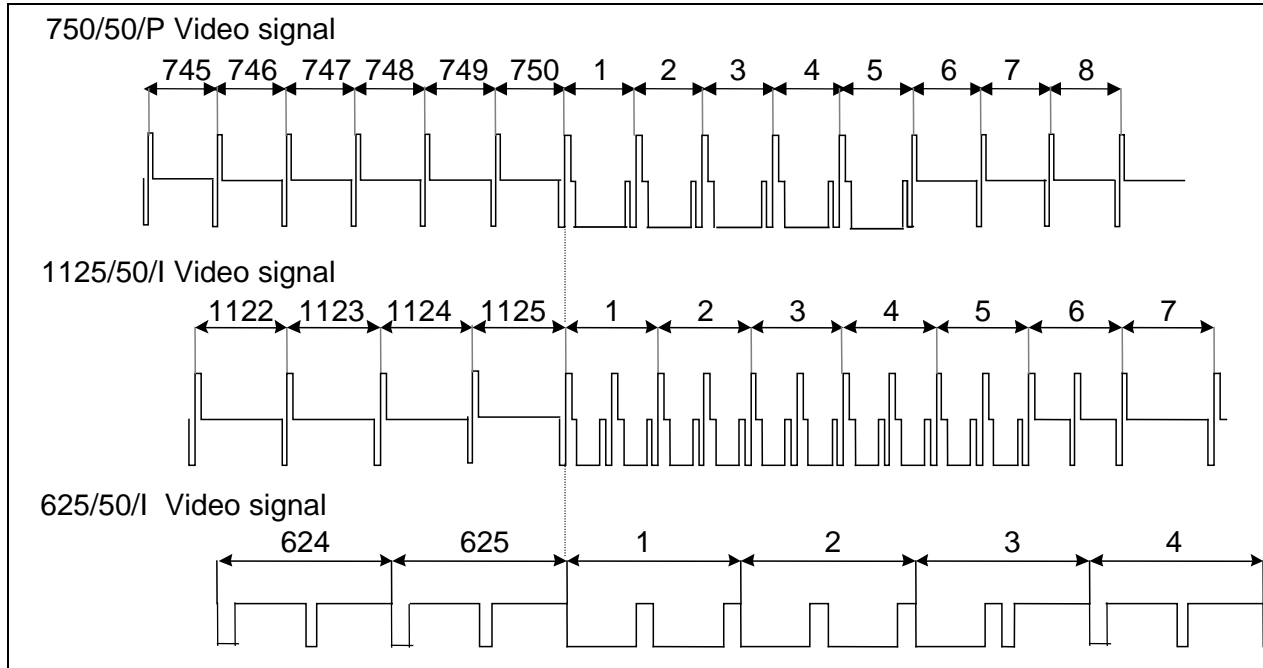
Figure 4-4: Default Signal Alignment in 50 Hz Field Rate Systems

4.5.3.2. 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.

4.5.3.3. 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.

4.5.3.4. 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.

4.5.3.4.1. 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
<u>HD,</u>
3G Level A,
3G Level B,
Dual,
SD

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.

SD will configure the generator to output signals over one coaxial signal conductor (SMPTE259M).

4.5.3.4.2. 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
525I/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.

4.5.3.4.3. Select the Sample Structure

Now that the basic configuration of the video carrying structure has been defined using the above controls, the following control is used to refine your selection criteria by selection the pixel structure of video.

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

This is the list of supported color spaces, 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.

Note: Not all sample structures are available in all link and image formats.

4.5.3.4.4. 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 selection mode.

TGx
Signal Format
Signal
[Signal Name]
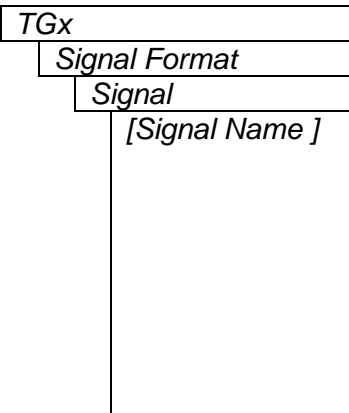
The name of the signal is displayed on this menu item and the following menu item has a short description.

"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 missing or is an old version.

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

4.5.3.4.5. 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]
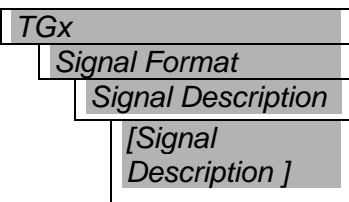
This is a sentence describing the signal selected with the *Signal* menu item.

4.5.3.5. 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.

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

4.5.3.5.2. 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.

4.5.3.5.3. 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, … _-20dB FS,_ … -2dB FS, -1dB FS, 0dB FS

By default, the tone level will be set to -20dB FS. 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.

4.5.3.6. Playing Additional Video and Audio Elements

The *Play Special Menu* is used to select additional, specialized video pattern files that can be overlaid or keyed over the selected test signal. Also, additional audio items can be selected to replace the generated tones.

An "overlay" is a full-frame video slide that is "keyed" or "linear mixed" with the selected test signal to add functionality to the generated signal. For instance, a circle with centre cross-hairs can be keyed over any test signal offering aspect ratio verification.

Other items like logos, text slates and small, simple animated sequences can be keyed over test signals to increase utilization of the test generator.

Audio test sequences can also be selected and played out, replacing the base generated tones.

User supplied .BMP files can replace the video test signal content. Also, user supplied .WAV files can replace audio channels.

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.
Key Item	Enable the overlay or specialized test signal, audio element, etc.
Special File	Select the file for keying over test signal.
Special Status	Information about the compatibility of the selected special file with the selected video format (Read Only)
Special H Posn	Move the horizontal position of the special video element.
Special V Posn	Move the vertical position of the special video element.
Overlay File	Select the full-frame file for replacing or keying over the test signal.
Overlay Status	Information about the compatibility of the selected overlay file with the selected video format (Read Only)
Custom Bitmap File	Select the full-frame, user supplied, .BMP file for replacing the test signal.
Custom WAV File	Select the mono or stereo, user supplied, .WAV file for replacing two audio channels.
Audio Channels	Select which group and channels to replace with the selected wave file.

4.5.3.6.1. Turning the Keyer On and Off

There are two types of elements that can be keyed over the test patterns from the generator; "overlay" and "special". They differ in that an "overlay" is full frame in size and it's position can NOT be moved. It is locked to the video H and V structure. Other "special" items can be positioned using the H and V position controls.

```
TGx
  Play Special
    Key Item
        None,
        Special,
        Overlay,
        Custom
```
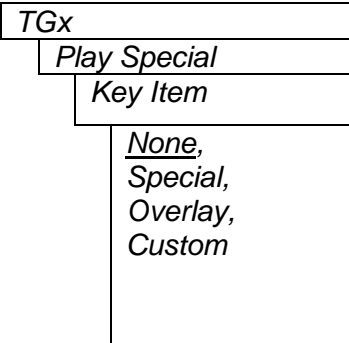
The selected *Overlay* or *Special* element can be enabled with this control. If the file has included audio, it will replace some of the configured tones.

The selected *Custom* bitmap and/or *Custom* wave file can also be selected to replace the video content and a stereo pair of tones.

When set to *None,* all elements will be removed, leaving just the selected test signal visible on the output and the configured tones on the embedded outputs.

4.5.3.6.2. Selecting a Special Video or Audio Element to Play Over the Test Signal Video and Audio

The Compact Flash card has a directory \special, off the root, that contains a set of files with .evt file extensions. These Evertz provided files, contain the specialized video and audio elements that can be keyed over the selected test signal. You can add more files by removing the Compact Flash card from the card edge, and dropping more .evt files into this directory.

```
TGx
  Play Special
    Special File
        None,
        xxxx.evt,
        yyyy.evt,…
```
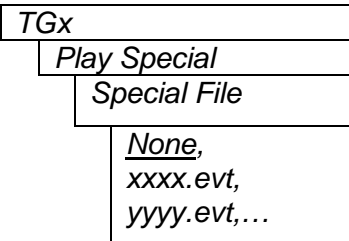
This menu item allows you to select the *Special* element. With this control, you can scroll through the .evt files in the \special directory. After selecting the desired file, use the above control to use it.

When *None* is displayed, there are no .evt files detected in the \special directory.

4.5.3.6.3. Determining the Compatibility of the Special Video Element With the Video Standard

The selected special item may or may not be compatible with the configured video format. The video keying hardware is limited to 10 bit 4:2:2 YCbCr video formats.

```
TGx
  Play Special
    Special Status
        Compatible,
        Not Compatible
```
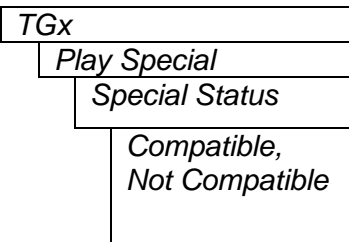
After selecting the desired file using the above control, examine this read-only menu item to determine if it is compatible with the configured video format.

Not Compatible is also displayed, when no .evt files are detected in the \special directory.

4.5.3.6.4. Horizontally Position the Special Video Element

The selected special video item can be moved, horizontally, around the video raster with this control.

| TGx |
| --- |
| Play Special |
| Special H Posn |
| <u>0,</u>
…
Line width |
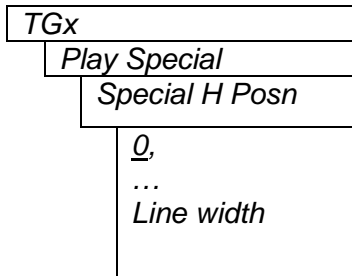
The range of the horizontal picture position control allows you to slide the special item off the right hand side of the picture and have it appear on left hand side. This will give you the ability to position the element anywhere on the raster.

0 will put the left edge of the graphic on the first active horizontal picture element.

4.5.3.6.5. Vertically Position the Special Video Element

The selected special video item can be moved, vertically, around the video raster with this control.

| TGx |
| --- |
| Play Special |
| Special V Posn |
| <u>0,</u>
…
Vertical height |
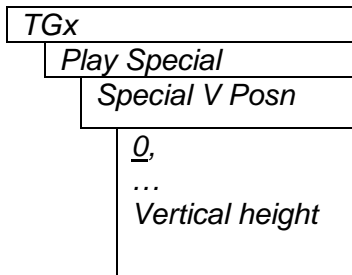
The range of the vertical picture position control allows you to slide the special item off the bottom of the picture.

0 will put the top edge of the graphic on the first row of active picture.

Note: On interlaced video standards, you can slide the image through one field into the next.

4.5.3.6.6. Selecting a Video Overlay Element to Play Over the Test Signal Video

The Compact Flash card has a directory \overlay, off the root, that contains a set of files with .evt file extensions. These Evertz provided files, contain the specialized video elements that can be keyed over the selected test signal. You can add more files by removing the Compact Flash card from the card edge, and dropping more .evt files into this directory.

| TGx |
| --- |
| Play Special |
| Overlay File |
| <u>None,</u>
xxxx.evt,
yyyy.evt,… |
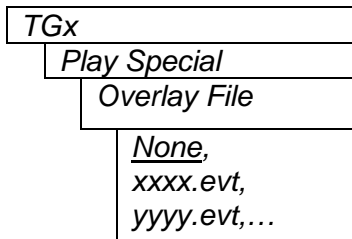
This menu item allows you to select the *Overlay* element. With this control, you can scroll through the .evt files in the \overlay directory. After selecting the desired file, use the *Key Item* control to use it.

When *None* is displayed, there are no .evt files detected in the \overlay directory.

4.5.3.6.7. Determining the Compatibility of the Overlay Video Element With the Video Standard

The selected overlay item may or may not be compatible with the configured video format. The video keying hardware is limited to 10 bit 4:2:2 YCbCr video formats.

TGx
Play Special
Overlay Status
Compatible, *Not Compatible*
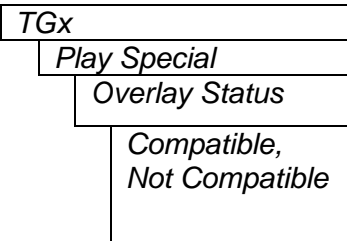
After selecting the desired file using the above control, examine this read-only menu item to determine if it is compatible with the configured video format.

Not Compatible is also displayed, when no .evt files are detected in the \overlay directory.

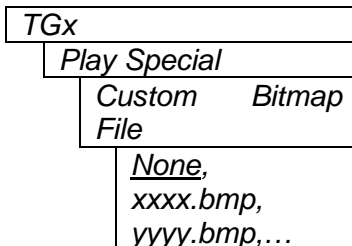#### 4.5.3.6.8. Selecting a Customer Supplied Video Bitmap to Play Over the Test Signal Video

The Compact Flash card has a directory \custom, off the root, that can contain user supplied bitmap files with .bmp file extensions. These customer provided files, contain the specialized video full field slates that can replace the selected test signal. You can add more files by removing the Compact Flash card from the card edge, and dropping more .bmp files into this directory.

> ✍ **The 7851TG2-3G currently only supports the following image file format: Bitmap, uncompressed at 24-bit. ANY other format will NOT be recognized by the module and will not appear in a list of available bitmap files.**

> ✍ **When creating custom bitmaps, the user must use the proper dimensions for the 720p and 1080i. For 720p, the bitmap should be 1280x720 pixels. For 1080i, the bitmap should be 1920x1080 pixels, etc.**

TGx
Play Special
Custom Bitmap File
None, *xxxx.bmp,* *yyyy.bmp,…*

This menu item allows you to select a *bitmap* element. With this control, you can scroll through the .bmp files in the \custom directory. After selecting the desired file, use the *Key Item* control to use it.

When *None* is selected, no .bmp files will be used.

4.5.3.6.9. Selecting a Customer Supplied Audio WAV File to Play Over a Pair of Audio Tones

The Compact Flash card has a directory \custom, off the root, that can contain user supplied mono or stereo wave files with .wav file extensions. These, customer provided files, contain the specialized audio that can replace selected audio tones. You can add more files by removing the Compact Flash card from the card edge, and dropping more .wav files into this directory.

> ✍ **The 7851TG2-3G currently only supports the following wav file format: Microsoft, uncompressed PCM at 48K rate with 1 or 2 Channels. ANY other format will NOT be recognized by the module and will not appear in the list of available wav files.**

TGx	This menu item allows you to select an audio element. With this control, you can scroll through the .wav files in the \custom directory. After selecting the desired file, use the *Key Item* control to use it. The wave file will be applied to the channels selected with the next control.
Play Special	
Custom WAV File	
None, xxxx.wav, yyyy.wav,…	When *None* is selected, no .wav files will be used.

4.5.3.6.10.Selecting a Pair of Audio Tones to Replace with WAV Audio

When the above control is used to select a .wav file, it will be applied to the audio channels selected with this control, replacing the generated tones.

TGx	The selected audio channel tones will be replaced with audio from the .wav file selected above. If the .wav file is mono, both the channels will have the same content.
Play Special	
Audio Channels	
Group 1, 1&2, Group 1, 3&4, Group 2, 1&2, Group 2, 3&4, Group 3, 1&2, Group 3, 3&4, Group 4, 1&2, Group 4, 3&4,	

4.5.4. 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.

4.5.4.1. Accessing Information About this Module and its Firmware

Utilities	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.
About…	

4.5.4.2. 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.

4.5.4.3. 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.

4.5.4.4. 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.

5. VISTALINK® MODULE CONTROL

This section describes the VistaLINK® control and monitoring available on the 7851TG2-3G.

5.1. GENERAL

The *VistaLINK®* tabs control miscellaneous parameters of the module. These parameters are tab divided as shown below:

Config:	Select the operational frame rate, link and image formats of the two test signal generators
TG 1(2) Video/Audio:	Set H and V phase of the generators as well as configure the audio embedders
TG 1(2) Signal:	Select the signals to output
Genlock:	Configure the gunlock source. Status information is also available.
Text Message:	Configure the OSD text messaging on the two generators
Monitor:	Various status information about the card

All controls except the *Text Message* feature are described above in the card edge control section.

5.2. TEXT MESSAGE

The *Text Message* tab is used to configure and apply a one or two line text message over the test signal being displayed. You can position and choose to scroll (right to left) the message at different rates. The two test signal generators have independent controls.

5.2.1. Enabling the Message

The *Message Enable* selection provides the following options:

Disable	Turn off message
Enable Line 1	Turn on one line of text
Enable Line 2	Turn on the second line of text
Enable Line 1 & Line 2	Turn on both lines of text

The two lines of text always move together with line 1 above line 2 and they are left justified.

5.2.2. Setting the Message

The *Message Line 1(2)* text field is used to input the messages to display. You are limited to 17 characters per line.

5.2.3. Setting the Message Crawl Rate

The **Message Crawl Rate** can be set to **No Crawl** if stationary text is desired. Alternatively, you can select **500ms** (1/2 second), **1, 2, 3, 4**, or **5** seconds. This is the approximate duration that the message stays stationary between shifts. The text moves at a character at a time, right to left. After it disappears of the left side of the screen, it will appear on the right side.

5.2.4. Setting the Message H and V Position

The **Message H(V) Position** can be set, with a pair of sliders, to anywhere on the screen. The slider scale is in character positions and the number of characters wide/high is video format dependant. The **Message H Position** is not used when crawling is turned on, so only the V position can be set.

6. VISTALINK® REMOTE MONITORING/CONTROL

6.1. 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 and 7700R2X2-HES), 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.

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