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REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	May 00
1.1	Added Embedded Audio features, reformatting and minor typographical changes	Dec 02
1.1.1	Fixed minor typographical errors	Aug 05
1.1.2	General format clean up	May 09

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1. OVERVIEW

The 7750TG Test Signal Generator provides a cost-effective method of generating 270 Mb/s serial digital test signals. The 7750TG is ideal for checking signal path integrity, monitor alignment or to determine system performance over varying cable lengths. The 7750TG generates a wide variety of industry standard test signals in 525 line and 625 line SMPTE 259M-C video formats and offers four 270 Mb/s outputs. Error detection and handling (EDH) codes are embedded on all the outputs to allow you to verify the performance of your digital signal paths.

The 7750TG provides an analog genlock input that allows you to synchronize the test signals to your plant horizontal and vertical timing.

Separate audio tones can be embedded into each channel of one of the four embedded audio groups. The user can select which of the audio groups the tones will be embedded into. The audio level is fixed at –20dB full scale.

Features:
- 525 line and 625 line formats
- 8 position DIP switch selects output format and genlock reference
- Card edge toggle switch selects test signal
- 4 embedded audio tones, selectable audio group assignment
- 4 outputs
- EDH inserted on the outputs for signal path performance verification
- On screen display of test signal names
- On screen text message can be used for source identification
- On screen setup menu
- Front panel LEDs indicate genlock presence, module fault and audio signal presence on the output
- Tally output upon loss of genlock
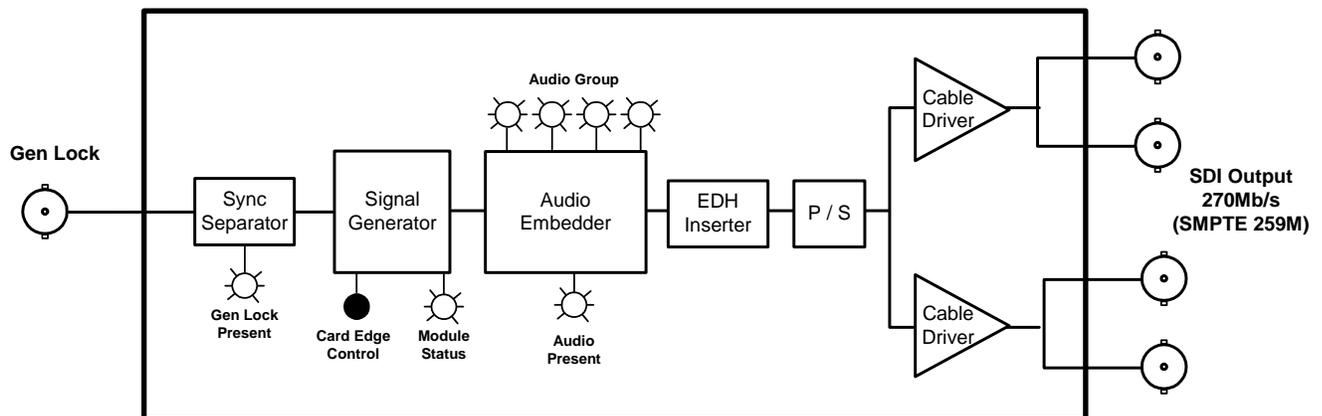
Figure 1-1: 7750TG Block Diagram

2.   INSTALLATION

The 7750TG module comes with a companion rear plate that has 5 BNC connectors. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
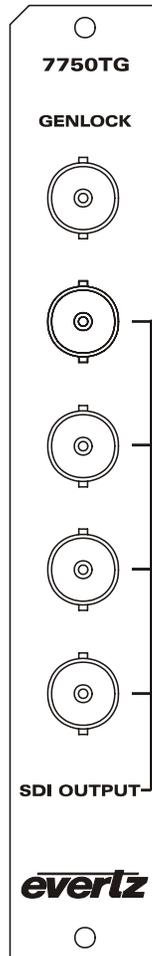
Figure 2-1: 7750TG Rear Panel

GENLOCK: Input BNC connector for analog Genlock reference. The genlock signal may be standard definition colour black video or 0.3 V bi-level sync. The *Reference Phase* On screen menu is used to set up the timing of the output signal with respect to the reference input. Jumper J2 on the A7700REF sub-module selects whether the reference input is terminated or high impedance. (See section 6.3)

SDI OUTPUT: There are four BNC connectors with serial component video outputs compatible with the SMPTE 259M standard. The output video format is selected using DIP switch 1. The test signal output is selected using the toggle switch located on the card edge.

3. SPECIFICATIONS

3.1. GENLOCK INPUT

Type: NTSC or PAL Colour Black 1 V p-p
Composite Bi-level sync (525I or 625I) 300 mV
Connector: 1 BNC per IEC 61169-8 Annex A
Termination: 75 ohm (jumper selectable)

3.2. SDI SERIAL VIDEO OUTPUTS

Number of Outputs: 4
Standard: SMPTE 259M-C (270 Mb/s)
Embedded Audio: Up to 4 tones in one audio group as specified in SMPTE 272M. Selectable tone frequencies (from 60Hz to 10kHz) and audio group. Audio level is set to –20dB full scale
Connectors: 4 BNC per IEC 61169-8 Annex A
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 740ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.2 UI

3.3. ELECTRICAL

Voltage: + 12VDC
Power: 6 Watts
EMI/RFI: Complies with FCC Part 15, class A and EU EMC directive

4.   STATUS LEDS

4.1.   MODULE STATUS LEDS

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

LOCAL FAULT: This Red LED will blink on and off if the microprocessor is not running. The LED will be on solid when there is a fault in the module power supply.

AUDIO: This Green LED will be On when there is audio embedded into the outputs.

SIGNAL PRESENT: This Green LED will be On when there is a valid genlock signal present at the module genlock input.

> **This LED does not necessarily indicate that the genlock signal is the correct frame rate for the selected output video format. For example, if a 59.94 Hz signal is required for the selected output video format, but a 50 Hz signal is present at the genlock input, the SIGNAL PRESENT LED will be On. In this case the output video will NOT be properly referenced but will constantly try to re-sync to the genlock frame reference.**

4.2.   AUDIO GROUP STATUS LEDS

Four LEDs located on the lower end of the module (opposite the DIP switch) indicate the presence of embedded audio in the output video. The audio group LED 1 is located closest to the center of the module.

Group LED	Color	Audio Group Status
1	Off	There is no group 1 audio on the video output.
	Green	Group 1 audio is being embedded.
2	Off	There is no group 2 audio on the video output.
	Green	Group 2 audio is being embedded.
3	Off	There is no group 3 audio on the video output.
	Green	Group 3 audio is being embedded.
4	Off	There is no group 4 audio on the video output.
	Green	Group 4 audio is being embedded.

Table 4-1: Audio Group Status LEDs

5.   CARD EDGE CONTROLS

The 7750TG is equipped with an 8 position DIP switch to allow the user to select output video format and turn the genlock on/off. The On position is down, or closest to the printed circuit board. Table 5-1 gives an overview of the DIP switch functions.

DIP Switch	Function
1	Video Output Format Selection
2	
3	
4	Not used, set to Off
5	
6	Gen Lock Enable
7	Not used, set to Off
8	

Table 5-1: DIP Switch Functions – Overview

A three position, return to center toggle switch is used to select the various test signal patterns and is also used in conjunction with a momentary pushbutton to operate the On screen Setup menu.

5.1.   SELECTING THE OUTPUT VIDEO FORMAT

DIP switch 1 is used to select the output video format of the 7750TG.

DIP 1	DESCRIPTION
Off	525i/59.94
On	625i/50

Table 5-2: Video Standard Switch Settings

5.2.   SELECTING THE GENLOCK REFERENCE TYPE

The 7750TG can free run on its internal crystal oscillator or be referenced to a genlock signal applied to the GENLOCK input. The genlock signal must be standard definition color black video or 0.3 V bi-level sync at the same frame rate as the output video. DIP switch 6 is used to turn the genlock on/off. The *Reference Phase* On screen menu is used to set up the timing of the output signal with respect to the reference input. (See section 5.4.2)

DIP 6	DESCRIPTION
Off	The output video will free run on its internal crystal oscillator.
On (default)	The output video will be phase locked to the genlock reference.

Table 5-3: Genlock Switch Settings

5.3.   SELECTING THE TEST SIGNAL

When the 7750TG is not in the on screen setup menu, the toggle switch located on the front edge of the module is used to select the test signal. Each time the toggle switch is pressed down, the 7750TG advances to the next test signal. Each time the toggle switch is pressed up, the 7750TG changes to the previous test signal. The name of the current test signal is shown momentarily on the lower left corner of the screen. Table 5-4 and Table 5-5 show the test signals that are available for the 525 and 625 line video standards. Most of the test signals are industry standard signals.

Test Signal Name		Test Signal Name
SMPTE Color bars		NTC 7 Composite
100% Color bars		NTC 7 Combination
White Field		FCC Composite
Grey Field		FCC Multiburst
Black		Bowtie
SDI Pathological		60% Multiburst
100% White Window		Y Multipulse
80% White Window		Component Multipulse
50% White Window		Y Ramp
20% White Window		Valid ramp
5 Step		Modulated Ramp
10 Step		Shallow Ramp
Chroma Freq. Response		Convergence
SinX/X Pulse		2T Pulse and Bar

Table 5-4: 525 Line Test Signal Selection

Test Signal Name		Test Signal Name
75% Color bars		CCIR 17
100% Color bars		CCIR 18
White Field		CCIR 330
Grey Field		CCIR 331
Black		Bowtie
SDI Pathological		60% Component Multiburst
5 Step		100% Component Sweep with Markers
10 Step		60% Component Sweep with Markers
Y Ramp		SinX/X Pulse
Valid ramp		Convergence
Modulated Ramp		Pulse and Bar
Shallow Ramp		

Table 5-5: 625 Line Test Signal Selection

5.4.   CONFIGURING THE TEST GENERATOR USING THE ON SCREEN MENU

An On screen menu (OSD) is used to configure many of the test generator's parameters. The three position, return to center, **toggle switch** and momentary **pushbutton** located on the front edge of the module are used to navigate the OSD setup menus and configure the cards various controls.

To enter the OSD menu system, press the push button once. This will bring you to the main setup menu where you can use the **toggle switch** to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the **pushbutton** to select the next menu.

On all menus, there is a selectable item *Done*. Selecting *Done* will take you to the previous menu (the one that was used to get into the menu). If you are at the top level of the menu tree then selecting *Done* will exit the OSD menu and return the 7750TG to the normal operating mode.

Once you are in a sub menu, there may be another menu level, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the next choice with the same procedure as in the main menu.

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

When you have stopped at the desired value, depress the **pushbutton**. This will update the parameter with the selected value and move the arrow back to the left side of the parameter list. Continue selecting and adjusting other parameters or use the *Done* commands to return to the next higher menu level.

5.4.1. Top Level Menu Structure

The following is a brief description of the top level of the menu tree that appears when you enter the On screen menu. Selecting one of these items will take you down into the next menu level.

Reference Phase	Sets the timing phase of the test signal to the Genlock reference input.
Audio Setup	Configure what audio tones will be embedded into the test signal and which audio group will be used.
On Screen Message	Configure the On screen message.
Done	Exit On Screen Menu System

5.4.2. Setting the Timing of the Output Video with Respect to the Genlock Input

The *Reference Phase* menu is used to set the timing of the output video to the Genlock Reference. The V and H parameters allow you to control the timing of the output video with respect to the beginning of the frame on the Genlock reference input. An internally generated digital video sync structure, locked to analog genlock reference signal is used to genlock the 7750TG test 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 bi-level input 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 is shown in Figure 5-1.

The V parameter provides a coarse adjustment of timing and sets the line number of the output video that will be aligned with beginning of the reference frame. The H parameter provides a fine adjust of timing and sets the pixel number of the line on the output video set by the V parameter that will be aligned with the beginning of the reference frame. If adjustments to the H parameter cause it roll through the pixel number at the start of a new line (the EAV) then the V parameter will change to the next higher or lower line.   The factory default is to align the EAV of Line 1 of the output video with the beginning of the reference frame according to SMPTE Recommended Practice RP168-2002.
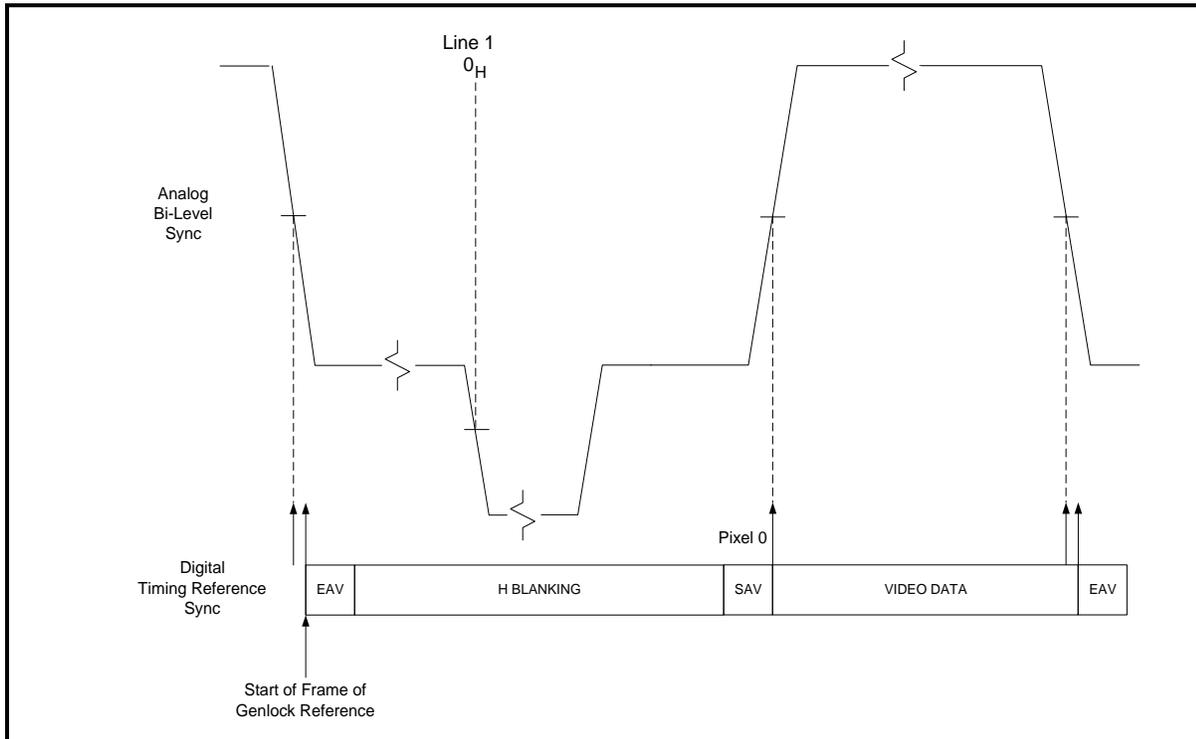
Figure 5-1: Default Gen Lock Reference Timing

5.4.3. Configuring Embedded Audio Parameters

The Audio Setup menu is used to select the audio group where embedded audio will be placed and the frequency of the tones that will be put into each of the 4 embedded audio channels.

Group	Selects the Audio Group where embedded audio will be placed.
Ch 1:	Selects the audio signal for Audio Channel 1
Ch 2:	Selects the audio signal for Audio Channel 2
Ch 3:	Selects the audio signal for Audio Channel 3
Ch 4:	Selects the audio signal for Audio Channel 4
Done	Return to main menu

5.4.3.1. Audio Group Selection

The *Group* parameter selects the Audio Group where embedded audio will be placed.

AUDIO GROUP:		
	Off	No audio will be embedded in the video output.
	1, 2, 3, 4	Up to 4 groups of audio may be embedded in the output video. Audio will be embedded into the selected group. There are four green LED's under the DIP switches that indicate which of the four groups audio is being embedded into.

5.4.3.2. Audio Channel Selection

Each Audio Group has four audio channels. The *Ch 1, Ch 2, Ch 3,* and *Ch 4* parameters select the Audio signal that will be embedded into each of the 4 channels of the audio group selected by the *Audio Group* parameter.

AUDIO Ch 1		
	Mute	Embedded audio in this channel will be silent.
	60 Hz *100 Hz* *200 Hz* *400 Hz* *800 Hz* *1.0 kHz* *1.6 kHz* *2.0 kHz* *3.2 kHz* *4.0 kHz* *5.0 kHz* *6.4 kHz* *8.0 kHz* *10 kHz*	Selecting one of these signals will set the frequency of the tone that is embedded into this channel.

5.4.4. Configuring the On Screen Message Display

The 7750TG has a programmable 16-character text message that may be used to display a source identification message or any other information on the screen. The *On Screen Display* menu is used to enter the text message, to turn it on and off and set the position on the screen. The *On Screen Display* menu is also used to set the length of time that signal name display is on after the user changes the test signal.

Message Display	Turns the message display on and off.
Message	Edit the On screen message.
Set Message Position	Sets horizontal and vertical position of the message on the screen.
Signal Name Duration	Set the duration that the signal name display is on after test signal changes.
Done	Exit On Screen Menu System

5.4.5. Editing the On Screen Message Display

The *Message* submenu is used to edit the text message. When you enter the *message* submenu, the actual text message is displayed on the top line.

TEXT MESSAGE	Edit the message
Justify	Used to move the message within the 16 char text message block
Clear	Clears the complete message to space characters
Done	Exit On Screen Display Menu System

To edit the message, press the pushbutton when the > indicator is on the left of the message. The ^ indicator will appear under the left character of the message. Use the toggle switch to change the character indicated by the ^ or press the pushbutton to advance to the next character. When you have finished editing the message the > will automatically appear to the left of the message. Use the toggle switch to select the *Clear*, *Justify* or *Done* menu items and press the pushbutton to exit the *Message* submenu.

5.4.6. Positioning the On Screen Message Display

The *Position Message* submenu is used to position the text message on the character raster. When you enter the *Position Message* submenu, a box the size of the maximum length message will appear on the screen. Use the toggle switch to move the box horizontally. When you press the pushbutton you will be able to move the box vertically on the screen using the toggle switch. Press the pushbutton quickly twice to exit the *Position Message* submenu.

Messages that are shorter than 16 characters can be moved within the 16-character text box using the *Justify* submenu item. This allows shorter messages to be positioned all the way to the left or right side of the screen

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5.4.7. Setting the Display Time for the Signal Name Display

The *Signal Name Display* menu item is used to set the length of time the On screen signal name is displayed after the user selects a new signal. Use the toggle switch to select a duration in seconds. The Signal name display can also be turned permanently *On* or *Off*.
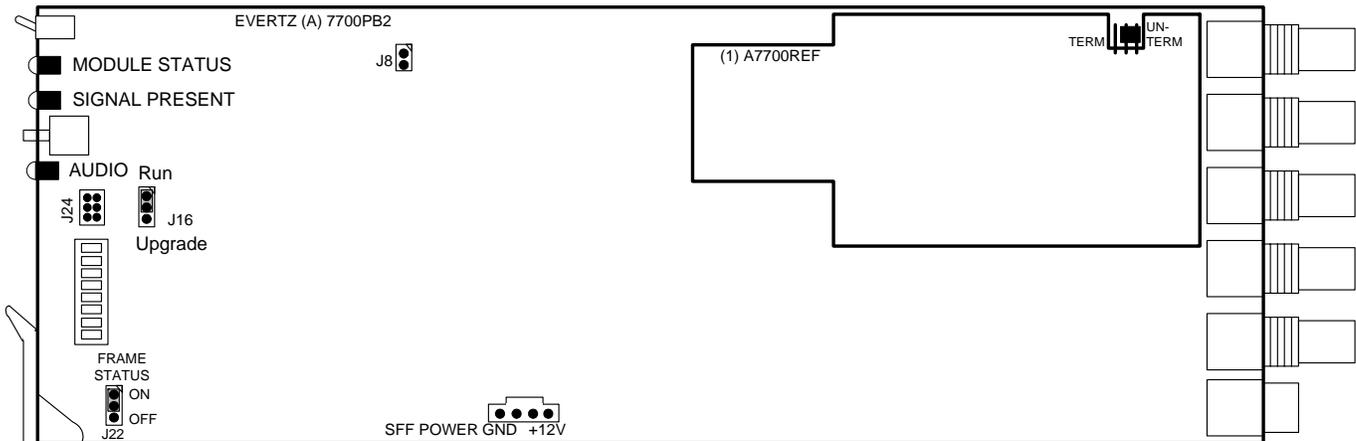
6. JUMPERS

Figure 6-1: Location of Jumpers

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

FRAME STATUS: The FRAME STATUS jumper J22 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper. (Default) When this jumper is removed, local faults on this module will not be monitored. For convenience you may re-install the jumper so that only one side is connected.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE: The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* chapter in the front of this binder for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* chapter in the front of this binder. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.3. SELECTING WHETHER THE GENLOCK REFERENCE INPUT IS TERMINATED

TERM/UNTERM: The TERM/UNTERM jumper J2 located on the A7700REF genlock submodule is used to terminate the genlock input. When it is in the TERM position a 75 ohm terminating resistor will connect the input to ground. When it is in the UNTERM position the genlock input will be high impedance.

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