



## Plug-in Modules Expand The Capability Of The Multiformat Signal Generator

### Multi Format Video Generator Main Frame

The LT 443D Multiformat Video Generator Mainframe can be used for multiformat digital broadcast systems. Various plug-in modules enable the output of SDI signals (i.e. HDTV, SDTV), sync signals, and analog signals. With these signals and genlock functions, timing is settable in increments of frames, lines, pixels or clock intervals. Users can customize the signal generator as desired.

### FEATURES

#### • Applicable To Multiformat HDTV

For the SDI signals, a 20 format HDTV module and a 525 line/625 line SDTV module are provided. The NTSC/PAL composite analog video signal generator is available with the 10-field ID signal.

Since each module is capable of simultaneous outputs, a multiformat system can be constructed to include both 74.25 MHz and 74.25/1.001 MHz outputs as the system grows.

#### • Easy-to-use Sync Signals

For today's digital TV systems, BB (NTSC/PAL) and HDTV tri-level sync signals can be generated simultaneously. Timing is set in intervals of frame, line, pixels or clock.

#### • ID Character Blinks

A 20-character ID display function is provided with selectable blink on/off times to verify live program channel. A natural picture pattern and logo can be superimposed with a compact flash memory card (containing user bit map data) installed to optional internal RAM.

#### • Various Patterns Include Stress Testing

With the SDI module installed, monoscope, natural picture, and basic color patterns can be output. High-speed pattern switching while scrolling at selectable directions and rates stress tests systems for digital motion artifacts.

#### • Embedded Audio

Embedded audio in all SDI modules have capabilities to set separate channel level, frequency, click ID, or silence. Setting individual channel levels in 1 dB steps (0 to -60dBfs) allows confirmation of system channel parade order. Choosing from 30 discrete frequencies allows confirmation of Lfe encode/decoders.

#### • Digital Black Outputs

All digital black outputs for SDB and HDB modules can set the raster to 0%/40%/50% flat field, embedded audio has same capabilities as SDI outputs plus separately timeable in frame, line, pixel or clock intervals.

#### • User-friendly Operability

Leader's traditional design and operability concepts are reflected in this instrument. User-friendly operation includes significantly reduced power-on initialization time required in a high-performance instrument.

### Main Frame SPECIFICATIONS

<b>Modules</b> Number of slots: 4 Identifier function: Modules are automatically recognized. (Plug-Play)	<b>External Interface</b> <b>Ethernet:</b> 10/100Base-T, Transmission active status and Remote Control USB *3 USB 1.1 accommodation (feature support)	<b>Power Requirements</b> AC 90 - 250V 50/60Hz
<b>LCD Display</b> Display Characteristics: 20 letters x 2 lines (Back-light installed)	*1 Card is not included as accessory *2 Natural picture is available as OP70 *3 This function will be supported.	<b>Power Consumption</b> 75W max. *4
<b>Internal Clock</b> Internal reference frequency: 27 MHz	<b>General Specifications</b> <b>Operating</b> Temperature Range: 0° to 40° Humidity Range: ≤90 %RH (without condensation)	<b>Dimensions</b> 426 (W) x 44 (H) x 560 (D) mm 16 3/4 (W) x 1 3/4 (H) x 22 (D) in.
<b>Memory card slot</b> <b>Flash card:</b> Compact flash *1 (CFA type-1) <b>Function:</b> Load logo (feature support) and natural picture data *2		<b>Weight</b> 7 kg *4 15.4 lbs. *4  *4 When four plug-in units (i.e., LT 443D-HD, LT 443D-SD, LT 443D-BL, LT 443D-GL) are installed.

## LT 443D-HD HD-SDI



The LT 443D-HD (HD-SDI Module) can generate 14 formats HD-SDI when used with the mainframe. Available functions include, Logo and ID Character display, embedded audio, simple motion of sixteen test patterns or natural picture. Natural picture display is available as option70 \*1.

### SPECIFICATIONS

#### Output

HD-SDI Video output : 1-system 2-outputs

#### Standards Supported

SMPTE 240M, SMPTE 274M, SMPTE 296M

#### SDI Outputs

Bit rate: 1.485, 1.485/1.001 Gbps

Amplitude: 800 mVp-p  $\pm$  10%

Overshoot:  $\leq$ 10 %

Rise / fall time:  $\leq$ 270 ps (20 % to 80 %)

DC offset: 0 V  $\pm$  0.5 V

Output Impedance: 75  $\Omega$

Return loss:  $\geq$ 15 dB (5 MHz to 742.5 MHz)  $\geq$ 10 dB (742.5 MHz to 1.485 GHz)

#### Functions

**Video Formats:** 1035/60i, 1035/59.94i, 1080/60i, 1080/59.94i, 1080/50i, 1080/30p, 1080/29.97p, 1080/25p, 1080/24p, 1080/23.98p, 1080/24(PsF), 1080/23.98(PsF), 720/60p, 720/59.94p

#### Test Patterns

Color Bar 100/75 %, Multiformat Color bar,

Flat Field 100/50 %, Line Sweep 100 %,

Multiburst 100 %, Bowtie\* 100 %

Ramp, Shallow Ramp, 10 Step

Pulse & Bar, Check Field

Red Raster 100 %, Cross & Dot,

Monoscope, Natural Picture\*1

\*As per Tektronix

\*1 Option 70

#### Timing Adjustment

Any position within frame

#### Simple Motion Picture

Set speed and direction (H, V)

#### ID Character

Number of Characters: 20 max.

#### Embedded Audio

8 Ch (4 Ch x 2 Group)

Sampling: 48 kHz, 20/24-bit

Set frequency and level for each channel

Audio click function

Adjustable frequency, level

Sync with Video signal

Selectable non-frame number or with number

Selectable emphasis (flag only)

Frequency: 50 Hz to 20 kHz

Level: -60 to 0 dBFS (1dB step) or Silence.

## LT 443D-SD SD-SDI



The LT 443D-SD (SD-SDI Module) can generate 525/625 line format for 4:2:2 component signal SDI outputs with the mainframe. Logo & ID Character display function, simple motion of test patterns or picture can be displayed, embedded audio & Natural picture display (option70 \*1)

### SPECIFICATIONS

#### Output

SD-SDI Video output : 1-system 2-outputs

#### Standards Supported

SMPTE 125M, SMPTE 259M,

ITU-R BT 601, ITU-R BT 656

#### SDI Outputs

Bit rate: 270 Mbps

Amplitude: 800 mVp-p  $\pm$ 10%

Overshoot:  $\leq$ 10%

Rise / fall time: 0.4 to 1.5 ns (from 20% to 80%)

DC offset: 0V  $\pm$ 0.5 V

Output Impedance: 75  $\Omega$

Return loss:  $\geq$ 15 dB (5 MHz to 270 MHz)

#### Functions

**Video Formats:** 525/59.94 - 270MHz, 625/50 - 270MHz

#### Test Patterns

Color Bar 100/75%, EBU Color Bar, BBC Color Bar, SMPTE Color Bar, Ramp & Color Bar: 525/625, Flat Field 100/50/0 %, Field ID, Cross Hatch, Line Sweep

100/60%, Multi Burst 100/60%, Over Size Ramp, Digital Limit Ramp, Shallow

Ramp, 10 Step,

Check Field: SMPTE RP-178

Monoscope: Normal, Invert

Bowtie 100%

Pulse & Bar

Red Raster

Multi Pulse

Natural Picture\*1

#### Timing Adjustment

Any position within frame

(V: line, 27 MHz per clock)

#### Simple Motion Picture

Set speed (field, frame) and direction (H, V)

(Video only)

V: 0 to 256 lines, 2 line steps.

H: 0 to 256 dots, 4 dot steps.

#### ID Character (Video)

Number of Characters: 20 max.

#### Embedded Audio

8 Ch (4 Ch x 2 Group)

Sampling 48 kHz at 20/24-bit

Adjustable frequency, level for each channel

Audio click function: 1, 2, 3, 4 sec, none.

Sync with Video signal

Selectable non-frame number or with number

Frequency: 50 Hz to 20 kHz

Level: -60 to 0 dBFS (1dB step) Silence.

Selectable emphasis (flag only)

\*1 Available in case of mainframe with natural picture option. (LT443D-70)

## LT 443D-HDB



This generator has all of the features and functions of the LT 443D-HD high definition multiformat generator plus two standard HD digital black outputs.

## LT 443D-SDB



This generator has all of the features and functions of the LT 443D-SD standard definition multiformat generator plus two standard SD digital black outputs.

## LT 443D-GL GENLOCK



The LT 443D-GL Genlock Module has an external reference loop through and a 3-system independent black signal generator. External analog reference inputs can be NTSC/PAL black burst, 14 formats of HDTV tri-level sync or 525p/625p sync. It can also accept black burst with a 10 field ID as per SMPTE 318M. Output sync signals can be generated in 3-systems, as above, with independent timing. Both genlock and black sync timing have a 5 frame settable range for NTSC/PAL black burst and HDTV analog tri-level sync signal inputs.

### SPECIFICATIONS

#### Genlock

Loop-through Input: BNC 75  $\Omega$   
Return loss:  $\geq 30$  dB ( $\geq 0.3$  MHz,  $\leq 30$  MHz)

#### Reference Signal Input

Tri-level sync for HDTV: SMPTE 240M/274M/296M  
525p/625p analog sync: SMPTE 293M/ITU-R BT 1358  
NTSC black burst: SMPTE RP 154/170M/312M  
PAL black burst: ITU-R BT 470-6

#### Reference Input Level

HDTV: Positive 300 mV, Negative -300 mV  
525p/625p: -300 mV, NTSC: -286 mV, PAL: -300 mV  
External Lock Range:  $\pm 10$  ppm  
Jitter:  $\leq 0.5$  degree (burst lock),  $\leq 1$  ns with (sync lock)

#### Mode Switch

INT/EXT: select to AUTO or MANUAL  
AUTO: EXT when sync reference is detected  
INT when sync reference is absent  
MANUAL: Mode is switched by INT/EXT menu  
(INT mode for absent reference)

#### Genlock

H-PHASE (Fine): Throughout range of H-PHASE (coarse)  
H-PHASE (Coarse):  $\pm 1/2$  line with respect to input signal.  
Resolution: 0.0741  $\mu$ s step  
V-PHASE:  $\pm 1$  field with respect to input signal in 1 line steps.  
( $\pm 1/2$  frame in case of progressive)  
F-PHASE:  $\pm 5$  frame with respect to input signal in 1 frame steps.  
NTSC BB input, has same timing as line 1 NTSC and line 4 HDTV

#### Analog Sync Signal Output

Black1/Black2/Black3  
Standards  
Tri-level sync for HDTV: SMPTE 240M/274M/296M, 525p/625p  
Analog sync signal: SMPTE 293M/ITU-R BT 1358,  
NTSC black burst signal: SMPTE RP 154/170M/312M,  
PAL black burst signal: ITU-R BT 470-6  
Sync Level (75  $\Omega$ )  
HDTV: Pos. 300 mV  $\pm 6$  mV; Neg. -300 mV  $\pm 6$  mV  
525p: -300 mV  $\pm 6$  mV; 625p: -300 mV  $\pm 6$  mV  
NTSC: 40 IRE  $\pm 1$  IRE; PAL: -300 mV  $\pm 6$  mV  
Blanking Level: 0 mV  $\pm 15$  mV

#### Horizontal Sync Width

1125 line format: Positive: 593 ns  $\pm 40$  ns Negative: 593 ns  $\pm 40$  ns  
750 line format: Positive: 539 ns  $\pm 40$  ns Negative: 539 ns  $\pm 40$  ns  
525p: 2.35  $\mu$ s  $\pm 0.05$   $\mu$ s; 625p: 2.35  $\mu$ s  $\pm 0.1$   $\mu$ s  
NTSC/PAL: 4.7  $\mu$ s  $\pm 0.1$   $\mu$ s (NTSC/PAL)

**Vertical Sync Time:** 5H (HDTV) / 6H (525p) / 5H (625p) / 3H (NTSC) / 2.5H (PAL)

**Output Impedance:** 75  $\Omega$ , 1-BNC

Return Loss:  $\geq 30$  dB ( $\geq 0.3$  MHz,  $\leq 39$  MHz)

#### Timing Variable Range

H-PHASE:  $\pm 1/2$  line; Resolution: 1 dot  
V-PHASE:  $\pm 1$  field ( $\pm 1/2$  frame progressive)  
Resolution: 1 line  
F-PHASE:  $\pm 5$  frame  
Resolution: 1 frame

## LT 443D-BL ANALOG BLACK



The LT 443D-BL Analog Black Module can generate 14 formats of HDTV analog tri-level sync, 525p/625p analog sync and NTSC/PAL black burst signals. It consists of 3-independent systems, each with 2-outputs, to provide simultaneous multiformat black sync signals. Each system can be assigned an output format capable of independent output timing. Also, it accepts a black signal with a 10 field ID conforming to SMPTE 318M. In adjusting timing, the settable range is a frame referenced to a 54 MHz clock for 525p/625p analog sync signal and NTSC/PAL black burst signal, and a frame by 74.25 MHz or 74.25 MHz clock for HDTV analog tri-level sync signal inputs.

### SPECIFICATIONS

#### Black 1,2/ Black 3,4/ Black 5,6 Outputs

##### Tri-level Sync For HDTV:

(SMPTE 240M/274M/296M)

##### 525p/625p Analog Sync Signal:

(SMPTE 293M/ITU-R BT 1358)  
NTSC black burst signal:  
(SMPTE 170M/312M/RP 154)  
PAL black burst signal: (ITU-R BT 470-6)

##### Sync Level (75 $\Omega$ )

HDTV: Pos. 300 mV  $\pm 6$  mV, Neg. -300 mV  $\pm 6$  mV  
525p: -300 mV  $\pm 6$  mV  
625p: -300 mV  $\pm 6$  mV  
NTSC: 40 IRE  $\pm 1$  IRE  
PAL: -300 mV  $\pm 6$  mV  
Blanking Level: 0 mV  $\pm 15$  mV

##### Rise, Fall Time

HDTV: 54 ns  $\pm 20$  ns  
525p: 70 ns  $\pm 10$  ns  
625p: 100 ns  $\pm 10$  ns  
NTSC: 140 ns  $\pm 10$  ns  
PAL: 200 ns  $\pm 10$  ns

##### Horizontal Sync Width

1125 line format  
Positive: 593 ns  $\pm 40$  ns  
Negative: 593 ns  $\pm 40$  ns  
750 line format  
Positive: 539 ns  $\pm 40$  ns  
Negative: 539 ns  $\pm 40$  ns  
525p: 2.35  $\mu$ s  $\pm 0.05$   $\mu$ s  
625p: 2.35  $\mu$ s  $\pm 0.1$   $\mu$ s  
NTSC/PAL: 4.7  $\mu$ s  $\pm 0.1$   $\mu$ s (NTSC/PAL)

**Vertical Sync Time:** 5H (HDTV) / 6H (525p) / 5H (625p) / 3H (NTSC) / 2.5H (PAL)

##### Output Impedance: 75 $\Omega$

Return Loss:  $\geq 30$  dB ( $\geq 0.3$  MHz,  $\leq 39$  MHz)  
Output Connector: 2-BNC  
(Black 1,2/Black 3,4/Black 5,6)

##### Timing Variable Range

H-PHASE:  $\pm 1$  line  $\pm 1$  dot  
Resolution: 1 dot  
(54 MHz, 74.25 MHz or 74.25/1.001 MHz)  
V-PHASE:  $\pm 1$  Frame  $\pm 1$  line  
Resolution: 1 line  
F-PHASE:  $\pm 5$  frame (dependant on format)  
Resolution: 1 frame

## LT 443D-AA ANALOG AUDIO MODULE



The LT 443D-AA Analog Audio Module fits into the LT 443D main frame and generates analog audio test tones. Two 600 Ohm balanced outputs are provided (each on an XLR-3P connector.) Output level and frequency can be independently set for each output. Audio level can be swung from -40 to 4dBm and it is settable in 1dBm steps. Test tones can be set from 50 Hz to 20KHz (30 fixed steps) and silence.

### SPECIFICATIONS

<b>Output</b>	
<b>Number of Outputs</b>	2
<b>Output Impedance</b>	600Ω, balanced
<b>Output Amplitude</b>	0.775 Vrms (into 600Ω at 0 dBm)
<b>Output Amplitude Accuracy</b>	±0.5 dB (at 1 kHz)
<b>Output Amplitude Flatness</b>	±0.5 dB (1 kHz ref.)
<b>Output Connector</b>	XLR-3P x 2
<b>Function</b>	
<b>Sampling Frequency</b>	48 kHz (Sync to video signal)
<b>Frequency</b>	50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1.0 k, 1.2 k, 1.5 k, 1.6 k, 2.0 k, 2.4 k, 3.0 k, 3.2 k, 4.0 k, 4.8 k, 5.0 k, 6.0 k, 8.0 k, 9.6 k, 10 k, 12 k, 15 k, 16 k, 20 kHz, silence
<b>Level</b>	-40 to 4 dBm (settable in 1 dBm steps)

## LT 443D-DA DIGITAL AUDIO MODULE



The LT 443D-DA Digital Audio Module fits into the LT 443D main frame and generates digital audio test signals. 4 pairs of AES/EBU audio signals are provided for a total of 8 channels; each pair is output onto a 75 Ohm BNC. Output level, frequency and audio click can be independently set for each output. Digital audio level can be swung from -60 to 0 dBFS and it is settable in 1dB steps. Test tones can be set from 50Hz to 20KHz (30 fixed steps) and silence. Sampling frequency is fixed at 48KHz and it is synced to the video signal from the LT 443D; audio to video timing can be varied. 20 and 24 bit resolutions are supported.

The module also provides a word clock output, as well, a separate output (1 BNC, 2 channels) of silence signal (DARS grade 2) is also provided.

### SPECIFICATIONS

<b>Output</b>	
<b>AES/EBU Digital Audio Output</b>	
<b>Number of Outputs:</b>	4 (2-channel outputs)
<b>Output Impedance:</b>	75Ω, unbalanced
<b>Output Amplitude:</b>	1 Vp-p ±0.1 V (into 75Ω)
<b>Output Connector:</b>	BNC
<b>Silence Signal (DARS grade 2) Output</b>	
<b>Number of Outputs:</b>	1 (2-channel outputs)
<b>Output Impedance:</b>	75Ω, unbalanced
<b>Output Amplitude:</b>	1 Vp-p ±0.1 V (into 75Ω )
<b>Output Connector:</b>	BNC
<b>48 kHz Word Clock</b>	
<b>Number of Outputs:</b>	1
<b>Output Impedance:</b>	75Ω, unbalanced (1 Vp-p output)
<b>Output Amplitude:</b>	1 Vp-p ±0.1 V (into 75Ω ), 5 V CMOS, selectable
<b>Output Connector:</b>	BNC
<b>Signal Specifications</b>	
<b>Specifications</b>	ANSI S4.40 (AES3-1992), AES11-1997 SMPTE 276M, AES-3id-2001
<b>Function</b>	
<b>Sampling Frequency</b>	48 kHz (sync to video signal)
<b>Resolution</b>	20 bits, 24 bits, selectable
<b>Preemphasis</b>	OFF, 50/15 μs, CCITT, selectable(CS bit can only be selected.)
<b>Frequency</b>	50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1.0 k, 1.2 k, 1.5 k, 1.6 k, 2.0 k, 2.4 k, 3.0 k, 3.2 k, 4.0 k, 4.8 k, 5.0 k, 6.0 k, 8.0 k, 9.6 k, 10 k, 12 k, 15 k, 16 k, 20 kHz, silence
<b>Level</b>	-60 to 0 dBFS (settable in 1 dB steps)
<b>Audio Click</b>	1, 2, 3, 4 sec, none
<b>Output ON/OFF</b>	Selectable
<b>Timing</b>	Variable Range: ±1 AES/EBU frame Settable in 512 fs (24.576 MHz) steps * The timing can be varied with respect to the Video Unit installed in the LT 443D mainframe. The settings are common to the digital audio, silence and word clock signals.

\* Frequency, level, and audio click can be set to each channel. Other items (except timing) can be respectively set to the 2-channel outputs.



## The Lt 444 Is A Changeover Unit That Switches To The Backup System When Failures Occur.

The LT 444 is a changeover unit that automatically switches the signal from the primary signal to the backup signal when problems are detected in the primary signal. If a switch occurs from the primary signal to the backup signal, the LT 444 indicates the channel that caused the problem on the front panel LED. The LT 444 can be configured in the system with the LT 443D.

### FEATURES

- Input/Output**  
 Provides 11 channels (a single channel consists of PRIMARY input, BACKUP input, and OUTPUT output) on a single LT 444.
- Delay For Starting The Monitor**  
 The delay for starting the error monitor at power up can be set to FAST or SLOW depending on the rise time of the system signal source being connected.
- Determination Criteria Of The Signal Level**  
 The internal preset switch allows level detection switching among SD-SDI, AES/EBU digital audio, NTSC or PAL analog black burst, HD analog tri-level sync, HD-SDI (only supported on channels 1 to 6), and other signals.
- Error Display**  
 When a signal level error is detected, the LT 444 illuminates the error LED on the front panel as well as the panel LED that indicates the channel causing the problem. This feature allows quick investigation of the problem.

### LT 444 SPECIFICATIONS

<b>Inputs</b>	
<b>PRIMARY Inputs</b>	1 input each for 11 channels (75 Ω BNC connector)
<b>BACKUP Input</b>	1 input each for 11 channels (75 Ω BNC connector)
<b>Outputs</b>	
<b>OUTPUT Outputs</b>	1 output each for 11 channels (75 Ω BNC connector)
<b>Input/Output Characteristics (CH1 to CH11)</b>	
<b>Return Loss</b>	30 dB 0 to 10 MHz 15 dB 10 MHz to 750 MHz 10 dB 750 MHz to 1.5 GHz
<b>Input Signal Type</b>	Set the type of input signal applied to the LT 444 using the internal dip switch.
<b>Signal Type</b>	HD-SDI (CH1 to CH6 only) SD-SDI (270 Mb/s) SD-SDI (143 Mb/s) AES/EBU digital audio Tri-level sync signal NTSC black burst PAL black burst
<b>Determination Criteria of the Signal Level</b>	
<b>Detection Level</b>	Detects an error when the amplitude of the input signal drops by 2 to 5 dB from the defined level and makes the switch. The detection level can be set to LOW or HIGH for each signal type.
<b>Error Display</b>	
<b>Total Error LED</b>	Notifies errors by illuminating the error LED on the panel.
<b>Error Channel LED</b>	Detects the channel causing the error and shows the channel by illuminating the corresponding LED.
<b>Panel Key Lock</b>	
<b>Time to Key Lock</b>	The key lock is automatically enabled when key operation is not detected for 60 s.
<b>External Control (REMOTE) Connector</b>	
<b>Application Connector Type</b>	For external remote control. 9-pin D-sub connector
<b>Dimensions and Weight</b>	16 3/4 (W) x 1 3/4 (H) x 22 (D) in., 8.8 lbs. 426 (W) x 44 (H) x 560 (D) mm (excluding protrusions), 4 kg
<b>Supplied Accessories</b>	Rack supports ..... 2 Rack support attachment screws ..... 4 Power cord ..... 1 Instruction manual ..... 1

### ● LT 444 REAR PANEL

