Leader

LT 4600A

MULTIFORMAT VIDEO GENERATOR

Specification

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1. GENERAL

The LT 4600A is a compact, 1U half-rack size SDI video signal generator that supports the triple-rate SDI (3G/HD/SD) format. In addition to test pattern output including color bars and SDI check fields, the LT 4600A is equipped with numerous features such as ID characters, QVGA logo marks, safety area markers, audio embedding, genlock function for external reference signals, and three analog black signals.

2. FEATURES

- **Triple-rate SDI Ready**

  Supports 3G (level A and level B), HD (including dual link), and SD.
  The LT 4600A provides two outputs for two signals. The pattern and timing of each signal can be adjusted separately. (However, only one signal can be used for 3G-B and HD (DL).)

- **ID Character Overlay**

  ID characters can be overlaid at any position on the display. In addition, ID characters can be scrolled horizontally or displayed in a blinking state for checking whether the display has frozen.

- **Logo Mark Overlay**

  A logo mark up to 320 (dot) × 240 (line) in size (QVGA size) can be overlaid at any position on the display. Logo marks are 4-level monochrome data converted from bitmap data.

- **Safety Area Markers**

  90% and 80% safety area markers can be overlaid on the display. For 3G and HD, a 4:3 aspect marker can also be overlaid.

- **Pattern Scrolling**

  Equipped with a function for scrolling patterns in eight directions. The speed can also be adjusted.

- **Audio Embedding**

  The LT 4600A can embed 32 channels (link A, link B, 4 channels each × 4 groups) of audio signals for 3G-B and 16 channels (4 channels × 4 groups) of audio signals for 3G-A, HD, and SD. The frequency, level, and the like can be set for each channel.

- **Lip Sync Patterns**

  The LT 4600A can output lip sync patterns in which the video and audio are synchronized. By using Leader’s LV 5770(A), you can accurately measure the lip sync of the video and audio on SDI signals.

- **Genlock Function**

  The LT 4600A can synchronize with NTSC/PAL black burst signals and HD tri-level sync signals.
  NTSC/PAL black burst signal with field reference pulse and NTSC black burst signal with 10 field IDs are also supported.
  Furthermore, a Stay-in-Sync function is available in case errors occur at the genlock input.

- **Analog Black Output**

  Equipped with three independent black signals. The timing can be adjusted by selecting a NTSC/PAL black burst signal or a HD tri-level sync signal whose clock frequency is the same as in the SDI output format.
  NTSC/PAL black burst signal with field reference pulse and NTSC black burst signal with 10 field IDs are also supported.

- **Word-Clock Output**

  Equipped with one 48 kHz word-clock signal synchronized with video signals.

- **AES/EBU Serial Digital Audio Output**

  Equipped with two 48 kHz AES/EBU signals synchronized with video signals.

- **Ethernet**

  Standard support for SNMP makes it easy to integrate the LT 4600A in a network environment.

- **External Memory**

  Firmware updating and user data writing and saving are possible by connecting a USB memory device on the front panel.

- **Presets**

  Up to 10 presets can be saved. You can recall a preset to start the LT 4600A with the same settings every time.

3. SPECIFICATIONS

3.1 SDI Video Output

● SDI Electrical Characteristics

Bit Rate	
3G	2.970 Gbps, 2.970/1.001 Gbps
HD, HD (DL)	1.485 Gbps, 1.485/1.001 Gbps
SD	270 Mbps
Output Amplitude	800 mVp-p ± 10%
Overshoot	Less than 10%
Rise and Fall Times	
3G	≤ 135 ps (20 to 80%)
HD, HD (DL)	≤ 270 ps (20 to 80%)
SD	0.4 ns to 1.5 ns (20 to 80%)
DC Offset	0 ± 0.5 V
Output Impedance	75 Ω
Return Loss	≥ 15 dB (5 MHz to 1.485 GHz)
	≥ 10 dB (1.485 to 2.970GHz)
Outputs	Two signals two outputs (*1)
Output Connector	BNC

*1 One signal two outputs for 3G-B. One signal one output for HD (DL).
The output settings can be specified separately for the two signals, but for 3G and HD, different frame frequencies (60 Hz, 59.94 Hz, and 50 Hz) cannot be specified at the same time.

● Compliant Standards

3G-A	SMPTE ST 274, SMPTE ST 296, SMPTE ST 425
3G-B	SMPTE ST 274, SMPTE ST 372, SMPTE ST 425
HD (DL)	SMPTE ST 274, SMPTE ST 372
HD	SMPTE ST 274, SMPTE ST 292, SMPTE ST 296、 SMPTE RP 211
SD	SMPTE ST 125, SMPTE ST 259
SDI Embedded Audio	
3G, HD, HD (DL)	SMPTE ST 299
SD	SMPTE ST 272
SDI Payload ID	SMPTE ST 352

- **Supported Formats**

3G-A Formats and Standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Compliant Standards
YCBCR 4:2:2	10 bits	1920×1080	60/59.94/50/P	SMPTE ST 274
	12 bits	1920×1080	60/59.94/50/I	SMPTE ST 425
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
YCBCR 4:4:4	10 bits	1280×720	60/59.94/50/30/29.97/25/24/23.98/P	SMPTE ST 296
				SMPTE ST 425
		1920×1080	60/59.94/50/I	SMPTE ST 274
			30/29.97/25/24/23.98/P	SMPTE ST 425
			30/29.97/25/24/23.98/PsF	
	12 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
RGB 4:4:4	10 bits	1280×720	60/59.94/50/30/29.97/25/24/23.98/P	SMPTE ST 296
				SMPTE ST 425
		1920×1080	60/59.94/50/I	SMPTE ST 274
			30/29.97/25/24/23.98/P	SMPTE ST 425
			30/29.97/25/24/23.98/PsF	
	12 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	

3G-B Formats and Standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Compliant Standards
YCBCR 4:2:2	10 bits	1920×1080	60/59.94/50/P	SMPTE ST 274
	12 bits	1920×1080	60/59.94/50/I	SMPTE ST 372
			30/29.97/25/24/23.98/P	SMPTE ST 425
			30/29.97/25/24/23.98/PsF	
YCBCR 4:4:4	10 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
	12 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
RGB 4:4:4	10 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
	12 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	

HD (DL) Formats and Standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Compliant Standards
YCBCR 4:2:2	10 bits	1920×1080	60/59.94/50/P	SMPTE ST 274
	12 bits	1920×1080	60/59.94/50/I	SMPTE ST 372
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
YCBCR 4:4:4	10 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
	12 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
RGB 4:4:4	10 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
	12 bits	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	

HD and SD Formats and Standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Compliant Standards
YCBCR 4:2:2	10 bits	1280×720	60/59.94/50/30/29.97/25/24/23.98/P	SMPTE ST 292 SMPTE ST 296
		1920×1080	60/59.94/50/I	SMPTE ST 292
			30/29.97/25/24/23.98/P	SMPTE ST 274
			24/23.98/PsF	SMPTE ST 292 SMPTE RP 211
		720×487	59.94/I	SMPTE ST 259
		720×576	50/I	SMPTE ST 125

- **Timing Adjustment**

Adjustment Range	Entire frame
Adjustment Unit	
V	Lines
H	Clocks (148.5 MHz, 148.5/1.001 MHz, 74.25 MHz, 74.25/1.001 MHz, 27 MHz)

● **Test Patterns**

3G, HD	100% color bar, 75% color bar, multiformat color bar (ARIB STD-B28, pattern 2 area can be set to 100% white, 75% white, or +I), check field, blue field 100%, green field 100%, red field 100%, flat field white 100%, black 0%
SD	
525i/59.94	100% color bar, 75% color bar, SMPTE color bar, check field, blue field 100%, green field 100%, red field 100%, flat field white 100%, black 0%
625i/50	100% color bar, EBU color bar, BBC color bar, check field, blue field 100%, green field 100%, red field 100%, flat field white 100%, black 0%
Automatic Switching	Automatically switches between available patterns (except for check field)
Switch Time	1 to 255 sec

● **Pattern Scrolling**

Direction	Eight directions (up, down, left, right, and their combinations)
Speed Range and Unit	
Interlace	In unit of fields
V	0 to 256 lines, in 1 line steps
H	0 to 256 dots, in 2 dot steps
Progressive	In unit of frames
V	0 to 256 lines, in 1 line steps
H	0 to 256 dots, in 2 dot steps

* Not available when the check field pattern is selected.

● **Safety Area Markers**

3G, HD	Action safe area (90%) Title safe area (80%) 4:3 aspect ratio (can be turned on and off separately)
SD	Action safe area (90%) Title safe area (80%) (can be turned on and off separately)

* Not available when the check field pattern is selected.

● **ID Characters**

Number of Characters	Up to 20 characters
Size [Dots]	32×32, 64×64, 128×128, 256×256
Intensity	100%, 75% (black only for the background color)
Display Position	Anywhere on the display
Display Position Adjustment Resolution	
V	1 line
H	1 dot
Blinking Display (*1)	OFF, 1 to 9 sec
Scrolling (*1)	
Function	Scroll including the ID character background
Direction	Two directions (left and right)
Speed Range and Unit	
Interlace	In unit of fields
	0 to 256 dots, in 2 dot steps
Progressive	In unit of frames
	0 to 256 dots, in 2 dot steps

* Not available when the check field pattern is selected.

*1 The blinking display and scrolling can be used simultaneously.

● **Logo Mark**

Logo Mark Data	4-level monochrome data from level 0 to 3
Maximum Size	320 (dots) × 240 (lines) (QVGA size)
Number of Logo Marks That Can Be Saved in the LT 4600A	
	Up to 4
Display Position	Anywhere on the display
Display Position Adjustment Resolution	
V	1 line
H	1 dot
Display Level	Any level from 0 to 3
File Format	
Before Conversion	24-bit full color bitmap format (.bmp)
After Conversion	Original format (.lg)
Conversion Color Matrix	Y = (0.212×R) + (0.701×G) + (0.087×B)
	Converts 256-level monochrome data (Y) to 4 levels (levels 0 to 3) using specified thresholds
Conversion Method	Using the Logo App
Logo Mark Data Transfer	Save the data to a USB memory device and transfer to the LT 4600A.

* Not available when the check field pattern is selected.

● Channel On/Off

Function	Each of the Y/G, Cb/B, and Cr/R components can be turned on and off for each channel independently.
On	Outputs the specified Y/G, Cb/B, or Cr/R signal
Off	
Y/G	040h/000h
Cb/B	200h/000h
Cr/R	200h/000h

* Not available when the check field pattern is selected.

* Black pattern can be output by turning off all channels and all embedded audio signals.

● Image Overlay

Display Precedence	ID characters > logo mark > safety area markers > test pattern (The display order cannot be changed.)
Simultaneous Display	ID characters, logo mark, safety area markers, and test pattern can be displayed simultaneously.

● Embedded Audio

Embedded Channels	Can be turned on and off at the group level
3G-A, HD, SD	16 channels (4 channels × 4 groups)
3G-B	32 channels (link A, link B, 4 channels each × 4 groups)
Sampling Frequency	48 kHz sampling (synced with the video signal)
Resolution	20 bits, 24 bits
Pre-emphasis	OFF, 50/15, CCITT (only the CS bit is switched)
Frequency	SILENCE, 400 Hz, 800 Hz, 1 kHz
Level	-60 to 0 dBFS (1 dBFS steps)
Audio Click	OFF, 1 to 4 sec

* Audio (including packets) cannot be embedded when the check field pattern is selected.

* The frequency, level, and audio click can be set for each channel.

* The following limitations apply for SD (525i/59.94).

· For 16 channel output, the resolution is set to 20 bits.

· Up to three groups (12 channels) can be output at 24-bit resolution.

● Lip Sync Patterns

Supported Formats	3G, HD, HD (DL), SD
Value	On, Off

* Not available when the check field pattern is selected.

* Safety area markers, ID characters, and logo mark cannot be overlaid.

* The audio click setting of embedded audio is disabled, and audio synchronized to the lip sync pattern is output.

3.2 Genlock Function

External Reference Input	
Format	BNC 75 Ω loop-through
Compliant Standards	
NTSC Black Burst Signal	SMPTE RP 154, SMPTE ST 170, SMPTE ST 318
PAL Black Burst Signal	EBU N14, ITU-R BT 1700
HD Tri-Level Sync Signal	SMPTE ST 240, SMPTE ST 274, SMPTE ST 296
Sync Level	
NTSC Black Burst Signal	-286 mV
PAL Black Burst Signal	-300 mV
HD Tri-Level Sync Signal	±300 mV
Operation Mode	
Internal	Operates using the internal signal
Stay-in-Sync	Holds the last genlock input frequency when the signal is interrupted

3.3 Analog Black Output

Compliant Standards	
NTSC Black Burst Signal	SMPTE RP 154, SMPTE ST 170, SMPTE ST 318
PAL Black Burst Signal	EBU N14, ITU-R BT 1700
HD Tri-Level Sync Signal	SMPTE ST 240, SMPTE ST 274, SMPTE ST 296
Output Signal	
Outputs	6 (3 signals × 2 outputs)
Output Format Setting	Each of the three signals can be configured independently.
Output Impedance	75 Ω
Output Connector	BNC
Timing Adjustment	
Value	Each of the three signals can be configured independently.
Adjustment Range	
NTSC Black Burst Signal	±5 frames
PAL Black Burst Signal	±2 frames
HD Tri-Level Sync Signal	1 frame (entire frame)
Adjustment Unit	
NTSC/PAL Black Burst Signal	In units of 0.0185 µs (54 MHz clock unit)
HD Tri-Level Sync Signal	In units of 0.0135 µs (74.25/1.001 MHz clock unit or 74.25 MHz clock unit)

* HD tri-level sync signal of 3G format (1080p) cannot be output.

* The output settings can be specified separately for the three signals, but for HD tri-level sync signal, different frame frequencies (60 Hz, 59.94 Hz, and 50 Hz) cannot be specified at the same time.

3.4 Word-Clock Output

Output Frequency	48 kHz
Output Amplitude	5V CMOS Compatible (when not terminated)
Output Connector	BNC
Outputs	1
Timing Adjustment	
Adjustment Range	±1 AES/EBU frame
Adjustment Unit	512 fs (24.576 MHz)

3.5 AES/EBU Digital Audio Output

Compliant Standards	ANSI S4.40, AES3-2009, AES11-2009, SMPTE ST 276
Output Impedance	75 Ω unbalanced
Output Amplitude	1 Vp-p ± 0.1 V
Output Connector	BNC
Outputs	2 (each 2 channel pair)
Timing Adjustment	
Adjustment Range	±1 AES/EBU frame
Adjustment Unit	512 fs (24.576 MHz)
Sampling Frequency	48 kHz sampling (synced with the video signal)
Resolution	20 bits, 24 bits
Pre-emphasis	OFF, 50/15, CCITT (only the CS bit is switched)
Frequency	SILENCE, 400 Hz, 800 Hz, 1 kHz
Level	-60 to 0 dBFS (1 dBFS steps)
Audio Click	OFF, 1 to 4 sec
Lip Sync	ENABLE, DISABLE
Sampling Clock Accuracy	Grade 2 (±10 ppm)

* The frequency, level, and audio click can be set for each channel.
(When lip sync is enabled, the audio click setting is disabled, and audio synchronized to the lip sync pattern is output.)

* Turn off all channels to output a digital audio reference signal (DARS).

3.6 External Interface

Ethernet	
Specifications	10BASE-T/100BASE-TX auto switching
Function	Transmission of operation status (e.g., genlock synchronization status) SNMP v1 compliant
USB	
Connector	USB Type A
Specifications	USB 2.0
Supported Media	USB memory device (up to 8 GB)
Function	Saving and loading of preset data saving and loading of logo data updating of firmware

3.7 Presets

Presets	Saves the panel settings (*1)
Number of Presets	10
Recall Method	Front panel
Copy Method	Copy all presets from the LT 4600A to a USB memory device or copy all presets from the USB memory device to the LT 4600A

* Last memory is not supported. By setting POWER ON RECALL, you can start the LT 4600A with preset settings.

*1 Logo data and device-specific information (e.g., IP address, time) cannot be saved.

3.8 LCD

Number of Characters	20 characters × 2 lines
Backlight	On, Off

3.9 General Specifications

Environmental Conditions	
Operating Temperature	0 to 40 °C
Operating Humidity Range	85 %RH or less (no condensation)
Optimal Temperature	10 to 35 °C
Operating Environment	Indoors
Elevation	Up to 2,000 m
Overvoltage Category	Ⅱ
Pollution Degree	2
Power Requirements	
Voltage	90 to 250 VAC
Power Consumption	25W max.
Dimensions	213 (W) × 44 (H) × 400 (D) mm (excluding protrusions)
Weight	3.0kg
Accessories	Power cord .....1 Cover/Inlet stopper 1
Sold Separately	LR 2478 (rack mount adapter for two units) LR 2481 (rack mount adapter for one unit)