

# LT4610 SYNC GENERATOR

## TEST / SYNC GENERATOR with GPS & Time-code Capabilities



The LT 4610 is a 1RU rack size Sync Generator that supports the triple-rate SDI (3G/HD/SD) format. LT4610 is equipped with a redundant power supply, which is very valuable if power is lost to the main supply. In addition to test pattern output including color bars and SDI check fields, the LT 4610 is equipped with numerous features such as ID characters, QVGA logo marks, safety area markers, audio word-clock, lip-sync, genlock function for external reference signals, and six analog black signals.

### MAIN FEATURES

- Outputs 3G-SDI, Dual Link, HD-SDI and SD-SDI signals.
- The ID characters can be superimposed at any arbitrary position on the screen.
- A logo mark, up to 320 (pixels) by 240 (lines) in QVGA size can be superimposed at any arbitrary position on the screen. Logo is converted from bitmap to four-grade monochrome data.
- A 90% and 80% safety-area markers can be superimposed on the screen.
- Simple motion picture mode is provided to scroll the pattern.
- The 32channels of embedded audio signals (link A and link B – each 4ch x 4 groups) for 3G-SDI (level B), and the 16 channels of embedded audio signals (4ch x 4 groups) can be superimposed. The frequency and level can be respectively set for each channel.
- LT 4610 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. (3G-SDI Level A/HD-SDI/SD-SDI only)
- The LT 4610 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.
- Six independent analog black signal outputs are provided. The black burst signal with the same format as the SDI output, or HDTV tri-level sync signal with the same format of clock frequency can be selected for variable timing. A 48KHz word clock output and a 48KHz AES/EBU output are provided to synchronize the audio signal. The
- LT4610 is equipped with a real-time clock and a battery to keep time regardless of whether the power is on or off. LT4610 also keeps time if a GPS signal is not received, when the LT4610 is equipped with the GPS option.
- Standard support for SNMP via Ethernet makes it easy to integrate the LT 4610 in a network environment.
- Up to 10 presets can be saved. You can recall a preset to start the LT 4610 with the same settings every time.
- USB slot is available on the front panel to save and update user data settings.
- Redundant power supply provides extra reliability. Alarms are generated with SNMP and displayed on front panel when errors occur.

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# LT 4610 SPECIFICATIONS

## ● Compliant Standards

Embedded Audio

3G、HD、HD(DL)	SMPTE ST 299
SD	SMPTE ST 272
Payload ID	SMPTE ST 352

Analog Black Output

NTSC Black Burst Signal	SMPTE ST 170、SMPTE ST 318、SMPTE RP 154
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PAL Black Burst Signal

HD Tri-Level Sync Signal	ITU-R BT1700、EBU N14
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AES/EBU Digital Audio Output

ANSI S4.40、AES3-2009、AES11-2009、SMPTE ST276
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## ● SDI Format and Standards

### 3G-A Formats and Standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Compliant Standards
YCbCr 4:2:2	10bit	1920×1080	60/59.94/50/P	SMPTE ST 274
			60/59.94/50/I	SMPTE ST 425
	12bit	1920×1080	30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
YCbCr 4:4:4	10bit	1280×720	60/59.94/50/30/29.97/25/24/23.98/P	SMPTE ST 296
			60/59.94/50/I	SMPTE ST 425
		1920×1080	30/29.97/25/24/23.98/P	SMPTE ST 274
			30/29.97/25/24/23.98/PsF	SMPTE ST 425
	12bit	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
		1280×720	60/59.94/50/30/29.97/25/24/23.98/P	SMPTE ST 296
			60/59.94/50/I	SMPTE ST 274
10bit	1920×1080	30/29.97/25/24/23.98/P	SMPTE ST 425	
		30/29.97/25/24/23.98/PsF		
	12bit	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	10bit	1920×1080	60/59.94/50/P	SMPTE ST 274
			60/59.94/50/I	SMPTE ST 372
	12bit	1920×1080	30/29.97/25/24/23.98/P	SMPTE ST 425
			30/29.97/25/24/23.98/PsF	
YCbCr 4:4:4	10bit	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
	12bit	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	
RGB 4:4:4	10bit	1920×1080	30/29.97/25/24/23.98/P	
			30/29.97/25/24/23.98/PsF	
	12bit	1920×1080	60/59.94/50/I	
			30/29.97/25/24/23.98/P	

### HD(DL)フォーマットと規格

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

### HD and SD Formats and Standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Compliant Standards
YCbCr 4:2:2	10bit	1280×720	60/59.94/50/30/29.97/25/24/23.98/P	SMPTE ST 292
			60/59.94/50/I	SMPTE ST 296
		1920×1080	30/29.97/25/24/23.98/P	SMPTE ST 274
			24/23.98/PsF	SMPTE ST 292
	12bit	720×487	59.94/I	SMPTE ST 259
			720×576	50/I

## ● Input / Output

SDI Outputs

Output Connectors	2 x BNCs
3G-A、HD、SD	2 outputs
3G-B、HD(DL)	1 output
Output Impedance	75 Ω
Output Amplitude	800mVp-p ± 10%
Return Loss	≥ 15 dB (5 MHz to 1.485 GHz)
	≥ 10 dB (1.485 to 2.970GHz)
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 ± 0.5V

Genlock Input

Input Connectors	2 x BNCs
Input Signals	Analog composite sync signal
	Analog component sync signal
Input Configuration	BNC 75 Ω loop-through
Input Impedance	75 Ω
Max. Input Voltage	± 5V (DC + Peak AC)
Operating Input	
Level Range	± 6dB
External Lock Range	± 5ppm

Analog Black Output

Output Connectors	6 x BNCs
Output Signals	Analog composite sync signal
	Analog component sync signal

Output Impedance

Sync Level	75 Ω
NTSC	40 ± 1 IRE
PAL	-300 ± 6mV
HD	± 300 ± 6mV
Blanking	0 ± 15mV

AES/EBU Digital Audio Output

Output Connector	1 x BNC
Output Amplitude	1Vp-p ± 0.1V
Output Impedance	75 Ω unbalanced

AES/EBU Silence Output

Output Connectors	1 x BNC
Output Amplitude	1Vp-p ± 0.1V
Output Impedance	75 Ω unbalanced

Word-Clock Output

Output Connector	1 x BNC
Output Frequency	48kHz
Output Amplitude	≥ 3.5V (when 75 Ω terminated and high-level)

## ● External Interface

Ethernet

Specifications	IEEE 802.3
Protocol	SNMP v2c
Input Connector	RJ-45
Function	Transmission of trap (when detects error)
	Transmission of operation status (e.g., genlock synchronization status)
Type	10BASE-T / 100BASE-TX (auto switching)

USB

Specifications	USB 2.0
Supported Media	USB memory device
Functions	Saving and loading of preset data,
	Saving and loading of logo data,
	Firmware update
	MIB file acquisition
Connector	USB Type A

## ● LCD

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

# LT 4610 SPECIFICATIONS

## ●SDI Video Output

### ●SDI Electrical Characteristics

#### Bit Rate

3G	2.970Gbps、2.970/1.001Gbps
HD、HD(DL)	1.485Gbps、1.485/1.001Gbps
SD	270Mbps

### ●Timing Adjustment

Adjustment Range Entire frame

#### Adjustment Unit

V	Lines
H	Clocks

#### Dual link

Link B  $\pm 10 \mu$  s range

### ●Test Patterns

#### 3G、HD

100% color bar, 75% color bar, multi-format color bar (ARIB STD-B28, pattern 2 area can be set to 100% white, 75% white or +I), check field, flat field white 100%, black 0%, red 100%, green 100%, blue 100%

#### SD

525i/59.94	100% color bar, 75% color bar, SMPTE color bar, check field, flat field white 100%, black 0%, red 100%, green 100%, blue 100%
625i/50	100% color bar, EBU color bar, BBC color bar, check field, Flat field white 100%, black 0%, red 100%, green 100%, blue 100%

#### Automatic Switching

Automatically switches between available patterns (except for check field)

#### Switching Time

1~255sec

### ●Pattern Scrolling

#### Direction

Eight directions (up, down, left, right and their combinations)

#### Speed Range and Unit

##### Interlace

V	In unit of fields
	0 to 256 lines, 1 lines steps
H	0 to 256 dots, in 2 dot steps

##### Progressive

V	In unit of frames
	0 to 256 lines, 1 line steps
H	0 to 256 dots, 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 unknit of fields
	0 to 256 dots, in 2 dot steps
Progressive	In unit of frames
	0 to 256 dot, 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 (dot)×240 (line) (QVGA size)

#### Number of Logo Marks

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

$Y = (0.212 \times R) + (0.701 \times G) + (0.087 \times B)$   
Converts 256-level monochrome data (Y) to 4 levels (levels 0 to 3) using specified thresholds.

#### Conversion Method

Using the logo application

#### Logo Mark Data Transfer

Save the data to a USB memory device and transfer to the LT4610

\* Not available when the check field pattern is selected.

### ●Channel On / Off

#### Function

Each of the Y/G, Cb/B, Cr/R components can be turned on and off for each channel independently. Outputs the specified Y/G, Cb/B or Cr/R signal

#### On

Y/G	040h/040h
Cb/B	200h/040h
Cr/R	200h/040h

#### Off

\* Not available when the check field pattern is selected

### ●Image Overlay

#### Display Precedence

ID characters > logo mark > safety area markers > test pattern  
(The display order cannot be changed.)

#### Simultaneous Display

ID character, 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 (4ch x 4 groups)

#### 3G-B

32 channels (link A, link B, 4ch each x 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 0dBFS (1dBFS 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

#### Setting SDI 1 output is synchronized to AES/EBU output

\* Not available when the check field pattern is selected

\* Safety marker, ID character and logo mark cannot be embedded.

\* When lip sync is enabled, the audio click setting is disabled, and audio synchronized to the lip sync pattern is output.

## ●Genlock Function

### Genlock Formats

NTSC-BB, NTSC-BB+Ref, NTSC-BB+ID, NTSC-BB+Ref+ID, NTSC-BB+S, NTSC-BB+S+Ref, NTSC-BB+S+ID, NTSC-BB+S+Ref+ID, PAL-BB, PAL-BB+Ref, 525/59.94I, 525/59.94P, 625/50I, 625/50P, 1125/60I, 1125/59.94I, 1125/50I, 1125/24I, 1125/23.98I, 1125/30P, 1125/29.97P, 1125/25P, 1125/24P, 1125/23.98P, 750/60P, 750/59.94P, 750/50P, 750/30P, 750/29.97P, 750/25P, 750/24P, 750/23.98P

### ●Timing Adjustment

#### Adjustment Range

NTSC Black Burst Signal	$\pm 5$ frames
PAL Black Burst Signal	$\pm 2$ frames
HD Tri-Level Sync Signal	1 frame (entire frame)
FINE	1 clock step

## ●Analog Black Output

### Analog Black Formats (Six independent analog black signal)

NTSC-BB, NTSC-BB+Ref, NTSC-BB+ID, NTSC-BB+Ref+ID, NTSC-BB+S, NTSC-BB+S+Ref, NTSC-BB+S+ID, NTSC-BB+S+Ref+ID, PAL-BB, PAL-BB+Ref, 525/59.94I, 525/59.94P, 625/50I, 625/50P, 1125/60I, 1125/59.94I, 1125/50I, 1125/24I, 1125/23.98I, 1125/30P, 1125/29.97P, 1125/25P, 1125/24P, 1125/23.98P, 750/60P, 750/59.94P, 750/50P, 750/30P, 750/29.97P, 750/25P, 750/24P, 750/23.98P

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## ● Timing Adjustment

Setting	
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
HD 3 值同期信号	In units of 0.0135 μs

## ● Word-Clock Output

Timing Adjustment	
Adjustment Range	±1AES/EBU frame
Adjustment Unit	512 fs (24.576 MHz)

## ● AES/EBU Digital Audio Output

Timing Adjustment	
Adjustment Range	±1AES/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 step)
Audio Click	OFF, 1 to 4 sec
Sampling Clock Accuracy	Grade 2 (±10 ppm)

## ● AES/EBU Silence Output

Timing Adjustment	
Adjustment Range	±1AES/EBU frame
Adjustment Unit	512 fs
Sampling Frequency	48 kHz sampling (synced with the video signal)
Resolution	20 bits
Pre-emphasis	OFF
Frequency	SILENCE
Level	MUTE
Lip Sync	Synced with SDI1 output
Sampling Clock Accuracy	Grade 2 (±10 ppm)

- \* The frequency, level, and audio click can be set for each channel.
- \* Turn off all channels to output a digital audio reference signal (DARS)

## ● Lip Sync Pattern

Setting	Selectable between SDI1+AES/EBU and SDI2
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## ● Presets

Presets	Saves the panel settings (*1)
Number of Presets	10
Recall Method	Front panel
Copy Method	Copy all presets from the LT 4610 to a USB memory device or copy all presets from the USB memory device to the LT 4610.

- \* Last memory is not supported. By setting POWER ON RECALL, you can start the LT 4610 with preset settings.

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

## ● Internal Clock

Clock Frequency	13.5MHz
Frequency Accuracy	±0.1ppm (25±5°C)

## ● 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	I
Pollution Degree	2
Power Requirements	
Voltage	AC 90~250V
Power Consumption	80W max.

Dimensions	482 (W) × 44 (H) × 400 (D) mm (excluding protrusions)
Weight	3.6 kg (LT 4610 only) 3.8kg (LT 4610 with LT 4610SER01)
Accessories	Power codes.....2 Cover / inlet stoppers.....2 CD-ROM (Logo App, instruction manual).....1

## LT4610SER01 Time Code, CW Sync and GPS Option

This option adds GPS Sync Input, 10 MHz CW Sync Input and LTC Input / Output functions. Time-code generator function is synced to Internal Time Information or GPS's Time Information, and available to generate ATC (LTC, LTC and AES/EBU Embedded Time-code) on the time information of GPS. This option is also equipped with a Holdover Function so that GPS signal and the CW signal phase and frequency will be held when there is a loss of signal.

### Standards

#### ● GPS Sync

Compliance Standards	SMPTE ST 2059
GPS Input	
Input Connector	1 x BNC
Input Impedance	50 Ω
Antenna, Pre-amplifier Power Supply	
Voltage	5V, 3.3V, OFF
Electric Current	50 mA max. (built-in overcurrent protection circuit)
GPS Receiving	
Reception Frequency	1575.42MHz (L1)
Reception Code	C/A code
Receiving Sensitivity	Up to -130 dBm (input level into antenna)
Hold Over Function	When the GPS signal is interrupted, holding the previous frequency and phase.

#### ● 10MHz CW Sync

CW Input	
Input Connector	1 x BNC
Input Impedance	50 Ω
Input Signal Level	0.5 to 2Vp-p
Input Signal Frequency	10MHz
Frequency Tolerance Range	±5ppm
Hold Over Function	When 10MHz CW signal is interrupted, holding the previous frequency.

#### ● LTC Input / Output

Compliance Standards and Output	SMPTE 12M-1 Input
In/Output Connector	D-SUB 15 pin (Input and output shared)
Number of Input	1
Input Impedance	10k Ω balanced
Input Signal Level	0.5 to 4 Vp-p
Number of Output	3
Output Impedance	600 Ω balanced
Output Signal Level	2 Vp-p ±10%

#### ● Time-Code

Reference Time	Internal / GPS / LTC
Frame Rate	Synced with ANALOG BLACK 1
Drop Frame Mode	On, Off
ATC Setting	
LTC Insert Setting	On, Off
LTC Setting	
Output Setting	On, Off
Timing Adjustment Range	±42ms (Increase and decrease depending on frame rate)
Timing Adjustment Unit	0.01ms
AES/EBU Time-code Insert Setting	On, Off
Leap Second	
Apply Setting	Timer setting the application date and time.
Summer Time	
Apply Setting	Timer setting the application date and time.