Leader

LV5300A   WAVEFORM MONITOR

LV5350   WAVEFORM MONITOR

LV7300   RASTERIZER

LV7300-SER01	SDI INPUT
LV7300-SER02	SDI INPUT / EYE
LV5300-SER11 / LV5350-SER11	BATTERY ADAPTER V MOUNT
LV5300-SER12 / LV5350-SER12	BATTERY ADAPTER QR GOLD
LV5300-SER20 / LV5350-SER20 / LV7300-SER20	AUDIO
LV5300-SER21 / LV5350-SER21 / LV7300-SER21	CLOSED CAPTION
LV5300-SER22 / LV5350-SER22 / LV7300-SER22	CIE
LV5300-SER23 / LV5350-SER23 / LV7300-SER23	HDR
LV5300-SER24 / LV5350-SER24 / LV7300-SER24	TSG
LV5300-SER25 / LV5350-SER25 / LV7300-SER25	FOCUS ASSIST
LV5300-SER26 / LV5350-SER26 / LV7300-SER26	LAYOUT
LV5300-SER27 / LV5350-SER27 / LV7300-SER27	TALLY
LV5300-SER28 / LV5350-SER28 / LV7300-SER28	4K
LV5300-SER40 / LV5350-SER40 / LV7300-SER40	EXTENDED VEC

Specification

1.   GENERAL

The LV5300A WAVEFORM MONITOR, LV5350 WAVEFORM MONITOR, and LV7300 RASTERIZER are compact waveform display devices supporting 12G-SDI to SD-SDI standards. The LV5300A and LV5350 are 3U half-rack size waveform monitors with a built-in LCD while the LV7300 is a 1U half-rack size rasterizer that can be connected to an external LCD.

The LV5300A and LV7300, while being compact, support the eye pattern display of a variety of SDI signals up to 12G-SDI. The video signal waveform display, vector display, and picture display enable quality control of various video signals. The status display allows you to view various error statuses and analyze system stability and problems using the event log. Audio signals embedded in SDI signals can be shown on the level display, Lissajous display, and status display.

The LV5300A, LV5350, and LV7300 employ DC power supplies, which enables them to be used in locations where AC power supplies are not available. Moreover, the LV5300A and LV5350 can be operated off of batteries by installing a battery mount option.

For operating these instruments, in addition to the keys and knobs, which are available on conventional instruments, USB mouse, touch panel (*1), and remote control through a Web browser can be used according to your application.

Furthermore, a rich lineup of options is available in addition to these powerful functions, operability, and portability. Through the combination of options, these instruments can be used in the measurement and monitoring of video and audio signals in a wide variety of applications including (1) quality control applications of video and audio signals at filming locations, (2) video-engineer station applications in outside broadcast vans, (3) maintenance applications to isolate fault areas when problems occur, (4) post production applications for controlling the video signal levels, and (5) broadcast equipment compliance applications for determining whether video and audio signals comply with appropriate standards.

*1   The LV7300 requires a touch-panel type external monitor to be connected to the main unit. The touch panel interface on the external monitor is connected to the LV7300's USB port. The video interface on the external monitor is connected to the LV7300's monitor output connector. LEADER does not guarantee that all touch panel type monitors will work with the LV7300.

2.   FEATURES

- **Support for a Variety of SDI Signal Inputs**

  12G-SDI, 6G-SDI, 3G-SDI, HD-SDI, and SD-SDI single link, and 4K 3G dual link standards are supported, allowing SDTV, HDTV, 2K, and 4K video signals to be monitored from a single unit. Up to two HDTV and SDTV video signals can be displayed simultaneously.

- **Superb Operability**

  Operability was prioritized in the design of these instruments. You can use the best control interface according to your liking or situation. In addition to the conventional keys and knobs on the front panel, you can control the instrument remotely using a USB mouse. Further, the LV5300A and LV5350 have a 7-inch full-HD touch panel. The LV7300 can be connected to a USB touch panel interface of a touch-panel monitor. These interfaces allow intuitive control and configuration through touch operation.
  The LV7300 has dedicated keys for controlling the function menus that can be controlled from a remote screen.
  These instruments can also be controlled remotely by connecting a dedicated remote controller (sold separately), controlled remotely from a Web browser on a PC over an Ethernet connection, and used to perform automatic measurements using TELNET or FTP.

- **Compact**

  While providing high flexibility through various options and high functionality for various situations, the LV5300A is 3U half-rack size with 300 mm depth, the LV5350 is 3U half-rack size with 85 mm depth, and the LV7300 is 1U half-rack size with 300 mm depth.

- **4K Video Format (SER28)**

  In addition to SD-SDI, HD-SDI, 3G-SDI single link, 6G-SDI single link, 12G-SDI single link, and 4K 3G dual link are supported. These cover SDI signals from SD video format to HD video format and even 4K video format.

- **Transmission Quality Analysis Function**

  Signal analysis functions have been enhanced based on the SDI signal measurement technology that Leader has cultivated over the years. Other enhancements have been made to various transmission error monitoring, external sync phase difference display, lip sync measurement (SER20), SDI signal frequency deviation measurement function, equivalent cable length meter function, and the ancillary data analysis function, which has become more important with the introduction of 4K video signals.

- **Video Analysis Functions**

  Numerous types of displays are available for the various video signals such as the video signal waveform display, vector display, picture display, 5-bar display, and CIE chromaticity diagram display (SER22). In addition, quality control (QoE) functions for video signals are available including freeze error, black error, and gamut error detection functions. Detected errors can be recorded in event logs.

- **Audio Analysis Functions (SER20)**

  For audio signals, level meter display is possible on audio signals embedded in SDI. The SER20 AUDIO option allows Lissajous display, surround display and detection of mute and clip errors. Detected errors can be recorded in event logs.

- **Eye Pattern Display (LV5300A/LV7300-SER02/SER28) (*1)**

  Eye pattern display and jitter display, which are physical layer measurements of SDI signals from SD-SDI to 12G-SDI, are possible. These physical layer measurements can be performed using cursors or performed automatically. Measurements can be exported via a network.
  A histogram can be superimposed on the eye pattern display.

- **Closed Caption Decode Display Function (SER21)**

  Japanese closed captions embedded in SDI signals, CEA-608 and CEA-708 closed captions supporting multiple languages, teletext, and OP47 subtitles can be decoded and displayed.

- **External Sync Signal Input**

  The phase difference and synchronization states of SDI or IP video signals can be shown graphically based on an external reference sync signal (black burst, tri-level sync).

- **Customizable Layout (SER26)**

  Video signal waveforms, vector waveforms, picture, and other items of input video signals can be laid out freely in the sizes of your choice. Up to 2 input signals can be displayed simultaneously.

- **SDI Reclock Output and SDI Signal Generation Function (SER24/SER28)**

  Two SDI signal reclock output connectors are available. SDI OUTPUT 1 can reclock and output a signal from SDI INPUT 1 or SDI INPUT 2 by switching.
  The function of SDI OUTPUT 2 on the LV5300A and LV5350 can be switched between the reclocked output of the SDI signal of SDI INPUT 2, the SD output of the screen display, and the SDI signal generation function.
  The function of SDI OUTPUT 2 on the LV7300 can be switched between the reclocked output of the SDI signal of SDI INPUT 2 and the SDI signal generation function.
  The SDI signal generation function supports HD-SDI to 12G-SDI. For the pattern, you can select the HD multiformat color bar, the 4K multiformat color bar, or the color raster pattern, which allows you to select any level. You can also overlay a moving box or insert embedded audio. When SER23 is installed, the HDR color bar can be output.

- **External Monitor Output**

  The SDI output of the measurement screen is transmitted from SDI OUTPUT 2 on the LV5300A and LV5350 by switching the function and from the SDI monitor output connector on the LV7300. The signal can be displayed on an external SDI monitor in full high definition resolution.
  Further, because the LV7300 can also output the measurement screen in TMDS format from the monitor output connector, the output signal can be displayed on an HDMI monitor (*2) in full high definition resolution.

- **CINELITE Feature**

  The CINELITE feature makes it easy to manage the levels of specific points on the picture display. This is useful for adjusting the gain of multiple cameras to the same reference point. Furthermore, the CINELITE Advanced feature makes it possible to synchronize measurements with the video signal waveform display and vector display. The CINEZONE feature makes it possible to check the luminance distribution of the whole picture display at a glance. Furthermore, it can support the camera's False Color, using false color settings.

- **Screen Capture Feature**

  A screen capture feature, which captures the entire display as still-image data, is available. Not only can captured data be displayed on the instrument, but it can also be compared with an input signal or saved to a USB memory device as bitmap data for viewing on a PC.

- **Time Code Display**

  The timecodes embedded in SDI signals can be displayed. The timecode can also be used as the timestamps in the event log to check continuity.

- **External Remote Connector**

  A contact terminal can be used to load presets, switch the input signal, and transmit alarms.

- **Ethernet Port**

  The following features become available when you connect the instrument to a PC: remote control through TELNET, file transfer through FTP, remote control and alarm generation through SNMP, remote control from a Web browser through HTTP, and internal clock synchronization through SNTP. Using the LV7290 REMOTE CONTROLLER (sold separately) allows up to eight LV5300As, LV5350s, or LV7300s to be remote controlled.

- **HDR (SER23)**

  Level monitoring is possible on HLG and PQ defined in ITU-R BT.2100 as well as S-Log3, C-LOG, and Log-C compatible HDR signals. Level control is possible based on the estimated brightness (Nits) of a display taking the OOTF into consideration. Video signal waveform display supports IRE scale as well as HDR scale. On CINEZONE display, the SDR area is displayed in monochrome, while the HDR area is displayed using colors corresponding to the brightness. This makes it easy to view the brightness distribution in the HDR area.
  Furthermore, you can display the MAX FALL and MAX CLL compliant with CEA-861.

- **3D-LUT Support (SER23)**

  By loading Cube files, various formats can be supported, which is effective for simultaneous SDR/HDR production. The interpolation method uses 33-point tetrahedral interpolation, supporting WFM/VEC/CIE and the picture display. Up to two channels are supported for 2K and one channel is supported for 4K. Up to 10 Cube files can be registered.

- **SDR Full Range**

  In the waveform and scale displays, as well as the picture display, data is converted into a color space that supports full range before being displayed.

- **Focus Assist (SER25)**

  A new focusing algorithm based on nonlinear super-resolution technology has been developed, allowing highly sensitive focusing even on low-contrast images that were difficult to be focused in on in the past. You can select the sensitivity according to the image scene.

*1   Only SDI INPUT 1 supports the eye pattern display.
*2   LEADER does not guarantee the operation on all HDMI monitors.

3.   SPECIFICATIONS

3.1   SDI Video Formats and Standards (SER01/SER02/SER28)

Table 3-1   SD video signal formats and standards

Color System	Quantization	Image	Field Frequency/Scanning	Supported Standard
YC$_B$C$_R$ 4:2:2	10 bit	720×487	59.94 /I	SMPTE ST 259
		720×576	50 /I	

Table 3-2   HD video signal formats and standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Supported Standard
YC$_B$C$_R$ 4:2:2	10 bit	1280×720	60/59.94/50/30/29.97/25/24/23.98 /P	SMPTE ST 292-1 SMPTE ST 296
		1920×1080	60/59.94/50 /I	SMPTE ST 274 SMPTE ST 292-1
			30/29.97/25/24/23.98 /P	
			30/29.97/25/24/23.98 /PsF	

Table 3-3　3G-A video signal formats and standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Supported Standard
YC$_B$C$_R$ 4:2:2	10 bit	1920×1080	60/59.94/50 /P	SMPTE ST 274 SMPTE ST 425-1
			48/47.95 /P	-
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 425-1 SMPTE ST 2048-2
	12 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
YC$_B$C$_R$ 4:4:4	10 bit	1280×720	60/59.94/50/30/29.97/25/24/23.98 /P	SMPTE ST 296 SMPTE ST 425-1
		1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
	12 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 425-1
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
RGB 4:4:4	10 bit	1280×720	60/59.94/50/30/29.97/25/24/23.98 /P	SMPTE ST 296 SMPTE ST 425-1
		1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
	12 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 425-1
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
			30/25/24 /PsF	
XYZ 4:4:4	12bit	2048×1080	30/25/24 /P	SMPTE ST 425-1
			30/25/24 /PsF	SMPTE ST 428

Table 3-4   3G-B-DL Video Signal Formats and Standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10 bit	1920×1080	60/59.94/50 /P	SMPTE ST 274 SMPTE ST 372 SMPTE ST 425-1
			48/47.95 /P	-
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 372 SMPTE ST 425-1 SMPTE ST 2048-2
	12 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1 SMPTE ST 2048-2
YC_BC_R 4:4:4	10 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1 SMPTE ST 2048-2
	12 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1 SMPTE ST 2048-2
RGB 4:4:4	10 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1 SMPTE ST 2048-2
	12 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 372
			30/29.97/25/24/23.98 /PsF	SMPTE ST 425-1 SMPTE ST 2048-2
XYZ 4:4:4	12bit	2048×1080	30/25/24 /P	SMPTE ST 372
			30/25/24 /PsF	SMPTE ST 425-1 SMPTE ST 428

Table 3-5　3G(DL)-4K Video Signal Formats and Standards

Division Transmission System	Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
Square	YC$_B$C$_R$ 4:2:2	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-3 SMPTE ST 2036-1
				30/29.97/25/24/23.98 /PsF	-
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-3 SMPTE ST 2048-1
				30/29.97/25/24/23.98 /PsF	-
2 sample interleave	YC$_B$C$_R$ 4:2:2	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-3 SMPTE ST 2036-1
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-3 SMPTE ST 2048-1

* You also need the SER28.
* When these signals are displayed, phase differences of up to 100 clocks (approx. 0.67 μs) between links are automatically corrected.
* 3G-B DS links are supported.

Table 3-6　6G video signal formats and standards

Division Transmission System	Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
2 sample interleave	YC$_B$C$_R$ 4:2:2	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2081-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2081-10

* You also need the SER28.

Table 3-7　12G video signal formats and standards

Division Transmission System	Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
2 sample interleave	YC$_B$C$_R$ 4:2:2	10 bit	3840×2160	60/59.94/50 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
				48/47.95/P	-
			4096×2160	60/59.94/50/48/47.95 /P	SMPTE ST 2048-1 SMPTE ST 2082-10
		12 bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2082-10
	YC$_B$C$_R$ 4:4:4	10 bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2082-10
		12 bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2082-10
	RGB 4:4:4	10 bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2082-10
		12 bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2082-10

*　　12G-SDI TYPE 1 is supported.

*　　You also need the SER28.

3.2　SDI Audio Formats and Standards (SER01/SER02/SER20)

Supported Standard
12G, 6G, 3G, HD	SMPTE ST 299
SD	SMPTE ST 272
Sampling Frequency	48 kHz
Quantization	24 bit
Format	L-PCM
Clock Generation	Generated from the video clock
Synchronization	Synchronized to the video signal
	All SDI signals must be synchronized during Simul Display.

SDI Audio Channel Separation

Separates up to four groups (16 channels) from any SDI input.

3.3　SDI Input Connector (SER01/SER02/ SER28)

Connector Type	BNC
Number of Input Connectors	2 (SDI INPUT 1, 2)
Input Impedance	75Ω

Input Return Loss
5 MHz to 1.485 GHz	-15 dB or more
1.485 to 2.970 GHz	-10 dB or more
2.970 to 5.940 GHz	-7 dB or more (SDI INPUT 1)
5.940 to 11.880 GHz	-4 dB or more (SDI INPUT 1)
Maximum Input Voltage	±1 V (DC + peak AC)
12G-SDI Input	SDI INPUT 1
Eye Pattern, Jitter Display	Eye pattern, jitter display is possible only on SDI INPUT 1.

3.4　SDI Output Connector (SER01/SER02/SER24/SER28)

Connector Type	BNC

Number of Output Connectors

2 (SDI INPUT 1, 2)

Output Impedance	75Ω

Output Return Loss
5 MHz to 1.485 GHz	-15 dB or more
1.485 to 2.970 GHz	-10 dB or more
2.970 to 5.940 GHz	-7 dB or more (SDI OUTPUT 1)
5.940 to 11.880 GHz	-4 dB or more (SDI OUTPUT 1)
Output Voltage	800 mVp-p ± 10 % (into 75 Ω)

Output Signal (LV5300A/LV5350)

Reclocked signal of SDI input (*1), TSG output, SDI monitor output

SDI OUTPUT 1	Reclock output of SDI INPUT 1 or selected reclock output of SDI INPUT 1/2
SDI OUTPUT 2	Reclock output of SDI INPUT 2 (*1), SDI monitor output, or TSG output

SDI Monitor Output Signal

Outputs the LCD screen in HD, 3G-A, or 3G-B-DL.

SDI Monitor Output Format

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Supported Standard
YC$_B$C$_R$ 4:2:2	10bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			24/23.98 /PsF (*2)	
			60/59.94/50/48/47.95 /P	

SDI Monitor Output Synchronization

Synchronizes to the refresh rate of the LCD (free run)

Output Signal (LV7300)　　　Reclocked signal of SDI input (*1), TSG output

　SDI OUTPUT 1　　　　　　Reclock output of SDI INPUT 1 or selected reclock output of SDI INPUT 1/2

　SDI OUTPUT 2　　　　　　Reclock output of SDI INPUT 2 (*3) or TSG output

*1　When SDI system setting is 2K SD/HD/3G-B-DL/3G-A and input signal is 6G-SDI, reclock output is not possible.

*2　Equivalent to 48I when the SDI input is 48P.

*3　This is not output when the input is 6G-SDI, 12G-SDI.

3.5　　External Reference Input

Connector Type　　　　　　BNC

Number of Input Connectors　1 pair

Input Impedance　　　　　　15 kΩ passive loop-through

Input Return Loss　　　　　≥ 30 dB for 50 kHz to 30 MHz into 75 Ω

Maximum Input Voltage　　　±5 V (DC + peak AC)

Input Signal　　　　　　　　Tri-level sync or NTSC/PAL black burst signal

Function　　　　　　　　　　Video signal waveform display and phase difference display based on the phase of an external sync signal

*　The display position of the video signal waveform display and the measured phase of the phase difference display based on the phase of the external sync signal may vary by ±1 clock depending on the timing when the external sync signal or SDI signal is connected or disconnected or when the device is restarted.

*　Video signal waveform display based on the phase of an external sync signal is not possible for the following formats.
  • 3G's 720/30P, 720/29.97P, 720/25P, 720/24P, 720/23.98P
  • 3G(DL), 6G, 12G
  • Frame frequency 48P, 47.95P

*　Phase difference display based on the phase of an external sync signal is not possible for the following formats.
  • 3G's 720/30P, 720/29.97P, 720/25P, 720/24P, 720/23.98P
  • Frame frequency 48P, 47.95P

3.6　　Monitor Output Connector (LV7300)

SDI Output Connector

Function	Output the displayed screen to an SDI monitor
Output Connector	BNC
Number of Output Connectors	
	1
Output Impedance	75Ω
Output Return Loss	
5 MHz to 1.485 GHz	15 dB or more
1.485 to 2.97 GHz	10 dB or more
Output Voltage	800 mVp-p ± 10 % (into 75 Ω)
Output Signal	Outputs the LCD screen in HD, 3G-A, or 3G-B-DL.
Output Format	

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10 bit	1920×1080	60/59.94/50 /I 24/23.98 /PsF (*1)	SMPTE ST 274
			60/59.94/50/48/47.95 /P	

Synchronization	Synchronized with the LCD refresh rate (free run)

TMDS Output Connector

Function	Output the displayed screen to an HDMI monitor (*2)
Output Connector	HDMI
Number of Output Connectors	
	1
Signal Format	Single Link T.M.D.S
DDC	Not supported
HOT PLUG Detection	Not supported
Output Signal	Outputs the LCD screen
Image	1920×1080
Frame Frequency	60P, 59.94P, 50P, 48P, 47.95P
Synchronization	Synchronized with the LCD refresh rate (free run)
Touch Control	Touch control possible by connecting the USB touch panel interface of a touch panel monitor to the LV5300A, LV5350 or LV7300 (*3)

*1　Equivalent to 48I when the SDI input is 48P.
*2　LEADER does not guarantee the operation on all HDMI monitors.
*3　LEADER does not guarantee that all touch panel type monitors will work with the LV7300.

3.7 Headphone Output

Output Connector
   LV5300A, LV5350   One 3.5 mm mini jack (stereo)
   LV7300   One stereo jack
Output Signal   2 channels from the audio signals that are being displayed on the screen (downmixed Lt and Rt are also possible)
Sampling Frequency   48 kHz
Volume Adjustment   Using the menu
Power Output   100 mW maximum (into 8 Ω load)

3.8 Control Connectors

USB Port
   Port Type   Standard A
   Number of Ports   2
   Specifications   USB 2.0
   Compatible Devices   USB memory, USB mouse, touch panel monitor
      USB Memory Feature   Saves capture data, preset data, event log data, and data dumps
        Supported USB Memory Format
                       FAT32 (*1)
      USB Mouse Feature   Used to control on the screen
      Touch panel monitor   Touch control of the displayed screen (*2, *3)

Ethernet Port
   Supported Standard   IEEE802.3
   Supported Protocol
      TELNET (*4)   Command control, status query
      FTP   File transfer
      SNMP   Command control, alarm query
      HTTP   Remote monitoring and control from a Web browser
      SNTP   Internal clock synchronization
   Connector Type   RJ-45
   Function   Remote control from an external PC or remote controller (*4), file transfer, status information query
   Type   10Base-T, 100Base-TX, 1000Base-T

Remote Connector

Port Type	15-pin D-sub (female)
Locking Screws	Inch screws (No.4-40UNC)
Number of Ports	1
Control Signal	LV-TTL level (low active)
Input Voltage Range	0 to 5 V DC
	All inputs are pulled up to +3.3 V (control is also possible using +5 V)
Function	Load preset settings, switch input signals, transmit alarm signals, and activate tally
Alarm Output	Outputs alarms signals when a format alarm occurs, when various errors occur, when the fan malfunctions, or when the internal temperature is abnormal

*1   We do not guarantee the operation of all USB-HDDs and USB memory. The this instrument may not operate normally depending on the connected USB device.
*2   Pinch out and swipe operations are not supported.
*3   LEADER does not guarantee that all touch panel type monitors will work with the LV7300.
*4   You cannot use TELNET and the LV7290 at the same time.

3.9   Front Panel

Display (LV5300A/LV5350)

LCD Type	7-inch color TFT
Resolution	1920×1080
Refresh Rate	60 Hz, 59.94 Hz, 50 Hz (free run)
Touch Panel	Electrostatic touch panel
	Tapping the display shows touch keys
Key LEDs	All the keys are dimly back-lit.
	The selected key is lit more brightly.
Power Switch	Electronic switch (which remembers whether the instrument is on or off)
Last Memory	Backs up the panel settings to memory
Key Lock	Lock by holding down the SYS key. Prevents unintentional operations on the instrument.

3.10   Capturing

Screen Capture

Function	Captures the screen
Display	Displays only the captured image or overlays the captured image over the input signal
Media	Internal memory (RAM) and USB memory
	You can only save one screen capture to the internal memory.
Data Output	Saved to bitmap format to a USB memory device or to a file format that the instrument can load (BSG).
Data Input	Data saved to a USB memory device can be loaded and displayed on the instrument.

3.11　　TSG (SER24/SER28)

Table 3-8　HD video signal formats and standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Supported Standard
YC$_B$C$_R$ 4:2:2	10 bit	1280×720	60/59.94/50 /P	SMPTE ST 292-1
			30/29.97/25/24/23.98 /P	SMPTE ST 296
		1920×1080	60/59.94/50 /I	SMPTE ST 274
			30/29.97/25/24/23.98 /P	SMPTE ST 292-1
			30/29.97/25/24/23.98 /PsF	

Table 3-9　3G-A, 3G-B-DL video signal formats and standards

Color System	Quantization	Image	Frame (Field) Frequency/Scanning	Supported Standard
YC$_B$C$_R$ 4:2:2	10 bit	1920×1080	60/59.94/50/48/47.95 /P	SMPTE ST 274 SMPTE ST 425-1
			48/47.95 /P	-
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 425-1 SMPTE ST 2048-2
YC$_B$C$_R$ 4:4:4	10 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274 SMPTE ST 425-1
			30/29.97/25/24/23.98 /P	
			30/29.97/25/24/23.98 /PsF	
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 425-1 SMPTE ST 2048-2
			30/29.97/25/24/23.98 /PsF	
RGB 4:4:4	10 bit	1920×1080	60/59.94/50 /I	SMPTE ST 274 SMPTE ST 425-1
			30/29.97/25/24/23.98 /P	
			30/29.97/25/24/23.98 /PsF	
		2048×1080	30/29.97/25/24/23.98 /P	SMPTE ST 425-1 SMPTE ST 2048-2
			30/29.97/25/24/23.98 /PsF	

Table 3-10　6G video signal formats and standards

Division Transmission System	Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
2 sample interleave	YC$_B$C$_R$ 4:2:2	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2081-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2081-10

*　　You also need the SER28.

Table 3-11　12G video signal formats and standards

Division Transmission System	Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
2 sample interleave	YC$_B$C$_R$ 4:2:2	10 bit	3840×2160	60/59.94/50 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
				48/47.95/P	-
			4096×2160	60/59.94/50/48/47.95 /P	SMPTE ST 2048-1 SMPTE ST 2082-10
	YC$_B$C$_R$ 4:4:4	10 bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2082-10
	RGB 4:4:4	10 bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2036-1 SMPTE ST 2082-10
			4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 2048-1 SMPTE ST 2082-10

*　　You also need the SER28.

Output Pattern　　　　　　　100% color bar, 75% color bar, HD multiformat color bar (*1), 4K multiformat color bar (*1), color raster, gamma, cross hatch, 10 step, limit lamp, check field, lip sync pattern (SER20), HDR color bar (SER23) (*1)

YCbCr/RGB on/off, Level Adjustment

When the following patterns are selected, you can turn on and off YCbCr or RGB separately.
When COLOR RASTER pattern is selected, you can set the YCbCr or RGB levels separately. Moreover, if Structure is set to RGB, You can set R, G, and B level in interlocking.

Pattern	YCbCr/RGB on/off separately	YCbCr/RGB level adjustment separately	RGB level adjustment interlocking
100% color bar	Yes		
75% color bar	Yes		
HD multiformat color bar	Yes		
4K multiformat color bar	Yes		
Color raster	Yes	Yes	Yes
Gamma	Yes		
Cross hatch	Yes		
10 step	Yes		
Limit lamp	Yes		
Check field			
Lip sync pattern			
HDR color bar	Yes		

Scrolling (*2)   ON, OFF
  Direction   Eight directions (up, down, left, right, and their combinations)
  Speed Range and Unit   Per frame (field)
                                         4 to 124 dots, in 4 dot steps
Moving Box (*2)   ON, OFF
  Colors   WHITE, YELLOW, CYAN, GREEN, MAGENTA, RED, BLUE, BLACK
  Speed   1 to 3
Embedded Audio
  Number of Embedded Channels
                                         16 channels max. (*3)
  Embedding On/Off   On/off at the audio group level
  Audio Level   -20d BFS, -18 dBFS, 0 dBFS, mute
  Audio Frequency   1 kHz
  CRC Error Addition   An incorrect CRC is inserted into the Y component of the first line.

*1   It cannot be set in horizontal 1280, 4096, and 2048 pixel format.
*2   Either scrolling, or moving box can be turned on.
*3   For 4096×2160 6G and 2048×1080 3G-B-DL, only 8 channels are embedded.

3.12   Presets

Preset   Saves panel settings (with a few exceptions)
Number of Presets   60
Preset Loading Method   Front panel or remote connector (*1)
Copying   All preset data can be copied from the instrument to a USB memory device or from a USB memory device to the instrument. (To be shared by LV5300A, LV5350, and LV7300)

*1   The number of presets loaded from the remote connector can be 8 or 60.

3.13   Display

Number of simultaneously displayed SDI input signals

SD, HD, 3G-A, 3G-B-DL	2
3G(DL)-4K (SER28)	1
6G (SER28)	1
12G (SER28)	1

Display Mode

Single display	Displays a single input signal
Simul Display	Displays two input signals simultaneously

Alarm Indications

System Alarm Indication	Displays an alarm when the fan malfunctions or when the internal temperature is abnormal
Error Indication	Displays an error when an receive signal error occurs

Display Layout

Multi Display	Control the WFM/PIC and other display functions in multiple areas from a single screen

Customized Layout (SER26)

Function	Freely arrange the windows shown with the WFM, VECT, PIC, AUDIO, STATUS, and EYE (LV5300A/LV7300-SER02) keys (one of each), and a window consisting of six displays shown with MULTI
Display Format	Displays up to two single link input signals in tiled, mixed, V aligned, or H aligned mode.
Normal Mode	Each display area is divided evenly.
Tiled Display	The windows are divided into two quadrants.
Mixed Display	The windows are cascaded.
V Aligned Display	The windows are arranged top to bottom.
H Aligned Display	The windows are arranged side by side.
Tile Mode	The display contents arranged in the display are shown in two quadrants per screen.
V Aligned Mode	The display contents arranged in the display are shown in two vertical divided windows per screen.
H Aligned Mode	The display contents arranged in the display are shown in two horizontally divided windows per screen.

Enhanced Layout (SER26)

Function	When multiple channels of single link are displayed, the selected channel is automatically shown in a specific area. You can make the specific area larger than the other areas to show the selected channel enlarged.

Time Display
   Displayed Contents   Current time, time code
   Current Time Display   The time based on the internal clock
   Time Code Display   LTC, VITC, D-VITC (SD only)
   Supported Standard
     LTC, VITC   SMPTE ST 12-2
     D-VITC   SMPTE ST 266
Tally Display
   Remote Connector   Turn on and off the tally display by controlling through the remote connector
Camera ID Display
   Instrument Setting   Shows the camera ID set with the instrument's menu
  Iris Display   Shows the Iris set with the instrument's menu

3.14   Video Signal Waveform Display

Waveform Control
  Display Mode
    Overlay   Overlays component signals
    Parade   Displays component signals side by side
    Blanking Interval   H and V blanking periods can be masked.
  RGB Conversion   Converts a YC_BC_R signal into an RGB signal and displays the result
    Channel Assignment   GBR or RGB order
  Pseudo-Composite Display Artificially converts component signals into composite signals and displays the result
  Line Select   Displays the selected line
  Sweep Modes   H, V
  Color   7 colors to choose from

Vertical Axis
  Gain   ×1, ×5, ×10
  Variable Gain
    Gain x1   ×0.2 to ×2.0
    Gain x5   ×1.0 to ×10.0
    Gain x10   ×2.0 to ×10.0
  Amplitude Accuracy   ±0.5% (single default display)
   3G (1080/60P, 1080/59.94P, 1080/50P)
    Y Signal   ±0.5 % (1 to 60 MHz)
    C_BC_R Signal   ±0.5 % (0.5 to 30 MHz)
    Low-Pass Attenuation ≥ 20 dB (at 40 MHz)

3G, HD (1080/60P, 1080/59.94P, 1080/50P)

Y Signal	±0.5 % (1 to 30 MHz)
C_BC_R Signal	±0.5 % (0.5 to 15 MHz)
Low-Pass Attenuation	≥ 20 dB (at 20 MHz)

SD

Y Signal	±0.5 % (1 to 5.75 MHz)
C_BC_R Signal	±0.5 % (0.5 to 2.75 MHz)
Low-Pass Attenuation	≥ 20 dB (at 3.8 MHz)

Horizontal Axis

Line Display

Display Format	Overlay (1H, 2H)
	Parade (1H, 2H, 3H)
Magnification	×1, ×10, ×20, ACTIVE, BLANK

Field Display

Display Format	Overlay (1V, 2V) (*1)
	Parade (1V, 2V, 3V)
Magnification	×1, ×20, ×40
Time Accuracy	±0.5% (single default display)

Cursor Measurement

Composition

Horizontal Cursors	2 (REF and DELTA)
Vertical Cursors	2 (REF and DELTA)
Simultaneous Display	Displays the horizontal cursors and vertical cursors simultaneously
Amplitude Measurement	mV, %, R%, DEC, HEX
Time Measurement	Second display
Frequency Display	Computes and displays the frequency with the length of one period set to the time between two cursors
Cursor Value Display	Displays measured values at the cursors

Scale

Type	%, V, decimal, hexadecimal
Display Colors	7 colors to choose from

HDR Scale (SER23)	Adds an HDR scale to each scale for HDR

*1   2V display is not possible when the input signal is progressive.

3.15　Vector Display

Vector Mode	Vector, RGB vector (SER40), YCbCr vector (SER40)
Display Colors	7 colors to choose from
Blanking Interval	H and V blanking periods can be masked (according to the video signal waveform display settings).
Pseudo-Composite Display	Artificially converts component signals into composite signals and displays the result
Line Select	Displays the selected line
Gain	×1, ×5, IQ-MAG
Variable Gain	
Gain x1	×0.2 to ×2.0
Gain x5	×1.0 to ×10.0
Gain IQ-MAG	
Not SD, component display	
	0.620 to 6.240
SD, component display	
	0.580 to 5.840
Not SD, pseudo-composite display	
	0.570 to 5.700
SD, pseudo-composite display	
	0.520 to 5.260
Amplitude Accuracy	±0.5 %
Scale	
Type	AUTO, ITU-R BT.601, ITU-R BT.709, DCI, ITU-R BT.2020
Color Bar Saturation	75%, 100%
IQ Axis	Show or hide
ARIB Check Marker	OFF, STD-B66, STD-B72
Display Colors	7 colors to choose from
Variable Scale	ON, OFF
Color Wheel	ON, OFF
Vector Marker Display	Displays a marker and numeric value at the specified location on the vector display
Number of Markers	1
Numeric Display	Displays the marker position numerically
Cb	Displays the C_B position as a percentage
Cr	Displays the C_R position as a percentage
deg	Displays the hue in degrees.
d	Displays the distance from the center as a percentage
Variable Marker	Marker and frame resizing
Histogram Display	Displays the Y, R, G, and B histograms
5-Bar Display	
Function	Converts an SDI signal into Y, R, G, B, and composite values, and then displays the five peak levels.
Channel Assignment	RGB, GBR
Scale	%, mV, HEX, DEC
Error Level	Based on the gamut error, composite gamut error, and luminance error thresholds

	Line Select	Displays the selected line
	Low-Pass Filter	The same as for gamut errors

3.16　Picture Screen

Quantization	8 bit (internal signal processing is performed with signed 12 bit or higher)
Level Mapping	Maps the black level to 0 (8bit), SDI code value (when receiving 10 bit RGB) 1024 to 255 (8 bit)
Display Sizes	Reduced, actual size, ×2 (4K not supported), full frame (4K not supported)
Quality Adjustment and Color Selection	
	Brightness, contrast, RGB gain, RGB bias, chroma gain, monochrome display (RGB gain, RGB bias, chroma gain not valid)
Frame Rate	Converts the frame rate based on the LCD frame rate (60P, 59.94P, 50P)

SCTE-104 Display	
Function	SCTE-104 message monitoring
Supported Standard	SMPTE 2010, ANSI/SCTE 104
Supported Format	For Dual / Quad Link, Link1 only (Link cannot be changed)
Supported Input Channel	SDI INPUT 1 / 2 / 3 / 4 (DS1 only)
Display	Superimpose when SCTE-104 message is detected
Display Location	OFF / Top left / Top right / Bottom left / Bottom right
Display Time	1 to 10 seconds (1 second step)
SPLICE Display	When a splice_request_data message is detected, the details of the message are displayed

Aspect Marker Display	
3G (17:9 aspect ratio)	16:9, 14:9, 13:9, 4:3, 2.39:1
3G (16:9 aspect ratio), HD	
	17:9, 14:9, 13:9, 4:3, 2.39:1, AFD (*1)
SD	16:9, 14:9, 13:9, AFD (*1)
Aspect Marker Format	Line, shadow (99 levels), or black
Safety Marker Size	ARIB TR-B4, SMPTE RP-218, or user-defined
AFD Display (*1)	Displays abbreviations for SMPTE ST 2016-1-2007 standard AFD codes
Line Select	Marks the selected line
Error Indication	Displays markers in the gamut error and level error areas

*1　AFD Supports only SD or HD.

3.17　Superimpose Display (SER21)

Displays closed captions, European closed captions, and Japanese closed captions over the picture

Closed Caption
　Supported Standards (Mapping Standards)
　　EIA-708　　　　　　　　　SMPTE ST 334
　　　Supported Languages　English / Danish / Dutch / Faroese / Finnish / French /
　　　　　　　　　　　　　　German / Icelandic / Irish / Italian / Norwegian / Portuguese
　　　　　　　　　　　　　　/ Spanish / Swedish / Korean
　　EIA/CEA-608-B (EIA-708-B)
　　　　　　　　　　　　　　SMPTE ST 334
　　EIA/CEA-608-B (EIA/CEA-608-B)
　　　　　　　　　　　　　　SMPTE ST 334
　　VBI (EIA/CEA-608-B Line21)
　　　　　　　　　　　　　　CIA/EIA-608-B
　　　Supported Languages　English / Spanish / French / Portuguese / German / Danish /
　　　　　　　　　　　　　　Italian / Finnish / Swedish
　　Supported Video Formats　SD, HD, 3G-A, 3G-B-DL,
　　　　　　　　　　　　　　3G(DL)-4K (close caption decoding only for link 1),
　　　　　　　　　　　　　　6G (close caption decoding only for sub 1),
　　　　　　　　　　　　　　12G (close caption decoding only for sub 1)

European Closed Caption
　Supported Standards
　　Teletext　　　　　　　　VBI (ITU-R BT. 653-3 System B) (SD only), OP47
　　　Supported Languages　English / Czech / Slovak / Estonian / French / German /
　　　　　　　　　　　　　　Italian / Romansh / Lithuanian / Polish / Portuguese / Spanish
　　　　　　　　　　　　　　/ Romanian / Serbian / Croatian / Slovenian / Swedish /
　　　　　　　　　　　　　　Finnish / Hungarian / Turkish / Ukrainian / Romanian /
　　　　　　　　　　　　　　Bulgarian

Simple Japanese Closed Caption Display

	Displays a simple Japanese closed caption on the picture display. (Select HD, SD, analog, or portable closed caption to display. Select language 1 or 2.)
Supported Standard	ARIB STD-B37 short form data
Supported Video Formats	SD, HD, 3G-A, 3G(DL)-4K (close caption decoding only for link 1), 12G (close caption decoding only for sub 1)

525i/59.94 (SMPTE 259M)

Display	Display position control is supported only for HD and SD closed captions.
Characters	Only Kanji, roman numerals, katakana, hiragana, additional characters (ARIB STD-B24), additional kanji (ARIB STD-B24), and 1-byte DRCS are displayed.
Character Sizes	Supports only standard, medium, small, and specified size codes

Logging

Logged Events	Clear screen command, text closed caption display event, time code, TV commercial material check result
Data Format	Text

TV Commercial Material Checking

Function	Checks whether closed caption displays are present during the closed caption prohibited time
Check Period	The material start time and end time can be specified using timecodes.
Log Display Color	
Closed Caption during Prohibited Time	
	Red
Closed Caption Not during Prohibited Time	
	Green
Check Result Display	Displays OK or NG when measurements are complete

3.18　CINELITE Display

Function	Video levels are displayed numerically.

f Stop Display (not supported on the SER23)

Displays f Stop values relative to a reference point
Set in reference to an object with an 18% reflectance
f Stop gamma correction

Fundamental Gamma	ITU-R BT.709, hybrid log gamma (HLG)(SER23), PQ (SER23), S-Log3 (SER23)
User Correction Table	3 types (data acquired with a real device)

% Display (SDR)

Narrow Range　　Displays the luminance level or RGB level as a percentage with the SDI code value 64 assumed to be 0% and the SDI code value 940 assumed to be 100%

Full Range　　Displays the luminance level or RGB level as a percentage with the SDI code value 0 assumed to be 0% and the SDI code value 1023 assumed to be 100%

Gradation Display

Narrow Range　　Displays the luminance or RGB value with the SDI code value 64 assumed to be 0 and the SDI code value 940 assumed to be 255

Full Range　　Displays the luminance or RGB value with the SDI code value 0 assumed to be 0 and the SDI code value 1023 assumed to be 255

CV Display　　Decimal, hexadecimal
Displays the SDI signal code value as YCBCR or RGB according to the input signal
(only for measurement size 1×1)

HDR Display (SER23)
　HLG
　　System Gamma OFF

Narrow Range	Displays the relative HLG luminance with the SDI code value 64 assumed to 0% and 940 assumed to be 1200% or 100%
Full Range	Displays the relative HLG luminance with the SDI code value 0 assumed to 0% and 1023 assumed to be 1200% or 100%
System Gamma ON	Assuming a Display with a peak brightness of 1000 Nits
Narrow Range	Displays the relative HLG luminance with the SDI code value 64 assumed to 0Nits and 940 assumed to be 1000Nits
Full Range	Displays the relative HLG luminance with the SDI code value 0 assumed to 0Nits and 1023 assumed to be 1000Nits
PQ	Converts the luminance level to the display's Nits and displays the result
Narrow Range	SDI code value 64 to 940 are assumed to be 0Nits to 10000Nits
Full Range	SDI code value 0 to 1023 are assumed to be 0Nits to 10000Nits
S-Log3	Converts the reflectance to IRE with SDI code value 95 assumed to be 0% and 589 assumed to be 100% and displays it as a percentage
C-Log	Displays the percentage with the SDI code value 128 assumed to 0% and 614 assumed to be 100%
Log-C	
EI200	Displays the percentage with the SDI code value 95 assumed to 0.39% and 853 assumed to be 83%
EI400	Displays the percentage with the SDI code value 95 assumed to 0.39% and 917 assumed to be 90%
EI800	Displays the percentage with the SDI code value 95 assumed to 0.39% and 976 assumed to be 95%
EI1600	Displays the percentage with the SDI code value 95 assumed to 0.39% and 1022 assumed to be 94%
Measured Points	3
Measurement Sizes	1 × 1 pixel, 3 × 3 pixels, and 9 × 9 pixels

3.19　CINELITE Advanced Display

Function	Synchronizes the markers on the waveform display, vector display, and chromaticity diagram display to the points selected with CINELITE
Waveform Display Link Markers	
	Synchronizes the markers on the waveform display to the points selected with CINELITE
Number of Link Markers	Up to 16 (for YRGB, YGBR display) (including the 4 reference points)
Vector Link Markers	Synchronizes the markers on the vector display to the points selected with CINELITE
Number of Link Markers	Up to 4 (including the 1 reference point)
Vector Numeric Display	Displays numerically the active marker position
Cb	Displays the C_B position as a percentage
Cr	Displays the C_R position as a percentage
deg	Displays the hue as an angle (°).
d	Displays the distance from the center as a percentage
CIE Chromaticity Diagram Display Link Markers (SER22)	
	Synchronizes the markers on the CIE chromaticity diagram display to the points selected with CINELITE
Number of Link Markers	Up to 4 (including the 1 reference point)

3.20   CINEZONE Display

SDR Display
  Gradation and Step

Function	Adds colors to the display in accordance with luminance levels
Display Colors	Linear (1024 colors), step (12 colors)
Upper Limit	Values equal to or greater than the upper limit are displayed in white
Narrow Range	-6.3 to 109.4 %
Full Range	1.0 to 100.0 %
Lower Limit	Values less than the lower limit are displayed in black
Narrow Range	-7.3 to 108.4 %
Full Range	0.0 to 99.0 %

  Search

Function	Monochrome display of the set luminance level range
	Color display within ±0.5% of the set luminance level
Display Colors	Green
Level Setting	
Narrow Range	-7.3 to 109.4 %
Full Range	0.0 to 100.0 %
Upper Limit	Values equal to or greater than the upper limit are displayed in red
Narrow Range	-6.3 to 109.4 %
Full Range	1.0 to 100.0 %
Lower Limit	Values less than the lower limit are displayed in blue
Narrow Range	-7.3 to 108.4 %
Full Range	0.0 to 99.0 %

  False Color

Function	Adds colors to the display of the set luminance level range
Display Colors	11 colors (Red, Orange, Yellow, Straw, Pink, Light Pink, Cyan, Green, Teal or Light Blue, Blue, Purple)

HDR display (SER23)

Function	Adds colors to the display in accordance with luminance levels
HDR Area Setting	Displays color according to the brightness
SDR Area Setting	Monochrome display
Upper Limit	Displays magenta for values exceeding the limit
	Ref.LEVEL to 100% (code values 64 to 940 or 0 to 1023 assumed to be 100%)
Lower Limit	Displays black for values less than the limit
	0% to Ref.LEVEL% (code values 64 to 940 or 0 to 1023 assumed to be 100%)

3.21　Focus Assist (SER25)

Detection Sensitivity	LOW, MIDDLE, HIGH
Highlight Display Color	WHITE, GREEN, BLUE, RED
Picture Luminance Level	OFF, EMBOSS, 25%, 50%, 75%, 100%

3.22　CIE Chromaticity Diagram Display (SER22)

Display Standard　　　　　CIE1931 (xy display), CIE1976 (u'v' display)

Display Type　　　　　　　Chromaticity diagram display, color temperature display

Display Mode

　Chromaticity Diagram Display

　　　　　　　　　　　　　Luminance display, color display

　Color Temperature Display　Luminance display

Colorimetry　　　　　　　ITU-R BT.601(525), ITU-R BT.601(625), BT.709, DCI, ITU-R BT.2020

Clipping

　ON　　　　　　　　　　Clips negative values of the input signal to zero

　OFF　　　　　　　　　Displays negative values of the input signal according to ITU-R BT.1361

Smoothing　　　　　　　Displays by averaging data every two pixels

Accuracy　　　　　　　　±0.005 (relative to the measurement coordinate value)

Chromaticity Diagram Display Scale

　Triangle　　　　　　　Select two from ITU-R BT.601 (525), ITU-R BT.601 (625), ITU-R BT.709, DCI, and ITU-R BT.2020

　User-defined Triangle　Set a single user-defined triangle

　Background　　　　　Color sample, white background, black background

　Sub scale　　　　　　Color temperature curve, grid (0.1 steps), white point (D65), triangle name (each can be turned on or off)

　Cursor　　　　　　　Displays the cursor position in coordinates

　Gamma　　　　　　　ITU-R BT.709, user (1.5 to 3.0), HLG (SER23), PQ (SER23), S-Log3 (SER23), C-Log (SER23), Log-C (SER23)

3.23   HDR Display (SER23)

Supported Standard	ITU-R BT.2100 (HLG: Hybrid Log Gamma, Full range / Narrow range),
	ITU-R BT.2100 (PQ: Perceptual Quantization, Full range / Narrow range),
	S-Log3, C-Log, Log-C
Supported Formats	All formats except SD-SDI
Function	
Video Waveform Display	Scale, cursor
Vector Display	Histogram
Picture Screen	
HDR CINEZONE	
HDR CINELITE	
MAX CLL, MAX FALL (CEA-861 Supported)	
	Supports HLG and PQ
START	MAX CLL, MAX FALL computation start
STOP	MAX CLL, MAX FALL computation stop
MAX CLL, MAX FALL Error	
	When the measurement result is equal to or greater than the specified threshold, it is displayed turns red and recorded as the event log.

3.24   Audio Display

Input Signal	SDI embedded audio
Format	L-PCM
Sampling Frequency	48 kHz
Quantization	24 bit
Supported Standard	
3G, HD	SMPTE ST 299
SD	SMPTE ST 272
Clock Generation	Generated from the video clock
Synchronization	Must be synchronized to the video clock.
	All SDI signals must be synchronized.
Channel Separation	Separates up to two groups (8 channels) from an SDI input.
Maximum Number of Display Channels	
	8 (from any SDI input, displayed in groups)
Display Types	Level meter, Lissajous (SER20), correlation meter (SER20), surround (SER20), status (SER20)

Level meter

Displayed Channels	8ch
Dynamic Range	SDI-60 dBFS, -90 dBFS, reference level±3 dB
Level Accuracy	±0.3 dB
	(-50 to 0 dBFS, 1 kHz, signal source impedance 40 Ω or less)
Frequency Response	30 Hz to 20 kHz ± 0.4 dB (4 dBu, 1 kHz reference, TRUE PEAK response)
	20 Hz to 20 kHz + 0.4 dB, -0.6 dB (4 dBu, 1 kHz reference, TRUE PEAK response)
Meter Response Model	TRUE PEAK, PPM typeⅠ, PPM typeⅡ, VU
Peak Hold Time	0.0 to 5.0 s (in 0.5 s steps), HOLD
Level Setting	-40.0 to 0.0 dBFS (standard level, warning level, over level)
Level Numeric Display	Displays the levels numerically
	Numeric display in red when level-over is detected
	Displays a blue "M" when mute is detected (ON/OFF selectable. The displays changes to a blue ■ when the layout size is small.)
	Displays "U.L" when audio is not detected

Lissajous Display (SER20)

Displayed Channels	2 channels × 1
	2 channels × 4
Display Mode	X-Y, MATRIX
Correlation Meter	Displays the correlation between two channels as a value from -1 to 1
Channel Assignment	
SINGLE LISSAJOU	L, R
MULTI LISSAJOU	L1, R1 to L4, R4

Surround Display (SER20)

Function	Displays a graphical representation of a sound field
Surround Format	5.1 channels
Channel Mapping	L, R, C, LFE, Ls, Rs, Lt, Rt
Center Channel Format	NORMAL, PHANTOM CENTER
Gain	×1, AUTO

Status Display (SER20)

Level	Audio levels are displayed using numbers (dBFS).
Error Detection	Counts the number of errors that occur for each channel
Level Over	Counts the number of times that the level of the input signal exceeds the set value
Detection Setting	-40.0 to 0.0 dBFS
Clipping	Counts the number of times that a received signal exceeds the maximum signal value for the specified number of consecutive samples
Detection Setting	1 to 100 sample
Mute	Counts the number of times that the length of a received mute signal exceeds the specified period
Detection Setting	1 to 5000 ms
Parity Error	Counts the number of times that the input signal's parity bit and the parity bit recalculated by the instrument differ
Validity Error	Counts the number of times that the input signal's validity bit is 1
CRC Error	Counts the number of times that the CRC of the channel status bits and the calculated CRC are different
Elapsed Time	Displays the amount of time that has elapsed since the instrument was reset
Channel Status Bits	Dump display, text display
User Data Bits	Dump Display

3.25   Status Display

Signal Detection	Detects the presence of an SDI signal
Format Display	Displays the video signal format

Frequency Deviation Display

Function	Displays the sampling frequency deviation
	Displays an error if ±10 ppm is exceeded
Measurement Range	±100 ppm
Precision	±2 ppm

Equivalent Cable Length Display

Function	Displays SDI signal attenuation in terms of cable length
	Displays an error if the specified cable length is exceeded

Supported Cables

12G	L-5.5CUHD
3G, HD	LS-5CFB, 1694A
SD	L-5C2V, 8281

Display Range

12G	< 10 m, 10 to 80 m, > 80 m
3G	< 10 m, 10 to 100 m, > 100 m
HD	< 10 m, 10 to 130 m, > 130 m
SD	< 50 m, 50 to 200 m, > 200 m

Precision

12G, 3G, HD	±20 m
SD	±30 m
Resolution	10 m

Error Count Display	Up to 999999 errors for each error type
Count Period	1 second, 1 field (frame)

Embedded Audio Channel Display

Displays the embedded audio channel numbers

*   If the input signal is 3G-B-DL, only stream 1 is supported.

SDI Signal Error Detection

CRC Error	Detects 3G and HD signal transmission errors
EDH Error	Detects SD signal transmission errors
TRS Position Error	Detects TRS embedding position errors
TRS Code Error	Detects TRS protection bit errors
Line Number Error	Detects errors with the line numbers embedded in 3G and HD signals
Illegal Code Error	Detects data within the range of 000 to 003h and 3FC to 3FFh in locations other than TRS and ADF

Ancillary Data Packet Error Detection

Checksum error	Detects ancillary data transmission errors
Parity Error	Detects ancillary data header parity errors

   Embedded Audio Packet Error Detection (*1)

BCH Error	Detects audio packet transmission errors
DBN Error	Detects audio packet continuity errors
Parity Error	Detects audio packet parity errors
Embedded Position Error	Detects the presence of audio in lines where it should not be embedded
Sample Counter Error	Detects asynchronous audio by measuring the number of audio samples

*1　If the input signal is 3G-B-DL, only stream 1 is supported.

Video Error Detection

Freeze Error	Detects freezing of video within the specified time range
Detection Method	Video interval checksum
Time Specification	2 to 300 frames
Black Error	Detects video blackouts
Black Level Specification	0 to 100%
Area Specification	1 to 100%
Time Specification	1 to 300 frames
Level Error	Detects luminance level errors and chrominance level errors

   Luminance Level Detection Range

Upper limit	-51 to 766 mV
Lower Limit	-51 to 766 mV

   Chrominance Level Detection Range

Upper limit	-400 to 399 mV
Lower Limit	-400 to 399 mV

Gamut Error   Detects gamut errors
   Detection Range
      Upper limit   90.8 to 109.4%
      Lower Limit   -7.2 to 6.1%
   Low-Pass Filter

Format	Low-Pass Filter	
	HD/SD: 1 MHz	HD: 2.8 MHz SD: 1 MHz
SD 720×487	Approx. 1 MHz (EBU R103-2000)	Approx. 1 MHz
SD 720×576	Approx. 1 MHz (EBU R103-2000)	Approx. 1 MHz
HD 1280×720	Approx. 1 MHz	Approx. 2.8 MHz
HD 1920×1080 (frame rate ≤ 30 Hz)	Approx. 1 MHz (IEEE STD 205)	Approx. 2.8 MHz
HD 1920×1080 (frame rate > 30 Hz)	Approx. 2 MHz	Approx. 5.5 MHz
HD 2048×1080 (frame rate ≤ 30 Hz)	Approx. 1 MHz (IEEE STD 205)	Approx. 2.8 MHz
HD 2048×1080 (frame rate > 30 Hz)	Approx. 2 MHz	Approx. 5.5 MHz
4K 3840×2160 (frame rate ≤ 30 Hz)	Approx. 4 MHz	Approx. 11 MHz
4K 3840×2160 (frame rate > 30 Hz)	Approx. 8 MHz	Approx. 22 MHz
4K 4096×2160 (frame rate ≤ 30 Hz)	Approx. 4 MHz	Approx. 11 MHz
4K 4096×2160 (frame rate > 30 Hz)	Approx. 8 MHz	Approx. 22 MHz

   Area Specification   0.0 to 5.0%
   Time Specification   1 to 60 frames
Composite Gamut Error   Detects level errors that occur when component signals are
                               converted to composite signals
   Detection Range
      Upper limit   90.0 to 135.0%
      Lower Limit   -40.0 to 20.0%
   Low-Pass Filter   The same as the gamut error
   Area Specification   0.0 to 5.0%
   Time Specification   1 to 60 frames

SDI Analysis Features
   Event Log Display
      Function   Records detected errors, events—such as the instrument
                               switching between input signals, and timestamps.
      Log Capacity   Up to 1000 events
      Operation   Logs all events from start to finish
      Data Output   Overwrite mode, Stop after 1,000 events

Data Dump Display

Display Format	Displays serial data sequence or displays each color component separately
SD, HD, 3G-A	PICTURE, stream 1, stream 2
3G-B-DL	PICTURE, link A, link B
3G(DL)-4K (SER28)	PICTURE, link 1, link 2
6G (SER28), 12G (SER28)	
	PICTURE, sub 1, sub 2, sub 3, sub 4
Display Format Details	
PICTURE	Links or streams 1 and 2 are combined and displayed in a picture structure.
Stream 1/2	Displays each stream in a transmission structure
Link A, B, 1, 2, 3, 4	Displays the selected link
Line Select	Displays the selected line
Sample Select	Displays from the selected sample
Jump Feature	Jumps to an EAV or SAV
Data Output	Text output to USB memory

Phase Difference Display

Function	Displays the phase difference between a reference signal and an SDI signal numerically and graphically
Reference Signal	
SD, HD, 3G-A, 3G-B-DL	External sync signal, Ach
3G(DL)-4K (SER28)	External sync signal, Ach
6G (SER28), 12G (SER28)	
	External sync signal
Display Range	
Vertical	1 frame
	For 3G-B-DL 47.95P to 60P, ±1 frame measurement possible
Horizontal	±1 line

*   If the reference signal is set to an external sync signal, the measured phase may vary by ±1 clock depending on the timing when the external sync signal or SDI signal is connected or disconnected or when the power is turned on and off.

SDI Ancillary Data List Display

List Display Details	Presence or absence of each ancillary data type, embedded line number, and number of packets per frame
Dump Display	The selected ancillary data is displayed in hexadecimal or binary.

EDH Display (Only for SD)

Supported Standard	SMPTE RP 165
Displayed Contents	Analyzes and displays EDH packets and displays received CRC errors
Display Format	Text, hexadecimal, binary

Payload ID Display
  Supported Standard   SMPTE ST 352
  Displayed Contents   Analyzes and displays payload information
  Display Format   Text and binary
Displaying Audio Control Packets
  Supported Standard   SMPTE ST 299-1, SMPTE ST 272
  Displayed Contents   Displays audio control packet analysis
  Display Format   Text, hexadecimal, binary
  Display Format   1, 2, 3, 4
Japanese Closed Caption Display (*1)
  Supported Standard   ARIB STD-B37
  Displayed Contents   Analysis display of closed caption signals
  Display Format   Text, hexadecimal, binary
English Closed Caption Display
  Supported Video Formats SD, HD, 3G-A, 3G-B-DL,
                  3G(DL)-4K (close caption decoding only for link 1),
                  6G (close caption decoding only for sub 1),
                  12G (close caption decoding only for sub 1)
  CDP Packet Display Details
    CDP packet header information
                  Presence or absence of timecode packet,
                  Presence or absence of closed caption packet and validity of this packet,
                  Presence or absence of closed caption service packet and validity of this packet,
                  Presence or absence of the FUTURE data packet
    Time Code   When time code packets are present
    Closed Caption Data   When valid closed caption packets are present
    Presence or absence of CC1 to 4, TEXT1 to 4, XDS packets
  XDS Packet Display Details
                  Contents adviser information
                  Copy management information
  Display content of ProgramDescription packet
                  Stuffing Descriptor
                  AC3 Audio Descriptor
                  Caption Service Descriptor
                  Content Advisory Descriptor
                  Extended Channel Name Descriptor
                  Service Location Descriptor
                  Time-Shifted Service Descriptor
                  Component Name Descriptor
                  DCC Arriving Request Descriptor
                  DCC Arriving Request Descriptor
                  Redistribution Control Descriptor

Inter-Stationary Control Signal (NET-Q) Display (*1)

        ARIB STD-B39

        Analysis display of inter-stationary control signals

        Text, hexadecimal, binary

        Q signal logging

        Analysis display of the format ID

        Outputs Q signal logs in CSV format through a USB memory device

Data Broadcast Trigger Signal Display (*1)

        ARIB STD-B35

        Text, hexadecimal, binary

V-ANC User Data Display (*1)

        ARIB TR-B23

        Hexadecimal, binary

AFD Packet Display	SMPTE ST 2016-3
	Text, hexadecimal, binary

SCTE-104 Display

Function	SCTE-104 message monitoring
Supported Standard	SMPTE 2010, ANSI/SCTE 104
Supported Format	For Dual / Quad Link, Link1 only (Link cannot be changed)
Supported Input Channel	SDI INPUT 1 / 2 / 3 / 4 (DS1 only)
Display	Superimpose when SCTE-104 message is detected
Display Time	1 to 10 seconds (1 second step)
Log	Records when SCTE-104 message is detected
DUMP Display	Displays DUMP data when SCTE-104 message is detected
SPLICE Display	When a splice_request_data message is detected, the details of the message are displayed
SPLICE Log	Records when a splice_request_data message is detected
SR Live Packet Display	Text, hexadecimal, binary
ARRI Metadata Display	Text, hexadecimal, binary

User-Defined ANC Packet Display

        DID, SDID

        Y, C

        Hexadecimal, binary

*1   Supported video formats are as follows:SD, HD, 3G-A,
     3G(DL)-4K (close caption decoding only for link 1), 12G (close caption decoding only for sub 1)

Lip Sync Display (SER20)

Displays the phase difference between the video and audio

Lip Sync Measurement

Function　　　　　　　Measures the time difference between the SDI signal and digital audio signal and displays the results numerically and graphically

Reference Signal　　　A Leader TSG that supports lip syncing (*1)

Measurement Method　Measures the time difference when the luminance level of the video signal exceeds the specified value and when the audio level signal exceeds the specified value

Luminance Level Setting 25 to 100%

Audio Signal Level Setting

-30 to 0 dBFS

Supported Audio Signals　Embedded audio signal

Measurement Range (Bar Display)

±50 ms, ±100 ms, ±500 ms, ±1.0 s, ±2.5 s

Measurement Range (Numeric Display)

±3999 ms

Measurement Resolution　1 ms

*1　TSG patterns not made by Leader may be supportable by specifying the video signal setting and audio signal setting.

3.26   Eye Pattern (LV5300A/LV7300-SER02)

SDI Input Connector	SDI INPUT 1
Display	Displays the input SDI waveform before equalizing
Number of Displays	
1-Screen Display	Displays the eye pattern of the selected filter in a single screen
2-Screen Display	Displays the timing filter and eye pattern of the selected filter in two screens
Waveform Display Color	7 colors to choose from
Scale Display Color	7 colors to choose from
Method	Equivalent time sampling
Amplitude Accuracy	800 mV ± 5 % (for 800 mV input)
Time Axis	
2 UI Display	
12G (SER28)	12.5 ps/div
6G (SER28)	25 ps/div
3G	50 ps/div
HD	100 ps/div
SD	550 ps/div
4 UI Display	
12G (SER28)	25 ps/div
6G (SER28)	50 ps/div
3G	100 ps/div
HD	200 ps/div
SD	1100 ps/div
16 UI Display	
12G (SER28)	100 ps/div
6G (SER28)	200 ps/div
3G	400 ps/div
HD	800 ps/div
SD	4400 ps/div
Time Axis Accuracy	±3 %
Jitter Filter	
10Hz	HPF 10Hz
100Hz	HPF 100Hz
1 kHz	HPF 1 kHz
100 kHz	HPF 100 kHz
TIMING	HPF 10Hz
ALIGNMENT	
12G (SER28), 6G (SER28)	HPF 100 kHz
3G, HD	HPF 100 kHz
SD	HPF 1 kHz
Cursor Measurement	Amplitude measurement using Y cursors
	Time measurement using X cursors
	Rise time and fall time measurement using the TrTf cursor

Automatic Measurement Items

	Eye pattern's amplitude
	Rise time (the time for the signal to rise from 20 to 80 % of its amplitude)
	Fall time (the time for the signal to fall from 80 to 20 % of its amplitude)
	Timing jitter
	Jitter
	Rising edge overshoot
	Falling edge overshoot
Histogram Display	Displays the frequency distribution of the eye pattern waveform amplitudes

3.27　Jitter Display (LV5300A/LV7300-SER02)

SDI Input Connector	SDI INPUT 1
Display	Displays the jitter component of an SDI signal
Number of Displays	
1-Screen Display	Displays the jitter waveform of the selected filter in a single screen
2-Screen Display	Displays the timing jitter and the jitter waveform of the selected filter in two screens
Waveform Display Color	7 colors to choose from
Scale Display Color	7 colors to choose from
Method	Phase detection method
Gain	×16, ×8, ×4, ×2, ×1
Measurement Range	
12G (SER28)	
×16	0.00 to 1.20 UI
×4	1.20 to 4.80 UI
×2	4.80 to 9.60 UI
×1	9.60 to 19.20 UI
3G, HD, SD, 6G (SER28)	
×8	0.00 to 1.20 UI
×2	1.20 to 4.80 UI
×1	4.80 to 9.60 UI
Time Axis	1H, 2H, 1V, 2V (*1)
Time Axis Accuracy	±3 %

Jitter Filter

10Hz	HPF 10Hz
100Hz	HPF 100Hz
1 kHz	HPF 1 kHz
100 kHz	HPF 100 kHz
TIMING	HPF 10Hz
ALIGNMENT	
12G (SER28), 6G (SER28)	
	HPF 100 kHz
3G, HD	HPF 100 kHz
SD	HPF 1 kHz
Cursor Measurement	Jitter value measurement through the use of cursors
Automatic Measurement Display Feature	
	Displays the jitter value in seconds (sec) and unit intervals (UI)
Automatic Measurement Items	
	Timing jitter, alignment jitter, jitter
Accuracy	Input jitter frequency: 1 kHz. Filter setting: 10 Hz, within measurement range
0 UI < automatic measured value ≤ 1 UI	
	±10 % + 0.07 UI
1 UI < automatic measured value ≤ 7 UI	
	±10 %

*1   2V display is not possible when the input signal is progressive.

3.28   Tally Display

Number of Displays	3 (TALLY-1, TALLY-2, TALLY-EXT) (*1)
Display Colors	7 colors to choose from
Control Method	Remote connector, RS-422/485 connector (SER27)

*1   The number of displays per channel. Arranged using the customized layout feature or the enhanced layout feature.

3.29   Camera ID Display

Number of Displays	2 (LABEL-1, LABEL-2) (*1)
Iris Display	1 (IRIS) (*1)
Control Method	Instrument

*1   The number of displays per channel. Arranged using the customized layout feature or the enhanced layout feature.

3.30   General Specifications

Environmental Conditions
    Operating Temperature   0 to 40 °C
    Operating Humidity Range   85 %RH or less (no condensation)
    Optimal Temperature   10 to 30 °C
    Operating Environment   Indoors
    Elevation   Up to 2,000 m
    Overvoltage Category   I
    Pollution Degree   2
Power Requirements
    Voltage   DC 10 to 18 V
    Power Consumption
        LV5300A   80 W max.
        LV5350   60 W max.
        LV7300   80 W max.
Dimensions
    LV5300A   215 (W) × 132 (H) × 132 (D) mm (excluding protrusions)
    LV5350   215 (W) × 132 (H) × 85 (D) mm (excluding protrusions)
    LV7300   213 (W) × 44 (H) × 300 (D) mm (excluding protrusions)
Weight
    LV5300A   2.95 kg max. (excluding accessories and battery option)
    LV5350   2.5 kg max. (excluding accessories and battery option)
    LV7300   2.25 kg max. (including options, excluding accessories)
Accessories   AC adaptor (GST90A-12)(LV7300) 1