Leader

LV5900A

WAVEFORM MONITOR

8K | 4K | 12GSDI | 6GSDI | 3GSDI | HDSDI | EYE | MADI

9-inch full HD panel
4U : 223 (W) × 172 (H) × 360 (D) mm

General

The LV5900A waveform monitor supports SMPTE ST 2082-12, which is used to receive 7680(8192)x4320 / 59.94P YCBCR10bit 8K video via 12G-SDI QUAD LINK. As the LV5900A supports not only 8K but also a 4k input and four simultaneous HD inputs, you can use it as a high-end 8K monitor and switch between other formats as needed.
The waveform, vector, picture, and eye pattern displays enables easy measurement and quality control of video signals. The status display allows you to confirm system stability with comprehensive event logs and long-term charts.

Features

Unmatched ease of use
- Dedicated buttons and knobs for simple operation.
- Optional control with USB mouse
- 9-inch full HD panel with touch operation

Wide range of 2K/4K/8K Formats
- 12G/6G/3G/HD-SDI single link
- 6G-SDI dual link
- 3G-SDI dual link and quad link
- HD-SDI quad link
- 12G-SDI dual link and quad link(8K)
- 8K Square Division (4 x 4K)

Comprehensive Transmission Quality Monitoring
- External sync phase difference display
- Lip sync measurement
- SDI signal frequency deviation measurement
- Equivalent cable length meter
- Ancillary data analysis

Video Monitoring
- Full suite of displays
  - waveform display ・vector display ・picture display
  - 5-bar display ・CIE chromaticity, and more
- Quality control (QoE) functions
  - Freeze error ・Black error ・Gamut error

Audio Monitoring
MADI audio and Embedded SDI Audio
- Level meter ・Lissajous ・Surround (8K is not supported.)
- Loudness ・Mute ・Clip error detection, etc.

Eye Pattern
- HD-SDI to 12G-SDI support
- Eye pattern available for each of 4 SDI inputs
- Automatic eye measurement
- Jitter display
- Histogram

Closed Caption Decode
- CEA-608 CEA-708 ・Japanese closed captions
- Teletext ・OP47 Subtitles

Timing Characteristics vs External Sync
The phase difference and synchronization states of SDI video signals are shown graphically versus the external reference sync signal to identify any link timing issue.

Customizable Layout
Waveforms, vector, picture, etc. can be laid out freely (in both size and location) of your choice to match the monitoring need.

SDI Signal Generation Function
- HD-SDI to 12G-SDI support
- 8K video format support

HDR
ITU-R BT.2100（HLG, PQ), S-Log3, C-Log, Log-C
Precise level control is possible based on the estimated display brightness (Nits) using the OOTF.

Focus Assist
The LV5900A offers a new focusing algorithm based on nonlinear super-resolution technology. This makes accurate focus evaluation possible, even for difficult low-contrast, high resolution frames.

Superb Operability

The LV5900A is designed to give top priority to operability. A 9-inch full HD LCD panel features wide viewing angles and excellent color reproducibility. This model can also be used as a high-grade HD picture monitor. In addition, a touch-panel external monitor connected through USB interface enables intuitive operations and settings through touch operation.

2K/4K/8K Video Formats

Video format support includes SDI signals ranging from 8K video with quad link of 12G-SDI, 4K video over single link 12G-SDI, dual link of 6G-SDI, quad link of 3G-SDI and quad link of HD-SDI, in addition to single link HD-SDI and 3G-SDI.

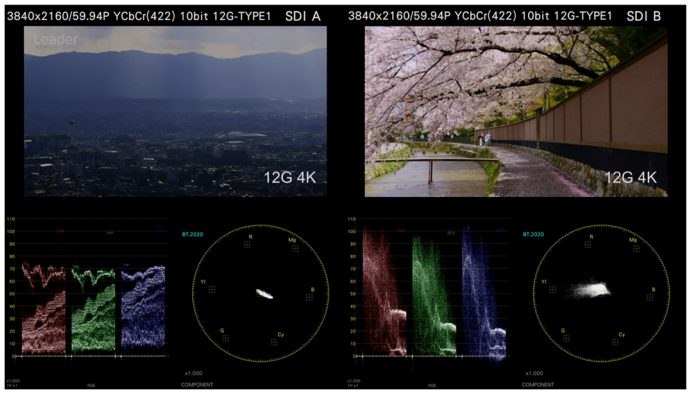
8K Square Division

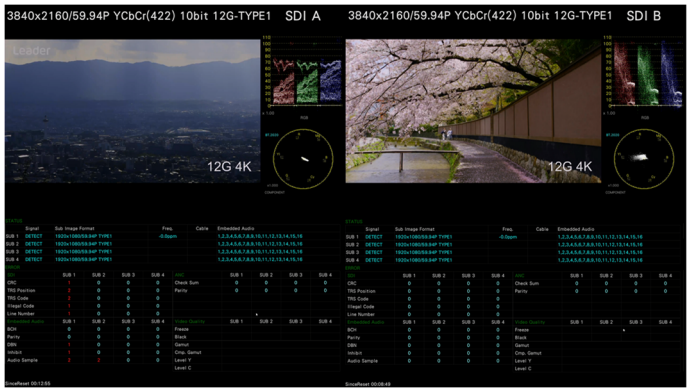
The LV5900A also supports 8K divided into 4K sized squares. While the 8K square division system is not included in the television signal standard, it is a system used when existing 4K equipment is repurposed to partially process the video signal in each area.

4K/12G-SDI Simultaneous Display of 2 Inputs

In the case of 12G-SDI, two 4K inputs can be displayed simultaneously.

2-screen display





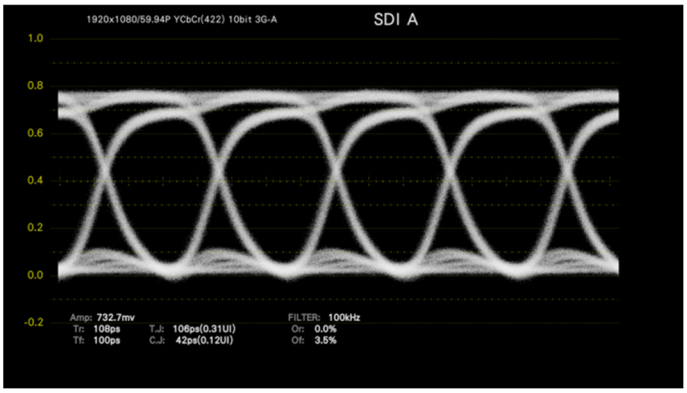
Transmission Quality Analysis

The LV5900A provides enhanced ancillary data analysis which includes sync measurement (8K support coming), SDI signal frequency deviation measurement, and equivalent cable length measurement.

Eye Pattern Display

Both eye-pattern and jitter displays are available for SDI signals covering from HD-SDI through 12G-SDI. The LV5900A automatically calculates key eye measurement values. Furthermore, a histogram can be superimposed on the eye-pattern display for more detailed physical layer evaluation.

Eye Pattern Display



Signal Alignment

Phase differences and synchronization status of all SDI video signals can be checked graphically against external reference signals (black burst, tri-level sync signal).

Closed Caption Decode

CEA-608 or CEA-708 closed captions, teletexts, OP47 subtitles as well as Japanese subtitles are decoded and displayed for HD to 4K formats.

Closed caption display

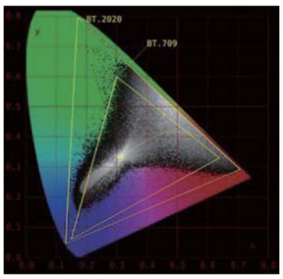
Video Analysis

A comprehensive selection of displays are available for monitoring video signals including waveform, vector, picture, 5bar gamut, and CIE chromaticity diagram mapping. In addition, automated quality control (QoE) alerts include freeze error, black error, and gamut error detection functions. Detected errors can be recorded in event logs.

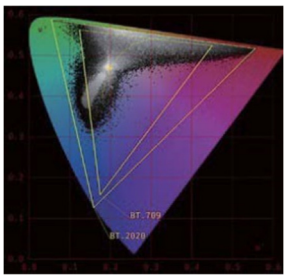
CIE Chart

The LV5900A features a chromaticity display that supports ITU-R BT.709 and ITU-RBT.2020 colorimetry. The display mode conforms to CIE 1931 (xy diagram) and CIE1976 (u'v' diagram). Because the CIE chart display can display two color areas, it can be used to reduce the color within the BT.709 color area or confirm the contents exceeding the BT.709 color area by using equipment that conforms to BT.2020. For the color display, chromaticity points are displayed by using colors that are contained in video signals (or are available on the picture). Chromaticity points can be measured at each point with the cursor.

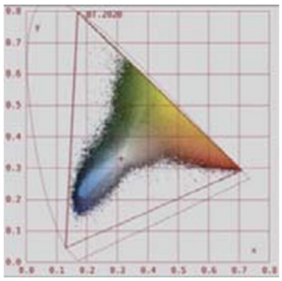
xy chromaticity coordinate display



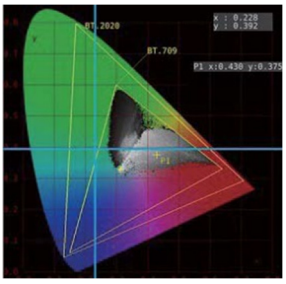
u' v' chromaticity coordinate display



xy coordinate color indication

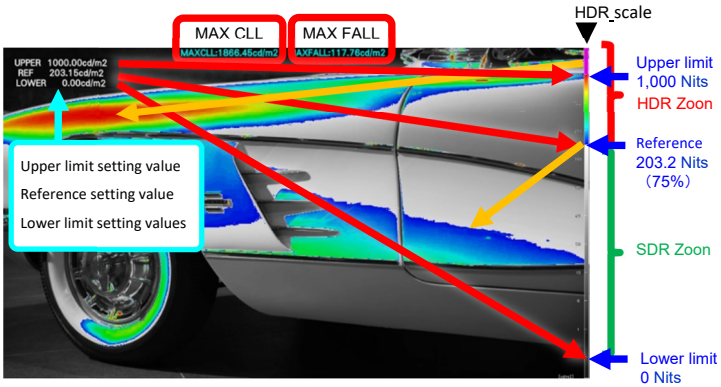


A light blue is a measurement function cursor



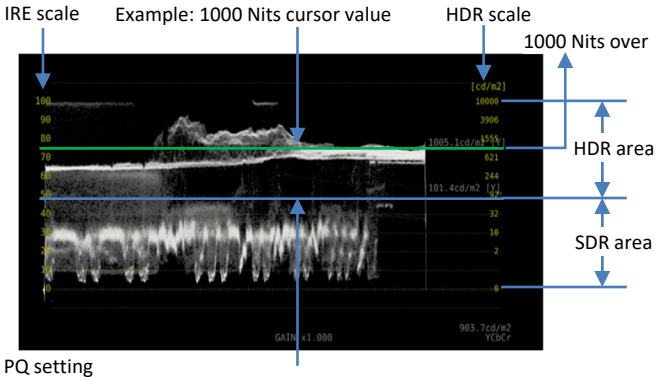
HDR

Level monitoring of HDR signals includes support for S-Log3, HLG, and PQ as specified in ITU-R BT.2100, and level management at an assumed luminance (Nits) on the display with OOTF is possible. The HDR scale is added to the IRE scale and, for the CineZone display, the luminance distribution in HDR and SDR can be easily evaluated.



The SDR part is rendered monochrome, the HDR region is colored according to luminance.
Content above an upper limit value is colored magenta.
The upper limit value, the reference value, and the lower limit value can be varied.

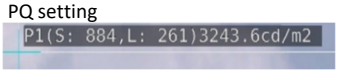
HDR waveform display



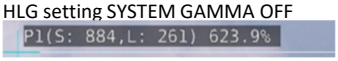
HDR Pixel Measurement

A crosshair cursor can be used to evaluate up to three points in an image simultaneously.

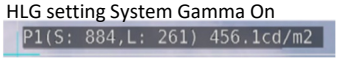
PQ setting



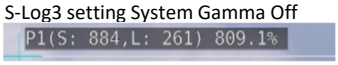
HLG setting SYSTEM GAMMA OFF



HLG setting System Gamma On



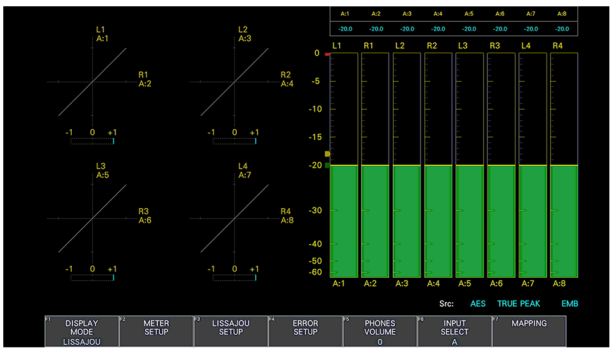
S-Log3 setting System Gamma Off



Audio Analysis Function

For audio embedded in SDI, or for discreet MADI input, level meter, Lissajous, surround display (8K not supported), loudness, mute, clip error detection, and other audio tools are available. Detected errors can be recorded in event logs.

Audio display

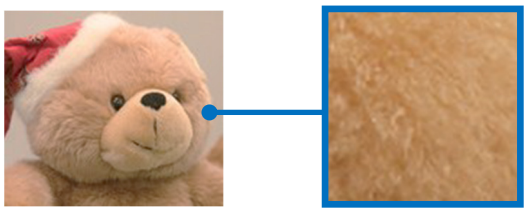


Focus Assist

The LV5900A offers a unique tool to quickly identify focal issues in low-contrast, high-pixel count images. A proprietary algorithm provides visual cues to help achieve focus in these difficult conditions.

Focus assist display

After focus adjustment
(The green part is the focus adjustment point)

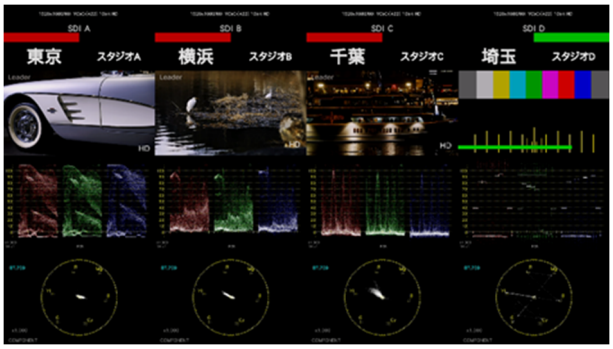


Enlarged view (After focus adjustment)

ID / Iris / Tally Display

Display camera ID, and tally information received via Serial RS-422/485 ports. Remote connectivity is also supported.

ID/Iris/Tally Display



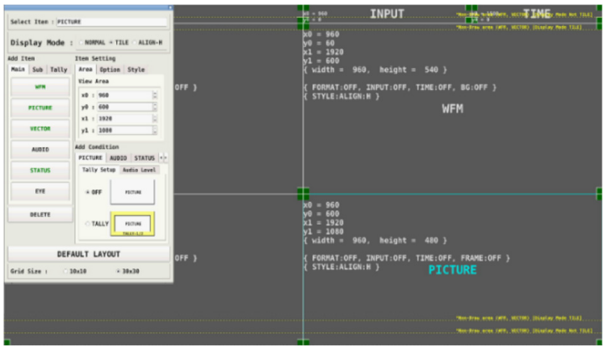
SDI Signal Generator

The built-in SDI signal generator supports HD-SDI to 12G-SDI signals. Patterns include HD multi-format color bars, 4K multi-format color bars (simple pattern), and flat field patterns with selectable levels. Overlay of a moving graphic and embedded audio are also supported. To qualify the pull-in margin of receivers in 4K quad-link systems, the phase of each link can be controlled.
Sample patterns: 100% color bar, 75% color bar, HD multi-format color bar, 4K multi-format color bar, color luster, gamma, cross hatch, 10-step, limit lamp, check field, lip sync pattern, HDR color bar.

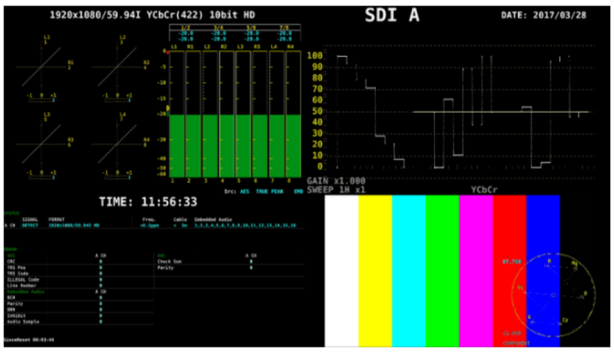
Customizable Layout

Unique to Leader products, the user can fully customize the screen layout to match the monitoring situation. Waveform, vector, picture, etc. can be sized and arranged in nearly any position.
Multiple input signals up to four inputs can be displayed simultaneously, and one single input signal can be displayed in multiple windows.

Customized layout setting screen



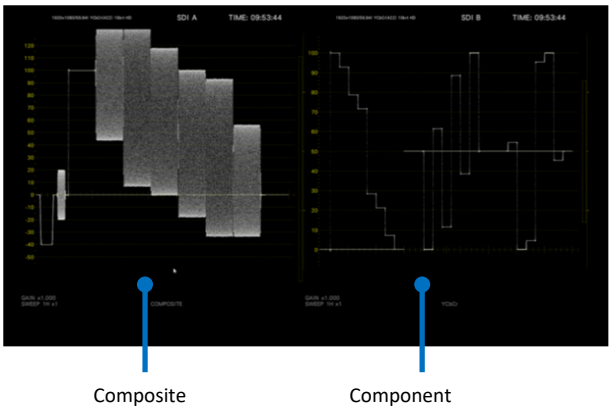
Layout Set measurement screen



Simultaneous Display

SDI input signals from the four rear inputs can be assigned to any of the A to D display channels. By allocating one SDI input signal to multiple display channels, it is possible to monitor video signals in multiple display formats. For example, SDI input 1 can be rendered as composite video on display channel A and as a component video waveform on display channel B.
*Only HD, 3G-A, and 3G-B-DL are supported.
*It is not possible to monitor errors in the background of input channels not assigned to display channels.

Display assignment display image



SDI Video Formats

Supported Standard: HD, 3G-A, 3G-B-DL, HD(DL), 3G-B-DS, 3G(DL)-2K, 3G(DL)-4K, HD(QL), 3G(QL), 6G, 12G, 12G(QL), 12G(DL)

For more information on standards, see "SDI Input Format Standards" on page 15.

SDI Audio Formats and Standards

Supported Standard	SMPTE ST 299
Sampling Frequency	48 kHz
Quantization	24 bit
Format	L-PCM
Clock Generation	Generated from the video clock
Synchronization	Synchronized to the video signal All video and audio streams must be synchronized during Simul Display.
SDI Audio Channel Separation	
2K, 4K	Separates up to 16 channels into groups G1 to G4 from the specified SDI input
8K(QL)	Separates up to 32 channels into groups G1 to G8 from LINK1 (SUB1), LINK2 (SUB5), LINK3 (SUB9), and LINK4 (SUB13) of the SDI input
8K(DL)	Separates up to 32 channels into groups G1 to G4 from LINK1 (SUB1, SUB2) and LINK2 (SUB9, SUB10) of the SDI input

MADI Input Audio Formats and Standards

Supported Standard	AES-10
Sampling Frequency	48 kHz
Quantization	24 bit
Format	L-PCM
Clock Generation	Generated from the MADI input signal
MADI Audio Channel (*1)	
2K, 4K	Fix to 8ch or fix to 16ch
8K	Fix to 16ch or fix to 32ch

*1 MADI does not have the concept of audio groups, but groups of four channels are divided into G1 to G8 to provide operability similar to that of SDI embedded audio.

SDI Input Connector

Connector Type	BNC
Number of Input Connectors	4 (SDI INPUT 1, 2, 3, 4)
Input Impedance	75 Ω
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
5.940 to 11.880 GHz	-4 dB or more
Maximum Input Voltage	±1 V (DC + peak AC)
Eye Pattern Display	Select any of the input connectors from SDI INPUT 1 to 4 to show the eye pattern.

SDI Output Connector

Connector Type	BNC
Number of Output Connectors	4 (SDI OUTPUT 1, 2, 3, 4)
Output Impedance	75 Ω
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
5.940 to 11.880 GHz	-4 dB or more
Output Voltage	800 mVp-p ± 10 % (into 75 Ω)
Output Signal	Reclocked signal of SDI input (*1), TSG output
Reclocked Signal	Reclocks the SDI signals of SDI INPUT 1 to 4 and outputs them through SDI OUTPUT 1 to 4
Select Reclocked Signal	SDI OUTPUT 1 can reclock and output a signal from SDI INPUT 1 to 4 by switching. (*2)
Signal Generation Function	SDI OUTPUT 1 to 4 output SDI signals as a TSG

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

*2 Valid when the display assignment mode is set to off.

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 10 field IDs are supported.
Function	Video signal waveform display (*1) and phase difference (*2) display based on the phase of an external sync signal Waveform display of external sync signal (*3)

* 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.

*1 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
- HD(DL)'s 1080/60P, 1080/59.94P, 1080/50P
- 3G(DL), 3G(QL), HD(QL), 6G, 12G, 12G(QL), 12G(DL)
- Frame frequency 48P, 47.95P

*2 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
- 12G(DL)

*3 Waveform display using an external sync signal is not possible for the following formats.
- HD(DL), 3G(DL)-2K, 3G-B-DS, 12G(For 4K 2-screen display)

MADI Input/Output Connectors

MADI Input Connector

Connector Type	BNC
Number of Input Connectors	1
Input Impedance	75 Ω
Maximum Input Voltage	±1 V (DC + peak AC)

MADI Output Connector

Connector Type	BNC
Number of Output Connectors	1
Output Impedance	75 Ω
Output Signal	Reclocks the MADI signals of MADI INPUT
Output Voltage	450 mVp-p ± 10 % (into 75 Ω)

Monitor Output Connector

SDI Output Connector

Function	Output the displayed screen to an SDI monitor
Output Connector	BNC
Number of Output Connectors	1
Output Impedance	75 Ω
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	10bit	1920×1080	60/59.94/50 /I	SMPTE ST 274
			60/59.94/50 /P	

Synchronization	Synchronized with the LCD refresh rate (free run or frequency synchronization with the external reference signal(*1))

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
Synchronization	Synchronized with the LCD refresh rate (free run or frequency synchronization with the external reference signal(*1))
Touch Control	Touch control possible by connecting the USB touch panel interface of a touch panel monitor to the LV5900A (*3)

*1 Frame (field) frequencies 24 Hz and 23.98 Hz are not supported.
*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 LV5900A.

Headphone Output

Output Connector	One 3.5 mm mini jack (stereo)
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)

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, data dumps, and loudness log data
USB Mouse Feature	Used to control on the screen
Touch panel monitor	Touch control of the displayed screen (*1,*2)

Ethernet Port

Supported Standard	IEEE802.3
Supported Protocol	
TELNET (*3)	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
Type	10Base-T, 100Base-TX, 1000Base-T
Function	Remote control from an external PC, file transfer, status information query

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 activate tally, and start, stop, and clear the loudness measurement
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

RS-422/485 Connector

Supported Protocols	
Leader	Receives tally, camera ID, and camera iris signals and displays them
TSL UMD Protocol	Tally (TALLY-1, TALLY-2), camera ID (LABEL-1) reception display
Supported Versions	UMD 3.1, UMD 4.0
Port Type	RJ-45
Number of Ports	2

*1 Pinch out and swipe operations are not supported.
*2 LEADER does not guarantee that all touch panel type monitors will work with the LV5900A.
*3 You cannot use TELNET and the LV7290 at the same time.

Front Panel

Display

LCD Type	9-inch color TFT
Resolution	1920×1080P
Refresh Rate	60 Hz, 59.94 Hz, 50 Hz (free run or frequency synchronization with the external reference signal(*1))
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.

*1 The LCD refresh rate changes automatically depending on the frame rate of the external reference signal.

Frame Rate of the External Reference Signal	LCD Refresh Rate
23.98Hz	Free run
24Hz	Free run
25Hz	50Hz
29.97Hz	59.94Hz
30Hz	60Hz

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.

Frame Capture (4K 2-screen display is not supported)

Function	Captures frame data
Input Signal	SDI signal
Display	Displays only the captured frame data or superimposes the captured frame data over the input signal
Media	Internal memory (RAM) and USB memory Stores 1 frame or 16 consecutive frames (4 frames for 8K, 32 frames for some formats) in the internal memory
Data Output	Saved to DPX or TIFF format to a USB memory device or to a file format that the instrument can load (FRM). (*1)
Data Input	Data saved to a USB memory device can be loaded and displayed on the instrument. (*2)
Capture Timing	Manual and automatic (error capture)
Error Capturing	Automatically captures frame data when an error occurs
Error Location Search	Can be searched on Frame Capture Viewer

*1 Only FRM format is supported for 8K.
*2 An input signal in the same format as the frame data is required.

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.

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

Display

Number of simultaneously displayed SDI input signals

HD、3G-A、3G-B-DL	4
HD(DL)	2
3G-B-DS	1
3G(DL)-2K	2
3G(DL)-4K	1
HD(QL)	1
3G(QL)	1
6G	1
12G	
4K 2-Screen Display On	2
4K 2-Screen Display Off	1
12G(QL)	1
12G(DL)	1

Display Mode

Single display	Displays a single input signal
Simul Display	Displays two or more input signals simultaneously
4K 2-Screen Display	For 4K 12G, displays two channels of 4K input signals simultaneously (*1)

Display Assignment Mode (Only HD, 3G-A, and 3G-B-DL are supported)

Maps the input video signal of a channel to multiple areas (*2)

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

Function	Freely arrange the windows shown with the WFM, VECT, PIC, AUDIO, STATUS, and EYE keys (one of each), and a window consisting of six displays shown with MULTI
Display Format	Displays up to four 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 four 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 four quadrants per screen.
V Aligned Mode	The display contents arranged in the display are shown in four vertical divided windows per screen.
H Aligned Mode	The display contents arranged in the display are shown in four horizontally divided windows per screen.

Enhanced Layout

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.

3G-B-DS Display Format

Aligned Display	The screen is divided into windows.

Time Display

Displayed Contents	Current time, time code
Current Time Display	The time based on the internal clock
Time Code Display	LTC, VITC
Supported Standard	
LTC, VITC	SMPTE ST 12-2

Tally Display

Remote Connector	Turn on and off the tally display by controlling through the remote connector
RS-485 Control	Shows tallies through RS-485 control

Camera ID Display

Instrument Setting	Shows the camera ID set with the instrument's menu RS-485 Control Shows the camera ID through RS-485 control Iris Display
RS-485 Control	Shows the iris through RS-485 control

*1 The signals that can be displayed simultaneously are the 4K input signals of SDI INPUT 1 and 2 or the 4K input signals of SDI INPUT 3 and 4.
Apply signals with the same format to both channels.

*2 Simultaneous display of HDR and normal picture or CINEZONE and normal picture is possible.
However, there is a limit to the number of channels that can be displayed. This can be set only for HD/3G-A/3G-B-DL single link. It cannot be set for 4K signals or SDI system that transmits multiple lines.

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 YCBCR signal into an RGB signal and displays the result
Channel Assignment	GBR or RGB order
Pseudo-Composite Display	Artificially converts component signals into composite signalsand 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, HD(DL) (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, HD(DL) (1080/60P, 1080/59.94P, 1080/50P)	
Y Signal	±0.5 % (1 to 30 MHz)
CBCR Signal	±0.5 % (0.5 to 15 MHz)
Low-Pass Attenuation	≥ 20 dB (at 20 MHz)

Horizontal Axis

Line Display	
Display Format	Overlay (1H, 2H) (*1) Parade (1H, 2H, 3H) 4Y parade (4H)
Magnification	×1 / ×10 / ×20 / ACTIVE / BLANK
Field Display	
Display Format	Overlay (1V, 2V) (*2) 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 Adds an HDR scale to each scale for HDR
External Sync Signal Waveform Display
Compatible SDI Systems Can be displayed for HD, 3G-A, 3G-B-DL, 12G(1-screen display), 6G, 3G(QL), 3G(DL)-4K, HD(QL), 12G(DL), and 12G(QL)
Features Waveform display of external sync signal
Vertical Axis
Gain ×1
Variable Gain CAL
Horizontal Axis
Line Display
Display Format 1H, 2H
Magnification ×1
Field Display
Display Format 1V, 2V
Magnification ×1
Scale
Type %
Display Colors 7 colors to choose from

*1 2H display is not possible when the input signal is 4K.
*2 2V display is not possible when the input signal is progressive.

Vector Display

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
Component display 0.620 to 6.240
Pseudo-composite display 0.570 to 5.700
Amplitude Accuracy ±0.5 %
Scale
Type AUTO, ITU-R BT.709, DCI, ITU-R BT.2020
Color Bar Saturation 75%, 100%
IQ Axis Show or hide
Display Colors 7 colors to choose from
Variable Scale ON, OFF
ARIB Check Marker OFF, STD-B66, STD-B72
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 CB position as a percentage
Cr Displays the CR 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(4K 2-screen display is not supported) Displays the Y, R, G, and B histograms
5-Bar Display (4K 2-screen display is not supported)
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 (8K is not supported.) Displays the selected line
Low-Pass Filter The same as for gamut errors

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 1024 to 255 (8bit)
Display Sizes Reduced, 1/4 8K (8K only), actual size (4K 2-screen display or 8K is not supported), ×2 (4K and 8K are not supported.), full frame (4K and 8K are 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)
Aspect Marker Display
17:9 aspect ratio 16:9, 14:9, 13:9, 4:3, 2.39:1
16:9 aspect ratio 17:9, 14:9, 13:9, 4:3, 2.39:1, 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 (*2) Displays markers in the gamut error and level error areas

*1 AFD Supports only HD-SDI.
*2 Errors are not displayed for the 4K 2-screen display.
* 8K signals are down converted internally to 4K and then displayed.
* For the 4K 2-screen display, signals are down converted internally to 2K and then displayed

Superimpose Display (4K 2-screen display or 8K is not supported)

Displays English closed captions, European closed captions, and Japanese closed captions over the picture
English Closed Caption
Supported Standards (Mapping Standards)
EIA-708 SMPTE ST 334
EIA/CEA-608-B (EIA-708-B) SMPTE ST 334
EIA/CEA-608-B (EIA/CEA-608-B) SMPTE ST 334
Supported Video Formats HD, 3G-A, 3G-B-DL, HD(DL) (close caption decoding only for link A), 3G(DL)-2K (3G-B not supported, close caption decoding only for link 1), 3G(DL)-4K (close caption decoding only for link 1), HD(QL) (close caption decoding only for link 1), 3G(QL) (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 OP47
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 HD, 3G-A, HD(DL) (close caption decoding only for link A), HD(QL) (close caption decoding only for link 1), 3G(QL) (3G-B not supported, close caption decoding only for link 1), 6G (close caption decoding only for sub 1) 12G (close caption decoding only for sub 1)

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
Loudness Synchronization	Simultaneous measurement with loudness measurement

CINELITE Display (4K 2-screen display is not supported)

Function	Video levels are displayed numerically.
f Stop Display	Displays f Stop values relative to a reference point Set in reference to an object with an 18% reflectance f Stop gamma correction (not supported on the HDR)
Fundamental Gamma	ITU-R BT.709, hybrid log gamma (HLG), PQ, S-Log3
User Correction	Table 3 types (data acquired with a real device)
% Display (SDR)	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%
Gradation Display	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
CV Display	Decimal, hexadecimal Displays the SDI signal code value as YC_BC_R or RGB according to the input signal (only for measurement size 1×1)
HDR Display	
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	
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

CINELITE Advanced Display (4K 2-screen display is not supported)

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 CB position as a percentage
Cr	Displays the CR 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	
	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)

CINEZONE Display (4K 2-screen display is not supported)

CINEZONE Display (SDR)

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

CINEZONE display (HDR)

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%)

* 8K signals are down converted internally to 4K and then displayed.

Focus Assist (4K 2-screen display is not supported)

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

* 8K signals are down converted internally to 4K and then displayed.

CIE Chromaticity Diagram Display(4K 2-screen display is not supported)

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	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.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, PQ, S-Log3, C-Log, Log-C
Line Select	Displays the selected line

HDR Display

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
Function	
Video Waveform Display	Scale, cursor
Vector Display (4K 2-screen display is not supported)	
	Histogram
Picture Screen (4K 2-screen display is not supported)	
HDR CINEZONE (*1)	
HDR CINELITE	
MAX CLL, MAX FALL (CEA861 compliant)	
START	MAX CLL, MAX FALL computation start
STOP	MAX CLL, MAX FALL computation stop

* 8K signals are down converted internally to 4K and then displayed.

Audio Display

Input Signal	SDI embedded audio, MADI
Format	L-PCM
Sampling Frequency	48 kHz
Quantization	24 bit
SDI Embedded Audio	
Supported Standard	
3G, HD, HD(DL)	SMPTE ST 299
Clock Generation	Generated from the video clock
Synchronization	Must be synchronized to the video clock. All SDI signals must be synchronized.
Channel Separation	
2K, 4K	Separates up to 16 channels into groups G1 to G4 from the specified SDI input
8K(QL)	Separates up to 32 channels into groups G1 to G8 from LINK1(SUB1), LINK2 (SUB5), LINK3 (SUB9), and LINK4 (SUB13) of the SDI input
8K(DL)	Separates up to 32 channels into groups G1 to G4 from LINK1(SUB1, SUB2) and LINK2 (SUB9, SUB10) of the SDI input

MADI	
Supported Standard	AES-10
Sampling Frequency	48 kHz
Quantization	24 bit
Format	L-PCM
Clock Generation	Generated from the MADI input signal
MADI Audio Channel	
2K, 4K	Fix to 8ch or fix to 16ch
8K	Fix to 16ch or fix to 32ch
Number of Display Channels	
SDI embedded audio signal	
2K, 4K 16 channels max.	
8K 32 channels max.	
MADI Signal	
2K, 4K Fix to 8ch or fix to 16ch	
8K Fix to 16ch or fix to 32ch	

* MADI does not have the concept of audio groups, but groups of four channels are divided into G1 to G8 to provide operability similar to that of SDI embedded audio

Display Types	Level meter, Lissajous, correlation meter, surround (8K is not supported.), status, loudness
Level meter	
Displayed Channels	
2K, 4K	8ch, 16ch
8K	16ch, 32ch
Dynamic Range	
SDI Embedded Audio	-60 dBFS, -90 dBFS, reference level±3 dB
MADI	-60 dBFS, -90 dBFS, reference level±3 dB
Meter Response Model	TRUE PEAK, PPM type Ⅰ, PPM type Ⅱ, 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	
Displayed Channels	
2K, 4K	2ch×1 2ch×4 2ch×8
8K	2ch×8 2ch×16
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 to L8, R8
Surround Display (8K is not supported.)	
Function	Displays a graphical representation of a sound field
Surround Format	5.1ch
Channel Mapping	L, R, C, LFE, Ls, Rs, Lt, Rt
Center Channel Format	NORMAL, PHANTOM CENTER
Gain	×1, AUTO

* Only CH Mode 8ch is supported.

Status Display	
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 (*1)	Counts the number of times that the input signal's parity bit and the parity bit recalculated by the instrument differ
Validity Error (*1)	Counts the number of times that the input signal's validity bit is 1
CRC Error (*1)	Counts the number of times that the CRC of the channel status bits and the calculated CRC are different
Code Violation (*1)	Counts the number of times that the state of the input signal's biphase modulation is abnormal
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

*1 This feature is not supported during MADI input.

Loudness Display (4K 2-screen display is not supported)

Function	Loudness chart display, numeric display, log, level meter display, peak value display
Supported Standard	ITU-R BS.1770, ARIB TR-B32, EBU R128, ATSC A/85
Measurement Channel	Simultaneous measurement of two audio sources
2K, 4K	
Mode (Main)	Monaural, stereo, 5.1, user specified channel
Mode (Sub)	Off, monaural, stereo
Channel	Selection User-defined assignment of eight channels
LFE Gain	0 to 10 times
8K	
Mode (Main)	22.2, 5.1, stereo
Mode (Sub)	Off, 5.1, stereo
Channel	Fixed assignment
LFE Gain	0 to 10 times
Measurement Trigger	Manual (panel), remote, timecode, mute
Measurement Mode	BS1770, ARIB, EBU, ATSC, CUSTOM
Target Level	
BS1770	-24.0 LKFS
ARIB	-24.0 LKFS (±1 LK)
EBU	-23.0 LUFS (±1 LU)
ATSC	-24.0 LKFS (±2 LK)
CUSTOM	-25.0 to -23.0 LKFS
Average Time	
Momentary Loudness	200 to 10000 ms
Short-term Loudness	200 to 10000 ms
Chart Display	
1 During Audio Measurement	Graph display of integrated loudness and momentary or short-term loudness
2 During Audio Measurement	Graph display of integrated, momentary, or short-term loudness
Measurement Time	2min, 10min, 30min, 1hour, 2hour, 6hour, 12hour, 24hour
MAG	Zoomed display of the target level from -18 to +9 (LK/LU)
Numeric Display	Absolute value and relative value displays of integrated loudness and momentary or short-term loudness
Integrated Loudness	Displayed in red when the target level range is exceeded
Momentary, Short-term Loudness	Displayed in red when the target level is exceeded
Log	
Log	Time Up to 24 hours
File	
Log	Saves gating block loudness in CSV format
Summary	Saves settings and measurement results in text format
Level Meter Display	
2K, 4K	Displays level meters for eight channels
8K	Displays level meters for 32 channels
Peak Value Display	Displays peak values of a measurement channel numerically

* For 2K or 4K, loudness display is possible only when CH Mode is set to 8ch.
For 8K, loudness display is possible only when CH Mode is set to 32ch.

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, 6G	L-5.5CUHD
3G, HD	LS-5CFB, 1694A
Display Range	
12G, 6G	< 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
Precision	
12G, 6G, 3G, HD	±20 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
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 (4K 2-screen display is not supported)
8K signals are down converted internally to 4K and then detected.

- 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
- Black Line Error: Detects consecutive black-level lines as error lines and displays the start line number and end line number of the consecutive error lines
  - Black Level Specification: 0 to 100 %
- 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:1MHz	HD:2.8MHz
HD 1280×720	Approx.1MHz	Approx.2.8MHz
HD 1920×1080 (frame rate≦30Hz)	Approx.1MHz (IEEE STD 205)	Approx.2.8MHz
HD 1920×1080 (frame rate＞30Hz)	Approx.2MHz	Approx.5.5MHz
HD 2048×1080 (frame rate≦30Hz)	Approx.1MHz (IEEE STD 205)	Approx.2.8MHz
HD 2048×1080 (frame rate＞30Hz)	Approx.2MHz	Approx.5.5MHz
4K 3840×2160 (frame rate≦30Hz)	Approx.4MHz	Approx.11MHz
4K 3840×2160 (frame rate＞30Hz)	Approx.8MHz	Approx.22MHz
4K 4096×2160 (frame rate≦30Hz)	Approx.4MHz	Approx.11MHz
4K 4096×2160 (frame rate＞30Hz)	Approx.8MHz	Approx.22MHz

  - 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
  - HD, 3G-A, 3G-B-DS: PICTURE, stream 1, stream 2
  - 3G-B-DL: PICTURE, link A, link B
  - HD(DL): PICTURE, link A, link B
  - 3G(DL)-2K: PICTURE, link 1, link 2
  - 3G(DL)-4K: PICTURE, link 1, link 2
  - 3G(QL), HD(QL): PICTURE, link 1, link 2, link 3, link 4
  - 6G, 12G: PICTURE, sub1, sub2, sub3, sub4
  - 12G(QL), 12G(DL): PICTURE, sub1 to sub16
- 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
  - Sub 1 to 16: Displays the HD sub image in a transmission structure.
- 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
  - HD, 3G-A, 3G-B-DL: External sync signal, Ach
  - 3G-B-DS: External sync signal
  - HD(DL): External sync signal, Ach, Cch
  - 3G(DL)-2K: External sync signal, Ach, Cch
  - 3G(DL)-4K: External sync signal, Ach, Cch
  - HD(QL), 3G(QL): External sync signal, Ach
  - 6G, 12G: External sync signal
  - 12(DL): Ach, Cch
  - 12(QL): External sync signal, Ach
- 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.

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 to 8

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 (4K 2-screen display or 8K is not supported)

- Supported Video Formats: HD, 3G-A, 3G-B-DL,
  HD(DL) (close caption decoding only for link A),
  3G(DL)-2K (3G-B not supported, close caption decoding only for link 1),
  3G(DL)-4K (close caption decoding only for link 1),
  HD(QL) (close caption decoding only for link 1),
  3G(QL) (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 Program Description 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
User-Defined ANC Packet Display
DID, SDID
Y, C
Hexadecimal, binary

*1 Supported video formats are as follows:
HD, 3G-A, HD(DL) (close caption decoding only for link A), HD(QL) (close caption decoding only for link 1),
3G(QL) (3G-B not supported, close caption decoding only for link 1),
6G (close caption decoding only for sub 1), 12G (close caption decoding only for sub 1)
12G(QL) (close caption decoding only for sub 1), 12G(DL) (close caption decoding only for sub 1)

Lip Sync Display (4K 2-screen display is not supported)
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, MADI 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 andaudio signal setting

Eye Pattern

SDI Input Connector: SDI INPUT 1 to 4 (select an input terminal to display)
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: 12.5ps/div
6G: 25ps/div
3G: 50ps/div
HD: 100ps/div
4 UI Display
12G: 25ps/div
6G: 50ps/div
3G: 100ps/div
HD: 200ps/div
16 UI Display
12G: 100ps/div
6G: 200ps/div
3G: 400ps/div
HD: 800ps/div
Time Axis Accuracy: ±3%
Jitter Filte
10Hz: HPF 10Hz
100Hz: HPF 100Hz
1kHz: HPF 1kHz
100kHz: HPF 100kHz
TIMING: HPF 10Hz
ALIGNMENT
12G、6G: HPF 100kHz
3G、HD: HPF 100kHz
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

Jitter Display

SDI Input Connector: SDI INPUT 1 to 4 (select an input terminal to display)
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
×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, 6G
×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
1kHz HPF 1kHz
100kHz HPF 100kHz
TIMING HPF 10Hz
ALIGNMENT
12G、6G HPF 100kHz
3G、HD HPF 100kHz
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 except for 60/59.94/50P of HD(DL).

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

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

Camera ID Display

Number of Displays 2 (LABEL-1, LABEL-2) (*1)
Iris Display 1 (IRIS) (*1)
Control Method Instrument, RS-422/485 connector

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

TSG

Supported standards and Output Pattern

Refer to the table below for output patterns and supported standards.
See page16 for details on supported standards.

Scrolling (*1)
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 ON, OFF (*1)
Colors WHITE, YELLOW, CYAN, GREEN, MAGENTA, RED, BLUE, BLACK
Speed 1 to 3
Frequency Phase Adjustment (8K is not supported.) (*1, *2)
Quad link Vary the phases of SDI OUTPUT 2 to 4 independently relative to SDI OUTPUT 1
Dual link Vary the phase of SDI OUTPUT 2 relative to SDI OUTPUT 1 and the phase of SDI OUTPUT 4 relative to SDI OUTPUT 3
Adjustment Range ±0.5 lines (in unit of video clocks)
±1/2 frames (in unit of lines)
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 Either scrolling, moving box, or frequency phase adjustment can be turned on.
*2 The output phase may be off by ±2 clock from the specified value as a result of switching the format or turning on and off the power.
*3 For horizontal 8192/4096/2048 pixel format at frame rates 60, 59.94, 30, 29.97 Hz, only 8 channels are embedded.

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 Ⅱ
Pollution Degree 2
Power Requirements
Voltage 90 to 250 VAC
Frequency 50/60Hz
Power Consumption 300 W max.
Dimensions 223 (W) × 172 (H) × 360 (D) mm (excluding protrusions)
Weight 6.5 kg max. (excluding accessories)
Accessories Power cord 1
Cover/Inlet stopper 1
Instruction manual (CD-ROM) 1

Supported standards and Output Pattern
The following table shows the patterns that are output for each video signal format.

	supported standards								YCbCr/RGB on/off separately	YCbCr/RGB level adjustment separately	RGB level adjustment interlocking
Pattern	HD	3G-A、3G-B-DL	3G(DL)-4K	3G(QL)	6G	12G	12G(QL)	12G(DL)			
100% color bar	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
75% color bar	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
HD multiformat color bar (*)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
4K multiformat color bar (*)			Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Color raster	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gamma	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Cross hatch	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
10 step	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Limit lamp	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes		
Check field	Yes	Yes	Yes	Yes	Yes	Yes					
Lip sync pattern	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
HDR color bar (*)	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes		

*It cannot be set in horizontal 8192, 4096, 2048 and 1280 pixel format.

SDI Video Formats and Standards

HD video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	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	

3G-A video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	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
	12bit	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
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
YC_BC_R 4:4:4	10bit	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 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
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
	12bit	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	10bit	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 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
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
	12bit	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
XYZ 4:4:4	12bit	2048×1080	30/25/24 /P	SMPTE ST 425-1
			30/25/24 /PsF	SMPTE ST 428

3G-B-DL、HD(DL) video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	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
	12bit	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 SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
YC_BC_R 4:4:4	10bit	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 SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
	12bit	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 SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
RGB 4:4:4	10bit	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 SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
	12bit	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 SMPTE ST 425-1
			30/29.97/25/24/23.98 /PsF	SMPTE ST 2048-2
XYZ 4:4:4	12bit	2048×1080	30/25/24 /P	SMPTE ST 372 SMPTE ST 425-1
			30/25/24 /PsF	SMPTE ST 428

* When these signals are displayed, phase differences of up to 100 clocks (approx. 1.34 µs) between HD(DL) links are automatically corrected.

3G-B-DS video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	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	
		1280×720	60/59.94/50/30/29.97/25/24/23.98 /P	SMPTE ST 296 SMPTE ST 425-1

3G(DL)-2K video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	12bit	1920×1080	60/59.94/50 /P	SMPTE ST 274 SMPTE ST 425-3
			48/47.95 /P	-
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 2048-2 SMPTE ST 425-3
YC_BC_R 4:4:4	10bit	1920×1080	60/59.94/50 /P	SMPTE ST 274 SMPTE ST 425-3
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 2048-2 SMPTE ST 425-3
	12bit	1920×1080	60/59.94/50 /P	SMPTE ST 274 SMPTE ST 425-3
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 2048-2 SMPTE ST 425-3
RGB 4:4:4	10bit	1920×1080	60/59.94/50 /P	SMPTE ST 274 SMPTE ST 425-3
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 2048-2 SMPTE ST 425-3
	12bit	1920×1080	60/59.94/50 /P	SMPTE ST 274 SMPTE ST 425-3
		2048×1080	60/59.94/50/48/47.95 /P	SMPTE ST 2048-2 SMPTE ST 425-3

* When these signals are displayed, phase differences of up to 100 clocks (approx. 0.67 µs) between links are automatically corrected.
* 3G-A and 3G-B-DL links are supported.

3G(DL)-4K video signal formats and standards

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
Square YC_BC_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_BC_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

* 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.

HD(QL) video signal formats and standards(Square)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	3840×2160	30/29.97/25/24/23.98 /P	-
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	-
			30/29.97/25/24/23.98 /PsF	-

When these signals are displayed, phase differences of up to 100 clocks (approx. 0.67 µs) between links are automatically corrected.

3G(QL) video signal formats and standards(Square)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	3840×2160	60/59.94/50 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			48/47.95 /P	-
		4096×2160	60/59.94/50/48/47.95 /P	SMPTE ST 425-5 SMPTE ST 2048-1
	12bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
			30/29.97/25/24/23.98 /PsF	-
YC_BC_R 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
			30/29.97/25/24/23.98 /PsF	-
	12bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
			30/29.97/25/24/23.98 /PsF	-
RGB 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
			30/29.97/25/24/23.98 /PsF	-
	12bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
			30/29.97/25/24/23.98 /PsF	-
XYZ 4:4:4	12bit	4096×2160	30/25/24 /P	SMPTE ST 425-5 SMPTE ST 428
			30/25/24 /PsF	-

3G(QL) video signal formats and standards(2 sample interleave)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	3840×2160	60/59.94/50 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			48/47.95 /P	-
		4096×2160	60/59.94/50/48/47.95 /P	SMPTE ST 425-5 SMPTE ST 2048-1
	12bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
YC_BC_R 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
	12bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
RGB 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
	12bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
XYZ 4:4:4	12bit	4096×2160	30/25/24 /P	SMPTE ST 425-5 SMPTE ST 428

* When these signals are displayed, phase differences of up to 100 clocks (approx. 0.67 µs) between links are automatically corrected.
* 3G-A and 3G-B-DL links are supported.

6G video signal formats and standards (2 sample interleave)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_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

12G video signal formats and standards (2 sample interleave)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	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
	12bit	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_BC_R 4:4:4	10bit	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
	12bit	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	10bit	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
	12bit	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

* For 4K 2-Screen Display Off, if you input 12G-SDI signal without the Sync Bit Insertion, the instrument displays "NO SIGNAL" and cannot receive the signal.

12G(QL) video signal formats and standards(Square)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	7680×4320	60/59.94/50/48/47.95/P	-
		8192×4320	60/59.94/50/48/47.95 /P	-
YC_BC_R 4:4:4	10bit	7680×4320	30/29.97/25/24/23.98 /P	-
		8192×4320	30/29.97/25/24/23.98 /P	-
	12bit	7680×4320	30/29.97/25/24/23.98 /P	-
		8192×4320	30/29.97/25/24/23.98 /P	-
RGB 4:4:4	10bit	7680×4320	30/29.97/25/24/23.98 /P	-
		8192×4320	30/29.97/25/24/23.98 /P	-
	12bit	7680×4320	30/29.97/25/24/23.98 /P	-
		8192×4320	30/29.97/25/24/23.98 /P	-

* 8K video is divided into four parts of 4K size, up, down, left and right, and the 4K size is divided by 2 sample interleave system.
Upper left: LINK1, upper right: LINK2, lower left: LINK3, lower right: LINK4.

12G(QL) video signal formats and standards(2 sample interleave)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	7680×4320	60/59.94/50/48/47.95/P	SMPTE ST 2082-12
		8192×4320	60/59.94/50/48/47.95 /P	-
YC_BC_R 4:4:4	10bit	7680×4320	30/29.97/25/24/23.98 /P	SMPTE ST 2082-12
		8192×4320	30/29.97/25/24/23.98 /P	-
	12bit	7680×4320	30/29.97/25/24/23.98 /P	SMPTE ST 2082-12
		8192×4320	30/29.97/25/24/23.98 /P	-
RGB 4:4:4	10bit	7680×4320	30/29.97/25/24/23.98 /P	SMPTE ST 2082-12
		8192×4320	30/29.97/25/24/23.98 /P	-
	12bit	7680×4320	30/29.97/25/24/23.98 /P	SMPTE ST 2082-12
		8192×4320	30/29.97/25/24/23.98 /P	-

12G(DL) video signal formats and standards(2 sample interleave)

Color System	Quantization	Image	Frame Frequency/Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	7680×4320	30/29.97/25/24/23.98/P	SMPTE ST 2082-11
		8192×4320	30/29.97/25/24/23.98/P	SMPTE ST 2082-11

HD video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	1280x720	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	

3G-A、3G-B-DL video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	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_BC_R 4:4:4	10bit	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
RGB 4:4:4	10bit	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

3G(DL)-4K video signal formats and standards

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
Square YC_BC_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_BC_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

3G(QL) video signal formats and standards(Square)

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	3840×2160	60/59.94/50 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			48/47.95 /P	-
		4096×2160	60/59.94/50/48/47.95 /P	SMPTE ST 425-5 SMPTE ST 2048-1
YC_BC_R 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
			30/29.97/25/24/23.98 /PsF	-
RGB 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			30/29.97/25/24/23.98 /PsF	-
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
			30/29.97/25/24/23.98 /PsF	-

*3G-A and 3G-B-DL links are supported.

3G(QL) video signal formats and standards(2 sample interleave)

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	3840×2160	60/59.94/50 /P	SMPTE ST 425-5 SMPTE ST 2036-1
			48/47.95 /P	-
		4096×2160	60/59.94/50/48/47.95 /P	SMPTE ST 425-5 SMPTE ST 2048-1
YC_BC_R 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1
RGB 4:4:4	10bit	3840×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2036-1
		4096×2160	30/29.97/25/24/23.98 /P	SMPTE ST 425-5 SMPTE ST 2048-1

* 3G-A and 3G-B-DL links are supported.

6G video signal formats and standards(2 sample interleave)

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_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

12G video signal formats and standards(2 sample interleave)

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	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_BC_R 4:4:4	10bit	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	10bit	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(QL) video signal formats and standards(2 sample interleave)

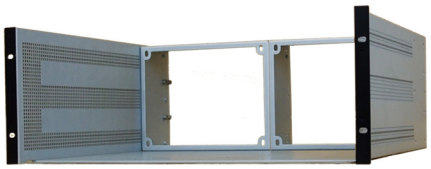
Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	7680×4320	60/59.94/50/48/47.95/P	SMPTE ST 2082-12
		8192×4320	60/59.94/50/48/47.95 /P	-
YC_BC_R 4:4:4	10bit	7680×4320	30/29.97/25/24/23.98 /P	SMPTE ST 2082-12
		8192×4320	30/29.97/25/24/23.98 /P	-
RGB 4:4:4	10bit	7680×4320	30/29.97/25/24/23.98 /P	SMPTE ST 2082-12
		8192×4320	30/29.97/25/24/23.98 /P	-

12G(DL) video signal formats and standards(2 sample interleave)

Color System	Quantization	Image	Field Frequency /Scanning	Supported Standard
YC_BC_R 4:2:2	10bit	7680×4320	30/29.97/25/24/23.98/P	SMPTE ST 2082-11
		8192×4320	30/29.97/25/24/23.98/P	-

Related accessories

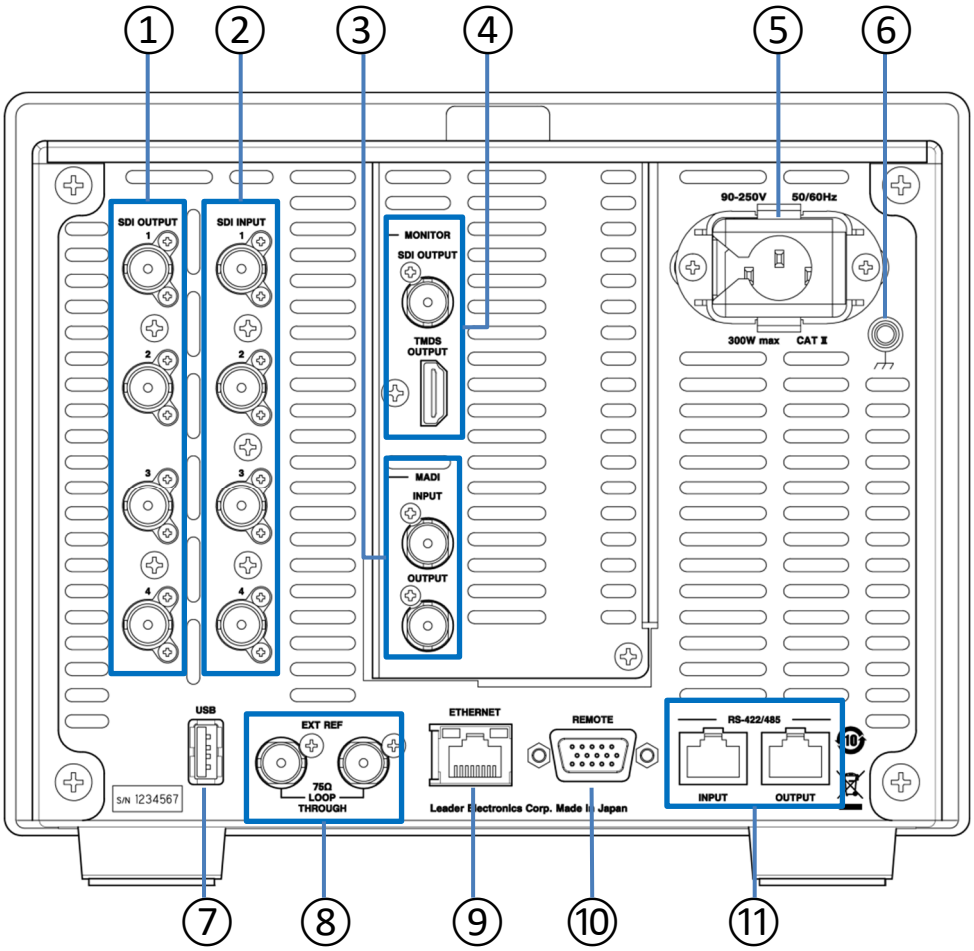
LR2490 Rack Mount Adapter
The LR2490 is a dual rack mount adapter used to install LV5900A waveform monitors into a 19-inch EIA standard rack.
It allows two LV5900As to be installed side by side.
Applicable model: LV5900A



LC2190 Blank Panel
The LC2190 is a blank panel for the LR2490 rack mount adapter. It can be used when installing a single LV5900A waveform monitor into the LR2490.
Applicable model: LV5900A

LV7290 REMOTE CONTROLLER
The remote controller LV7290 is used to remotely control either waveform monitors or rasterizers (LV5900A/LV5600/LV5350/LV5300A/LV7600/LV7300/LV7390) via Ethernet.
Connection is via ETHERNET on the rear of the product.
One remote controller can be connected to up to 8 waveform monitors or rasterizers. (Note, multiple LV7290s cannot be used with a single monitor or rasterizer.)
Dimensions and weight: 482(W) X44(H) X110(D) mm (excluding protrusions)
Weight : 1.2 kg

Rear panel



1 SDI OUTPUT
2 SDI INPUT
3 MADI
4 MONITOR
5 AC inlet
6 Ground terminal
7 USB
8 EXT REF
9 ETHERNET
10 REMOTE
11 RS-422/485

www.leader.co.jp/en

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Safety Precautions

In order to use the product correctly and safely, carefully read the instruction manual prior to first use.

April 2022