LPX500

Quad-input Waveform Monitor with
Dual-independant displays
for Hybrid IP/SDI workflows

LeaderPhabrix

Introducing the LPX500 Waveform Monitor

The LPX500 Hybrid IP/SDI waveform monitor is the first in a powerful new family of video analysis and generation instruments, encompassing next generation technology from the renowned Leader and PHABRIX Test and Measurement brands. The LPX500 offers a bank of four autonomous analyzers, enabling the simultaneous display of four 4K SDI or IP video source inputs.

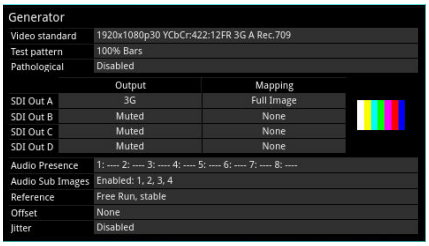
Re-designed, compact form factor

Housed in a fully re-designed and compact form factor, the LPX500 offers an 8-inch touchscreen and short depth, ideal for locations with limited rack space, including OB trucks. An independent second compact 8-inch touchscreen display is also offered via a dedicated USB-C connection. Using its built-in noVNC, the LPX500 also offers fast access to both displays over a remote network.

Quad 12G-SDI and dual 100GE-IP inputs

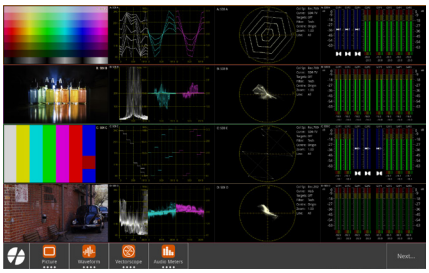
Supplying a bank of four autonomous analyzers, the LPX500 enables the simultaneous display of four 4K inputs, HDR and SDR inputs or even SDI and IP inputs. The instrument offers a 10G-IP toolset with dual SDI analyzer support as standard, and advanced Physical Layer Analysis (Eye and Jitter) offered as factory fitted options. The LPX500's comprehensive feature-set is designed to support SD/HD/3G/6G/12G-SDI, 10GE/25GE/100GE IP interfaces with SD/HD/UHD, SMPTE 2022-6, SMPTE ST 2110-10/20/30/31/40 with ST 2022-7, and AMWA NMOS.

Optional software licenses can also be added for SDI/IP AV Test Signal Generation, UHD/4K support, HDR, EUHD (47.95-60p RGB YCbCr 444 formats), 25GE and 100GE IP support.



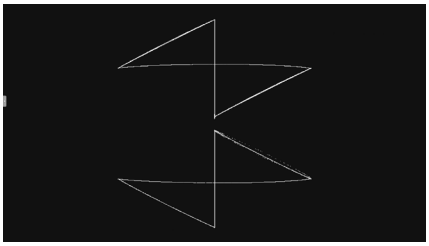
Up to 100G-IP/12G-SDI Audio & Video Generation and Analysis

Generate and analyze a comprehensive set of SDR/HDR, YCbCr/RGB, HD/3G/6G/12G SDI and HD/3G/6G/UHD/EUHD IP Formats. The LPX500 can simultaneously generate and analyze 1x ST 2110-20 video, 4x ST 2110-30/31 audio and 1x ST 2110-40 ANC. In ST 2022-7 mode, LPX500 compares the video, audio and ANC flows from A & B networks. LPX500 can also generate the instrument display as 1 x ST 2110-20 and 1 x 2110-30 flows for access by remote monitoring locations. The SDI pattern-set offers up to 32 channels of embedded audio per link or subfield (up to 64 channels on 12G interfaces) and core full screen SDI Pathological stress patterns as well as allowing the user to define conventional generator patterns up to full frame.



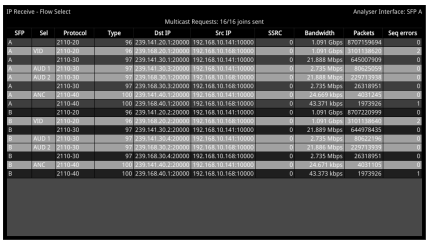
Powerful enhanced instrument layouts

Enhanced layouts not only extend the available screen real estate but now feature swipe gestures to navigate through configured layouts. Multiple screen layouts provide a huge canvas of extended screen real estate to move smoothly between up to 16 layouts, optimizing the viewing and touch experience on the unit.



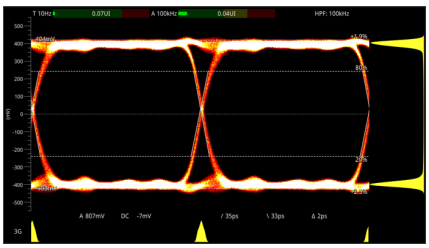
Out-of-the-box Video and Audio Analysis & Monitoring Toolset

A brand new RGB Vector Display instrument provides a tool to monitor gamut violations in production environments. Picture view, waveform monitor, vectorscope, 32 channel audio metering, decoded audio channel status information, ANC status and payload, on screen display of OP47 and CEA-608 in 708 closed captions and Ancillary Time Code (ATC), Loudness monitoring, and advanced control and logging with human readable event logs are all provided as standard.



Advanced suite of IP Monitoring Tools

IP media interfaces are provided as standard in the LPX500. This 10G/25G/100G IP enabled waveform monitor supports JT-NM TR 1001-1:2018, 2110-20 (video), 2110-30 (PCM audio), 2110-31 (AES transport), and 2110-40 ANC media flows all with 2022-7 Seamless Protection Switching, and independent PTP followers on both media ports for fully-redundant media network operation.



Fast, automated 12G-SDI Physical Layer Analysis

The Physical Layer Toolset is a factory-fitted option for fast 12G/6G/3G/HD/SD-SDI physical layer commissioning, testing and development. Its RTE™ (Real-Time Eye) Technology instantly highlights any SMPTE compliance issues and its realtime SDI jitter window provides simultaneous monitoring across five specified frequency bands, With its unique RTE™ (Real-Time Eye) multi-rate physical layer display, and automated SMPTE compliance measurements, the LPX500 offers a single product solution for SDI compliance verification.

An interface that puts you in control

Second, independent, touchscreen

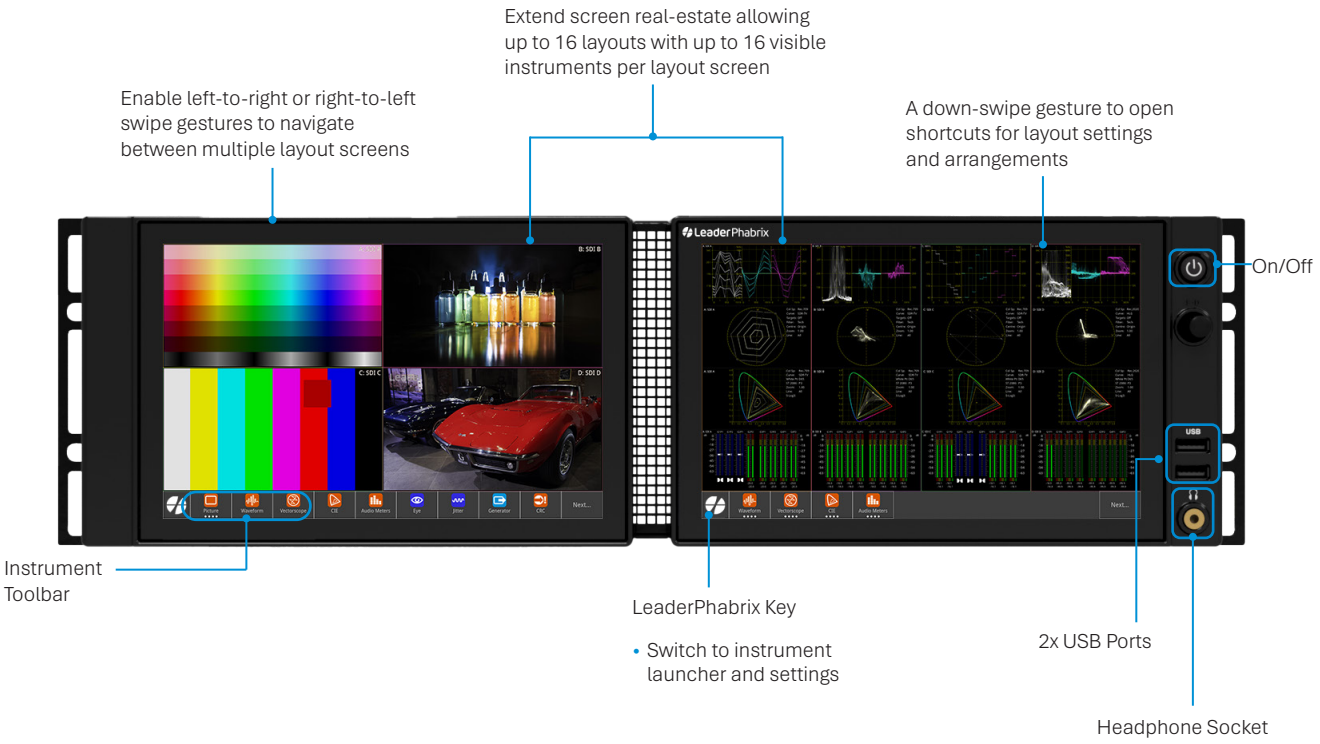
A second, compact screen unit can now optionally extend the unit's local display capabilities, allowing you to control the unit from either physical screen. The second screen is also touch-enabled and supports the same gestures as the primary screen on the main unit. Connection to the second display is over a dedicated USB-C connector.

Further remote screen output combinations are also available to output either screen, from either the DisplayPort or SDI Mon BNC display outputs. In addition, dual built-in VNC clients considerably improve the performance of the remote connection to either display over noVNC.

Enhanced layouts and gestures

Following the innovative app style interface of PHABRIX instruments, the LPX500 hides the complexity of modern SDI and IP systems providing an uncluttered view of critical information.

The enhanced layouts designed for the LPX500 not only extend the available screen real estate but now feature swipe gestures to navigate left or right through configured layouts and precise tap, hold and slide for instrument placement. Multiple screen layouts provide a huge canvas of extended screen real estate enabling you to move smoothly between instrument layouts, optimizing the viewing and touch experience on the unit.



Single or Multi Display Layout Modes

Layout capabilities are further extended in the LPX500 by Single or Multi display modes and analyzer link features. Switching between display modes enables you to switch the Analyzers to which your instruments are connected.

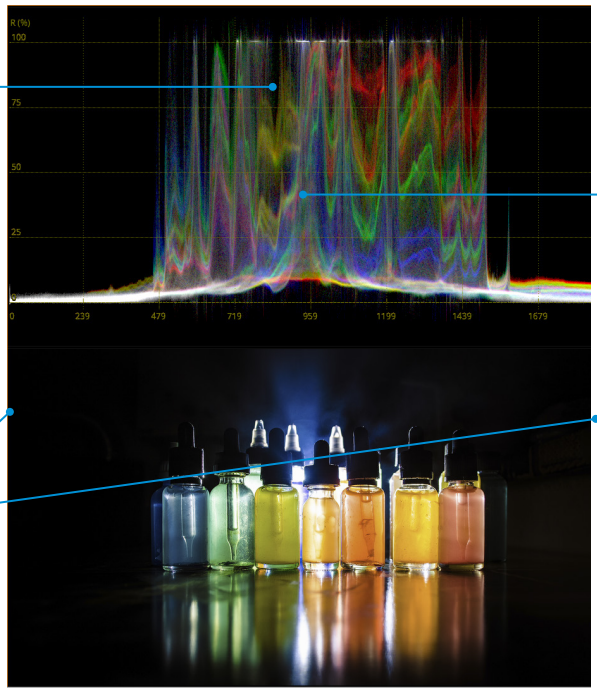
- **Single Mode**: All configured layout screens use the same Analyzer channel but you can switch between analyzer channels through the display mode shortcuts, context menu dropdown, toolbar softkeys, etc.
- **Multi Mode**: Allows instruments in the layout to connect to multiple analyzers.

Introducing our enhanced waveforms

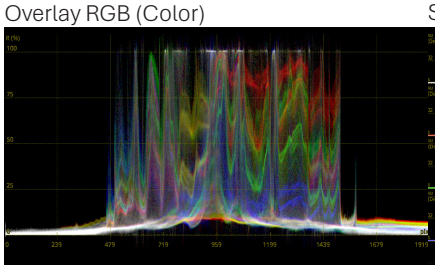
Utilizing a patented technique to efficiently deliver a high-resolution image processing pipeline with support for deep color sources up to 12-bits, our new waveform instrumentation delivers all the fine detail required for Camera Shading, Image Grading or critical QC of both SDR and HDR content.

A choice of Overlay, Stacked and Parade display modes are provided each with the option of multi-colored, highlighted, green or monochrome traces. The flexibility to display YCbCr, RGB, YRGB, YGRB and individual components is retained along with connected instrument cursor linked to Picture and Data view, and user markers linked to Vectorscope. Single Line Mode and H and V magnification are available for detailed inspection.

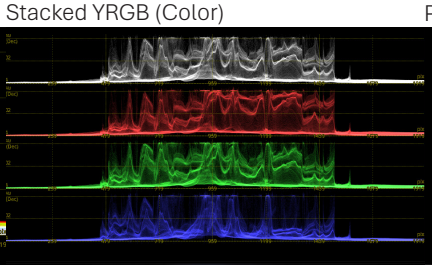
Luminance Nits scales and user-controlled Nits markers are provided for SDR, HLG, PQ, S-Log3, SR-live HDR formats. Both SMPTE-narrow and full-range operation are supported along with matrices for 709, 2020 and DCI P3 over a wide-range of YCbCr:422, RGB:444, SDI, 2110, HD/2K/UHD/4K/EUHD formats.



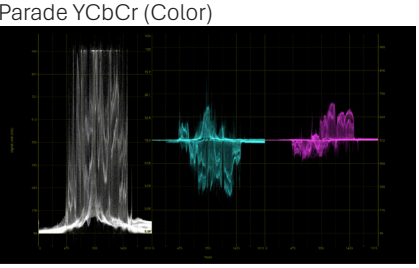
Overlay RGB (Color)



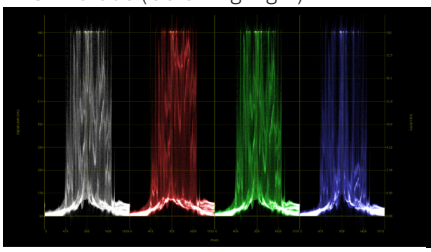
Stacked YRGB (Color)



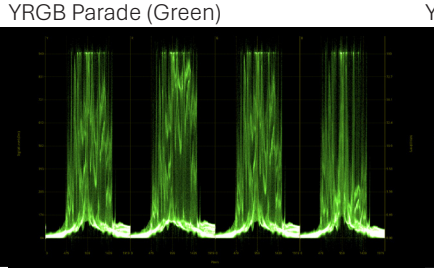
Parade YCbCr (Color)



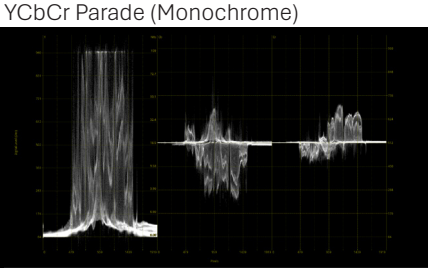
YRGB Parade (Color Highlight)



YRGB Parade (Green)



YCbCr Parade (Monochrome)

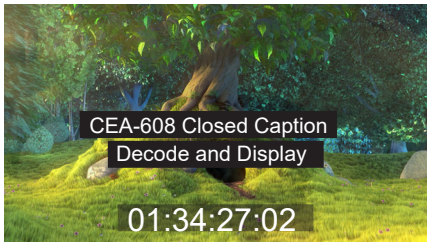


Standard Toolset

Picture view, waveform monitor, vectorscope, a new RGB vector tool, 32 channel audio metering, decoded audio channel status information, ANC status and payload, on screen display of OP47 and CEA-608 in 708 closed captions and Ancillary Time Code (ATC), Loudness monitoring, and advanced control and logging with human readable event logs and remote operator GUI access over noVNC are all provided as standard.

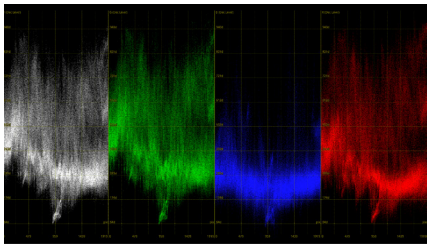
Picture Display

- Cursors linked to Waveform and Data View
- Action, graphics and user-definable custom safe areas
- 1/16, 1/4 or full size display



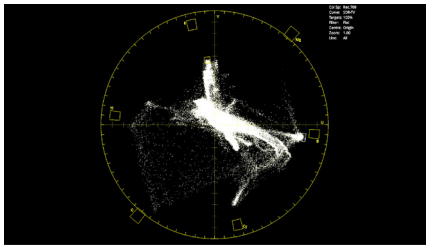
Auxiliary Data Decode

- Closed Captions OP47, CEA-608 in 708
- Primary Closed Caption decode picture window
- ANC Timecode with OSD
- Date, V-chip, AFD and Input name
- SCTE 104 indication and logging



Analyzer - Waveform

- YCbCr, YGBR and GBR display modes
- Cursor linked to Picture and Data View, Single line mode linked to Picture Cursor
- Configurable H and V Graticules
- User markers
- Overlay, Stacked, Parade, Single line, H & V Mag, Brightness, Persistence and Monochrome controls
- Horizontal or Vertical Measurement cursors

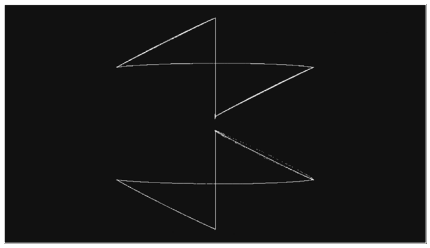


Analyzer - Vectorscope

- 75% and 100% Targets for ITU-R Rec. 709, Rec. 2020 and HDR formats
- Custom 'user markers' linked to Waveform
- Center on target or custom user markers
- 0.5x to 4x Mag, center on chosen target
- Single line mode linked to Picture Cursor
- Tooltip display of Cb, Cr and Hue Angle

Analyzer - Ancillary Status

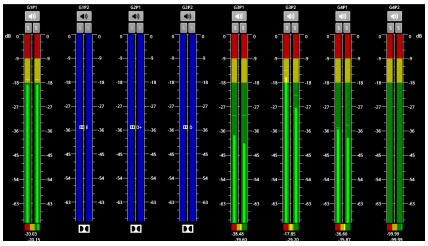
- SMPTE ST 291 VANC/HANC ancillary data presence/status window
- Grid View – clear visual overview, present/absent/fault indication
- List View–ANC present list with location & status information for Checksum, Parity, DBN
- Link to ANC Inspector
- Tooltip provides ST 291 ANC type overview, when operating via a mouse



RGB Vector Display

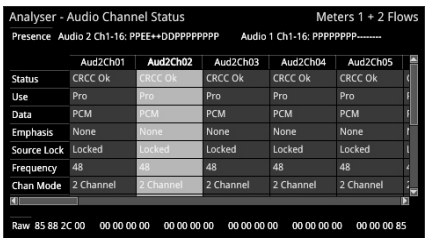
- Monitor gamut violations
- Support for both RGB vector and split RGB vector views
- Switchable display modes between raw and interpolate. Raw displays the individual pixel dot values, interpolate joins adjacent pixels with a line
- Selectable EBU R103 low pass horizontal filtering
- Configurable alarms for gamut violations including alarms for exceeding 1% EBU
- R103, percentage of pixel area and lower / upper gamut threshold levels

Standard Toolset



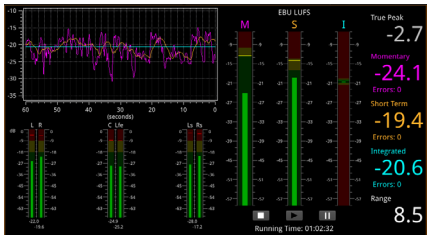
Analyzer - Audio Meters

- In Single layout: 2x meter windows can be opened, each monitoring a block of up to 16 channels, for a total of up to 32 channels
- In Multi layout : 4x meter windows can be opened, each monitoring up to 16 channels , for a total of 64 channels
- 2110 audio group display across up to 4 flows
- Ballistics: PPM-I, PPM-II, Vu, Vu-Fr, Fast
- Scales: dBFS, dBu -18, dBu -20, BBC, DIN45406, NordicN9
- Adjustable peak hold times: Off, 0.1 s to Inf
- Audio pair correlation meters, numerical level
- Detection of Dolby E, ED2, DD, DD+, DE line pos
- Stereo/mono audio preview bus



Audio Status

- 32 channel indication of audio type and presence, PCM, Dolby E, DD, DD+, ED2
- Decoded channel status information for up to 32 channels for SDI and 64 channels for IP
- Clear indication of useful audio parameters including CRC, PCM/data, sample frequency, word length
- Channel Status data view (Hex)

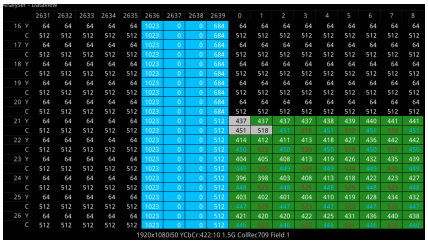


Loudness Monitoring

- EBU R128 and ITU-R BS.1770
- Indicators for true peak, range, momentary, short term and integrated loudness
- User control of integrated, momentary and short term targets
- User-adjustable true peak alarm threshold
- Loudness logging stored automatically

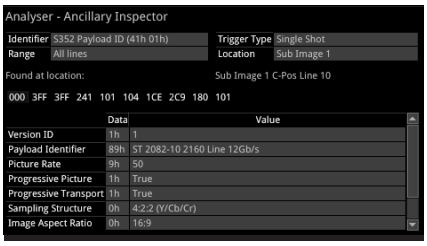
Data View Analyzer with ANC Inspector

The engineering grade Data View Analyzer and ANC Inspector tools provide easy, accessible visualization of the data on an SDI interface and associated ANC packets. Deep SDI data inspection with full freedom to inspect Active Picture, VANC, HANC and API controls to read back Active Picture Data under automation control is included. Also featured is ANC packet decapsulation and error reporting for detailed analysis and debug of ANC payloads.



Analyzer - Data View

- Allows analysis of complex faults
- Detailed view of data words in the SDI stream with tooltip hint
- Navigate function for rapid access to a required line, pixel or TRS word
- Color-coding to help identification
- Cursor linked to Picture and Waveform



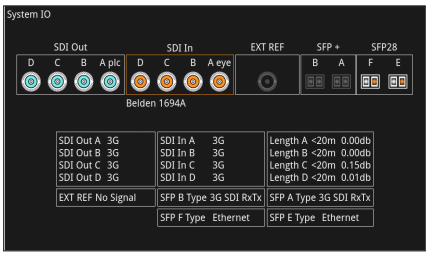
ANC Inspector

- Ancillary data packet analyzer
- Link from ANC Status window
- User-defined DID/SDID windowed search
- Trigger on error, single shot, continuous
- ANC packet capture with Hex view
- ANC packet decode view

Standard Toolset
IP I/O and Reference Config

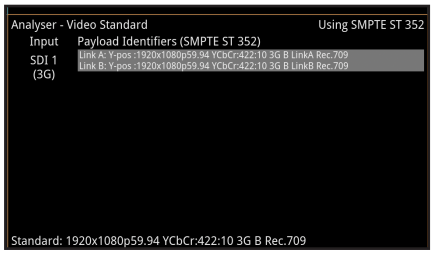
Video Timing & System Reference (2022-6)

- Measurement of the timing of inputs against reference
- Indication of reference status and stability
- Graphical and numeric display



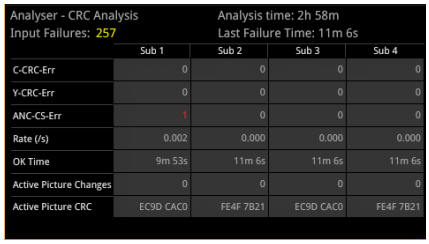
System IO (IP)

- Shows the status of signal inputs & outputs, external reference, cable length, and connector details
- IP: Active IP SFP receive inputs and transmit outputs are indicated



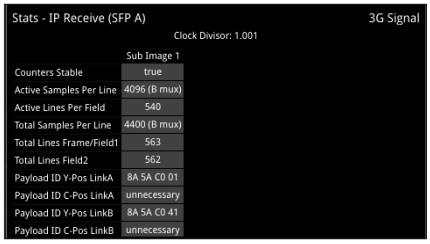
Analyzer - Video Standard (2022-6)

- Display of detected SMPTE ST 352 Payload ID for each SDI Link and Subframe
- Manual override of ST 352 ID
- Selection of SMPTE video format
- Indication of ST 352 errors



CRC Analysis (2022-6)

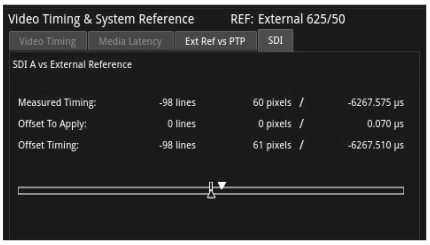
- Check for CRC errors on Y, C and ANC
- Reporting of the number of SDI input failures, the last failure time, total analysis time and error rates
- Detect active picture changes and view the active picture CRC to observe any changes in the expected active picture CRC value
- SDI switch line CRC masking control, for SMPTE RP168 compliance checking



Stats - IP Receive (2022-6)

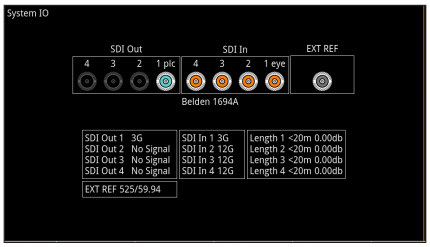
- Indication of data rate and clock divisor
- Reporting of active and total pixel and line counts
- Y and C payload ID

Standard Toolset
SDI I/O and Reference Config



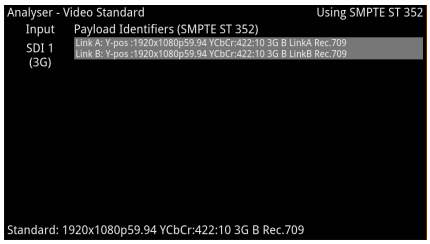
Video Timing & System Reference (SDI)

- Measurement of the timing of inputs against reference
- Indication of reference status and stability
- Indication of the relative co-timing of input SDI channels
- Graphical and numeric display



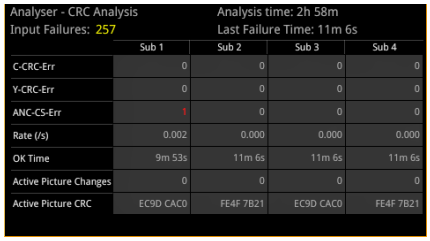
System IO (SDI)

- Shows the status of signal inputs & outputs, external reference, cable length, and connector details
- Select BNC, cable type, loop through and generator copy outputs



Analyzer - Video Standard (SDI)

- Display of detected SMPTE ST 352 Payload ID for each SDI Link and Subframe
- Manual override of ST 352 ID
- Selection of SMPTE video format
- Indication of ST 352 errors



CRC Analysis (SDI)

- Check for CRC errors on Y, C and ANC
- Reporting of the number of SDI input failures, the last failure time, total analysis time and error rates
- Detect active picture changes and view the active picture CRC to observe any changes in the expected active picture CRC value
- SDI switch line CRC masking control, for SMPTE RP168 compliance checking

Stats - SDI In (SDI)

- Cable length indication
- Indication of data rate and clock divisor
- Reporting of active and total pixel and line counts
- Y and C payload ID

Standard Toolset

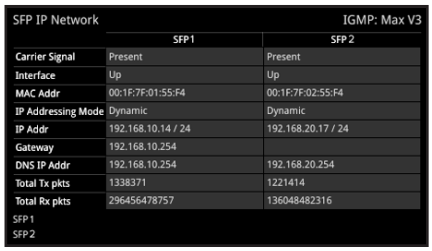
ST 2110 and ST 2022-6 Monitoring

The core IP feature set, provided as standard in the LPX500, offers an operator all of the ST 2110 confidence status monitoring in an intuitive and accessible manner.

The toolset supports simultaneous decapsulation of one video, four audio and one ANC Data flows. Supported SMPTE protocols include ST 2059 (PTP) ST 2110-20 (Uncompressed Video), -30 (PCM Digital Audio), -31 (AES3 Transparent Transport) and -40 (ANC Data). ST 2022-7 Seamless Protection Switching with AMWA NMOS IS-04, IS-05 and PTP system resource, is provided over two media network interfaces using industry standard optical ethernet SFPs. Audio handling conforms to ST 2110-30 Class C with support for 48 kHz streams from 1 to 10 channels at packet times of 1 ms and 1 to 64 channels at packet times of 125 µs.

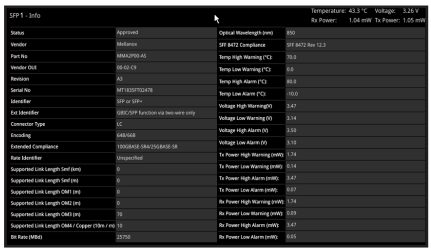
Also provides an indication of the timing relationship of each of the eight ST 2022-7 flows to PTP with status information, as well as a ST 2022-7 status tool that reports the health and relative timing skew of each ST 2022-7 pair, all with hardware time stamping.

SMPTE 2110 & 2022-6



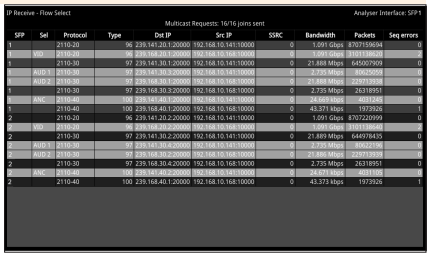
SFP IP Network

- Reporting of presence of SFPs, SFP MAC and IP addresses (flow source IP address), and interface status
- Tx and Rx packet counters for indication of traffic activity
- User configuration of SFP IP Addresses, Masks, Gateway and DNS addresses



SFP Information

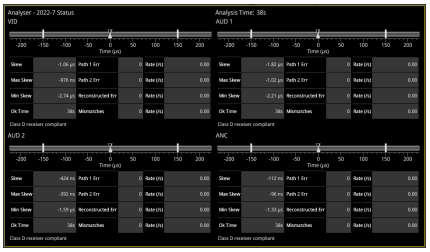
- SFP status information for monitoring the physical network connection
- Indication of SFP vendor and laser characteristics
- RX and TX power for debug of fiber connectivity



IP Receive Flows

- Reporting of the IP Flows available to the receiver and user selection of the required flows
- Indication of locked status, Protocol, Src and Dst IP and Port Numbers, SSRC, Packet Counts, Sequence, payload and CRC errors
- Configuration of Multicast Destination IP addresses and subsequent Multicast Join requests

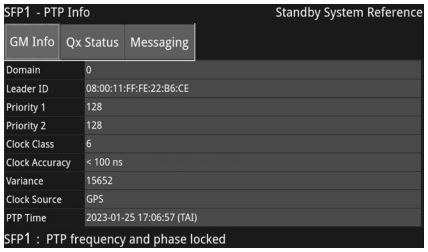
SMPTE 2110 & 2022-6



ST 2022-7 Status

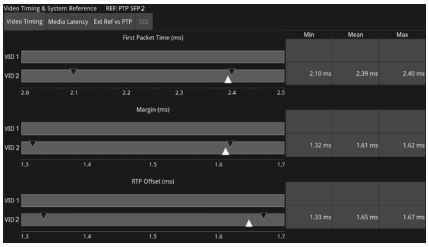
- Indication of the health of ST 2022-7 seamless protection
- Warning of ST 2022-7 flow-pair mismatch
- Warnings of errors on flows and errors on reconstructed output and error rates per second
- Class A, B, C, D markers

SMPTE 2110



ST 2110 PTP Info

- Control of PTP domain and communication mode (multicast, hybrid w/o negotiation)
- Indication of lock status
- Grandmaster information including leader ID and time source
- Indication of estimated frequency and phase lock offsets
- Indication of one step or two step traffic



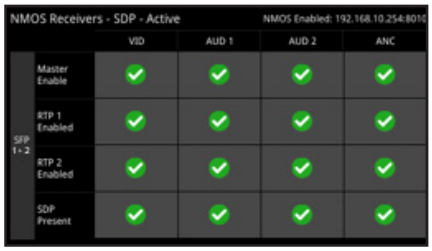
IP Flow Latency

- Indication of media latency
- Indication of relative timing of audio and ANC flows wrt video
- Indication of relationship of underlying media to PTP
- External analog reference timing wrt PTP

Standard Toolset

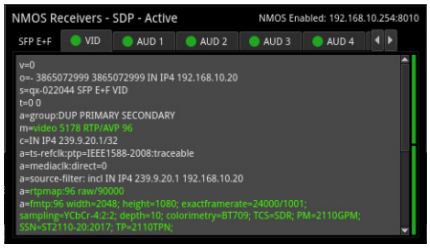
AMWA NMOS

A suite of AMWA NMOS tools provides flexibility when integrating with an NMOS controller and associated network topology. Supported protocols: IS-04 v1.0, 1.1, 1.2, 1.3 IS-05 1.02, 1.1 and IS-09 PTP domain. Provision of both in-band and out-of-band control topologies with manual, mDNS, DNS-SD and DHCP. Configure Senders and Receivers independently as single or dual NMOS end points. NMOS troubleshooting is aided by the simultaneous views of the state of both the Sender and Receiver Master and RTP Enables, SDP, and the IS-05 parameters. The receiver auto-detected video format and audio packet time and channel count are compared with the received SDP information for diagnosis of the format information supplied by the SDP record.



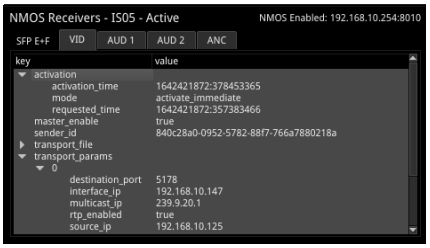
NMOS Receiver Status

- At a glance overview of the state of the receiver Master Enable, RTP Enables and SDP records for each media interface
- Available in 1/16 view - toggles with the SDP view
- Display of the Master, RTP and SDP of all Receiver flows



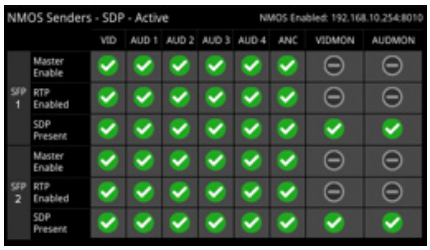
NMOS Receiver SDP

- Display of the active receiver SDP record
- User-configurable color highlighting for improved readability
- Display adapts with NMOS Dual or Single receiver configuration (single shown)



NMOS Receiver IS-05

- Display of the active receiver IS-05 parameters
- Individual tabs display IS-05 parameters for each receiver flow
- Human readable tree view of the IS-05 JSON with expand/collapse for rapid navigation
- Display adapts with NMOS Dual or Single receiver configuration (single shown)



NMOS Sender Status

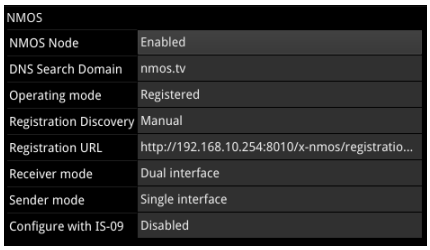
- At a glance overview of the state of the Sender Master Enable, RTP Enables and SDP records for each media interface
- Available in 1/16 view - toggles with the SDP view
- Display of the Master, RTP and SDP of all Generator flows
- Display of the Master, RTP and SDP status of all monitor GUI Interface flows

NMOS Sender SDP

- Display of the active sender SDP record
- User-configurable color highlighting for improved readability
- Display adapts with NMOS Dual or Single receiver configuration (dual shown)

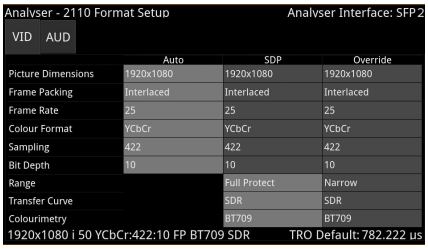
NMOS Sender IS-05

- Display of the active sender IS-05 parameters
- Individual tabs for the display of the IS-05 parameters for each generator and GUI sender flows
- Human readable tree view of the IS-05 JSON with expand/collapse for rapid navigation
- Display adapts with NMOS Dual or Single sender configuration (dual shown)



NMOS Setup

- Manual, mDNS or DNS-SD discovery of the Registry with DHCP
- Status reporting of registration and DNS domain
- Independent configuration of sender and receiver as single or dual NMOS endpoints
- NMOS node Enable/Disable
- IS-09 PTP Domain Enable/Disable
- Selectable NMOS endpoints

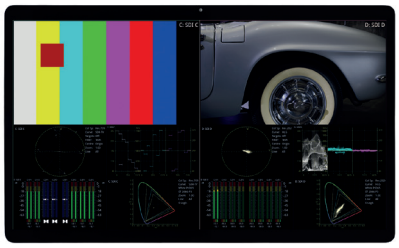


2110 Format Setup

- At a glance comparison of auto-detected, SDP and manual format settings
- User-configurable video format parameters for ST 2110-20 flows
- User-configurable audio format parameters for ST 2110-30/-31 flows includes packet time and channel count
- Automatic detection of audio format, channel count and packet time

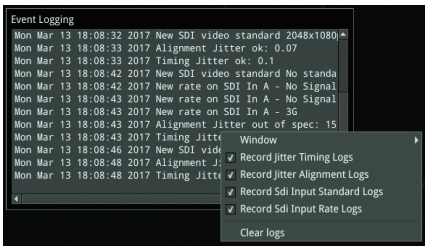
Remote Access

Various methods are provided to enable you to establish a remote connection with your LPX500, depending on your requirements.



noVNC

- Browser remote access using noVNC technology to deliver up to 16 simultaneous scalable instruments per display over a remote network



Event Logger

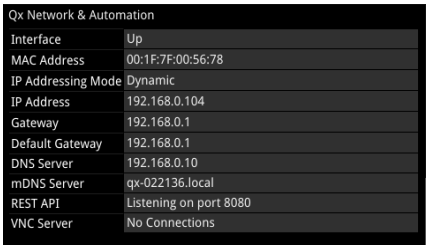
- SDI Input standard/status
- SDI physical layer timing and alignment jitter
- IP-Tx, IP-Rx, Flow and SFP records
- Reference Locking
- Audio input presence
- SCTE and REST AP request logs

LLDP Info — LLDP: Active

	SFP1 Neighbour	SFP2 Neighbour	Mgmt Neighbour
Sys Name	qx-022228	qx-022228	SIP-T48U
Sys Descr	PHABRIX LPX 1.0.0 2110	PHABRIX LPX 1.0.0 2110	108.85.179.10
Chassis ID	00:1F:7F:00:56:D4	00:1F:7F:00:56:D4	192.168.0.181
Port ID	00:1f:7f:02:56:d4	00:1f:7f:01:56:d4	80:5e:0c:58:88:3b
Port Descr	phabEth1	phabEth0	WAN PORT
Mgmt IP	192.168.0.103	192.168.0.103	
Primary VLAN	0	0	0

LLDP

- Identify port and device to which the LPX500 IP interfaces are connected
- Restrict information communicated over LLDP for IT security purposes
- Available in both ST 2110 and ST 2022-6



Qx Network & Automation

Interface	Up
MAC Address	00:1F:7F:00:56:78
IP Addressing Mode	Dynamic
IP Address	192.168.0.104
Gateway	192.168.0.1
Default Gateway	192.168.0.1
DNS Server	192.168.0.10
mDNS Server	qx-022136.local
REST API	Listening on port 8080
VNC Server	No Connections

Mgmt Interface Config

- Manual or Dynamic Addressing modes
- mDNS and DNS
- Select Default Gateway from Media or Management interfaces

USB File Manager

- Copy presets, instrument logs, screenshots and user TIFF images to and from USB memory stick
- Delete selected files

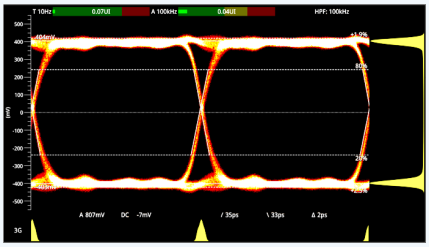
Remote Connectivity

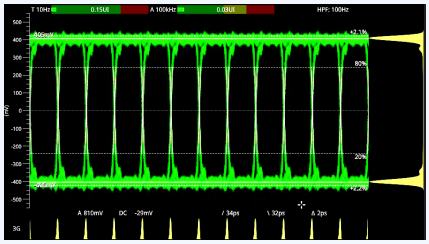
- File Transfer: FTP or Browser access to screenshots and PCAPs, User Test Patterns (TIFF), log files
- Remote Software Product Updates
- DisplayPort: UI video (1080p), UI audio (2-ch), local mouse
- SDI: UI video (1080p), UI audio (2-ch), local mouse
- noVNC: UI video (1080p high frame rate), remote mouse with screenshots
- KVM: HDMI or DVI (1080p compressed), remote mouse with screenshots
- ST 2110: UI (-20), Audio 2-ch (-30)
- Many KVM Options available - including Long Distance Connectivity, Cloud-based solutions, multiple access

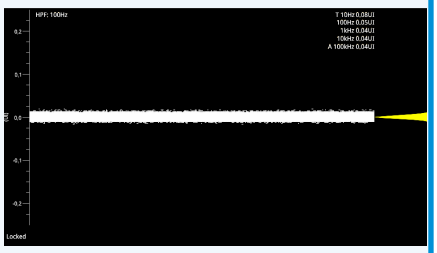
Optional Toolsets

Fast, automated 12G-SDI physical layer analysis
[LPX500ISE]

The Physical Layer Toolset is a factory-fitted option for fast 12G/6G/3G/HD/SD-SDI physical layer commissioning, testing and development. Its RTE™ (Real-Time Eye) Technology instantly highlights any SMPTE compliance issues and its realtime SDI jitter window provides simultaneous monitoring across five specified frequency bands, jitter histogram and video trigger options. Built-in automation control allows testing to be performed faster, more reliably and at lower cost. Included in the option are a full range of SDI eye measurements including amplitude, DC offset, transition times, overshoot and health indication with both amplitude and time histograms, as well as choice of color, heat-map overlays and infinite persistence display.







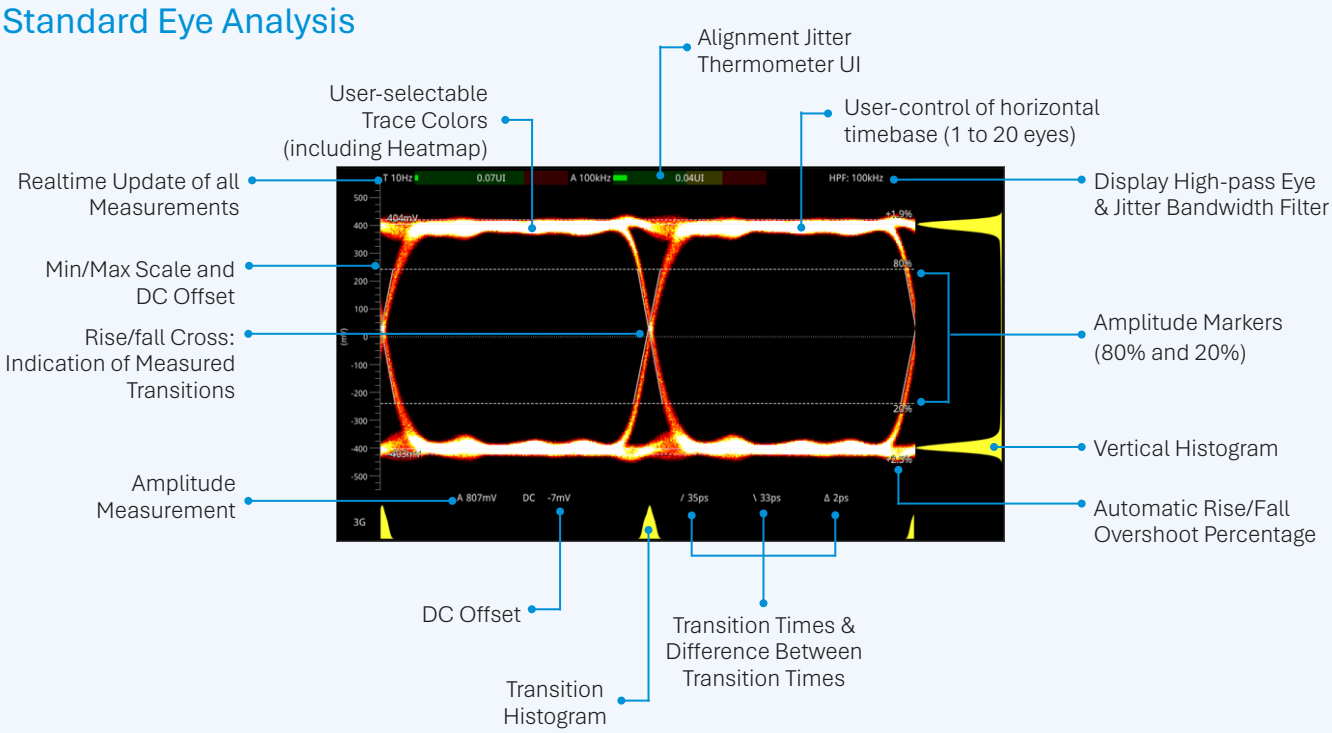
SDI EYE Analysis

- RTE™ (Real-Time Eye) for testing SMPTE compliance with indication of DC offset
- Automatic measurements of: DC level, amplitude, rise and fall time, rise/fall overshoot, visual rise time indication
- Amplitude and time histograms
- Single or multiple eyes with choice of color, heat-map overlay and infinite persistence
- Timing and Alignment jitter thermometers
- User-definable time measurement cursors

SDI Jitter Analysis

- Realtime SMPTE jitter measurements down to 10 Hz
- 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz filters
- H, 2H, F, V Trigger
- Persistence control none to infinite
- +/– 0.25 to +/– 64 UI vertical scale adjustment
- Jitter amplitude histogram

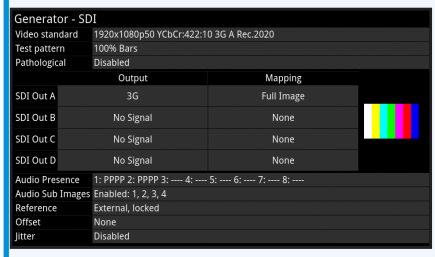
Standard Eye Analysis



Optional Toolsets

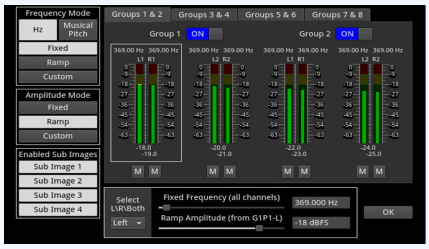
Audio and Video Generation
[Requires LPX500-GEN]

Simultaneously generate and analyze a comprehensive set of SDI and IP formats with the audio and video generation option. Moving test patterns with up to 32 channels of embedded audio per link or sub-field (up to 64 channels on 12G interfaces) is included. The Generator toolset option provides not only the core full screen SDI Pathological stress patterns (Eq, PLL, Clk, CheckField), but uniquely also allows the user to define a percentage combination of the SDI pathological and conventional generator patterns up to full frame. Importing TIFF files for checking of HDR/WCG graphics or display and evaluation with user-created test images is also included. The LPX500 offers a ST 2110-20 2K/HD, 4K/UHD video flow generator, 2110-30/-31 64 channel audio generator and 2110-40 ANC flow generator. It can also generate both pattern and UI 2022-7 flow pairs. The GUI as a flow offers 1 x ST 2110-20 user interface video and 1 x 2110-30/-31 2.0 stereo monitoring bus audio with ST 2022-7. An IP Transmit configuration tool provides an at-a-glance view of transmitted flow status and selected formats.



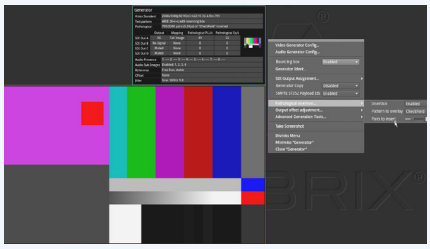
SDI Video Generation

- Confirms generated Video Standard and Test Pattern details
- BNC output, SFP output and sub-image/full image mapping information
- Reporting of SDI-STRESS pathological insertion statistics
- Moving test patterns (bouncing box)
- Import/display TIFF images



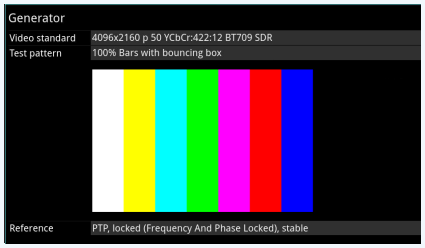
SDI Audio Generation

- Choice of fixed tones or chromatic scale – to assist channel identification
- Choice of fixed or ramp levels – to assist channel identification
- Custom config of number of active audio groups and channels
- Master gain control
- ST 2022-6: 32 channel audio generation can be replicated in all sub frames providing a total of up to 64 channels



SDI Pathological Generation

- Conventional SDI pathological stress patterns, Eq, PLL and CheckField
- New proposed SMPTE combined pathological stress pattern: Eq + PLL + Color Bars + Clock
- Define a percentage combination of SMPTE or SDI pathological and conventional patterns up to full frame



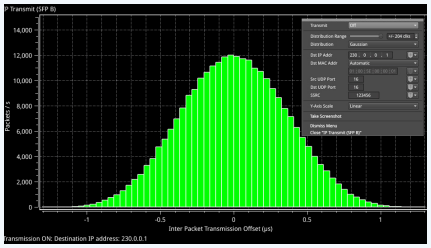
2110 Video/ANC Gen

- 2110: Generate ST 2110/2022-7 Test Signals as a flow
- 2110: Monitor (GUI) as a flow
- 2110-20: 2K/HD, 4K/UHD video flow generator (422/444, YCbCr/RBG, 10/12-bit)
- 2110-40: 1 x ANC flow generator
- Timecode Generator ATC_LTC, ATC_VITC, locked to PTP or Local Time with Jam Sync and Drop Frame, VITC1/2 Reverse and signaling of SDI Line number and H Offset
- Import of TIFF images
- Bouncing Box pattern movement
- ST 2110-20 EUHD 47.95-60p RGB YCbCr 444 formats [requires LPX500-EUHD]

2110 Audio Generation

- 2110: Generate up to four ST 2110/2022-7 audio flows
- 2110-30/-31: Up to:

  64 audio channels 2110-30 at 125 µs
  60 audio channels 2110-31 at 125 µs
  8 audio channels 2110-30 at 1 ms
  6 audio channels 2110-31 at 1 ms



IP Transmit (ST 2022-6)

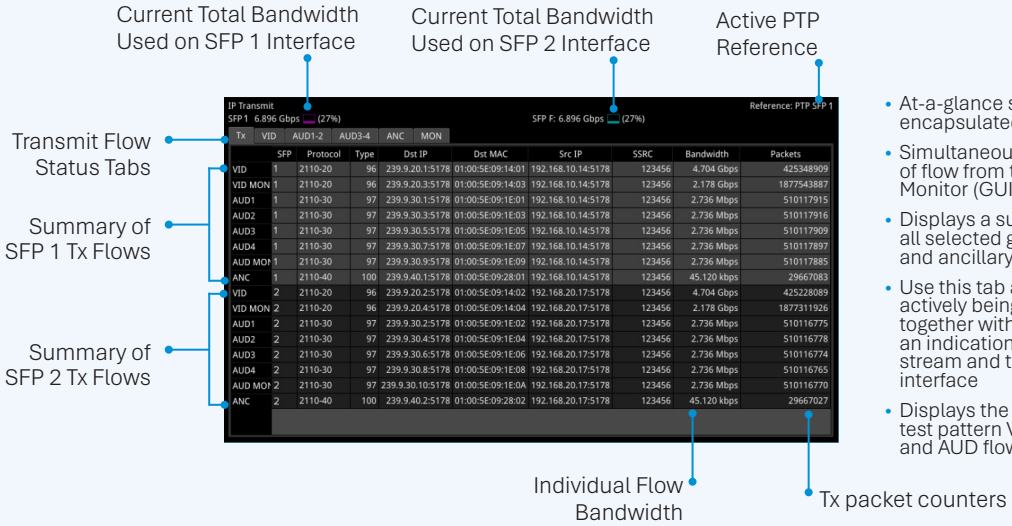
- Evaluate the ability of a receiver to handle a ST 2022-6 flow with jitter
- Configuration of Transmission flow addresses, port numbers and SSRC
- Inter-packet jitter onto outgoing flow
- Gaussian or uniform distribution
- Flow control on/off

Optional Toolsets

GEN IP

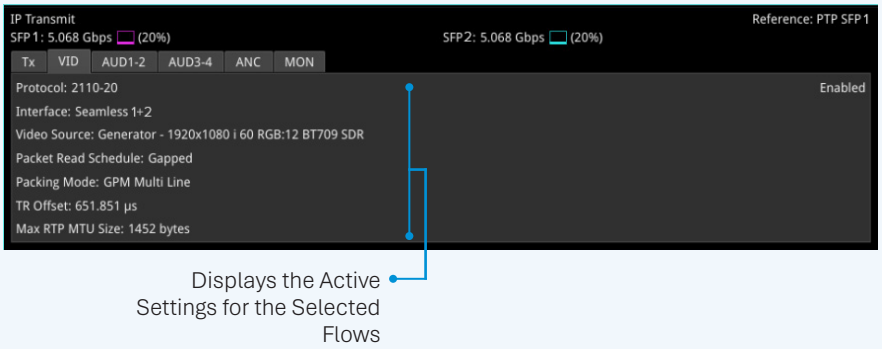
Audio and Video Generation [LPX500-GEN]

IP Transmit - Tx Status



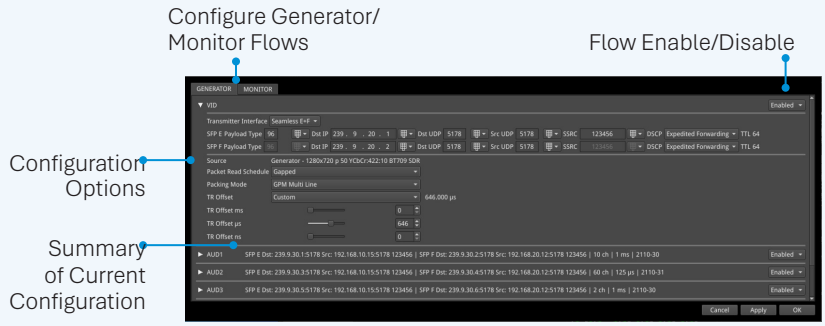
- At-a-glance status overview of all flows being encapsulated and transmitted
- Simultaneously transmit two different types of flow from the unit: Generator Flows and Monitor (GUI) Flows
- Displays a summary of the current status of all selected generator / monitor video, audio and ancillary flows being transmitted
- Use this tab as an overview of all flows actively being transmitted from the unit, together with the active PTP reference and an indication of bandwidth used by each stream and the total bandwidth used on each interface
- Displays the current information about the test pattern VID, AUD, ANC and monitor VID and AUD flows

IP Transmit - VID, AUD1-2, AUD3-4, ANC, MON Status



- The VID tab displays the active settings for the Video Generator: Protocol, Interface, Video Source, Packet Read Schedule, Packing Mode, TR Offset
- The AUD1-2, AUD3-4 tabs shows the active settings for the transmitted audio flows: Protocol, Packet Time, Channels, Audio Source
- The ANC tab displays the active settings for the Video Generator flows: Protocol, Interface, Packet Packing, Keep Alive, Timecode, TR Offset
- The MON tab displays the active settings for transmission of the Monitor flows: Protocol, Interface, Video Source, Packet Read Schedule, Audio Source, Packet Time, Channels,

Transmission Configuration



- List of available flows in an expandable list
- Each minimized flow provides a single line summary of the current settings for information
- Configure the VID, AUD1, AUD2, AUD3, AUD4 Generator Flows
- Configure the VID MON, AUD MON Monitor flows
- 2110-20: Gapped/Linear Packet Read Schedule, BPM/GPM Packing Mode
- SDI/Egress Time Stamp, user control of TR Offset
- 2110-40 ANC, Keep Alive and ATC-LTC or ATC-VITC Timecode locked to PTP or Local Time

Optional Toolsets

IP HDR

4K/UHD ST 2110 Extended UHD Format Support

[LPX500-EUHD] (Also Requires LPX500-UHD)

Out of the box the LPX500 supports YCbCr 4:2:2 and YCbCr/RGB 444 formats in 2110-20 up to a max payload of approx 12 Gbps. If you are working with Extended Reality (xR), fixed installation LED walls and Graphics Card applications, then the LPX500-EUHD option provides support for Analysis and Generation of UHD/4K YCbCr/RGB 444 formats in the range 47.95P – 60P.

EUHD Format Support

- Analysis of 2110-20 flows at UHD/4K 444 (RGB/YCbCr) 8/10/12 bit 47.95P-60P
- 4K60P RGB:12 Mean bandwidth approx. 20 Gbps (equivalent to a peak bandwidth of around 21 Gbps for a gapped flow)

High Dynamic Range (HDR) Visualization & Analysis Toolset

[LPX500-HDR]

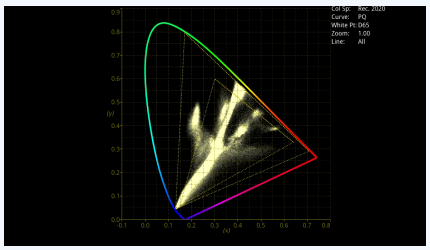
The LPX500's comprehensive HDR toolset includes a signal generator, CIE chart, Luma false color highlighting or heat map, waveform monitor and vectorscope. All the main live production SDR and HDR formats are supported: Standard Dynamic Range (SDR) BT.709, BT.2020 as well as HDR BT.2100 HLG, PQ, Sony S-Log3 and SR Live. The Waveform provides a Cd/m^2 (nits) graticule along with BT.2048 diffuse white markers. The flexible user controlled HDR heatmap offers 7 simultaneous programmable color overlay bands with presets for HDR and SDR ranges, plus a user custom preset. The CIE 1931 xy display provides overlays for BT.709, BT.2020 and ST.2086 gamut (P3) to enhance the visualization and analysis of your HDR / WCG content.

HDR Generator

An extensive set of test patterns include BT.2111 HDR color bars for HLG, PQ, S-Log3 and SR Live as well as a full set of SDR 709 patterns mapped via display light to each of the four HDR formats for line checks, comparative monitor set-up and the evaluation of HDR to SDR converters.

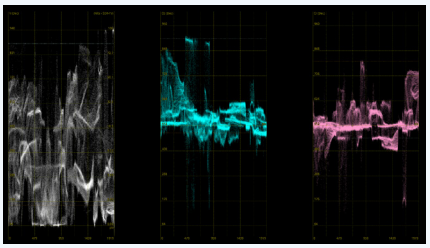
False Color Highlighting

- Programmable Heat Map to highlight luminance zones providing quick identification of shadows, skin or mid-tones or specular highlights
- Seven simultaneous programmable color overlay bands
- Presets for HDR and SDR ranges plus user custom



Analyzer - CIE Chart

- CIE 1931 xy display
- Single line mode linked to picture cursor
- Pan and zoom
- ITU-R BT. 709, BT. 2020 and ST 2086 gamut overlays
- Tooltip co-ordinate display
- Support for BT. 1886, BT. 2100 HLG and PQ, Sony S-Log3, SR Live



HDR Waveform

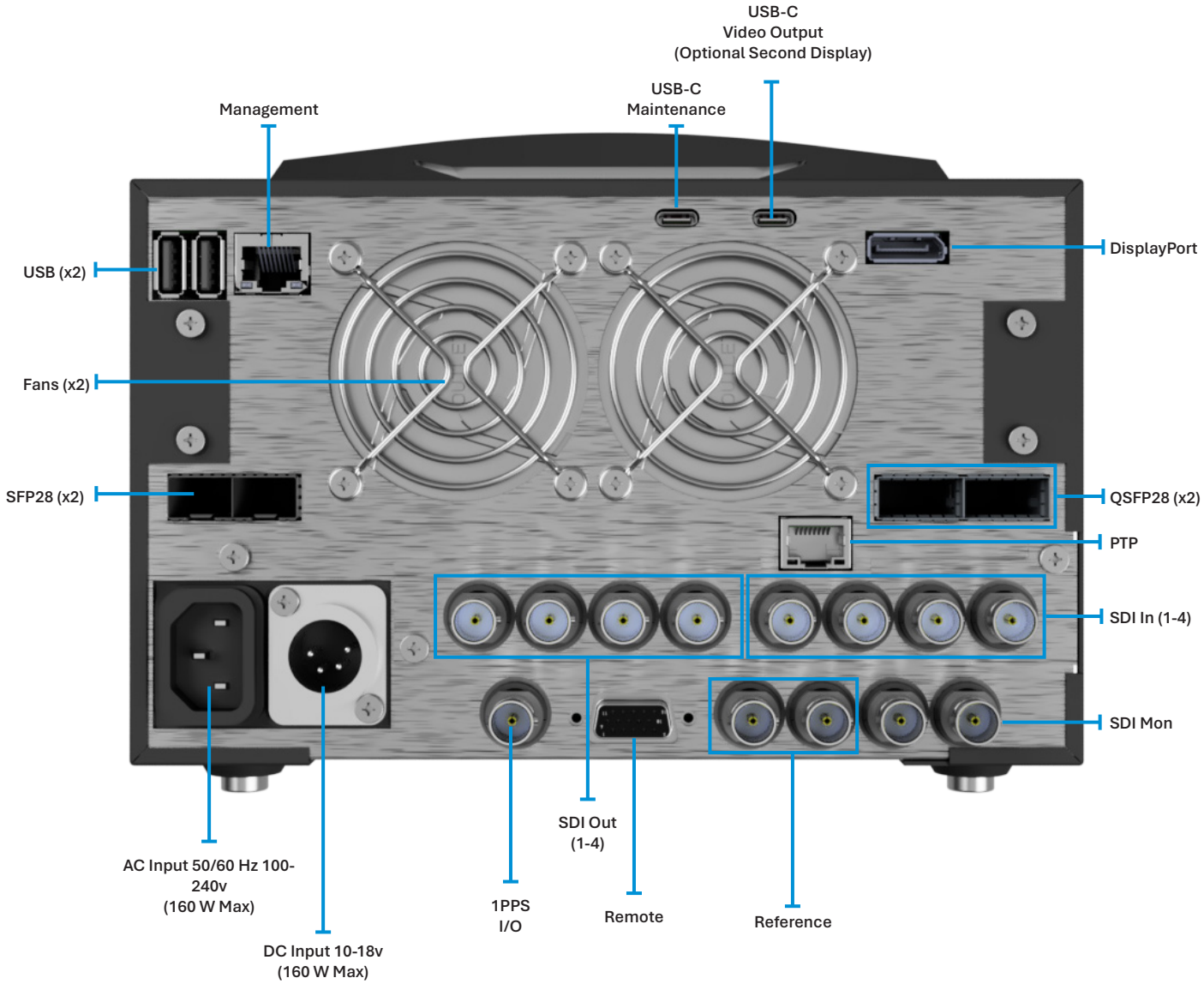
- Waveform HDR graticules with Nits (Cd/m²)
- BT. 2408 diffuse white markers
- Support for BT. 1886, BT. 2100 HLG and PQ, Sony S-Log3, SR Live

Specifications

Formats supported (Generation, Analysis & Monitoring)	
ST 2110-20/-30/-31/-40 / 2022-7 / 2022-6 Analysis over 10G Ethernet	●
ST 2110-20/-30/-31/-40 / 2022-7 / 2022-6 Analysis over 25G Ethernet	O
ST 2110-20/-30/-31/-40 / 2022-7 / 2022-6 Analysis over 100G Ethernet	O
ST 2110-20/-30/-31/-40 / 2022-7 / 2022-6 Generation	O
SDI IO	Factory Option
270M / 1.5G / 3G-SDI HD / SD Analysis	Factory Option
1.5G / 3G-SDI HD Generation	O†
1.5G / 3G / 6G / 12G-SDI UHD Over SDI	O†
25G IP Link Rates Over SFP28	O
100G IP Link Rates Over QSFP28	O
Hardware and Software Options Supported	
Audio / Video Generator (SDI, ST 2022-6, ST 2110)	O (SDI, 2022-6, 2110)
RTE™ Real-Time Eye input (12G/6G/3G/HD/SD-SDI) x 1 (SDI in 1) BNC	Factory Option
UHD / 4K Upgrade	O (SDI, 2110)
Data View Analyzer, ANC Status and ANC Inspector	●
32 Channel Audio Metering and 5.1/2.0 Loudness Measurement	●
64 Channel Audio Metering and 5.1/2.0 Loudness Measurement	O (Requires LPX500-QUAD)
HDR/WCG Support	O
ST 2022-6, ST 2110/20/30/31/40 Decap with Class C Audio, ST 2022-7, Single PTP	●
ST 2110 Network Traffic Measurement Toolset	O
ST 2110-20/30/31/40 Generator Toolset with Class C Audio, ST 2022-7	O
PCAP	O
EUHD Formats over 25G 2110-20	O
SDI inputs / outputs	
4 x SDI inputs, SD / HD / 3G / 6G / 12G, 75 ohm terminated BNC	Factory Option
4 x SDI outputs, HD / 3G / 6G / 12G, 75 ohm BNC	Factory Option
Ethernet inputs / outputs (accepts MSA SFPs and QSFPs)	
2 x SFP28, supporting 10G (standard) and 25G cages (optional)	● (25G license optional)
2 x QSFP28 100G cages	● (100G license optional)
Audio inputs / outputs	
2 channel 48 kHz PCM audio on DisplayPort and SDI Instrument output	●
User interface	
Integrated 1920 x 1200 8 inch LCD multitouch touchscreen	●
USB-C DisplayPort Alt Mode for secondary 8-inch touchscreen	O
DisplayPort instrument output, 1920 x 1080, 4:4:4 RGB, Type A*	DisplayPort
SDI 3Gbit instrument out, 1920 x 1080, 4:2:2 YCbCr*	BNC
ST 2110-20, ST 2110-30 instrument out, 1920 x 1080, 4:2:2 YCbCr*	●
Remote Browser GUI access (noVNC)*	●
Reference	
1 x 75 ohm BNC reference input, tri-level or B&B with cross lock	●
Networking & control	
10/100/1000 BASE-T	●
Leader Remote Interface (15 pin high-density D-Type socket)	●
Monitoring	
Headphone Socket (3.5mm)	●
Form factor	
LPX500 Size (Width x Height x Depth - excluding display bezel)	210mm x 127.3mm x 150 mm
Weight	3.6Kg
LPX500 Extended Monitor Size (Width x Height x Depth - excluding display bezel)	210mm x 127.3mm x 47mm
LPX500 Extended Monitor Size (Width x Height x Depth - including display bezel)	220mm x 133mm x 75mm
LPX500 Extended Monitor Weight	1.4Kg
Electrical	
4 pin XLR DC power connector	11v - 18v, Typ. 85W, Max. 120W
Internal AC power supply with IEC connector	100-240 VAC, Typ. 85W, Max. 120W
Warranty	
Warranty (1 year)	●
Extended Warranty Package (3 - 5 years)	O

† Requires SDI Factory Option * Secondary display support requires LPX500-EM ● Standard O Optional

Rear Panel - IO View



Ordering LPX500

LPX500 Chassis Options

LPX500I*	3U SD/HD/2K 10GbE IP Waveform Monitor/Analyser
LPX500IS	3U SD/HD/2K 10GbE IP/SDI Waveform Monitor/Analyzer
LPX500ISE	3U SD/HD/2K 10GbE IP/SDI Waveform Monitor/Analyzer,Eye/Jitter

LPX500 Chassis Upgrades (Return to Factory)

LPX500M-IS	LPX500 SDI/IO Return to factory upgrade (requires LPX500I)
LPX500M-ISE	LPX500 SDI Eye/jitter Return to factory upgrade (requires LPX500IS)

Hardware Option

LPX500-EM	Extended Monitor providing a secondary screen

Software Options for IP/SDI

LPX500-GEN	SDI/IP AV Test Signal Generator (SDI requires LPX500IS or LPX500ISE)
LPX500-UHD	2K Extended + UHD/4K IP/SDI (SDI requires LPX500IS or LPX500ISE)
LPX500-HDR	HDR/WCG, CIE1931, HDR Heat map (PQ, HLG, S-Log3, SR Live)
LPX500-QUAD	Display 4 inputs simultaneously

Software Options for IP

LPX500-IP-25G*	25GbE media network (requires 2x PHSFP-25GE-SR or 2x PHSFP-25GE-LR)
LPX500-IP-100G*	100GbE media network (requires 2x PHSFP-100GE-SR or 2x PHSFP-100GE-LR)
LPX500-IP-EUHD*	Add RGB, 12b, 444, 48-60Hz formats to ST2110 (requires LPX500-UHD)

LPX500 Fitting Kits

LPX500-K1	3U 19 inch rackmount kit (1x LPX500 Chassis)
LPX500-K2	3U 19 inch rackmount kit (2x LPX500 Chassis)
LPX500-K3	LPX500 desktop kit (Carry case & Feet)*

Cables

PHQXC-1	12G-SDI Eye measurement test cable 1m

SFP Accessories

PHSFP-10GE-SR*	SFP+ 10GBASE-SR Ethernet MM 850nm 300m
PHSFP-10GE-LR*	SFP+ 10GBASE-LR Ethernet SM 1310nm 10km
PHSFP-25GE-SR*	SFP28 25GBASE-SR Ethernet MM 850nm 100m
PHSFP-25GE-LR*	SFP28 25GBASE-LR Ethernet SM 1310nm 10km
PHSFP-100GE-SR*	QSFP28 100GBASE-SR4 Ethernet MM 850nm 100m
PHSFP-100GE-LR*	QSFP28 100GBASE-LR4 Ethernet SM 1310nm 10km

LPX500 Extended Warranty

LPX500I-3YEAR*	LPX500I Upgrade from 1 to 3 Year Warranty (excludes SFP)
LPX500I-5YEAR*	LPX500I Upgrade from 1 to 5 Year Warranty (excludes SFP)
LPX500IS-3YEAR	LPX500IS Upgrade from 1 to 3 Year Warranty (excludes SFP)
LPX500IS-5YEAR	LPX500IS Upgrade from 1 to 5 Year Warranty (excludes SFP)
LPX500ISE-3YEAR	LPX500ISE Upgrade from 1 to 3 Year Warranty (excludes SFP)
LPX500ISE-5YEAR	LPX500ISE Upgrade from 1 to 5 Year Warranty (excludes SFP)

* Upcoming Release

Supported 2K/HD/SD SDI Formats

The following SDI formats are available on LPX500.
[LPX500IS / LPX500ISE]

SMPTE Stnds. Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	HDR†	SDI‡	2022-6
ST 259 (ST 125)	SD (625i)	720 x 576	4:2:2 (YCbCr)	10	50i	-	OA	A
ST 259 (ST 125)	SD (525i)	720 x 485	4:2:2 (YCbCr)	10	59.94i	-	OA	A
ST 292 (ST 296)	HD	1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p,	O●	O●	●
ST 292 (ST 274)	HD	1920 x 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 292 (RP 211)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30psF, 29.97PsF, 25psF, 24PsF, 23.98PsF	O●	O●	●
ST 292 (ST 2048-2)	HD	2048 x 1080	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF	O●	O●	●
ST 372 (ST 274)	Dual Link HD	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O●	O●	-
ST 372 (ST 274)	Dual Link HD	1920 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	-
ST 372 (ST 274)	Dual Link HD	1920 x 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	-
ST 372 (ST 274)	Dual Link HD	1920 x 1080	4:2:2 (YCbCr)	12	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	-
ST 372 (ST 2048-2)	Dual Link HD	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O●	O●	-
ST 372 (ST 2048-2)	Dual Link HD	2048 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	-
ST 372 (ST 2048-2)	Dual Link HD	2048 x 1080	4:4:4 (YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	-
ST 372 (ST 2048-2)	Dual Link HD	2048 x 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	-
ST 425-1 (ST 274)	3G Level A (1)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level A (1)	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O●	O●	●
ST 425-1 (ST 296)	3G Level A (2)	1280 x 720	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60p, 59.94p, 50p, 30p, 29.97p	O●	O●	●
ST 425-1 (ST 274)	3G Level A (2)	1920 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level A (2)	2048 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 274)	3G Level A (3)	1920 x 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i, 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level A (3)	2048 x 1080	4:4:4 (YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 274)	3G Level A (4)	1920 x 1080	4:2:2 (YCbCr)	12	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level A (4)	2048 x 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 274)	3G Level B-DL (I)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level B-DL (I)	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O●	O●	●
ST 425-1 (ST 274)	3G Level B-DL (II)	1920 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level B-DL (II)	2048 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 274)	3G Level B-DL (III)	1920 x 1080	4:4:4 (YCbCr/RBG)	12	60i, 59.94i, 50i, 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level B-DL (III)	2048 x 1080	4:4:4 (YCbCr/RBG)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 274)	3G Level B-DL (IV)	1920 x 1080	4:2:2 (YCbCr)	12	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●
ST 425-1 (ST 2048-2)	3G Level B-DL (IV)	2048 x 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	O●	O●	●

KEY
● - Generator with LPX500-GEN option and Analyzer
O - Optional
O● - Optional Generator with LPX500-GEN option and Analyzer
A - Analyzer Only
'-' - Not Available

† **Note:** Optional HDR formats require LPX500-HDR

‡ **Note:** SDI formats require LPX500IS / LPX500ISE

Supported 2K/HD/SD IP Formats

The following 2K/HD/SD ST 2110-20 formats are provided as standard.
[LPX500I / LPX500IS / LPX500ISE]

Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	2110 HDR†	2110 SDR
720 x 576	4:2:2 (YCbCr)	10	50i	-	A
720 x 485	4:2:2 (YCbCr)	10	59.94i	-	A
1280 x 720	4:2:2 (YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
1280 x 720	4:4:4(YCbCr/RGB)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
1280 x 720	4:4:4(YCbCr/RGB)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
1920 x 1080	4:2:2(YCbCr)	8	60I, 59.94I, 50I	OA	A
1920 x 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i	O●	●
1920 x 1080	4:2:2(YCbCr)	12	60I, 59.94I, 50I	O●	●
1920 x 1080	4:4:4(YCbCr/RGB)	8	60I, 59.94I, 50I	OA	A
1920 x 1080	4:4:4(YCbCr/RGB)	10	60I, 59.94I, 50I	O●	●
1920 x 1080	4:4:4(YCbCr/RGB)	12	60I, 59.94I, 50I	O●	●
1920 x 1080	4:2:2 (YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
1920 x 1080	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
1920 x 1080	4:4:4(YCbCr/RGB)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
1920 x 1080	4:4:4(YCbCr/RGB)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
1920 x 1080	4:4:4(YCbCr/RGB)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
1920 x 1080	4:2:2 (YCbCr)	8	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	OA	A
1920 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF	O●	●
1920 x 1080	4:2:2 (YCbCr)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	O●	●
1920 x 1080	4:4:4(YCbCr/RGB)	8	30PsF, 29.97PsF, 25PsF, 24psF, 23.97PsF	OA	A
1920 x 1080	4:4:4(YCbCr/RGB)	10	30psF, 29.97psF, 25psF, 24PsF, 23.97PsF	O●	●
1920 x 1080	4:4:4(YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	O●	●
2048 x 1080	4:2:2 (YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
2048 x 1080	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
2048 x 1080	4:4:4(YCbCr/RGB)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
2048 x 1080	4:4:4(YCbCr/RGB)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
2048 x 1080	4:4:4(YCbCr/RGB)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
2048 x 1080	4:2:2(YCbCr)	8	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	OA	A
2048 x 1080	4:2:2(YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	O●	●
2048 x 1080	4:2:2(YCbCr)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	O●	●
2048 x 1080	4:4:4(YCbCr/RGB)	8	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	OA	A
2048 x 1080	4:4:4(YCbCr/RGB)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	O●	●
2048 x 1080	4:4:4(YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	O●	●

KEY
● - Generator with LPX500-GEN option and Analyzer
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O● - Optional Generator with LPX500-GEN option and Analyzer
A - Analyzer Only
'-' - Not Available

† **Note:** Optional HDR formats require LPX500-HDR

Supported 4K/UHD Formats

The following SDI formats are optional LPX500.
[LPX500-UHD + LPX500IS / LPX500ISE]

SMPTE Stnds. Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	SDI HDR†	SDI SDR
ST 425-3 Annex B.1 (ST 2036-1)	Quad-link HD-SQ	3840 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-3 Annex B.1 (ST 2048-1)	Quad-link HD-SQ	4096 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-3 Annex B.2, (ST 2036-1)	Dual 3G-B-DS	3840 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-3 Annex B.2, (ST 2048-1)	Dual 3G-B-DS	4096 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-10 M1 (ST 2036-1)	6G-2SI	3840 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-10 M1 (ST 2048-1)	6G-2SI	4096 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 (ST 2036-1)	Quad-link 3G-A, B (1) 2SI	3840 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O●	O●
ST 425-5 (ST 2048-1)	Quad-link 3G-A, B (1) 2SI	4096 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O●	O●
ST 425-5 (ST 2036-1)	Quad-link 3G-A, B (2) 2SI	3840 x 2160	4:4:4 (YCbCr/RGB)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 (ST 2048-1)	Quad-link 3G-A, B (2) 2SI	4096 x 2160	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 (ST 2036-1)	Quad-link 3G-A, B (3) 2SI	3840 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 (ST 2048-1)	Quad-link 3G-A, B (3) 2SI	4096 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 (ST 2036-1)	Quad-link 3G-A, B (4) 2SI	3840 x 2160	4:2:2 (YCbCr)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 (ST 2048-1)	Quad-link 3G-A, B (4) 2SI	4096 x 2160	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 Annex B (ST 2036-1)	Quad-link 3G-A, B (1) SQ	3840 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O●	O●
ST 425-5 Annex B (ST 2048-1)	Quad-link 3G-A, B (1) SQ	4096 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O●	O●
ST 425-5 Annex B (ST 2036-1)	Quad-link 3G-A, B (2) SQ	3840 x 2160	4:4:4 (YCbCr/RGB)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 Annex B, (ST 2048-1)	Quad-link 3G-A, B (2) SQ	4096 x 2160	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 Annex B (ST 2036-1)	Quad-link 3G-A, B (3) SQ	3840 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 Annex B, (ST 2048-1)	Quad-link 3G-A, B (3) SQ	4096 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 Annex B (ST 2036-1)	Quad-link 3G-A, B (4) SQ	3840 x 2160	4:2:2 (YCbCr)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 425-5 Annex B (ST 2048-1)	Quad-link 3G-A, B (4) SQ	4096 x 2160	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-11 M1, ST 425-5 (ST 2036-1)	Dual-link 6G-2SI (I)	3840 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O●	O●
ST 2081-11 M1, ST 425-5 (ST 2048-1)	Dual-link 6G-2SI (I)	4096 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O●	O●
ST 2081-11 M1, ST 425-5 (ST 2036-1)	Dual-link 6G-2SI (II)	3840 x 2160	4:4:4 (YCbCr/RGB)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-11 M1, ST 425-5 (ST 2048-1)	Dual-link 6G-2SI (II)	4096 x 2160	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-11 M1 ST 425-5 (ST 2036-1)	Dual-link 6G-2SI (III)	3840 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-11 M1, ST 425-5 (ST 2048-1)	Dual-link 6G-2SI (III)	4096 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-11 M1 ST 425-5 (ST 2036-1)	Dual-link 6G-2SI (IV)	3840 x 2160	4:2:2 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2081-11 M1 ST 425-5 (ST 2048-1)	Dual-link 6G-2SI (IV)	4096 x 2160	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2082-10 M1, ST 425-5 (ST 2036-1)	12G-2SI (I)	3840 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	O●	O●
ST 2082-10 M1, ST 425-5 (ST 2048-1)	12G-2SI (I)	4096 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	O●	O●
ST 2082-10 M1 ST 425-5 (ST 2036-1)	12G -2SI (II)	3840 x 2160	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2082-10 M1 ST 425-5 (ST 2048-1)	12G -2SI (II)	4096 x 2160	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2082-10 M1 ST 425-5 (ST 2036-1)	12G-2SI (III)	3840 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2082-10 M1 ST 425-5 (ST 2048-1)	12G-2SI (III)	4096 x 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2082-10 M1 ST 425-5 (ST 2036-1)	12G-2SI (IV)	3840 x 2160	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●
ST 2082-10 M1 ST 425-5 (ST 2048-1)	12G-2SI (IV)	4096 x 2160	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	O●

KEY
O - Optional
O● - Optional Generator with LPX500-GEN option and Analyzer

† **Note:** Optional HDR formats require LPX500-HDR

Supported 4K/UHD IP Formats

The following 4K/UHD ST 2110-20 formats are optional with:
LPX500-IP-25G and LPX500-UHD.

Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	2110 HDR†	2110 SDR
3840 x 2160	4:2:2 (YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
3840 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
3840 x 2160	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	O●	●
3840 x 2160	4:4:4(YCbCr/RGB)	8	30p, 29.97p, 25p, 24p, 23.98p	OA	A
3840 x 2160	4:4:4(YCbCr/RGB)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	●
3840 x 2160	4:4:4(YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	●
4096 x 2160	4:2:2(YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	A
4096 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p , 30p, 29.97p, 25p, 24p, 23.98p	O●	●
4096 x 2160	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.95p , 30p, 29.97p, 25p, 24p, 23.98p	O●	●
4096 x 2160	4:4:4(YCbCr/RGB)	8	30p, 29.97p, 25p, 24p, 23.98p	OA	A
4096 x 2160	4:4:4(YCbCr/RGB)	10	30p, 29.97p, 25p, 24p, 23.98p	O●	●
4096 x 2160	4:4:4(YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	O●	●

The following 4K/UHD ST 2110-20 extended formats are optional with:
LPX500-IP-25G, LPX500-UHD and LPX500-EUHD.

Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	2110 HDR†	2110 SDR
3840 x 2160	RGB:444	8	60p, 59.94p, 50p, 48p, 47.97p	OA	OA
3840 x 2160	RGB:444	10	60p, 59.94p, 50p, 48p, 47.97p	O●	O●
3840 x 2160	RGB:444	12	60p, 59.94p, 50p, 48p, 47.97p	O●	O●
3840 x 2160	YCbCr:444	8	60p, 59.94p, 50p, 48p, 47.97p	OA	OA
3840 x 2160	YCbCR:444	10	60p, 59.94p, 50p, 48p, 47.97p	O●	O●
3840 x 2160	YCbCR:444	12	60p, 59.94p, 50p, 48p, 47.97p	O●	O●
4K Formats					
4096 x 2160	RGB:444	8	60p, 59.94p, 50p, 48p, 47.97p	OA	OA
4096 x 2160	RGB:444	10	60p, 59.94p, 50p, 48p, 47.97p	O●	O●
4096 x 2160	RGB:444	12	60p, 59.94p, 50p, 48p, 47.97p	O●	O●
4096 x 2160	YCbCr:444	8	60p, 59.94p, 50p, 48p, 47.97p	OA	OA
4096 x 2160	YCbCR:444	10	60p, 59.94p, 50p, 48p, 47.97p	O●	O●
4096 x 2160	YCbCR:444	12	60p, 59.94p, 50p, 48p, 47.97p	O●	O●

KEY
● - Generator with LPX500-GEN option and Analyzer
O - Optional
O● - Optional Generator with LPX500-GEN option and Analyzer
A - Analyzer Only
OA - Optional Analyzer

† **Note:** Optional HDR formats require LPX500-HDR

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SR Live for HDR