



Advanced Rasterizer and Waveform Monitor for Hybrid IP/SDI, 4K/UHD, HDR/WCG Generation, Analysis and Monitoring





Qx Series - Technology to power change





From the moment you first power up a Qx Series instrument, you'll appreciate the attention to detail in a platform designed to meet the increasing demands of monitoring and testing in SDI/IP hybrid environments. The Qx Series is equally at home in master control rooms, OB and link trucks, production studios, technical QC, product development, engineering compliance testing and operational system monitoring. Whether you are working in SD*, HD or UHD, SDR or HDR, SDI or IP, conventional or remote production, Qx rasterizers and waveform monitors bring together the user-configurability and advanced tools required for full operational flexibility when transitioning to your next generation workflows.

Available in three platforms, with a common look and feel, the Qx Series provides an intuitive user interface and toolsets that help with rapid fault diagnosis and reduce the need for staff training. The comprehensive feature set supports SD*/HD/3G/6G/12G-SDI, 10G/25G IP interfaces, and SD*/HD/UHD, IP SMPTE 2022-6, SMPTE 2110-10/20/30/31/40 (ST 2110-20 RGB payloads up to 21Gbps) with ST 2022-7, PCAP, Dolby E Decode and AMWA NMOS, easing system design and future-proofing your investment.

Analyzer/Generator - Simultaneous operation



The QxL and QxP provide simultaneous Generation and Analysis for a wide range of ST 2110-20/30/31/40, 2022-6 and SD*/HD/3G/6G/12G-SDI formats with support for up to 80 channels of 48 kHz Class C audio in 2110-30/31 and up to 128 channels over 12G SDI.

Configuration can be either Manual, or under REST API control enabling automated closed-loop testing for Engineering regression and manufacturing. ST 2110 Generation and Analysis is also NMOS enabled for ease of integration into IP based systems.

With a full suite of SDR Rec. BT 709/2020, plus native and mapped Wide Colour Gamut (WCG) HDR patterns in HLG, PQ, S-Log3 and SR-Live formats, you are equipped for flexible broadcast SDR and HDR operation.

Generator and Analyzer video format, colorimetry and transfer function can all be configured independently. You have the flexibility to send out an EUHD Rec BT.2100 HDR 12 bit RGB pattern with Class C audio and PTP locked Timecode and analyze the down-converted, down-mapped HD SDR Rec 709 return simultaneously.

Compliance - it's all about Test and Measurement

Developing products or commissioning the latest equipment is more than just implementation. Equipment has to be tested against the required standards for it to be considered fit for purpose.



In the 12G-SDI world, noise floors are required to be much lower to ensure that accurate and meaningful measurements can be taken. Qx SDI generation and measurement technology has been specifically adapted for 12G applications. With its unique class leading SDI-STRESS toolset, sophisticated RTE[™] (Real-Time Eye) multirate physical layer display, and automated SMPTE compliance measurements, the Qx Series offers a single product solution for SDI compliance verification.

If you are working in SMPTE ST 2110, with ST 2059 Precision Time Protocol (PTP), a core IP toolset, available in both the QxL and QxP offers an operator all of the IP confidence status monitoring in an intuitive and accessible manner. The optional IP-MEAS test suite provides a comprehensive set of tools for compliance verification and commissioning of your IP systems and equipment.

Hardware-based timestamping locked to PTP ensures accurate, realtime, deterministic timing measurements of media flows and ST 2110-21 buffer models.

Applications









Outside Broadcast

NEP UK selected Qx rasterizers for two of its new OB trucks, for use at major events and sporting fixtures. Hybrid SDI/IP capability was a key selling point for NEP enabling them to accommodate clients whether they are using conventional SDI or have made the move to IP. The ease of use of the Qx was also a major factor, making it quick and simple for both NEP engineering staff and freelancers to learn and use.

Engineering and Technical Director, NEP UK, said, "We've been very happy with the reliability of PHABRIX test and measurement equipment in the past, so it was an obvious fit to look at the Qx for these new IP-capable vehicles."

Sports and Live Events

PHABRIX recently concluded nine months of successful HDR technology trials with BT Sport in the run-up to the launch of BT Sport Ultimate. The Qx is now deployed to monitor and analyze SDR and HDR Wide Color Gamut (WCG) material on the live system. PHABRIX supported BT Sport, providing its Qx rasterizers and technical expertize, as they developed and refined their live production workflow for the launch of their new HDR, UHD and Dolby Atmos® supported proposition. On the bench PHABRIX collaborated with BT Sport to analyze and provide suggested settings for SDR to HDR converters and 'tone mappers' used in the trucks and throughout the network.

Manufacturing & Compliance Testing

Mellanox Rivermax[®] development and regression testing teams have been using the QxL to provide simultaneous analysis of the SMPTE ST 2110 Video, Audio and ANC DATA flows from their Rivermax[®] video streaming library for media and entertainment, running on Mellanox ConectX-5 and newer, Network Interface Cards," said Nir Nitzani, senior director SW development at Mellanox Technologies.

"The ability to install the QxL in the machine room and remotely access and control the realtime measurements from several sites has been an ideal fit with our engineering development workflow."

Extended Reality (XR)

7thSense chose a PHABRIX QxL 25G IP ST 2110 rasterizer for SDI and advanced IP 2110 product verification in-house, and at onsite installations. PHABRIX and 7thSense joined forces to develop the capability to output the next generation of ST 2110 IP formats, including UHD/4K 12 bit 444 60p.

Richard Brown, CTO, 7thSense, said, "As we begin delivering SMPTE 2110 support from our Delta Media Server and Juggler pixel processor products, we needed to ensure all of our solutions comply to the required specifications. We needed test and measurement technology that we could rely on, was robust, and supported the wide variety of formats we need to test."

Platforms to suit every workflow

The flexible architecture of the QxL and QxP offers many engineering grade tools as standard, together with in-field optional upgrades for UHD/4K, 2110-20 EUHD (RGB UHD/4K 48-60p), PCAP, Dolby E Decode, HDR, and Audio/Video/ANC test signal generation. A factory-fitted hardware option provides RTE[™] realtime SDI eye and jitter analysis with the further option of a highly advanced SDI-STRESS toolset.

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PHABRIX QxL - 10/25GbE / 12G-SDI

For realtime UHD IP workflows on 25G networks with video payloads up to 21 Gbps, the class-leading QxL provides support for ST 2110 and 2022-6 on generic 10G/25G SFP28 interfaces. The QxL is 10G IP-enabled as standard, with support for simultaneous generation and analysis of a JT-NM TR 1001-1:2020, ST 2110-20 (video), up to four 2110-30 (PCM) and 2110-31 (AES transport) audio and a 2110-40 ANC media flow, all with 2022-7 Seamless IP Protection Switching (SIPS) and AMWA NMOS IS-04 discovery and IS-05 device connection management.

Independent PTP slaves on both media ports are provided for fully-redundant media network operation with AMWA NMOS IS-04 discovery and IS-05 device connection management. The option of HDR, PCAP, Dolby E Decode and IP-MEAS in-field license upgrades means that you can tailor your system to your current needs while retaining full flexibility for the future.

Support for 25G IP, UHD/4K formats for both IP and SDI, including some HD/2K extended mode formats, PCAP, IP Measure, and UHD 2110 Extended Mode formats (YCbCr/RGB 444, 8-/10-/12-bit; 48 to 60 Hz), can also be added as optional licenses (for the full list of UHD and EUHD standards supported, please see pages 27 - 28).

SDI BNC and SFP media interfaces are available as a factory-fitted option. The SDI Eye and Jitter hardware option and the unique SDI-STRESS toolset provide all the tools for SDI physical layer analysis and compliance testing.

PHABRIX QxP - 10/25GbE / 12G-SDI

Introducing the latest member of the Qx test and measurement family - the QxP, the world's first portable, 12G-SDI, 25G ST 2110, combined waveform monitor, generator and analyzer, with mains and external DC power and a choice of V-mount or Gold mount (G-mount) external camera battery plate. This provides all of the functionality of the QxL in a handy, lightweight, portable 3RU chassis with an integral 1920 x 1200 7 inch LCD multi-touch screen. If you prefer buttons or mouse control then you are free to use any combinations of controls.

You can run all QxL instruments on the integral screen with minimal retraining. Plug in an external HDMI monitor and you have the same experience as if you were using the QxP as a conventional Rasterizer.



QxL / QxP

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Simplicity - an interface that puts you in control

The Qx's innovative app style interface is a radical change from traditional test and measurement systems. Intuitive mouse control with context-driven dropdown menus hides the complexity of modern SDI and IP systems providing an uncluttered view of critical information. Instruments can be resized, the system auto-presenting more information as the screen area permits.

The Qx offers a fully flexible user-defined instrument layout, displaying up to 16 instruments on a single 1920 x 1080 display. Individual instruments can switch between 1/16th, 1/4 or full screen. With an output frame rate of 50, 50.94 or 60 Hz to match the video format, the GUI has adjustable brightness for controlled lighting environments.



Adjust numeric values by dragging or

• Mouse over the numeric field and scroll for

Connect to USB keyboard, click and enter

scrolling the slider button

specific alpha numeric values

fine control

• Provides access to the instruments and

• Each Instrument available in the menu is

listed alongside a designated icon

other system menus available on the unit

• Errors are displayed in red font

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QxP Touchscreen - control at your fingertips



Introducing our new waveforms

PHABRIX is pleased to announce the development of class-leading Waveform Monitoring for the Qx Series of Rasterizers and Waveform Monitors. Utilizing a technique patented by PHABRIX to efficiently deliver a high-resolution image processing pipeline with support for deep color sources up to 12-bits, this 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 operation 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 the wide-range of YCbCr:422, RGB:444, SDI, 2110, SD*/HD/2K/UHD/4K/EUHD formats for which PHABRIX is famous.





As standard, the Qx Series offers a flexible user-defined instrument layout displaying up to 16 simultaneous windows, and the ability to change rapidly between bespoke layouts for different operational tasks with user presets.

Picture view, waveform monitor, vectorscope, 32 channel audio metering, decoded audio channel status information, detection of common Dolby formats, 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, remote operator GUI access over noVNC and a full REST API 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



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
- 12-bit processing

Analyser -	Audio Chanr	nel Status		Me	ters 1 + 2 Flo	ows
Presence Au	idio 2 Ch1-16: P	PEE++DDPPPPF	PPP Audio	1 Ch1-16: PPPP	РРРР	
	Aud2Ch01	Aud2Ch02	Aud2Ch03	Aud2Ch04	Aud2Ch05	
Status	CRCC Ok	CRCC Ok	CRCC Ok	CRCC Ok	CRCC Ok	(
Use	Pro	Pro	Pro	Pro		F
Data	PCM	PCM	PCM	PCM	PCM	F
Emphasis	None	None	None	None	None	1
Source Lock	Locked	Locked	Locked	Locked	Locked	ι
Frequency	48	48	48			4
Chan Mode	2 Channel	2 Channel	2 Channel	2 Channel	2 Channel	1

Audio Status

- 32 channel indication of audio type and presence, PCM, Dolby E, DD, DD+, ED2
- Decoded channel status information for up to 128 channels
- Clear indication of useful audio parameters including CRCC, PCM/data, sample frequency, word length
- Channel Status data view (Hex)



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 - 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
- IQ axis on/off
- 12-bit processing



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



Analyzer - Picture Copy

- Secondary closed caption decode: Monitor 608/708 closed captions in a second language, or compare different screen safe areas
- Independently manage overlay elements including; Closed Captions, Picture Safe Areas, V-chip, AFD, SCTE 104, Image Center Crosshairs



Analyzer - Audio Meters

- Two meter windows can be opened, each monitoring a block of up to 16 channels at a time, for a total of up to 32 channels of audio metering
- 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

S353 MPEG Recoding	\$305 SDTI	S348 HD-SDTI	S427 Link Encryption	S352 Payload ID
			S2031 DVB/SCTE	S2056 MPEG TS
S2068 3D Packing	S2064 Lip Sync		OP47 Caption	OP47 VBI/WST
ARIB-TR-829	RDD18 Metadata		RP223 UMID/ID	
			S12M-2 V-TCode	
EIA-608 Caption	RP207 Program			
5299-2 3G Audio	S299-1 HD Audio			
S299-1 HD Audio	Presence	✓ Checksum	Parity	Data Block No
Control Group 4 (E Audio Group 1 (E7 Audio Group 2 (E6 Audio Group 3 (E5 Audio Group 4 (E4 Control Group 4 (E4 Control Group 1 (E Control Group 3 (E	Oh) Present (Y-Pos) h) Present (C-Pos) h) Present (C-Pos) h) Present (C-Pos) h) Present (C-Pos) state Present (Y-Pos) 2h) Present (Y-Pos) 2h) Present (Y-Pos)	ок ок ок ок ок ок ок	ок ок ок ок ок ок	ок ок ок ок ок ок ок

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 and status information for Checksum, Parity, DBN
- Link to ANC Inspector
- Tooltip provides ST 291 ANC type overview





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.

rigger Type Single



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

ideo Timing & System Refere SDI A vs System Reference REF: Free Run Stabl Measured Timing: 0 lines 0 pixels / 0.000 µs SDI Co-Timing Input Early SDI A Late Time 0 ns SDI B -10 ns SDI C 0 ns SDI D 0 ns

Video Timing & System Reference (2022-6/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



Analyzer - Video Standard CRC Analysis (2022-6/SDI⁺) (2022-6/SDI⁺)

- Display of detected SMPTE S352 Payload ID for each SDI Link and Subframe
- Manual override of S352 ID
- Selection of SMPTE video format
- Indication of S352 errors

00 3FF 3FF 241 101 104 1CE 2C9 180 101 Data 0h 0h

ANC Inspector

alvser - Ancillary Inspecto S352 Payload ID (41h

- 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

I/O and Reference Configuration



System IO

- Shows the status of signal inputs and outputs, external reference, cable length, and connector details
- SDI mode: Select BNC or SFP I/O, cable type, loop through and generator copy outputs
- IP mode: Active IP SFP receive inputs and transmit outputs are indicated

Analyser - CRC Analy Input Failures: 257	sis			
	Sub 1	Sub 2	Sub 3	Sub 4
C-CRC-Err		0		
Y-CRC-Err	a	0	â	
ANC-CS-Err				
Rate (/s)	0.002	0.000	0.000	0.000
OK Time		11m 6a	11m 6a	11m 6a
Active Picture Changes	đ	Q	à	â
Active Picture CRC	EC90 GACD			FE4F 7821

- 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



AES IO Config

- Four versatile bi-directional AES unbalanced interfaces
- Audio meter monitoring pair, generator audio output or AES input
- SDI Input to AES Output de-embedder for both PCM and Dolby encoded audio
- Route AES Input signals to other AES outputs providing up to three copy outputs

Stats - SDI In A					12G Sign
Data Rate: 11.880000 GF	iz (lock Divisor:	1.000	Cable	e Length: <20r
	Sub Image 1	Sub Image 2	Sub Image 3	Sub Image 4	
Counters Stable	true				
Active Samples Per Line	1920	1920	1920	1920	
Active Lines Per Field	1080	1080	1080	1080	
Total Samples Per Line	2640	2640	2640	2640	
Total Lines Frame/Field1	1125	1125	1125	1125	
Total Lines Field2	progressive	progressive	progressive	progressive	
Payload ID Y-Pos	CE C9 80 01	CE C9 80 01	CE C9 80 01	CE C9 80 01	
Payload ID C-Pos	CE C9 80 01	CE C9 80 01	CE C9 80 01	CE C9 80 01	

Stats - SDI In (2022-6/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

* Available with SDI and PHQXL01-3G / PHQXP01-3G or PHQXL01E-3G / PHQXP01E-3G



ST 2110 and ST 2022-6 Monitoring

The core IP feature set, provided as standard in the QxL and QxP, 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 (SIPS) 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 80 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.

Carrier Signal P Interface U	SFP E Present	SFP F Present
Carrier Signal P Interface L	Present	Present
Interface L		
	ob	
MAC Addr 0	00:1F:7F:01:56:78	00:1F:7F:02:56:78
IP Addressing Mode	Dynamic	Dynamic
IP Addr 1	192.168.10.147 / 24	192.168.20.15 / 24
Gateway 1		192.168.20.254
DNS IP Addr 1		192.168.20.254
Total Tx pkts 4	40164547451	40161328222
Total Rx pkts 3	322592374382	11620037
SFP E :		

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 A - Info	Temperature: 35.7 °C Voltage: 3.22 V Rx Power: -4.18 dBm Tx Power: -2.97 dBm
Status	Approved
Vendor	Gigalight
Part No	GPP-85192-SRC
Vendor OUI	24-00-00
Revision	1.0
Serial No	M1901180211
Identifier	SFP or SFP+
Ext Identifier	GBIC/SFP function via two-wire only
Connector Type	LC
Encoding	64B/66B

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

SEP	Sel	Protocol	Type	Dat IP	Sec IP	SSRC	Bandwidth	Packets	Seg errors
A		2110-20	94	239.141.20.120000	192.168.10.141/10000	0	1.091 Gbps	8707159654	
	100			239,168,20,1,20000	192.168.10.168.10000			310/138620	
	1001			12532185820000	19210581014100000			100810093	
	LUON				192168110168110000			IP243130335	
	ANCE	2010440	100	211334174531220000	192364110341110000		24.669 kbps	4031/2/45	
		2110-40		239.168.40.1.20000	192.168.10.168.10000		43.371 kbps		
							1.091 Gbps		
1000	W/2	2116-20		231371582012220000	1921681036815000	0	1.091 Gays	315/138643	
		2110-30	97	239.141.30.2.20000	192,168,10.141,10000		21.889 Mbps	644978435	
	AU011	2110350		2003/4180/749:0000	1921581014110000		2,735 Millips	100000	
	4003	2110-30		239.168.30.2.20000	192,168,10,168,10000		21 886 Mbps	P24313333	
8				239.168.30.4.20000	192.168.10.168.10000		2.735 Mbps		
	ANC	2110-40	100	239.141.40.2.20000	192.168.10.14110000	0	24.671 kbps	4031105	
		2110-40		239.168.40.1.20000	192.168.10.168.10000		43.373 kbps		

IP Receive

- Reporting of the IP Flows available to the receiver and user selection of the required flows
- Indication of Qx 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

SFP A - PTP I	nfo		Standby System Refere		
GM Info	Qx Status	Messaging			
Communicatio	n Mode	Multicast (M/M)	Appl freq adjustmnt		
Delay Req Interval		Using GM value	Appl freg adj delta		
Announce Rec't Grace Period		3			
Latency Offset		0 ns	Offset from Master		
Local PTP State	:	Listening	Steps removed		

ST 2110 PTP Info - 2 port

- 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
- Two independent PTP followers



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
- Relative measure of Path Differential of flows on SFPB (Blue Network) relative to SFPA (Amber Network)
- · Class A, B,C, D markers

Video Tim	ing & System Refe	rence REF: PTP	
Video Tim	ing Media Latency	Ext Ref vs PTP	
Flow		Media Latency vs PTP (ms)
A VID		Y	
A AUD 1	1	_	⊽
A AUD 2			
A ANC		7	
B VID		¥	
B AUD 1			V V
B AUD 2			
B ANC		7	
		04 06	0.8 10 1
	0,0 0,2	0,0	010 110 11

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



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 (Dual shown)

NMO:	5 Receiver	s - ISO5 -	Active		NMOS Enabled: 192.168.10.254:8010
SFP E	+F VID	AUD 1	AUD 2	ANC	
key			value		<u>^</u>
▼ a n si ↓ tr v tr	ctivation activation mode requestec aster_enablender_id ansport_file ansport_par 0	_time _time e ams	16424213 activate_i 16424213 true 840c28a0	872:3784 immediat 872:3573 0-0952-57	53365 e 33466 82-8817-766a7880218a
	destir interf multio rtp_er sourc	ation_port ace_ip :ast_ip nabled e_ip	5178 192.168. 239.9.20. true 192.168.	10.147 .1 10.125	Ţ

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 (Dual shown)

IMOS	Sender	rs - IS05 -	Active		NMO	5 Enabled	: 192.168.10.25	4:80
SFP E							VIDMOI 4	۱.
key			va	lue				
▼ act ma	vation activatio mode request ster_ena	on_time ed_time ble	16 ac tri	41995897:2 tivate_imm	254319371 ediate			
SFP F	VID	AUD 1	AUD 2	AUD 3	AUD 4	ANC	VIDMOI 4	•
key			va	lue				
▼ act	vation activatio mode request	on_time ed_time	16 ac	41995897:3 tivate_imm	355052629 ediate			

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 (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 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



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 (Single shown)

VIB AUD			
	Auto	SDP	Override
Picture Dimensions	3840x2160	3840x2160	38/(0X216()
Frame Packing	Progressive	Progressive	Progressive
Frame Rate	50	50	60
Colour Format	1666.	YCbG-	RGB
Sampling	422	422	444
Bit Depth	10	10	8
Transfer Curve		≤DR	SDR
Colourimetry		ST709	BT709

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 QxL or QxP system, depending on your requirements.



noVNC

 Browser remote access using noVNC technology to deliver 16 simultaneous scalable instruments over a remote network

LLDP Info			LLDP: Active
	SFP A Neighbour	SFP B Neighbour	Mgmt Neighbour
Sys Name	switch-16628c	switch-16628c	phobos.phabrix.local
Sys Descr	MSN2010,Onyx,SWv3	MSN2010,Onyx,SWv3	Ubuntu 18.04.3 LTS Linux 4.15.0-88-generi
Chassis ID	EC:0D:9A:FC:D0:00	EC:0D:9A:FC:D0:00	2C:4D:54:D4:07:A1
Port ID	Eth1/8	Eth1/11	00:1b:21:3a:45:d6
Port Descr			enp3s0
Mgmt IP	192.168.10.254	192.168.10.254	192.168.10.231
Primary VLAN		0	0

LLDP

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

Remote Connectivity



- QxL/QxP can be controlled remotely over a network via a REST API
- Integrated control, monitoring and automated manufacturer testing

Qx Network & Autom	nation
Interface	
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
- Control access to REST API and VNC



Event Logger

- SDI Input standard/status
- SDI physical layer timing and alignment jitter
- Rest API requests
- IP-Tx, IP-Rx, Flow and SFP records
- Reference Locking
- Audio input presence

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USB File Manager

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



- File Transfer: FTP or Browser access to screenshots and PCAPs, User Test Patterns (TIFF), log files
- Remote Software Product Updates
- HDMI: UI video (1080p), UI audio (2-ch), local mouse
- SDI: UI video (1080p), UI audio (2-ch), local mouse
- noVNC: UI video (1080p low frame rate), remote mouse with screenshots
- KVM: HDMI or DVI (1080p compressed), remote mouse with screenshots
- ST 2110: UI (-20), Audio 2-ch (-30)
- Ul audio available as analog on D26 (rear panel)
- Machine Control via JSON API
- Many KVM Options available including Long Distance Connectivity, Cloud-based solutions, multiple access



Fast, automated 12G-SDI physical layer analysis [PHQXL01E-3G / PHQXP01E-3G]

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 eve 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.



- 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

- 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 adiustment
- Jitter amplitude histogram



⁺ Note: Optional UHD SDI formats require PHQXO-UHD



SDI-STRESS Testing [PHQXLO-SDI-STRESS Requires PHQXL01E-3G / PHQXPO-SDI-STRESS Requires PHQXP01E-3G]

The advanced SDI-STRESS option is available for stress testing and R&D evaluations of SDI interfaces up to 12G. A comprehensive API is included for rapid automation testing. The option includes the ability, under automation control, to insert SDI clock jitter from 10 Hz to 10 MHz (128 UI max) peak-to-peak, mute any of the SDI outputs, and control the SDI scrambler, sync-bit insertion, pre-emphasis, rise time and driver amplitude. The SDI-STRESS Eye amplitude measurement provides both Shorth Mean or Mode, with a histogram overlay and a user-defined window for the exploration of eye amplitude. Pseudo-Random Binary Sequence (PRBS) generation and analysis of PRBS-7, -9, -15, -23, -31 allows for deterministic measurement of link Bit Error Rates (BER).



Adv. Generator Tools

- Control of jitter insertion frequency and amplitude
- SDI scrambler and sync bit Insertion on/off
- SDI Bit Error (BER) insertion tool
- Control of SDI driver amplitude +/- 15%
- Control of pre-emphasis, rise/fall time



PRBS Analyzer

- Indication of PRBS cumulative received data and PRBS type
- Generation of PRBS-7, -9, -15, -23, -31
- Reported cumulative errors
- Calculated Bit Error Rate (BER)



Pathological Detector

- Generator status indication of rate at which the video pattern generator is creating SDI pathological conditions
- Indication of PLL and EQ pathological rates per second
- Detection on each active SDI link
- Realtime GPI outputs of pathological detect for external equipment triggering

Advanced Eye Analysis

(Additional features with SDI-STRESS option)





Audio and Video Generation [Requires PHQXL0-GEN / PHQX0-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 128 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 usercreated test images is also included. The QxL and QxP offer a ST 2110-20 2K/HD, 4K/UHD video flow generator, 2110-30/-31 80 channel audio generator and 2110-40 ANC flow generator. Uniquely, the QxL and QxP 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

- 12G/6G/3G/1.5G 4K/UHD and 2K/HD SDI signal generation
- Support for Single, Dual, Quad link SDI formats. Square division, 2SI, Level A & B
- 422, 444, 4224 and 4444, YCbCr and RGB formats, 10/12 bit
- Moving test patterns (bouncing box)
- Import/display TIFF images



2110 Video/ANC Generation

- 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 [PHQXLO-EUHD / PHQXPO-EUHD]



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 128 channels



2110 Audio Generation

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

80 audio channels 2110-30 at 125 μs 60 audio channels 2110-31 at 125 µs 10 audio channels 2110-30 at 1 ms 7 audio channels 2110-31 at 1 ms



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

Video standa	ard 40	96x2160p47.95 V	CoE=422:10 QL 30	S A SQ HLG Rec. 2020	
Test pattern	0	role with bouncing	ç baw		
Pathological	79	3/2048 pers (5.3	lus) of "CheckField	d" inserred	
	Dutput	Mapping	Pathological PLL	n Pathological Eq/s	
SOT OUT A	36	Gub Emage 1		70	
SDI Out B	36	Sub Image 1		-48	
SDI Out C	36	Sub Image 3	-61	44	and the second
SDI Out D	36	Stab Timage 4	52	- 42	
Audio Prese	nce 11	PPPP 2: - 3: PPI	PE PPPPS		
Audio Sub In	nages In	abled: 1, 2, 4			
Reference	Fi	ee Ruru stable			
Offset	0.	07 µs			
liner	50	NE 1995Hz 11 7HU	1		

SDI⁺ Generator - Status

- Confirms generated Video Standard and Test Pattern details
- BNC output, SFP output and sub-image/full image mapping information
- Video Reference, output offset adjustment and Jitter instertion (with optional SDI-STRESS Toolkit) details
- Reporting of SDI-STRESS pathological insertion statistics



Audio and Video Generation [PHQXLO-GEN / PHQXPO-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

- Reference: PTP SFP E SFP E: 4.809 Gbps 🛄 (19%) SFP F: 4.809 Gbps ___ (19%) VID AUD1-2 AUD3-4 ANC MON Enable acking Mode: GPM Single Line Displays the Active Settings for the Selected Flows **Transmission Configuration** Configure Generator/ Monitor Flows Flow Enable/Disable Configuration • Options Summary of Current Configuration
- 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,

• 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



Dolby® E Decoder and Metadata Analyzer [PHQXL0-DOLBY / PHQXP0-DOLBY]

The Dolby E Decoder and Metadata Analyzer option provides a clear and accessible view of the Dolby E metadata present in a selected Dolby E or ED2 audio stream. It also enables you to check the correct timing of Dolby E packets in the audio signal in an SDI or ST 2022-6 broadcast chain. You can check whether the Dolby E is created correctly and transferred transparently by network equipment such as routers, switchers, satellite links, etc. You can also choose to monitor the Dolby[®] audio from any of the SDI/2022-6 embedded audio, 2110-30/-31 or AES inputs. The decoded output and downmix can be metered, monitored, Loudness measured, and routed to AES outputs.

Dolby Metadata Analyzer

Program 2

	Analyser - Doll	iy Metadata E								
Source Pair/Channel of	Source	AUD2 Ch 3-4	Frame Rate	25	Or	iginal Rate		Bit Depth		
Source Fair/Charmer Or	Timecode	01:02:53:04	Config	5.1+2	Pro	ograms	2	Errors	None	
the Dolby Bitstream		L	c	Ls	L1	Ŕ	LFE	Rs	R1	
the Bolby Blistican	Begin Gain	0.00dB	0.0048	0.00d8	0.00dB	0.00dB	0.00dB	0.00dB	0.00dB	
	End Gain	0.0088	0.008	0.0088	0.008	0.0088	0.0088	0.008	0.0008	
Dolby Begin/End Gain	Prog Parame	ter	Value	Parameter		Value	Parameter		Value	
Values for Each Source	 Program Dialogu 	n i e Level	-23.0dB	Channel Mode			Bitstream M	ode	Complete Mai	
values for Each Source	Centre I	Downmix Level	-3.0dB	RF Mode Com	, pression	Film Standard	Line Mode C	ompression	Film Standard	
Signal	Surrour	d Downmix Level	-3.0dB	Room Type		Small	Mixing Level		103d8	
Signal	Lo/Ro C	entre Downmix Level	-3.0dB	Dolby Surroun	1d Mode	Not Surround	Preferred Str	ereo Downmix	Not Indicated	
	LU/Rt Ce	ntre Downmix Level	-3.0dB	Lfe Channel	IU EX MOUE	True	RF Overmod	ulation Protection	Disabled	
Program-dependente	Lt/Rt Su		el -3.0dB	Copyright Bit			Original Bitst			
Motodata for Dolby E	Audio P	roduction Informatio		AD Converter	Туре	Standard	DC Filter		Enabled	
Melauala IOI DOIDY E	Low Pat	S Hiller d Dhaca Shife	Enabled	LFE Low Pass I Dolby Meadob	Filter	Enabled Not Encoded	Surround 3d	b Attenuation	Disabled	
Program 1	· 2 Program	n 2	Cristines	contraction in the second		THE LINCOUCH				
riogrami	Dialogu		-23.0dB	Channel Mode					Complete Mai	
	Centre	Jownmix Level	-3.0dB	RF Mode Com	pression	Film Standard	Line Mode C	ompression	Film Standard	
	Lo/Ro C	a Downmix Level	-3.0dB	Dolby Surroun	nd Mode	Not Indicated	Preferred St	reo Downmix	Not Indicated	
	Lo/Ro S	urround Downmix Le	vel -3.0dB	Dolby Surroun	nd Ex Mode	Not Surround EX	Data Rate			
	Lt/Rt Ce	ntre Downmix Level	-3.0dB	Lfe Channel		False	RF Overmod	ulation Protection	Disabled	
Program-dependent	LU/Rt Su Audio B	rround Downmix Lev	er -3.0dB	Copyright Bit	Tune	Tes Standard	Original Bits	iream	Tes	
Matadata far Dalby F	Low Pas	s Filter	Enabled	LFE Low Pass I	Filter	Disabled	Surround 3d	b Attenuation	Disabled	
IVIELAUALA IUI DOIDY E	4									

Displays the Dolby E metadata present in the selected Dolby E or ED2 audio stream

- Enables you to check the correct timing of embedded Dolby E and ED2 in SDI and 2022-6 payloads
- Check that the Dolby E metadata has been created correctly for multiple programs using the easy to read metadata display
- You can choose to monitor the Dolby audio from any of the SDI, ST 2022-6 or 2110 input embedded audio pairs/channels or the AES input
- Dolby stream CRC error detection and display

Dolby Detection in Audio Metering



Dolby Decoder Metering and Status

8 Channels Automatically Identified from Dolby Program Metadata

2 Channels for 2.0 Stereo Downmix of Selected Dolby Program 8 Channel Audio Metering for Dolby E, and 2 Channels for Downmix

Dolby Decoder Panel• and Status Information



When the Dolby E decoder is selected as the metering source (ST 2110, SDI or 2022-6 mode), the view of the analyzer changes to display the 8 channels of decoded Dolby E audio as well as the stereo 2.0 downmix

- The meter channel identification is automatically configured from the Dolby program metadata
- Display of Dolby E source, line positioning (SDI, 2022-6), dialogue level and downmix program source



10G/25G PCAP Tool [PHQXLO-IP-PCAP / PHQXPO-IP-PCAP]

This Packet Capture (PCAP) tool provides a flexible range of options for your capture of the live IP traffic on either a single or both Media interfaces while in ST 2110 Mode. The PCAP data is then saved to USB memory stick for offline analysis using third-party network analysis tools. The PCAP data on the USB stick can be accessed remotely via Web Browser.



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- Full line-rate capture at 25 Gbps on a single interface, back-to-back packets
- Capture data on one or both media interfaces simultaneously up to 50 Gbps
 User control of packet capture size e.g. Full payload or headers only with user control of the Packet Capture size (12-1518 Octets)
- Manual Start-Stop, Auto Start-Stop at specified time, Capture Start Delay
- User controls for auto stop: No of Packets, File size, Duration
- Saves to USB stick with the option of Browser File transfer off the unit
- 4 GB PCAP max. file size

IP Network Traffic Measurement [PHQXLO-IP-MEAS / PHQXPO-IP-MEAS]

An advanced engineering suite of tools for ST 2110 analysis and debug offers the provision of up to four simultaneous dual Packet Interval Timing measurement windows per input for easy visualization of network congestion and sender packet distribution with max, mean and min inter-packet arrival times. Also included is detailed data reporting of flow packet, clock rates and PTP timing relationship, as well as the measurements of the ST 2110-21 Network Compatibility model (C_{INST}) and Virtual Receiver Buffer Model (VRX). Advanced measurement of IP flow latency and RTP clock timing relationships for debug of Audio, Video and ANC alignment, source PTP and encapsulation are featured.



Advanced Media Timing - Video

- TIme of First Received Packet of a Frame (video timing)
- Receiver Buffer Margin with respect to TROdefault
- Sender RTP offset

Video Tim	ing & System Reference REF: PTP SFP E							
Video Tim	ing Media Latency Ext Ref vs PTP							
Flow	Media Latency vs PTP (µs)	Min	Mean	Max	From VID	RTP clks	TSs	RTP clks/TS
E VID	X	766.81 µs	771.75 µs	776.70 µs		90000	50	1800.00
E AUD 1		161.69 µs	208.34 µs	302.76 µs	-563.41 µs	48000	8000	6.00
E AUD 2		162.54 µs	209.69 µs	304.04 µs	-562.06 µs	48000	8000	6.00
E ANC	<u>Y</u>	1.64 µs	6.59 µs	11.50 µs	-765.17 μs	90000		1800.00
F VID	Y	766.80 µs	771.71 µs	776.61 µs		90000		1800.00
F AUD 1		162.02 µs	208.68 µs	303.08 µs	-563.03 µs	48000	8000	6.00
F AUD 2	V	162.99 µs	210.12 µs	304.04 µs	-561.60 µs	48000	8000	6.00
F ANC	y	1.62 µs	6.55 µs	11.46 µs	-765.16 µs	90000	50	1800.00

Advanced Media Timing - Media Latency

- Numerical display of Mean, Min and Max latency measurements
- Measured RTP clocks/s, Timestamps/s and RTP clocks/timestamp interval
- Numerical display of Video to Audio and ANC relative latency measurement



Inter-packet Timing

- Stream health reporting using histogram to show the distribution of inter-packet arrival times
- Simultaneous reporting of ST 2022-7 primary and secondary flow
- Packet counts (log or linear scales) mapped against arrival times ($\mu s)$
- Easy diagnosis of congestion with max, mean and min inter-packet arrival times



ST 2110-21

- ST 2110-21 measurement of Network Compatibility Model ($C_{\rm INST}$) and Virtual Receiver Buffer Model (VRX)
- User control of VRX buffer read-schedule timing
- User control of C_{INST} buffer drain rate





Packet Interval Profile Generator [PHQXLO-IP-NGT / PHQXPO-IP-NGT]

(Also Requires PHQXLO-GEN or PHQXPO-GEN)

A ST 2022-6 packet generation tool for evaluating the ability of a receiver to handle a ST 2022-6 flow with jitter. Simulate IP video network packet jitter under a variety of network conditions by adjusting the transmission distribution profile. View the interval timing distribution of generated packets, and the number of packets generated each second, against



the deviation of each packet interval from the expected interval time.

IP Transmit (ST 2022-6)

- Configuration of Transmission flow addresses, port numbers and SSRC
- Inter-packet jitter onto outgoing flow
- Gaussian or uniform distribution
- Flow control on/off

4K/UHD ST 2110 Extended UHD Format Support [PHQXLO-EUHD / PHQXPO-EUHD]

(Also Requires PHQXLO-UHD or PHQXPO-UHD)

Out of the box the QxL and QxP support 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 PHQXLO-EUHD / PHQXPO-EUHD options provide

Resolution	Frame	Mapping	Gamut
4006x2160 -	All	- 1CbCr:422:10 -	VILG 2020
4096x2160	60p	All	HLG 2020
4096x2160	59.94p	VChEr/422/12	HLG 2020
+096x2160	500	Y65CH444:10	HLG 2020
4096x2160	4811	VCbCr:444:12	HLG 2020
4096x2160	47.950	RGEIO	HLG 2070
4096x2160	30/1	(PRODUCT)	HEG 2020
409682160	29.976	¥CbCr:422:10	HLG 2020
4096x2160	250	Veher:422:10	HE6 2020
4096x2160	240	VCBCP3822:10	10.6-2020
-10PRX2160	21.580	YChCr 422.10	HUR 2020

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 [PHQXLO-HDR or PHQXPO-HDR]

The Qx Series' 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 and Sony S-Log3 and SR Live. The Waveform provides a Cd/m² (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 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

QxP

	Qx	QxL	
Specifications		Contract Strengthered by	
opeemeditoris	Marine Marine Marine &	atom de Atomic Atomica (041.	******
Formats supported (Generation, Analysis & Monitoring)			
ST 2110-20/-30/-31/-40 / 2022-7 / 2022-6 Analysis over 10G Ethernet	0	•	•
ST 2110-20/-30/-31/-40 / 2022-7 / 2022-6 Analysis over 25G Ethernet	-	0	0
ST 2022-6 Generation	-	0	0
SDLO		Factory Option	Factory Option
3G / 1.5G / 270M*-SDI HD / SD* Analysis	•	Factory Option	Factory Option
3G / 1.5G / 270M*-SDI HD Generation	0	O †	O †
12G / 6G / 3G / 1.5G-SDI UHD Over SDI	0	O ⁺	O ⁺
25G IP Link Rates Over SFP28	-	0	0
Hardware and Software Options Supported			
Audio / Video Generator (SDI, ST 2022-6, ST 2110)	0	0	0
	(SDI, 2022-6)	(SDI, 2022-6, 2110)	(SDI, 2022-6, 2110)
UHD / 4K Upgrade	(SDI)	(SDI, 2110)	(SDI, 2110)
SDI-STRESS Testing Toolset (Requires SDI Eye and Jitter Toolset)	0	0	0
Data View Analyzer, ANC Status and ANC Inspector		•	
32 Channel Audio Metering and 5.1/2.0 Loudness Measurement		•	
HDR/WCG Support	0	0	0
Dolby E Analysis	0	0	0
ST 2022-6, ST 2110/20/30/31/40 Decap with Class C Audio, ST 2022-7, Dual PTP	0		
ST 2110 Network Traffic Measurement Toolset	0	0	0
ST 2022-6 Network Traffic Generator Toolset	0	0	0
	-	0	0
FUHD Formats over 25G 2110-20	-	0	0
SDI inputs / outputs		Ŭ	Ŭ
4 x SDI inputs. SD* / HD / 3G. 75 ohm terminated BNC		Factory Option	Factory Option
2 x SFP+ MSA / Non-MSA cages (12 Gbps copper or fiber SDI interfaces)		Factory Option	Factory Option
4 x SDI outputs, SD* / HD / 3G, 75 ohm BNC	•	Factory Option	Factory Option
Ethernet inputs / outputs (accepts generic SFPs)			
2 x SFP+ 10G Cages (shared with SDI SFP+ MSA/Non-MSA cages)		-	-
2 x SFP28 10 / 25G cages	-		
2 x QSFP28 cages (Reserved)	-	0	0
Audio inputs / outputs			
4 x 75 ohm AES selectable I/O (26 pin high-density D-Type socket)		•	
1 x Stereo analog audio output (26 pin high-density D-Type socket)	•	•	•
8 channel 48 kHz PCM audio on HDMI and SDI Instrument output			
User interface			
Integrated 1920 X 1200 / Inch LCD multitouch touchscreen	-	- HDML2.02	
SDI 3Gbit instrument out 1920 x 1080, 4:4:4 RGB, Type A	BNC	Micro BNC	Micro BNC
ST 2110-20. ST 2110-30 instrument out, 1920 x 1080, 4:2:2 YCbCr	-		
Remote Browser GUI access (noVNC)		•	•
Reference			
2 x 75 ohm BNC looping reference input, tri-level or B&B with cross lock		-	-
1 x 75 ohm Micro-BNC reference input, tri-level or B&B with cross lock	-		
Networking & control			
10/100/1000 BASE-T		•	
8 x bi-directional GPI (26 pin high-density D-Type socket)			
Monitoring			
Integral Speaker / Headphone Socket (1/4")	-	-	
Form factor			
Size (Width x Height x Depth - excluding projections)	211 x 44 x 253 mm	211 x 44 x 253 mm	215 x 132 x 330 mm
Weight	1.9 kg	1.9 kg	4.1 kg ‡
Electrical			
4 pin XLR DC power connector	10-18V, 50W typical, 100W max	10-18V, 70W typical, 100W max	11-17V, 70W typical, 100W max
External power supply	90-264 VAC, 50 W typical , 120 W max	90-264 VAC, 70 W typical, 120 W max	-
Internal AC power supply with IEC connector	-	-	100-240 VAC, 77 typical, 110 W max
Choice of External Battery V-mount or Gold-mount	-	-	•
Warranty			
Warranty (1 year)			
Extended Warranty Package (3 - 5 years)	0	0	0

Rear Panel - IO View

IP Only

Power 10 - 18 V QxL 11 - 17 V QxP



With Factory-fitted SDI Option



Ordering QxL

QxL Chassis Options

PHQXL	QxL 1U SD*/HD/2K 10GbE IP Rasterizer, Analyser only
PHQXL01-3G	QxL 1U SD*/HD/2K 10GbE IP/SDI Rasterizer, Analyser only
PHQXL01E-3G	QxL 1U SD*/HD/2K 10GbE IP/SDI Rasterizer, Eye/ Jitter, Analyser only

QxL Chassis Upgrade Options

PHQXLM-01	QxL SDI I/O return to factory upgrade (requires PHQXL)
PHQXLM-01E	QxL SDI Eye/Jitter return to factory upgrade (requires PHQXL01-3G)

QxL IP Options

PHQXLO-IP-25G	25GbE media network (requires 2x PHSFP-25G-SR or PHSFP-25G-LR)
PHQXLO-EUHD	Adds RGB, 12b, 444, 48-60Hz formats to ST2110 (requires PHQXLO-UHD)
PHQXLO-IP-MEAS	IP Measurement 2110-21, PIT histograms, timing
PHQXLO-IP-PCAP	PCAP 2x25Gbps line rate capture tool, 4GB max
PHQXLO-IP-NGT	2022-6 IP Network traffic Generator Tool (requires PHQXLO-GEN)
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

QxL SDI/IP Software Options

PHQXLO-DOLBY	Dolby E Decoder, Metadata Analyser, LtRt/LoRo downmix, metering
PHQXLO-GEN	SDI/IP AV Test Signal Generator (SDI requires PHQXL01-3G or PHQXL01E-3G)
PHQXLO-UHD	2K Extended + UHD/4K IP/SDI (ST 2110 requires PHQXLO-IP-25G) (SDI requires PHQXL01-3G or PHQXL01E-3G)
PHQXLO-HDR	HDR/WCG, CIE1931, HDR Heat map (PQ, HLG, S-Log3, SR Live)

QxL SDI Options

PHQXLO-SDI-	12G-SDI Stress Test Toolset (requires PHQXL01E-
STRESS	3G, PHQXLO-UHD, PHQXLO-GEN)
PHSFP-RT12-1310	SFP+ SM(10km) LC Non-MSA, Tx 1310nm, Rx 1260- 1620nm 12G/6G/3G/HD/SD*-SDI

QxL Fitting Kits / Cables

PHQXC-1	12G-SDI Eye Measurement Test Cable 1m
PHQXK1	19 inch rackmount kit (1x Qx/QxL chassis)
PHQXK2	19 inch rackmount kit (2x Qx/QxL chassis)
PHQXK3	9.5 inch rackmount kit (1x Qx/QxL chassis)

QxL Extended Warranty

PHQXL Upgrade from 1 to 3 Year Warranty (excludes SFP)
PHQXL Upgrade from 1 to 5 Year Warranty (excludes SFP)
PHQXL01 Upgrade from 1 to 3 Year Warranty (excludes SFP)
PHQXL01 Upgrade from 1 to 5 Year Warranty (excludes SFP)
PHQXL01E Upgrade from 1 to 3 Year Warranty (excludes SFP)
PHQXL01E Upgrade from 1 to 5 Year Warranty (excludes SFP)

Ordering QxP

QxP Chassis Options

PHQXP-V	QxP 3U SD*/HD/2K 10GbE IP Waveform Monitor/ Analyser, V-mount
PHQXP-G	QxP 3U SD*/HD/2K 10GbE IP Waveform Monitor/ Analyser, G-mount
PHQXP01-3G-V	QxP 3U SD*/HD/2K 10GbE IP/SDI Waveform Moni- tor/Analyser, V-mount
PHQXP01-3G-G	QxP 3U SD*/HD/2K 10GbE IP/SDI Waveform Moni- tor/Analyser, G-mount
PHQXP01E-3G-V	QxP 3U SD*/HD/2K 10GbE IP/SDI Waveform Moni- tor/Analyser, Eye/Jitter, V-mount
PHQXP01E-3G-G	QxP 3U SD*/HD/2K 10GbE IP/SDI Waveform Moni- tor/ Analyzer, Eye/Jitter, G-mount

QxP Chassis Upgrades (Return to Factory)

PHQXPM-01	QxP SDI I/O return to factory upgrade (requires PHQXP)
PHQXPM-01E	QxP SDI Eye/Jitter return to factory upgrade (requires PHQXP01-3G)

QxP IP Options

PHQXPO-IP-25G	25GbE media network (requires 2x PHSFP-25G-SR or PHSFP-25G-LR)
PHQXPO-EUHD	Add RGB, 12b, 444, 48-60Hz formats to ST2110 (requires PHQXPO-UHD)
PHQXPO-IP-MEAS	IP Measurement 2110-21, PIT histograms, timing
PHQXPO-IP-PCAP	PCAP 2x25Gbps line rate capture tool, 4GB max.
PHQXPO-IP-NGT	2022-6 IP Network traffic Generator Tool (requires PHQXPO-GEN)
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

QxP SDI/IP Software Options

PHQXPO-DOLBY	Dolby E Decoder, Metadata Analyser, LtRt/LoRo downmix, metering
PHQXPO-GEN	SDI/IP AV Test Signal Generator (SDI requires PHQXP01-3G or PHQXP01E-3G)
PHQXPO-UHD	2K Extended + UHD/4K IP/SDI (SDI requires PHQXP01-3G or PHQXP01E-3G)
PHQXPO-HDR	HDR/WCG, CIE1931, HDR Heat map (PQ, HLG, S-Log3, SR Live)
OVD SDI Ontion	

QxP SDI Options

PHQXPO-SDI-	12G-SDI Stress Test Toolset (requires PHQXP01E-
STRESS	3G, PHQXPO-UHD, PHQXPO-GEN)

PHSFP-RT12-1310 SFP+ SM(10km) LC Non-MSA, Tx 1310nm, Rx 1260-1620nm SD*/HD/3G/6G/12G-SDI QxP Fitting Kits

PHQXC-1	12G-SDI Eye Measurement Test Cable 1m
PHQXK7	3U 19 inch rackmount kit (1x QxP Chassis)
PHQXK8	3U 19inch rackmount kit (2x QxP Chassis)
PHQXK9	QxP desktop kit (adjustable feet plus handle)

QxP Extended Warranty

PHQXP-3YEAR	PHQXP Upgrade from 1 to 3 Year Warranty (excludes SFP)
PHQXP-5YEAR	PHQXP Upgrade from 1 to 5 Year Warranty (excludes SFP)
PHQXP01-3YEAR	PHQXP01 Upgrade from 1 to 3 Year Warranty (excludes SFP)
PHQXP01-5YEAR	PHQXP01 Upgrade from 1 to 5 Year Warranty (excludes SFP)
PHQXP01E-3YEAR	PHQXP01E Upgrade from 1 to 3 Year Warranty (excludes SFP)
PHQXP01E-5YEAR	PHQXP01E Upgrade from 1 to 5 Year Warranty (excludes SFP)

SDI SFP Interfaces

[Requires PHQXL01-3G / PHQXP01-3G or PHQXL01E-3G / PHQXP01E-3G]

SDI SFP Interface	Link Type	SFP+B Link Rates		SFP+A Link Rates	
SDI Transceivers Only					
One SDI Transceiver in Cage A	SFP Interface	N/A	N/A	Rx Ch1	Tx Ch1
	Single Link: Rx/Tx	N/A	N/A	BNC A Rx 0.27*/1.5/3/6/12	BNC A Tx 0.27*/1.5/3/6/12
Ŭ	Dual Link: N/A	N/A	N/A	N/A	N/A
	Quad Link: N/A	N/A	N/A	N/A	N/A
	SFP Interface	Rx Ch1	Tx Ch1	Rx Ch1	Tx Ch1
Two SDI Transceivers in Cages	Single Link: Rx/Tx	N/A	BNC C Tx (Tx Copy) 0.27*/1.5/3/6/12	BNC A Rx 0.27*/1.5/3/6/12	BNC A Tx 0.27*/1.5/3/6/12
A & B	Dual Link: Rx/Tx	BNC C Rx 0.27*/1.5/3/6	BNC C Tx 0.27*/1.5/3/6	BNC A Rx 0.27*/1.5/3/6	BNC A Tx 0.27*/1.5/3/6
	Quad Link: N/A	N/A	N/A	N/A	N/A
SDI Dual Receivers Only					
	SFP Interface	N/A	N/A	Rx Ch1	Rx Ch2
	Single Link: Rx	N/A	N/A	BNC A Rx 0.27*/1.5/3/6/12	N/A
One SDI Dual Receiver in Cage A	Dual Link: Rx	N/A	N/A	BNC A Rx 0.27*/1.5/3/6	BNC B Rx 0.27*/1.5/3/6
	Quad Link: N/A	N/A	N/A	N/A	N/A
	SFP Interface	Rx Ch1	Rx Ch2	Rx Ch1	Rx Ch2
Two SDI Dual Receivers in Cages	Single Link: Rx	N/A	N/A	BNC A Rx 0.27*/1.5/3/6/12	N/A
A & B	Dual Link: Rx	N/A	N/A	BNC A Rx 0.27*/1.5/3/6	BNC B Rx 0.27*/1.5/3/6
	Quad Link: Rx ^{1 2}	BNC C Rx 0.27*/1.5/3	BNC D Rx 0.27*/1.5/3	BNC A Rx 0.27*/1.5/3	BNC B Rx 0.27*/1.5/3
SDI Dual Transmitters Only					
	SFP Interface	N/A	N/A	Tx Ch2	Tx Ch1
One SDI Dual Transmitter in Cage A	Single Link: Tx	N/A	N/A	BNC B Tx (Tx Copy) 0.27*/1.5/3/6	BNC A Tx 0.27*/1.5/3/6/12
	Dual Link: Tx	N/A	N/A	BNC B Tx 0.27*/1.5/3/6	BNC A Tx 0.27*/1.5/3/6
	Quad Link: N/A	N/A	N/A	N/A	N/A
	SFP Interface	Tx Ch2	Tx Ch1	Tx Ch2	Tx Ch1
Two SDI Dual Transmitters in Cages	Single Link: Tx	BNC D Tx (Tx Copy) 0.27*/1.5/3/6	BNC C Tx (Tx Copy) 0.27*/1.5/3/6/12	BNC B Tx (Tx Copy) 0.27*/1.5/3/6	BNC A Tx 0.27*/1.5/3/6/12
A & B	Dual Link: Tx	BNC D Tx (Tx Copy) 0.27*/1.5/3/6	BNC C Tx (Tx Copy) 0.27*/1.5/3/6	BNC B Tx 0.27*/1.5/3/6	BNC A Tx 0.27*/1.5/3/6
	Quad Link: Tx ^{2 3}	BNC D Tx 0.27*/1.5/3	BNC C Tx 0.27*/1.5/3	BNC B Tx 0.27*/1.5/3	BNC A Tx 0.27*/1.5/3
SDI Dual Transmitter plus SDI Dual Receiver					
One SDI Dual Transmitter (Cage A) and One Dual SDI Receiver (Cage B)	SFP Interface	Rx Ch1	Rx Ch2	Tx Ch2	Tx Ch1
	Single Link: Rx/Tx	BNC C Rx 0.27*/1.5/3/6/12	N/A	BNC B Tx (Tx Copy) 0.27*/1.5/3/6	BNC A Tx 0.27*/1.5/3/6/12
	Dual Link: Rx/Tx	BNC C Rx 0.27*/1.5/3/6	BNC D Rx 0.27*/1.5/3/6	BNC B Tx 0.27*/1.5/3/6	BNC A Tx 0.27*/1.5/3/6
	Quad Link: N/A	N/A	N/A	N/A	N/A

¹ In quad link 2SI the Receivers will auto adapt to any order of sub-image to BNC mapping.

² In quad link square division the sub image order is: BNC A:TL, BNC B:TR, BNC C:BL, BNC D:BR.

³ In quad link 2SI the sub image order is: BNC A:Sub 1, BNC B:Sub 2, BNC C:Sub 3, BNC D:Sub 4.

Supported 2K/HD/SD* SDI Formats

The following SDI formats are available on QxL and QxP.

SMPTE Stnds. Link (Content)	Interface	Resolution	Sampling Structure	Pixel Frame/Field Rate Depth		HDR⁺	SDI‡	2022-6
ST 259 (ST 125)	SD (625i) *	720 x 576	4:2:2 (YCbCr)	10	50i	-	ОA	А
ST 259 (ST 125)	SD (525i) *	720 x 485	4:2:2 (YCbCr)	10	59.94i	-	ОA	А
ST 292 (ST 296)	HD	1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p,	0●	00	•
ST 292 (ST 274)	HD	1920 x 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i 30p, 29.97p, 25p, 24p, 23.98p	0•	00	•
ST 292 (RP 211)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30psF, 29.97PsF, 25psF, 24PsF, 23.98PsF	0●	00	•
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	0•	00	•
ST 372 (ST 274)	Dual Link HD	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	0●	00	-
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	0●	0●	-
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	0•	00	-
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	0●	0•	-
ST 372 (ST 2048-2)	Dual Link HD	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	0●	0●	-
ST 372 (ST 2048-2)	Dual Link HD	2048 × 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	0•	00	-
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	0•	00	-
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	0•	00	-
ST 425-1 (ST 274)	3G Level A (1)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	0●	00	•
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	0•	00	•
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	0●	00	•
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	0•	00	•
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	0●	00	•
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	0•	0•	•
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	0•	00	•
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	0•	0•	٠
ST 425-1 (ST 2048-2)	3G Level A (4)	2048 × 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	0●	00	•
ST 425-1 (ST 274)	3G Level B-DL (I)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	0•	0•	•
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	0•	00	•
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	0•	00	•
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	0•	00	•
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	0•	00	•
ST 425-1 (ST 2048-2)	3G Level B-DL (III)	2048 × 1080	4:4:4 (YCbCr/RBG)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	0•	00	•
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	0●	00	•
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	0•	00	•

KEY

• - Generator with PHQXLO-GEN / PHQXPO-GEN option and Analyzer

O - Optional

O - Optional Generator with PHQXLO-GEN / PHQXPO-GEN option and Analyzer

A - Analyzer Only

'-' - Not Available

⁺ Note: Optional HDR formats require PHQXLO-HDR or PHQXPO-HDR

* Note: SDI formats require PHQXL01-3G / PHQXP01-3G or PHQXL01E-3G / PHQXP01E-3G

Supported 2K/HD/SD* IP Formats

The following 2K/HD/SD* ST 2110-20 formats are provided as standard.

Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	2110 HDR ⁺	2110 SDR
720 x 576*	4:2:2 (YCbCr)	10	50i	-	А
720 x 485*	4:2:2 (YCbCr)	10	59.94i	-	А
1280 x 720	4:2:2 (YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	А
1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0●	•
1280 x 720	4:4:4(YCbCr/RGB)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	А
1280 x 720	4:4:4(YCbCr/RGB)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0●	•
1920 x 1080	4:2:2(YCbCr)	8	601, 59.941, 501	OA	А
1920 x 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i	0●	٠
1920 x 1080	4:2:2(YCbCr)	12	601, 59.941, 501	0●	٠
1920 x 1080	4:4:4(YCbCr/RGB)	8	601, 59.941, 501	OA	А
1920 x 1080	4:4:4(YCbCr/RGB)	10	601, 59.941, 501	0●	٠
1920 x 1080	4:4:4(YCbCr/RGB)	12	601, 59.941, 501	0•	٠
1920 x 1080	4:2:2 (YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	А
1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0.	٠
1920 x 1080	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	00	٠
1920 x 1080	4:4:4(YCbCr/RGB)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	А
1920 x 1080	4:4:4(YCbCr/RGB)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	00	٠
1920 x 1080	4:4:4(YCbCr/RGB)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0.	٠
1920 x 1080	4:2:2 (YCbCr)	8	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	OA	А
1920 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF	0●	•
1920 x 1080	4:2:2 (YCbCr)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	0●	٠
1920 x 1080	4:4:4(YCbCr/RGB)	8	30PsF, 29.97PsF, 25PsF, 24psF, 23.97PsF	OA	А
1920 x 1080	4:4:4(YCbCr/RGB)	10	30psF, 29.97psF, 25psF, 24PsF, 23.97PsF	0●	٠
1920 x 1080	4:4:4(YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	0●	٠
2048 x 1080	4:2:2 (YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	А
2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0●	٠
2048 x 1080	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0●	٠
2048 x 1080	4:4:4(YCbCr/RGB)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	А
2048 x 1080	4:4:4(YCbCr/RGB)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0●	٠
2048 x 1080	4:4:4(YCbCr/RGB)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0●	•
2048 x 1080	4:2:2(YCbCr)	8	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	OA	А
2048 x 1080	4:2:2(YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	0●	٠
2048 × 1080	4:2:2(YCbCr)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	0●	•
2048 x 1080	4:4:4(YCbCr/RGB)	8	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	OA	А
2048 × 1080	4:4:4(YCbCr/RGB)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	0●	•
2048 x 1080	4:4:4(YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.97PsF	0●	٠

KEY

• - Generator with PHQXLO-GEN / PHQXPO-GEN option and Analyzer

O - Optional

O• - Optional Generator with PHQXLO-GEN / PHQXPO-GEN option and Analyzer

A - Analyzer Only '-' - Not Available

⁺ Note: Optional HDR formats require PHQXLO-HDR or PHQXPO-HDR

Supported 4K/UHD Formats

The following SDI formats are optional on QxL/QxP [PHQXLO-UHD / PHQXPO-UHD + PHQXL01-3G / PHQXP01-3G or PHQXL01E-3G / PHQXP01E-3G]

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	0●	0●
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	0•	0●
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	0●	0●
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	0•	0●
ST 2081-10 M1 (ST 2036-1)	6G-2SI	3840 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	0●	0●
ST 2081-10 M1 (ST 2048-1)	6G-2SI	4096 x 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	0•	0●
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	0●	0●
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	0•	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	00	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0●	0●
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	0•	0●

KEY

O - Optional

 $\mathsf{O} \bullet$ - Optional Generator with <code>PHQXLO-GEN</code> / <code>PHQXPO-GEN</code> option and <code>Analyzer</code>

Supported 4K/UHD IP Formats

The following 4K/UHD ST 2110-20 formats are optional with: PHQXLO-IP-25G and PHQXLO-UHD or PHQXPO-IP-25G and PHQXPO-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	А
3840 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0•	•
3840 x 2160	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	0●	•
3840 × 2160	4:4:4(YCbCr/RGB)	8	30p, 29.97p, 25p, 24p, 23.98p	OA	А
3840 x 2160	4:4:4(YCbCr/RGB)	10	30p, 29.97p, 25p, 24p, 23.98p	0●	•
3840 × 2160	4:4:4(YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	0•	•
4096 x 2160	4:2:2(YCbCr)	8	60p, 59.94p, 50p, 48p, 47.97p, 30p, 29.97p, 25p, 24p, 23.98p	OA	А
4096 x 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p , 30p, 29.97p, 25p, 24p, 23.98p	0●	•
4096 x 2160	4:2:2 (YCbCr)	12	60p, 59.94p, 50p, 48p, 47.95p , 30p, 29.97p, 25p, 24p, 23.98p	0●	•
4096 x 2160	4:4:4(YCbCr/RGB)	8	30p, 29.97p, 25p, 24p, 23.98p	OA	А
4096 x 2160	4:4:4(YCbCr/RGB)	10	30p, 29.97p, 25p, 24p, 23.98p	0●	•
4096 x 2160	4:4:4(YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	0●	•

The following 4K/UHD ST 2110-20 extended formats are optional with: PHQXLO-IP-25G, PHQXLO-UHD and PHQXLO-EUHD or PHQXPO-IP-25G, PHQXPO-UHD and PHQXPO-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	0●	0●
3840 x 2160	RGB:444	12	60p, 59.94p, 50p, 48p, 47.97p	0●	0●
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	0●	0●
3840 × 2160	YCbCR:444	12	60p, 59.94p, 50p, 48p, 47.97p	0●	0●
4K Formats					
4096 × 2160	RGB:444	8	60p, 59.94p, 50p, 48p, 47.97p	OA	OA
4096 × 2160	RGB:444	10	60p, 59.94p, 50p, 48p, 47.97p	0●	0●
4096 × 2160	RGB:444	12	60p, 59.94p, 50p, 48p, 47.97p	0●	0●
4096 × 2160	YCbCr:444	8	60p, 59.94p, 50p, 48p, 47.97p	OA	OA
4096 × 2160	YCbCR:444	10	60p, 59.94p, 50p, 48p, 47.97p	0●	0●
4096 × 2160	YCbCR:444	12	60p, 59.94p, 50p, 48p, 47.97p	0●	0●

KEY

• - Generator with PHQXLO-GEN / PHQXPO-GEN option and Analyzer

O - Optional

O• - Optional Generator with PHQXLO-GEN / PHQXPO-GEN option and Analyzer

A - Analyzer Only

OA - Optional Analyzer

⁺ Note: Optional HDR formats require PHQXLO-HDR / PHQXPO-HDR

QxL Dimensions and Installation



Notes:

Notes:



For more information about IP, SDI, 4K/UHD and HDR contact:

www.phabrix.com



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VERSATILE HANDHELD TEST AND MEASUREMENT INCLUDING HYBRID IP/SDI & SDI EYE/JITTER ANALYSIS



"The Sx is ideal for broadcast, live production and video technology manufacturing..."



Sx Series Overview

Handheld Signal Generation, Analysis and Monitoring

With over 8000 units shipped worldwide, the Sx range of instruments are the broadcast industry's most popular handheld devices offering exceptional mobility in an easy to use, easy to carry format. Designed for commissioning, fault-finding and compliance testing, the PHABRIX Sx range is equally at home on an outside broadcast, in a studio facility, in remote locations with remote monitoring, or in a manufacturing and test environment.

The proven lightweight (0.9Kg) but rugged aluminum case is fitted with a high quality screen for instrument display and video monitoring, as well as an integral speaker and headphone jack for audio monitoring. The generator/analyzer operates via rechargeable lithium battery for up to 2 hours, and can also be powered by a mains adaptor to offer flexible operation around facilities.



Extensive Video & Audio Toolset

With simultaneous signal generation and analysis, the builtin core diagnostic toolset includes a multi-format Waveform, Vectorscope and Video display with support for 16-channel audio monitoring.

Other key optional capabilities include AV delay measurement, bitstream generation and analysis of Dolby E, Dolby Digital and Dolby Digital Plus as well as data view, VANC/ANC inspector, status logging and remote operation over Ethernet.

In	: 36A-1080pt	59 NC	AES		Out: 3	56A-16	88p58	Lock :	F	nee		_	00 :	14
Ī	Flow Conf	SFP 9 iguna inabl	ation-	5: OK Upda GNP	ate in Enable	Os-	IS Det	fault		Hostn Hostn	date ame at-	in 8 58-a4	Dhop	
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	Dest MAC Rx Packet	81 6	08 5e	88	01 02 Reset	SSRC	0		<u>ן</u> ן	Subne 255	t Mas 255	k 255	0	1
•	Destinati	on Fi	Iters	IP	Source	Filt	ers-		jį	Defau 192	1t Ga 168	tevas 10	1	İ
22-6 Deca	Ethernet- Rx Packet Tx Packet	Updat Ls 60 Ls 0	e in 51979	45-	SDI Samp S352	36 Stan 36 Sto ling: 189-0	dand 1: 59 1 422 1 A: 60 1	94p /ObCr 81		Rx Pac Tx Pac DropPa	kets kets ackets	0 2 0		
202	Selector A	LL	_		SMPT	E ST 3	274 19	20::108		VLAN		L	Reset	
Haj	n Menu Bena	erato	Ana	lyse	r Sig	Info	AUG	dio	Sys	tem	Logs	aing	2622-	6

Hybrid IP and SDI

The Sx TAG with its versatile SFP handles 3G/HD/SD-SDI, optical SDI, IP, HDMI and analog composite formats.

Comprehensive support is provided for modern broadcast IP systems with JT-NM Tested⁺ encapsulation and decapsulation of ST 2110-20/30/31/40 with IP to SDI gateway, ST 2059 PTP, AMWA NMOS IS-04, IS-05, and IS-08, as well as ST 2022-6.

Hybrid operation is supported with a built-in synchronizer that allows asynchronous SDI sources to be locked to PTP for ST 2110 encapsulation.

In: 30	2-1080150 NO	AES OL	t: 362-10	80150 Lock	: Free		11:02
	A 100kHz	0.10UI	T	10Hz	0.68UI		Hist.
50	n						Amp.
	10	Careforni Consectione					Jitter-
70			2. A	1.	Same and		Align
							Jitter-2
							Timing
							Eyes 10
-10							Update
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al.							Setup
₹ A	762nV /112p	s 119ps	∆7ps	r1.9%	L0.6%	LOM	The second secon
Main I	Menu Picture	1000	Signal	Waveform	Vector	Eye and	Jitter
		A DESCRIPTION OF A	Data	Monitor	Scope	Jitter	Analysis

3G-SDI Real-Time Eye (RTE[™]) Physical Layer Testing

Ideal for SDI physical layer line check, commissioning and testing, the SxE is unique in offering rapid display and analysis of 3G/HD/SD-SDI physical interfaces with a sophisticated Real-Time Eye and Jitter measurement toolset.

 $^{+}JT\text{-}NM$ Tested - For more details on the JT-NM Tested program at IBC 2019 and its test results please see https://jt-nm.org/jt-nm_tested

4x the flexibility

Unmatched flexibility, rapid fault finding

Sx TAG

- IP*/SDI/HDMI*
- IP Gateway*
- Optical*/Analog
- Video/Audio
- SD/HD/3G*
- AES/Dolby*
- Ref I/O

SxE

- Eye and Jitter
- Video/Audio
- SD/HD/3G
- $\bullet \, \mathsf{AES/Dolby}^*$
- Ref Input











- Video/Audio
- SD/HD/3G
- $\bullet \mathsf{AES/Dolby}^*$
- Ref Input





SxD

- Video/Audio
- Dual Link SDI
- SD/HD/3G
- $\bullet \, \mathsf{Dolby}^*$
- Ref Input







Generator



Video Generator

- The Sx can create video test signals for all supported SD and HD SDI output standards including the 3GHz standards at 1080p/50/59/60 Y, Cb, Cr
- Advanced video formats include support for RGB, XYZ 12bit and 2K formats
- A fully programmable Y Zone Plate



Audio Generator

- The Sx can embed an audio signal on all 16 embedded audio outputs
- The Audio Group menu controls which audio channels are present, signal type and amplitude
- Choice of: silence, adjustable tone, noise, AV Delay, Dolby test stream or AES input



Reference

- The Sx instrument can create video test signals that are either free-running or locked to a studio reference or input signal
- The Genlock menu is used to select the locking reference and provides a control for genlock phase offset in lines and pixels
- User control of Free Run frequency with +/- 100ppm pull range for SDI interface acceptance checking

Test Patterns

User Defined	Full Field White	Full Field Blue	Full Field Cyan	Full Field Green	Full Field Magenta	Full Field Red
Full Field Yellow	100% Full Field Bars	75% Full Field Bars	75% Bars Over Red	SMPTE Bars	SMPTE 219-75 Bars	SMPTE 219-100 Bars
SMPTE 219+i Bars	ARIB 28-100	ARIB 28-75	ARIB 28+i	Tartan Bars	5 Step	5 Step Vert
10 Step	10 Step Vert	Pathological EQ/PLL	Pathological EQ	Pathological PLL	Y Ramp Up	Y Ramp Down
Vertical Ramp	Legal Chroma Ramp	Full Chroma Ramp	Y Cr, Cb Ramp - Valid Ramps	Y Cr, Cb Ramp - Component Ramps	Chroma Ramp	Multi Burst
Pluge	Bowtie	AV Delay Patt 1	Bouncing Box	ر العام ا Ident Overlay	Zone Plate (Optional Toolset)	



Analyzer



Picture Monitor

- The picture is displayed in a window as a down-converted display
- A cursor may be turned ON over the area of the picture specified by the specified line and sample
- Monitor device input or output



Picture Zoom

- Zoom function provides a 1:1 unfiltered pixel view, centred on the position of the picture cursor
- HANC/VANC areas visible when cursor in blanking



Linked Cursors

 The picture cursor is linked to waveform, vectorscope and data views for rapid and accurate detailed measurement of the signal



Waveform Full Frame

- Displays selected analyzer or generator source
- Analog locking reference input view (TAG only)
- YCbCr GBR, Y, Cb, Cr, R, G, B modes
- Cursors may be displayed over the waveform to allow measurement of time or amplitude values
- Vertical and horizontal magnifications



Waveform Line Select

- The display may be restricted to a single line or all lines may be displayed at the same time
- The single line display is linked to the picture, vectorscope and data view



Vectorscope

- Choice of 100% or 75% graticules
- Display the Composite, SDI, SFP video input or the generator test pattern
- Display a specific video line linked to picture cursor
- x1, x2, x5 or x10 magnifications with position to centre, cyan, yellow, green, magenta, red, blue graticule locations

Control



Screen Grab

 Screen grabs can be saved and downloaded via a web browser or FTP transfer



Web Browser

- View and control the instrument display over a TCP/IP interface with a standard browser
- Ideal for remote location checking, engineering support, and fault analysis
- Allows access to key functions including screen dumps, loudness files and logging files



PC Simulator

- A free Sx simulator PC application is available on the PHABRIX website
- Indicates command IDs for automation programming
- Simultaneous operation



Audio



16 Channel Audio Meters

- Display up to 16 audio channels
- The source for each block of 8 meters may be independently set to allow metering of embedded audio inputs or outputs
- The current audio level in dBFs (decibels relative to 0dB full-scale) is displayed at the bottom of each meter

System



Instrument Presets

- Current settings in the Sx instrument can be saved as memories for future recall
- Memories can be exported to a single file, reimported or copied to other units
- Presets can be applied to the whole instrument or selectively within the Generator or Analyzer



AES/Analog Audio Meters

- AES and Analog (TAG) audio metering available as an alternative to embedded audio
- Dolby E metering selection



Audio Channel Status

- The Audio Status menu shows the Channel Status for the selected audio channel
- Displayed in decoded form as well as a raw hexadecimal data dump
- The source may either come from the input signal or from the generator output for rapid comparison purposes



Network Configuration

- The Network menu allows the Sx instrument to be configured as part of a network
- Support for automatic acquisition of network parameters via DHCP or manual configuration
- Remote control enable/disable and selection of port number



Software Status

- Serial number, Sx instrument MAC address, version information and battery state listed
- The date and time can be set and factory default settings recalled
- Display of loaded license options
- LCD brightness and screen saver configurations



Engineer Setup

- Manage the Sx settings including user access, clearing memories, factory default reset, software upgrades and audio calibration
- SDI input to SDI output loop through mode
- Control of SDI to IP-SFP gateway in Sx TAG

In: 720p25	NO	AES	Out: 720p	25	Lock	: Free	Log	01:37
Dealer	· Features	[Ha	rdware Sta	atus ——	Mes	sages	Tenperatur	
	or operona	CF Sc	188 "LD %r DAC	0 0 0	10 66 16	083 11	41.5 0	105.7 F
Shi	ow Dolby-E	AE	S SRC T PLL DT DRV-1	0	16 6 28	4261	Voltages Pover In	5.08V
Perma ALL o	nently rem ptions	iove Sõ	I EQ-1	ĕ	ĩõ	68	2.5V 3.3V	2.48V 3.28V
8 0 En	able	,					Fan 5.8V 3.5V	5.06V 3.50V
E Clea	r Options							
Suste							-5.8V	-4.43V 3.38V
Main Menu	Menories	Command	d Netuor	k Mi:	sc.	Utils	Engineer	

Utils

- Details of the unit's operating status
- Details the temperature and individual board voltages
- Lists any hardware errors that have been recorded



Signal



Video Timing

- Display the relationship between the selected video input with respect to the external reference input
- Offset feature to simplify system timing measurements



Video Status

- Display the status of the selected video input or output and any errors that have been found in the data stream
- Display of EDH, Active Picture and CRC data with cumulative run-time display of errors and error rate
- Display of estimated cable length for SDI inputs with selectable cable type

In:	3GA-1080p50	Out: 364	Out: 36A-1080p50 Lock: Free 16:30							
	Sounce In1	Ancilla	y Packets Status	Setup Reset						
	RP165-EDH									
8										
		ARIB+6 23-1								
-		ARIB-6 39		ARTE-E 37 HD						
ž.		ARTE-B 37 SE								
			de RDDS+W5S							
	Hark halabad	User+1	User-C							
ŝ		ent !Checksur	>Stream +DBN	Parity *Previous						
lain	Menu Video	Misc Audi	D ANC ANC	Dolby-E Video						
	Status	Status Stat	Inspector Status	Timing						

ANC Status

- Shows which ANC packets are present on the SDI input and whether any errors have been detected
- Each field is color coded according to whether the ANC packet is present (White), missing (Grey), has errors (Red), or has previously had errors (yellow)

In: 36A-2Kp50 1000#23	Out: 1099s23 Lock:	FA 11:43
Source Int J Video Fornat Int All Pix 2440 Active-Fix 2440 Active-Fix 2440 Active-Fix 2440 Freese Ciewe 0 Video Fornat In2 All Pix 2270 Active-Line 1000 Free Mc 1405 52 Active-Line 1000 Free Mc 1405 52 ResSuc Ciewe 0	Paytola ID Link I Standard STACS-CIGO Standard STACS-CIGO Transport programitive Protoce programitive Proper State State Aspect. Ratio programitive Aspect. Ratio programitive Aspect. Ratio program Aspect. Ratio program Aspect. Ratio program Save Into 4.2.2 VDGr - en Save Into 4	The IBOD Information property ISBN-TV ISBN-
Main Menu Video M	atus Tining Status In	NC

Video Format/Payload ID

- The updated Misc Status menu provides an easy to read side by side status view of SMPTE 352 Video Payload Packets (VPID) embedded in the selected video input and displays any errors that have been found
- Support single links of multi-link 3G and HD based UHD formats
- Selection of input or output for rapid comparison
- Display of raw data and decoded form

Logging



Log Setup

 Set Audio Thresholds and log specific video status events, including Output, Reference and Input Status, TRS Errors, Picture CRC

In: 1080150	HIT ARS	001 525159	Lock :	Free	Log 🔁 11.59
Time	Bate	Ettent		36 -01	320 Elientile /
1 15:21:47	05-07-2018	Output Std: 525	159		
E 15:21:48	05-07-2018	Ref. Unlocked 6	25/50i		
1 15:22:06	65-87-2018	Output Std: 525	159		
i 15:22:06	05-07-2018	Output Std: 525	159		
1 15:22:08	65-07-2018	Output Std: 525	159		
i 15:22:09	05-07-2018	Output Std: 525	159		
1 15:23:53	65-07-2018	Output Std: 625	150		
E 15:23:55	05-07-2018	Ref. Unlocked 6	25/50i		
E 16:06:30	65-07-2018	Ref. Locked 625	/501		
E 16:07:56	05-07-2018	Ref. Unlocked 6	25/50i		
E 16:32:43	65-07-2018	Ref. Locked Fre	e		
E 16:32:48	05-07-2018	Ref. Unlocked 6	25/50i		
E 16:32:56	65-87-2018	Ref. Unlocked A	bsent		
E 16:33:06	05-07-2018	Ref. Unlocked 6	25/50i		
E 16:34:51	65-67-2018	Ref. Unlocked A	bsent		
E 16:36:57	05-07-2018	Ref. Locked 625	/50i		
E 16:36:57	65-07-2018	Ref Unlocked 6	25/591		
	and the second	Long Lines	and the second se	1 Date	and the second second
asin Renu Tex	white Lag a	ISME 199	G PUL	Re	d Nan Lilmon Los
			hable		n cos

Event Log Display

• The Event Log menu displays a list of events with a time stamp showing when they occurred

In: 720p59	Out: 720p59	Lock : Free	12:51
Select All	Select Active	Clear All	Setup Reset
RP165-EDH	S272-SD Audio	S272-SD Aux	S272-SD Ctrl
S299-HD Audio	5299-HD Ctrl	S315-Cam. Pos.	S353-MPEG Recod
S305-SDTI	S348-HDTI	S427-Lnk .Enc 1	S427-Lnk . Enc. 2
S427-Link Enc	S352-Payload	0P47 Transport	OP47 Dist.
ITU-R BT 1685	RP214-KLV-V	RP214-KLV-H	RP223-UMID/ID
S2820-Audio	RP215 - Film	EIA-708 Caption	EIA-608 Caption
RP207 - Program	RP268 - VBI	S2010-SCTE MSGS	S2016-3 AFD
ARIB-B.22	ARIB-B.23-1	ARIB-B.23-2	ARIB-B.27 Capt.
ARIB-B.35	ARIB-B.39	ARIB-B.37 Ana	ARIB-B.37 HD
ARIB-B.37 Mob.	ARIB-B.37 SD	S2031-SCTE VBI	52016-4 PAN
RP196-HANC	S12N-2 V-TCode	RDD8-WSS	RP196-VANC
🖁 🗌 Mark Deleted	Π	í n	
2			
Main Menu Events Lo	g Setup	Log ANC	Add Mark Clear Log
		Status	in Log

ANC Log Setup

- The Log ANC Status menu allows customization of which ANC packets to log for changes in status (e.g. Present, Checksum Error, Missing, Parity Error)
- Logging of Dolby and AES Status as well as device system errors
- Control of logging duration

Core Toolset SxE Only





Automatic Eye and Jitter Measurements

- SxE offers instant, Real-Time Eye (RTE™) for rapid testing SMPTE SDI compliance and interop issues
- SMPTE compliant automated measurements for rise time, fall time, delta, rise and fall overshoot and cable length
- Flexible display of between 1 to a maximum of 20 eyes with Amplitude and Time Histograms
- Selectable: Decade filters, Eye color for 'hot spot' view, two Jitter timing/UI thermometers with green/amber/red indication, 40ms or infinite Persistence, choice from 6 Cable types



Jitter Analysis

- The realtime Jitter analysis instrument enables an engineer to analyze the nature of jitter present on the SDI interface against time
- By analyzing jitter in this detailed way, an engineer can not only determine if a signal is in or out of specification, but also get a feel for where any problems lie. A spiky waveform could indicate power supply noise and these visual clues aid the diagnosis
- Selection of decade filter and jitter timing/UI thermometers is common to the Real-Time Eye Display so as to give consistent indication of the
 effect of the decade filter across the two instruments
- Line or Vertical Time base selection: 1 H, 2H, 1V, 1 Frame
- Vertical Gain controls: 0.1, 0.2, 0.5, 1.0 UI/division
- 40ms or infinite Persistence



Eye and Jitter Logging

• SxE's eye and jitter logging tools provide user-selectable logging of jitter thresholds in two different decade filters, and records of Rise and Fall times, Amplitude and rise and fall overshoot

Core Toolset Sx TAG Only





Composite Waveform

• The Waveform monitor can display the waveform of the composite analog inputs





Composite Chroma

· Waveform monitor can display the chroma component of the composite waveform

In: 525159	NO AES	Out: 525159	Lock :	Free	Log L	18:23
						Setup
120					120	Line Al
100					100	20
00					05	Sample
						0
60					60	Eld 1
¥0						
						DEXCK
20					20	Luna
75				· · · · ·	7.75	v1 11
						A1 *
-20						×1 H
						Cursons
-10 bernet					-40	Off
Nornal						CVBSIn
ain Menu Pi	stong	Va	veforn	Vector		
		M	pnitor	Scope		

Composite Luma

• Waveform display of the low pass filtering of the composite waveform



Audio AES Eye

- Real time monitoring of the 75Ω AES input
- This allows the amplitude and quality of the AES waveform to be seen
- Allows the relationship of the AES input to reference to be checked



SFP Status

• All the necessary status information for monitoring the health of the SFP and its interface



Vectorscope (Composite)

 Vectorscope view of the composite or external reference inputs

Sx TAG IP Only 2110 and In-band Control



NMOS

- AMWA NMOS IS-04 Discovery and Registration v1.2, IS-05 Connection Management v1.0 and IS-08 Audio Channel Mapping v1.0.1 (ST 2110)
- Automatic Registered Mode connection to a network registry service
- NMOS client can Browse Senders and Receivers, and drag and drop to make connections

a 😔 🖂 🕼 🖕 🖓 🖓 🖓 👘 💭 🖂 📾 🏪 2 2 v=0 1443716955 1443716955 IN IP4 192.168.10.144 12110 0-0-0 eMf210 v==-0 no 2000 RFF/AVP 96 ==N 1H 295.48.20.1/44 =rtmps/96 sampling=rtmf=-1222 width=1920; height=10007 exacting entsp:96 sampling=rtmf=-1222 width=1920; height=10007 exacting =rts:refclk:ptp=tEEE1588=2008:08=00-11-ff=fe=22-b6-ce:0.

SDP and LLDP

- Generation and Reception of Session Description Protocol (SDP) records (ST 2110)
- Automatic transfer of Audio, Video and ANC Data flow parameters from sender to receiver
- Link Layer Discovery Protocol for SFP to switch connectivity and reporting

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	PL 800	102 HML 16 200			
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	BKP-0	100 100 00 01			
	PROPERTY OF THE	100 Hall 100		1.001	
	THE SPRING !!	100,100,00,100			

MN SET

- SFP can be controlled from either the Sx TAG GUI or inband over fiber using Riedel MN SET
- Remote SFP status monitoring, configuration and upgrade from a PC
- Rapid inspection of active SDP & flow formats
- Access to up to 8 Encap, 4 Decap Audio flows and 2022-7 Primary and Secondary flow configurations

Sx TAG Optional Toolset



TAG IP ST 2110/2022-6 Encap/Decap [PHSXO-IP]



ST 2110/ST 2059 PTP

- Selection of PTP Domain number and communication mode
- Indication of PTP lock status and version
- Reporting of PTP Leader ID
- Reporting of Delay Request and Grandmaster destination IP address
- PTP message counters



ST 2110 Audio Encap

- Primary and secondary Audio flow Source and Destination Unicast or Multicast address and Port number; RTP Payload Type
- Audio Flow Enable/Disable
- Selection of Audio Packet time: 1ms, 125μs, 250μs, 333μs, 500μs
- Tx Packet counters
- ST 2110-30 (PCM), -31 (AES3)



ST 2110 ANC Data

- ANC Data primary and secondary flow Source and Destination Unicast or Multicast address and Port number
- ANC Data Flow Enable/Disable
- Decap filtering on match of Source: IP Add or Port num, Destination: IP Add, Port num or MAC address and VLAN
- Packet Counters

 Tr. detect
 10 (0.2)
 0.4 (45)100
 Lock
 PL
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Video Flows

- Primary and secondary Video flow Source and Destination Unicast or Multicast address and Port number
- Video Flow Enable/Disable
- Decap filtering on match of Source: IP Add or Port num; Destination: IP Add, Port num or MAC address and VLAN
- Packet counters and Sender Type



ST 2110 Audio Decap

- Primary and secondary Audio flow Source and Destination Unicast or Multicast address and Port number
- ST 2110-30/-31
- Decap filtering on match of Source: IP Add or Port num, Destination: IP Add, Port num or MAC address and VLAN
- Automatic detection of Audio Packet time: 1ms, 125μs, 250μs, 333μs, 500μs
- Manual control of the number of audio channels for non-NMOS, SDP systems



IP-SDI and SDI-IP Gateway

- IP to SDI Gateway Enable/Disable routes SDI I/O to IP SFP
- Encap or Decap gateway for 2110-20/30/40 and 2022-6
- Test pattern generator is automatically disabled when gateway is active



ST 2110 Decap Setup: Video

- Decap of Narrow, Narrow Linear or Wide sender types
- Manual control of all Video Parameters
- Video Format, Sampling Format, Bit Rate, Frame Rate and Sender Type
- Useful for non-NMOS, SDP systems



ST 2110 Audio Map

- Control of mapping of Audio channels between 2110 flows and SDI I/O
- Support for up to 16 channels of audio per flow
- 8 Encap audio flows
- 4 Decap audio flows

SEP Mod	o SFP Status: ync	ak 1	Hastname-Set
Mode Microse	lo VertHoriz Hc Offset		MAC 40:A3:68 A0:80 C IP Address 192:168 10:23
Vertica	1 Offset		Subnet Hask 255 255 255 0
Horizor	tal Offset	4	192 168 10.254
Etherne Ex:	62443	VLAN ID Disabled	Re Packets 10005 TX Packets 10005 DrcePackets 0

SFP Setup

- Configure SFP management address
- Encap video synchronizer and Audio PCM sample rate converter with offset control
- Synchronizes incoming SDI gateway or generated Video and Audio patterns to PTP
- Decap primary and secondary flow clean switch

Sx TAG Options and Accessories



3G-SDI including advanced formats [PHSXO-3GADV]



- 3G-SDI Level A and Level B
- Provides advanced formats including 4:2:2 YUV, 4:4:4 RGB and 4:4:4 YUV at 10/12 bit
- Analyze signals such as SMPTE 425-B carrying 1 x SMPTE 372M Dual-link payload

Audio break out cable [PHSXC-1]



- A break-out cable is available to provide AES input and output as well as calibrated balanced analog audio input and output to broadcast levels
- Connected to the TAG D-type connector, it includes both BNC and XLR connectors

MSA/non-MSA SFP+ Support [PHSXM-CAGEP]



- 10Gbit/s multimode fiber • Included as standard with Sx TAG
- Replacement cages are available

SFP: Electrical or Optical Transceivers

SFP: HDMI Input & Output [PHSFP-HDMI-IN or -OUT]



Electrical Transceiver [PHSFP-RT30-HDBNC]

- Allows closed loop testing in SDI environments
- BNC cable adapters provided with SFPs

Optical Transceiver [PHSFP-RT30-1310 or -1550]

Single 1310/1550nm transmitter and receiver
 Allows closed loop testing of fibre installations

- PHSFP-HDMI-IN converts HDMI signals to SDI for analysis by the TAG
- PHSFP-HDMI-OUT converts the TAG SDI output to HDMI without scaling artefacts
- The overall system provides SDI to HDMI Gateway conversion of 3G*/HD/SD-SDI signals with up to 8 channels of audio

HDMI EDID Viewer [PHSXO-EDID]



- Displays both RAW ancillary data and decoded EDID information
- Read back of the EDID information over HDMI via the PHSFP-HDMI-OUT SFP [purchased separately]
- Key applications include testing video walls in MCR installations, OB applications, professional AV infrastructure and manufacturing companies

SFP: IP ST 2110 & ST 2022-6 [PHSFP-10SR-IP]







- With the PHSFP-10SR-IP SFP+ 850nm multimode module and the PHSXO-IP software option, the Sx TAG can be used for generation, analysis and monitoring of SMPTE ST 2110-10/20/30/31/40 with NMOS IS-04/IS-05/IS-08 and ST 2022-6 IP formats
- The overall system also provides SDI to IP and IP to SDI Gateway conversion of 3G*/HD/SD-SDI signals with up to 16 channels of audio
- This functionality has been developed in conjunction with Embrionix
- Additional configuration windows are provided to configure and manage the IP flows

Adv. Video Formats [PHSXOF]



• 3G level A and B

- 4:2:2 YUV, 4:4:4 RGB and 4:4:4 YUV at 10/12 bit and XYZ at 12 bit
- 2048 x 1080 (2K) SMPTE ST 428-9 and digital cinema 2048-2:2011

AV Delay Generation



AV Delay Generator

- Adapted EBU Tech 3305 AV Sync and Operational Test Pattern to support SD and HD formats
- Compatible with third party AV delay analysers e.g.:LAWO V_pro8
- Enable AV Delay audio on up to 16
 embedded channels and/or AES out

AV Delay Analysis [PHSXO-AVD]



AV Delay Analyzer

- Measure the system propagation delay (latency) of either video/audio
- Support for adapted EBU Tech 3305 AV Sync and operation test pattern
- Support for LAWO V_line AV Sync test
 pattern
- Realtime update of measured AV delay
- +/- 400ms operating range
- Select audio from SDI or AES input

SDI Data Display & VANC/ANC Inspector [PHSXOSD]



- Two instruments that provide a detailed view of the data words contained within the SDI stream and ancillary data (VANC and ANC) packets
- This allows the analysis of complex faults and is particularly useful in determining compatibility issues between equipment and when debugging new product development in an R&D environment
- The ancillary packet analyzer also includes a DID or SDID search editor, freeze and freeze on trigger function
- A sophisticated range of user-definable trigger parameters is provided including: ANC, VANC or ANC+VANC, DID and SubDID values, line number range, Checksum, DBN, Parity and ANC Gap Errors
- Cursor link for locating chosen packet in data view/picture windows

Enhanced Remote Control [PHSXOR]

In: 1880p23 NO AES Out: 36A-1888p60 Lock: * absent 💼 16:15	🗱 192.198.0.96 - PHABROX Remote Control Interface - v2.0.0.0 - 🗆 🗙	🗃 Phadeix SetVi Eye and littler Monitor v1.0 - 🗆 🔀
CP-LP Advessed Renconnect FR-domessed Post CLV1 Pradvisks Post CLV1 IP Address Post CLV1	Instant P Advance Object AD Comment Frequencies Owner of the Comment Tars Mod, 207, 1795, COMT Comment Tars Mod, 207, 1795, COMT Desires Tars Mod, 207, 1795, COMT Comment Tars Mod, 207, 1795, COMT Desires Tars Mod, 207, 1795, COMT Comment Tars Mod, 207, 1795, COMT Desires Tars Mod, 207, 1795, COMT Comment Tars Mod, 207, 1795, COMT Desires Tars Mode Tars Mode Tars Mode Tars Mode Tars Mode Tars Mode Tars Mode Tars Mode Tars Mode	Inter Matters Total Data
PNC Server 192_160_0_10 First Page Up Page Count Last Default Cancel	Cond Hall and Holds Hall and Holds <td>0.021 <td< td=""></td<></td>	0.021 0.021 <td< td=""></td<>

• This option allows complex applications to be created on a PC to perform test and measurement functions such as automated testing of routers and other broadcast equipment

• PHABRIX instruments act as a server and listen on a port waiting for incoming requests from clients such as a PC. All visual controls on the product have an associated command.



Dolby Bitstream Generator and Analyzer [PHSXO-DAG]



This toolset provides both Dolby Audio bitstream Generation and Analysis for Dolby E, Dolby Digital and Dolby Digital Plus. All Dolby related
metadata parameters can be logged

- The Main Menu window provides a clear and easy to read status of the detected type of audio in each group with a snapshot of the Dolby program config and Dolby E guard band timing
- The generator contains a number of pre-configured test bitstreams. Engineers can then adjust both Dolby E, the metadata parameters, and the Dolby E line number to test broadcast infrastructure and downstream audio encoding equipment
- The analyzer displays the stream type, the metadata of a selected audio stream, the PA spacing and any CRC errors. For Dolby E the timing relationship in the SDI video stream guard band is displayed and the analyzer indicates if this the recommended line position for that format
- The detected Dolby Audio type is displayed in the audio meters, however the audio is not decoded, Dolby E metering is provided
- Logging triggers for errors relating to Dolby Audio include CRC errors, timing, and common and program metadata

Advanced Zone Plate Generator [PHSXOZ]







Choice of Zone Plate, Grating or Sweep Patterns

- Sophisticated control set including: Start and End Frequency, Start Phase, Rate of change of Phase, Angle, and X and Y position
- Temporal control is particularly useful for testing up/down converters/monitors and applications which compress signals

Command Scripts with Print Report [PHSXOS]



• Allows an engineer to create a stack of commands for repeat testing of systems using the toolsets within the Sx series

- Tests can be configured and saved for recall by a user defined operator name. Command scripts can be created on the interface or created offline on a PC. The savings in time and the ability for an engineer to run a script to check equipment and return with a report is invaluable
- When 'run' reports are generated, they auto fill an on-board html file that can then be downloaded via the remote control facility and printed as a hard paper copy. The report also collects screen dumps of the instruments to accompany the report if required
- Additionally, users can add their own logo to personalize the reports

Sx TAG

Portable hybrid IP/SDI + Analog Generation, Analysis & Video/Audio Monitoring

Advanced Video Analysis Toolset

Sx TAG with its SFP, SDI and analog I/O offers incredible versatility in a handheld device. It is ideal for IP, 3G/HD/SD-SDI, optical SDI, HDMI and Analog test & measurement as well as AES eye analysis, for applications demanding true mobility and ease of use.

It provides support for SMPTE ST 2110-20/30/31/40 encapsulation/decapsulation with ST 2059 PTP, SDP and NMOS IS-04/IS-05/ IS-08 as well as SMPTE ST 2022-6 encapsulation/decapsulation, using 10GE IP SFP+ modules developed by Embrionix.

Useful hybrid IP/SDI features include SDI to IP and IP to SDI gateways for both ST 2110-20/30/40 and ST 2022-6 as well as the ability to generate an analog reference output following the ST 2059 PTP or 2022-6 IP input.



Ordering

PHSXTAGC TAG analyzer/generator/monitor SD/HD Handheld with PHABRIX soft carry case (includes SFP CAGE) PHSXTAGC-IP TAG analyzer/generator/monitor SD/HD + IP Handheld with PHABRIX soft carry case (includes SFP CAGE)

SFPs

Software Options

PHSXO-3GADV	TAG 3G-SDI includes advanced formats and 2K support	PHSFP-RT30-1310	SFP optical transceiver 3G*/HD/SD
PHSXOS	Command scripts + reports (repeat testing and create print	PHSFP-RT30-1550	SFP optical transceiver 3G*/HD/SD
PHSXOSD	SDI Data display + VANC/ANC Inspector	PHSFP-RT30-HDBNC	SFP electrical transceiver 3G*/HD/SD includes 2x HDBNC-BNC cables
PHSXOR	Enhanced Remote Control for integration	PHSFP-HDMI-IN	HDMI V1.4/DVI 1.0 HDMI Input
PHSXOZ	Advanced zone plate generator (Programmable Y zone	PHSFP-HDMI-OUT	HDMI V1.4/DVI 1.0 HDMI Output
PHSXO-DAG	Dolby E/D/D+ analysis + generation (streaming, metering, timing)	PHSFP-10SR-IP	10GBASE-SR ST 2022-6/2110 Encapsulator/Decapsulator
PHSXO-AVD	AV Delay Analysis		
PHSXO-ENGT	Engineering bundle with six options, namely PHSXO-3GADV, PHSXOS, PHSXOSD, PHSXOR, PHSXOZ, PHSXO-DAG	Accessories	
PHSXO-EDID	HDMI EDID viewer software license (requires PHSFP-HDMI- OUT)	PHSXM-CAGEP	Universal replacement SFP cage - MSA/Non-MSA with power down
PHSXO-IP	IP Encap/Decap license (requires PHSFP-10SR-IP)	PHSXC-1	D15 break out cable for AES, analog audio and GPI
Extended Warranty		PHSXWM	Sx wall mounting bracket for easy charging (does not include the charger)

Extended Warranty

PHSX-3YEAR	3 Year Warranty+
PHSX-5YEAR	5 Year Warranty +
Replacement battery s	service - pricing and availability on request

+One year warranty included as standard

SxE

Portable 3G/HD/SD Generation, Analysis & Monitoring with Advanced Physical Layer Analysis

Real-Time Eye technology for SMPTE compliance issues

With advanced SDI physical layer analysis (Eye & Jitter), the SxE is ideal for applications such as video technology manufacturing and live production.

The instant, RTE[™] (Real-Time Eye) technology speeds physical layer testing, and delivers automated measurements and logging for key parameters such as: rise time, fall time, delta, overshoot, undershoot and cable length. The Jitter analysis instrument enables an engineer to quickly analyze the nature of jitter present using a graph of jitter versus time.

Other key capabilities include Dolby[®] E, Dolby[®] Digital and Dolby[®] Digital Plus bitstream analysis, as well as video status logging, and remote operation over Ethernet. The SxE also now offers automatic link detection of single links of multi-link 3G and HD based UHD formats.



Ordering

PHSXE

SxE SD/HD/3G Handheld unit for Eye and Jitter compliance with PHABRIX soft carry case

Software Options

PHSXOS	Command scripts + reports (repeat testing + create print report)
PHSXOSD	SDI Data display + VANC/ANC Inspector
PHSXOR	Enhanced remote control integration
PHSXOZ	Advanced zone plate generator (Programmable Y zone plate)
PHSXOF	Advanced video formats + 2K (422/444, YUV/RGB, 10/12 bit, SMPTE 428-9 D-Cinema/SMPTE ST 2048-2-2011)
PHSXO-DAG	Dolby E/D/D+ analysis + generation (streaming, metering, timing)
PHSXO-AVD	AV Delay Analysis
PHSXO-ENG	Engineering bundle with six options, namely PHSXOS, PHSXOSD, PHSXOR, PHSXOZ, PHSXOF, PHSXO-DAG

Accessories

PHSXWM

Sx wall mounting bracket for easy charging (does not include the charger)

Extended Warranty

PHSX-3YEAR	3 Year Warranty+
PHSX-5YEAR	5 Year Warranty+
Replacement battery se	rvice - pricing and availability on request

+One year warranty included as standard

SxA

Portable 3G/HD/SD Generation, Analysis & Video/Audio Monitoring

Multi-channel audio analysis & monitoring

The SxA offers all of the same advanced signal generation, analysis and monitoring capabilities as the SxE, without the advanced Real-Time SDI physical layer analysis (eye and jitter instruments)

There's support for SMPTE compliance testing with over 350 different formats. An extensive array of video and audio tools includes a signal generator with moving test patterns, a high performance waveform, and ANC/VANC inspector. The SxA also offers 16 channel audio generation and metering with support for Dolby[®] E, Dolby[®] Digital and Dolby[®] Digital metadata and bitstream analysis. The SxA also now offers automatic link detection of single links of multi-link 3G and HD based UHD formats.



Ordering

PHSXAES

SxA AES SD/HD/3G Handheld unit with PHABRIX soft carry case

Software Options

PHSXOS	Command Scripts and Reports (Repeat testing and create print report)
PHSXOSD	SDI Data Display + VANC/ANC Inspector
PHSXOR	Enhanced Remote Control integration
PHSXOZ	Advanced zone plate generator (Programmable Y zone plate)
PHSXOF	Advanced video formats + 2K (422/444, YUV/RGB, 10/12bit, SMPTE 428-9 D-Cinema/SMPTE ST 2048-2:2011)
PHSXO-DAG	Dolby E/D/D+ analysis + generation (streaming, metering, timing)
PHSXO-AVD	AV Delay Analysis
PHSXO-ENG	Engineering bundle with six options, namely PHSXOS, PHSXOSD, PHSXOR, PHSXOZ, PHSXOF, PHSXO-DAG

Accessories

PHSXWM

Sx Wall mounting bracket for easy charging (does not include the charger)

Extended Warranty

PHSX-3YEAR	3 Year Warranty+
PHSX-5YEAR	5 Year Warranty+

Replacement battery service - pricing and availability on request

+One year warranty included as standard

SxD

Portable dual-link 3G/HD/SD-SDI Generation, Analysis & Video/ Audio Monitoring

Dual SDI input/output analysis

The SxD is a dual-link 3G/HD/SD-SDI version of the SxA which is designed for video technology manufacturing and production applications. It has two SDI inputs, two SDI outputs and no AES input or outputs. It offers support of multiple advanced video standards up to a combined maximum data rate of 3Gbits across the two SDI links, including 422/444, YUV/RGB, 10/12 bit and SMPTE 428-9 D-Cinema/SMPTE ST 2048-2:2011 formats. The SxD also now offers automatic link detection of single links of multi-link 3G and HD based UHD formats.



Ordering

PHSXDL

SxD Dual Link SD/HD/3G Handheld unit with PHABRIX soft carry case

Software Options

PHSXOS	Command Scripts and Reports (Repeat testing and create print report)
PHSXOSD	SDI Data Display + VANC/ANC Inspector
PHSXOR	Enhanced Remote Control integration
PHSXOZ	Advanced zone plate generator (Programmable Y zone plate)
PHSXO-DAG	Dolby E/D/D+ analysis + generation (streaming, metering, timing)
PHSXO-AVD	AV Delay Analysis
PHSXO-ENG	Engineering bundle with five options, namely PHSXOS, PHSXOSD, PHSXOR, PHSXOZ, PHSXO-DAG

Accessories

PHSXWM

Sx Wall mounting bracket for easy charging (does not include the charger)

Extended Warranty

PHSX-3YEAR	3 Year Warranty+
PHSX-5YEAR	5 Year Warranty+

Replacement battery service - pricing and availability on request

+One year warranty included as standard

Specifications

Description	TAG	SxA	SxD	SxE
Analyzer/Generator/Monitor combined	•	•	•	•
Display 480 x 272 pixels auto-scaling 16:9 24-bit TFT 95 x 54mm display	•	•	•	٠
3G-SDI, HD-SDI, SD-SDI as standard (3G-SDI available as an option on the TAG)	0	•	٠	•
Video				
SDI Output 1 x 75 ohm BNC	N/A	•	•	•
SDI Input 1 x 75 ohm BNC	N/A	•	•	•
SDI Input/output selectable 1 x 75 ohm BNC	•	N/A	N/A	N/A
Composite analog in (PAL/NTSC) 1 x 75 ohm	•	N/A	N/A	N/A
Composite analog out (PAL/NTSC) 1 x 75 ohm BNC	•	N/A	N/A	N/A
Dual Link output 2 x 75 ohm BNC	N/A	N/A	•	N/A
Dual Link input 2 x 75 ohm BNC	N/A	N/A		N/A
Geniock Bi/ In/SDI with cross lock		N/A	N/A	N/A
Reference View		N/A N/A	N/A N/A	N/A
Text ident/Logo ident				
EDH checking (SD-SDI) - CRC checking				
Video Test Signals - 10 bits	ě	ě	ě	ě
Video Test Signals - 12 bits, RGB 4:4:4	0	0	•	0
Static test patterns 35 - Bouncing Box - Moving zone plate - A/V delay - User defined DPX, YUV, TGA, BMP	•	•	•	•
SMPTE formats supported	•	•	•	•
Video timing Offset line - pixel - range	•	•	•	•
Physical layer measurements				
Automated measurement - Eye amp, Rise/Fall time, Delta, Rise/Fall Overshoot	N/A	N/A	N/A	•
Jitter thermometers alignment, timing	N/A	N/A	N/A	•
Eye bit rates 3Gbps, 1.485Gbps, 270Mbps	N/A	N/A	N/A	•
Audio				
Generator/Monitor 48kHz 20-bit (SD-SDI) 24-bit (HD/3G-SDI)	•	•	•	٠
Stereo balanced analog audio I/O (via 26-pin high-density D-type socket)	•	N/A	N/A	N/A
16 channel embedded audio	•	•	•	•
AES output 1 x 75 ohm BNC	N/A	•	N/A	•
AES input 1 x 75 ohm BNC	N/A	•	N/A	•
AES/GPI input/output (via 26-pin high-density D-type socket)	•	N/A	N/A	N/A
Test signal fixed tones 16	•	•		•
Test signal variable tones 1 Hz - 24 kHz in 1 Hz steps				
Audio levels variable 0 to -100dB in 1dB stars				
Dolby E/D/D plus present indication x 8 pairs	õ	õ	õ	õ
Internal speaker 0.5 watts	•	•	•	•
Audio DAC 24 bit stereo	•	•	•	•
Headphone socket 3.5mm	•	•	•	٠
Logging				
Eye and Jitter & Export Log	N/A	N/A	N/A	•
SDI Signal & Export Log	•	•	•	•
AES & Export Log	•	•	N/A	•
SFP				
Optical/Copper/HDMI -Tx/Rx	0	N/A	N/A	N/A
IP SMPTE 2110 & 2022-6 Tx/Rx	0	N/A	N/A	N/A
General				
Internal Battery supply - Lithium Polymer	Up to 2 hours			
Internal storage 8Gb	•	•	•	•
Remote Control - web browser interface - Ethernet 10/100 BASE T	•	•	•	•
Battery Replacement Service Available	•	•	•	•
AC power supply included (universal) + Carry Case	•	•	•	•
1 year manufacturer's warranty - 3 & 5 year extended warranty options available				
Size n.9211111, w:225mm, D:42mm, weight 0.9 kg including integral battery	-	-	-	•

• Standard • O Optional

Formats Supported (Generator/Analyzer)

SMPTE Stnds.	Interface	Resolution	Sampling	Pixel	Frame/Field Rate	SxA	SxD	SxE	TAG	TAG	TAG
Link (Content)			Structure	Depth					SDI	2022-6	2110
ST 259 (ST 125)	SD (625i)	720 x 576	4:2:2 (YCbCr)	10	50i	•	•	•	•	•	-
ST 259 (ST 125)	SD (525i)	720 x 485	4:2:2 (YCbCr)	10	59.94i	•	•	•	•	•	-
ST 292 (ST 296)	HD	1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p, 24p, 23.98p	•	•	•	•	٠	•
ST 292 (ST 260)	HD	1920 x 1035	4:2:2 (YCbCr)	10	60i, 59.94i	•	•	•	•	-	-
ST 292 (ST 274)	HD	1920 × 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i	•	•	•	•	•	•
ST 292 (ST 274)	HD	1920 × 1080	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	•	•	•	•	•	•
ST 292 (RP 211)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PSF, 24PsF, 23.98PsF	٠	•	٠	٠	•	*
ST 292 (ST 2048-2)	HD	2048 x 1080	4:2:2 (YCbCr)	10	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF, 30p, 29.97p, 25p, 24p, 23.98p	•	•	•	N/A	N/A	N/A
ST 372 (ST 274)	Dual Link HD	1920 × 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	N/A	•	N/A	N/A	N/A	N/A
ST 372 (ST 274)	Dual Link HD	1920 × 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	N/A	•	N/A	N/A	N/A	N/A
ST 372 (ST 274)	Dual Link HD	1920 × 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF 30p, 29.97p, 25p, 24p, 23.98p	N/A	•	N/A	N/A	N/A	N/A
ST 372 (ST 274)	Dual Link HD	1920 × 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF, 30p, 29.97p, 25p, 24p, 23.98p	N/A	•	N/A	N/A	N/A	N/A
ST 372 (ST 2048-2)	Dual Link HD	2048 × 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	N/A	•	N/A	N/A	N/A	N/A
ST 372 (ST 2048-2)	Dual Link HD	2048 × 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	N/A	•	N/A	N/A	N/A	N/A
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	N/A	•	N/A	N/A	N/A	N/A
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	N/A	•	N/A	N/A	N/A	N/A
ST 372 (ST 428-9)	Dual Link HD	2048 × 1080	4:4:4 (XYZ)	12	24PsF 24p	N/A	•	N/A	N/A	N/A	N/A
ST 372 (ST 428-19)	Dual Link HD	2048 × 1080	4:4:4 (XYZ)	12	30PsF, 25PsF 30p, 25p	N/A	•	N/A	N/A	N/A	N/A
ST 425-1 (ST 274)	3G Level A (1)	1920 × 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	•	•	•	0	0	0
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	0	•	0	0	**	0
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, 25p, 24p, 23.98p	0	•	0	0	-	-
ST 425-1 (ST 274)	3G Level A (2)	1920 × 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	0	•	0	0	-	-
ST 425-1 (ST 2048-2)	3G Level A (2)	2048 × 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	0	•	0	0	-	-
ST 425-1 (ST 274)	3G Level A (3)	1920 × 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i 30p, 29.97p, 25p, 24p, 23.98p	0	•	0	0	-	-
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	0	•	0	0	-	-
ST 425-1 (ST 428-9)	3G Level A (3)	2048 × 1080	4:4:4 (XYZ)	12	24PsF	0	•	0	0	-	-
ST 425-1 (ST 428-19)	3G Level A (3)	2048 × 1080	4:4:4 (XYZ)	12	30PsF, 25PsF	0	•	0	0	-	-
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	0	•	0	0	-	-
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	0	•	0	0	-	-
ST 425-1 (ST 274)	3G Level B-DL (I)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	٠	•	•	0		N/A
ST 425-1 (ST 2048-2)	3G Level B-DL (I)	2048 × 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	0	•	0	0	-	N/A
ST 425-1 (ST 274)	3G Level B-DL (II)	1920 × 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	0	٠	0	0	-	N/A
ST 425-1 (ST 2048-2)	3G Level B-DL (II)	2048 × 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	0	•	0	0	-	N/A
ST 425-1 (ST 274)	3G Level B-DL (III)	1920 × 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i 30p, 29.97p, 25p, 24p, 23.98p	0	•	0	0	-	N/A
ST 425-1 (ST 2048-2)	3G Level B-DL (III)	2048 × 1080	4:4:4 (YCbCr/RGB)	12	30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF, 30p, 29.97p, 25p, 24p, 23.98p	0	•	0	0	-	N/A
ST 425-1 (ST 428-9)	3G Level B-DL (III)	2048 × 1080	4:4:4 (XYZ)	12	24PsF	0	•	0	0	-	N/A
ST 425-1 (ST 428-19)	3G Level B-DL (III)	2048 x 1080	4:4:4 (XYZ)	12	30PsF, 25PsF	0	•	0	0	-	N/A
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	0	•	0	0	-	N/A
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	0	٠	0	0		N/A
ST 425-1 (ST 296)	3G Level B-DS	2x (1280 x 720)	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p, 24p, 23.98p	٠	•	٠	0		N/A
ST 425-1 (ST 274)	3G Level B-DS	2x (1920 × 1080)	4:2:2 (YCbCr)	10	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF, 30p, 29.97p, 25p, 24p, 23.98p	٠	•	•	0	-	N/A
ST 425-1 (ST 2048-2)	3G Level B-DS	2x (2048 × 1080)	4:2:2 (YCbCr)	10	60i, 59.94i, 50i, 30PsF, 29.97PsF, 25PsF, 24PsF, 23.98PsF, 30p, 29.97p, 25p, 24p, 23.98p	•	•	٠	0	-	N/A
Composite	CVBS		PAL-I, PAL-N		50i	N/A	N/A	N/A	٠	N/A	N/A
Composite	CVBS	NTS	SC-M, NTSC-M(JP), PAL-M		59.94i	N/A	N/A	N/A	•	N/A	N/A

Additional Formats (Analyzer - Single Link Only)

The SxA, SxD and SxE handhelds now offer automatic link detection of single links of multi-link 3G and HD based UHD formats, as shown in the table below.

SMPTE Stnds. Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	SxA	SxD	SxE	TAG SDI	TAG 2022-6	TAG 2110
"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	٠	٠	٠	N/A	N/A	N/A
"ST 425-3 Annex B.1, (ST 2048-1)"	Quad-link HD-SQ	4096 × 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	0	٠	0	N/A	N/A	N/A
"ST 425-3 Annex B.2, (ST 2036-1)"	Dual 3G-B-DS	3840 × 2160	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	•	•	•	N/A	N/A	N/A
"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	0	٠	0	N/A	N/A	N/A
ST 425-3 (ST 274)	Dual-link 3G-A,B (II)	1920 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60p, 59.94p, 50p	0	•	0	N/A	N/A	N/A
ST 425-3 (ST 2048-2)	Dual-link 3G-A,B (II)	2048 × 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCrA/RGBA)	10	60p, 59.94p, 50p, 48p, 47.95p	0	٠	0	N/A	N/A	N/A
ST 425-3 (ST 274)	Dual-link 3G-A,B (III)	1920 x 1080	4:4:4 (YCbCr/RGB)	12	60p, 59.94p, 50p	0	•	0	N/A	N/A	N/A
ST 425-3 (ST 2048-2)	Dual-link 3G-A,B (III)	2048 × 1080	4:4:4 (YCbCr/RGB)	12	60p, 59.94p, 50p, 48p, 47.95p	0	٠	0	N/A	N/A	N/A
ST 425-3 (ST 274)	Dual-link 3G-A,B (IV)	1920 x 1080	4:2:2 (YCbCr)	12	60p, 59.94p, 50p	0	•	0	N/A	N/A	N/A
ST 425-3 (ST 2048-2)	Dual-link 3G-A,B (IV)	2048 × 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	60p, 59.94p, 50p, 48p, 47.95p	0	٠	0	N/A	N/A	N/A
ST 425-5 (ST 2036-1)	Quad-link 3G-A,B (1) 2SI	3840 × 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	•	•	•	N/A	N/A	N/A
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	0	٠	0	N/A	N/A	N/A
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	0	٠	0	N/A	N/A	N/A
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	0	•	0	N/A	N/A	N/A
ST 425-5 (ST 2036-1)	Quad-link 3G-A,B (3) 2SI	3840 × 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	0	•	0	N/A	N/A	N/A
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	0	•	0	N/A	N/A	N/A
ST 425-5 (ST 2036-1)	Quad-link 3G-A,B (4) 2SI	3840 × 2160	4:2:2 (YCbCr)	12	30p, 29.97p, 25p, 24p, 23.98p	0	•	0	N/A	N/A	N/A
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	0	•	0	N/A	N/A	N/A
"ST 425-5 Annex B, (ST 2036-1)"	Quad-link 3G-A,B (1) SQ	3840 × 2160	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	0	•	0	N/A	N/A	N/A
"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	0	•	0	N/A	N/A	N/A
"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	0	•	0	N/A	N/A	N/A
"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	0	•	0	N/A	N/A	N/A
"ST 425-5 Annex B, (ST 2036-1)"	Quad-link 3G-A,B (3) SQ	3840 × 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	0	٠	0	N/A	N/A	N/A
"ST 425-5 Annex B, (ST 2048-1)"	Quad-link 3G-A,B (3) SQ	4096 × 2160	4:4:4 (YCbCr/RGB)	12	30p, 29.97p, 25p, 24p, 23.98p	0	٠	0	N/A	N/A	N/A
"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	0	•	0	N/A	N/A	N/A
"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	0	٠	0	N/A	N/A	N/A

Standard (Single Link Only)
 Optional (Single Link Only)

Accessories & Dimensions

PHABRIX Soft Carry Case

PHABRIX Sx Dimensions



Sx Wall Mounting Bracket [PHSXWM]



Sx Wall Mounting Bracket [PHSXWM] Dimensions







For more information about Sx Series of analyzers/generators, contact:

www.phabrix.com



PHABRIX products are continuously being updated. Please visit www.phabrix.com for latest product information April 2022





ADVANCED RASTERIZERS FOR 2K/3G/HD/SD SIGNAL GENERATION, ANALYSIS & MONITORING





Rx Series Overview

Faster fault diagnosis, ultra-flexible monitoring

Based on the award-winning Sx portable test & measurement range, the rackmounted Rx series of rasterizers delivers advanced 2K/3G/HD/SD signal generation, analysis and monitoring for faster compliance testing and fault diagnosis of both video and audio signals.



Up to 16 Simultaneous Instruments

Monitoring workflows are optimized with ultra-flexible, userdefined instrument display layouts. Up to 16 instruments can be presented simultaneously, at sizes ranging from full screen down to 1/16 screen. In multi-channel environments, channel identification is simplified with a dedicated window color per channel.

Monitoring configurations can be built to suit individual operators and key applications, with rapid recall of layout pre-sets for fast turnarounds. Up to 99 presets are available to suit even the largest facility.



Video Capture & Remote Access

To speed intermittent fault finding, the Rx Series offers video and audio capture to help diagnose problems. The capture can be triggered automatically when faults are identified by the analyzer, according to user-defined criteria.

Fault diagnosis is also quickened by the remote access capability, which allows engineers to monitor and analyze video via a web browser from any location.



Four Channel Eye & Jitter Analysis

Advanced diagnostic tools include up to four simultaneous Real-Time Eye[™] and Jitter physical layer analysis instruments plus closed caption, loudness and Dolby[®] monitoring. This makes the Rx Series ideal for OB trucks, broadcast facilities and video technology manufacturers.

Rx Rasterizers - 3x the choice

Available with built-in monitoring or ultra-compact design

Rx 2000

4 channel analyzer/generator with monitoring via dual built-in screens & audio speakers



Rx 1000

Compact 4 channel analyzer/generator and monitoring system



Rx 500

2 channel analyzer/generator & monitoring solution



User-defined Instrument Display Layout

Up to 16 instruments via HDMI/SDI display & remote browser

2 Channel QC Check - up to 4 channels simultaneously with 4 modules



Single Instrument



• Full screen mode available for picture display and waveform monitor enabling detailed analysis

Quad Screen



• Display four key instruments in quad screen for easy viewing

16 Instruments



• Display up to 16 instruments on a single 1920x1080 display



Four Channel Analysis



Up to 99 user configurable presets



• Each instrument or screen has a size icon to instantly resize to quarter or sixteenth size. Picture display and waveform monitor are also available in full screen



Indicative video centric preset

- All the tools needed to monitor or debug a video source with one click
- Full flexibility on which channels are analyzed and choice, size and location of instruments



Indicative audio centric preset

- Quickly access the tools you need to monitor and diagnose complex audio issues
- Powerful rasterizer provides simultaneous multiview of selected audio tools

Rx Series Toolsets



Video Toolset



Picture Display

- Scaling from 1/16, 1/4, 9/16, full screen
- Cursors linked to waveform and data view
- Action and title safe areas
- On screen configurable source ident
- Zoom, 4:3, 16:9



Waveform Monitor

- Configurable H and V graticules
- Overlay, Parade, Single line, H & V Mag, brightness, persistence and monochrome controls
- Time and amplitude measurement cursors
- Cursor linked to picture and data view
- A wide selection of YCbCr and GBR parade modes



Vectorscope

- 12-bit processing
- x1 to x10 magnification
- 75% and 100% targets
- I, Q axis



Auxiliary Data - Decode

- ANC time code configurable display
- Closed captions: WST/OP42/OP47, CEA-608 (in 708), CEA-708
- AFD/WSS/VI
- VChip



Input Timing

- Visual indication and measurement of video input timing with respect to reference
- Line and pixel offset controls to configure measurement



Multi-frame Grab

- Full stream capture and looped playback of single or multiple frames of video, embedded audio and ANC
- Export and import of grabbed files
- Manual or auto trigger controls
- Trigger on errors in ANC, CRC and EDH

Edit Phate

AV Delay Generator

- Adapted EBU Tech 3305 AV sync and operational test pattern to support SD and HD formats
- Compatible with third party AV delay analyzers e.g.:LAWO V_pro8
- Individual selection of audio pair
- Up to 16 channel audio insertion

Optional Toolset [PHRXO-AVD]



AV Delay Analysis

- Support for Adapted EBU Tech 3305 AV sync and operational test pattern
- Support for LAWO V_line AV Sync test pattern
- Realtime update of measured AV delay
- +/- 400ms operating range

Optional Toolset [PHRXO-GAMUT]



Gamut Meters*

- 6-bar check with YCbCr sources and 3-bar check with RGB sources
- Intuitive realtime display
- Picture window zebra out of gamut display
- [Only available with A and AG modules]



Audio Toolset



Audio Metering

- Metering of up to 16 embedded audio channels
- Metering Ballistics: PPM-I, PPM-II, Vu, Vu-Fr, Fast
- Scales: dBFS, BBC, BBCM, DIN, Nordic
- Adjustable peak hold times from 0.1s to Inf
- Audio pair phase meters
- Detection of Dolby DE, DD, DD+ and metering of decoded audio



Surround Channel Set-up

- Two 5.1 configuration presets
- User control of channel order routing
- Control of the mapping of 5.1 surround channels to PCM group, pair and channels



Loudness Monitoring

- EBU R128 and ITU-R BT.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 automaticallyGPI enable of Loudness Monitoring



Lissajous Display

- 2D display of phase relationship between the selected audio pair
- Selection of input PCM or decoded Dolby audio
- AGC or manual scaling



Downmix Monitoring

- 5.1 Surround sound to 2.0 Stereo downmixing
- User control of routing and soloing of PCM channels onto the downmix bus
- Downmix bus is independently routable to speaker/headphone and rear panel/HDMI outputs
- LoRo Downmix available from Dolby DD, DD+ decoder outputs

		Audio	Status -		_
en/L I PPP	P 21999 3	EE++ \$10089			
atus	Group 1 Pair	1-L 1			
Pro 48542 2-ch 24 of 24	POT Enchasis UsrBits Level	none 192-bit unlinoun			
Not. coccostot All OK	unknoun Dest TLne DRCC	000000000 OK			
	I PPE atus Pro 48645 2-ch 2-ch 2-ch 2-ch 2-ch 2-ch 2-ch 2-ch	I PPPP 2 PPP 3 alus Pro PDI Pro DI Pro PDI Expansis Sector 24 Level Not unknown Dest 00000000 Time All 0K DECC	L 1999 2 2009 3 02++ 4.000 ALIS Proc 1 Pain 1-L Y Pro Pro Pot Autor 1 Pain 1-L Y Pro Pot Pot Pot Pot Pot Pot Pot Po	L 19999 2 1999 3 12:++ 4.0049 skud Pro. POT POT POT POT POT Longitude 19401	L 1990 2 1997 3 12:++ 4 02:00 dros 1 1911 1 - L 1 Pro Fro For 2-ch 24 data 19-01 Usralis 19-01 Not. - unaroun Not. - unaroun Not. - unaroun Not. - unaroun Not. - unaroun Not. - unaroun - una

Audio Status

- 16 channel indication of audio type and presence with detection of Dolby DE, DD and DD+
- Decode of channel status information for each audio channel

Optional Toolset [PHRXO-BDG]



Dolby[®] Generator

- Generation of Dolby DE, DD and DD+ bitstreams
- User control of Dolby DE channel config, 16/20 bit, program metadata and frame position at video frame rate
- Control of Dolby DD and DD+ channel config and bit rates
- Choice of audio ramp or fixed tone levels

Optional Toolset [PHRXM-DOLBY]



Dolby[®] Metadata

- Decoding of metadata for Dolby DE, DD and DD+
- Indication of Dolby DE line position absolute or wrt ideal line
- Indication of CRC errors
- Dolby DD and DD+ Pa spacing and data rate

Dolby S	ietup E
Dolby Decoder 1	Dolby Decoder 2
Source SDI1	Source SDI1
Input Pair 0391	Input Pair 0392
Downillix Program 1	
Dolby E 5.1	Dolby D+
Danay E S. I	

Dolby[®] Decoder

- Two independent decoders
- Decode of Dolby DE, DD and DD+
- Creation of LoRo from Dolby DD and DD+ for DownMix monitoring
- Dolby DE program selection for DownMix monitoring

Rx Series Toolsets

ANC Toolset

1¥.	And	illary Status +	
			Setup Reset
S299-HD Audio	5299-HD Ctrl		
	S352-Pauload		
			\$129-2 V-1Code
Present			Previous

ANC Status

- Simple grid layout for rapid visual checking of VANC/ANC ancillary data packets
- Color-coded Packet display: Present, Absent or Fault
- User-definable selections with DID or SDID codes

Optional Toolset [PHRXO-DATA]



ANC Inspector

- Ancillary data packet analyzer
- User-definable DID/SDID search editor
 Cursor links to data view, picture and waveform tools
- Freeze and freeze on trigger function



SDI Data View

- Allows analysis of complex faults particularly useful in an R&D environment
- Detailed view of the SDI stream
- Grid, stream views & color coding to help identification
- Linked to waveform, picture and ANC inspector cursors

Video Formul Inti	Antiliary Data Service: F1: F2:
All Pixels 2640 Active Pixels 1920 Active Lines 1080 Pres Miz 1485.00	UST hot. Present. CER-608 Hot. Present. DEA-708 Service 12— 0P-67 Hot. Present. UBS Net. Present.
	VI Not Present. AFD Not Present. V-Onizi Not Present.

Misc Status

- Detected input video format and SDI framer re-sync indicator
- Signalled input video format ST 352 Payload ID
- Auxiliary data location/presence indicators



Video Status

- Reporting of CRC, ANC errors and run time
- Switch line handling
- EDH handling (SD)
- Active picture CRC
- Cable length indication, 6 Cable types



- Display of the current status of hardware modules
- Indication of fitted board options
- Indication of fitted SFP
- Check of system temperature, fan status and board supply voltage

Eye & Jitter Toolset



SDI Eye Analysis

- RTE $^{\rm \tiny M}$ (Real-Time Eye) technology for SMPTE compliance testing & trouble shooting
- Dual jitter thermometers with selectable filters (10Hz, 100Hz, 1kHz, 10kHz, 100kHz)
- Automatic amplitude, rise/fall time, under/overshoot and cable length measurements
- Amplitude and time histograms
- 1 to 10 eye display
- User-selectable heatmap and persistence controls

A 773hV / 150ps V75ps 410ps 70 00 L0 00 L0 01 L0 1

Optional Toolset - [AE & AGE Modules]



SDI Jitter Analysis

- Realtime SMPTE Jitter measurements down to 10Hz
- 10Hz, 100Hz, 1KHz, 100KHz filters
- 40ms or infinite persistence modes
- H, 2H, V trigger and sweep control
- 0.1, 0.2, 0.5, 1.0 UI/Div vertical gain

Board Status



Generation Toolset

Budord Dokod Loope State State Data State Sta

Video Generation

- 2K/3G/HD/SD-SDI signal generation including pathological test patterns for SDI stress testing (40 patterns in total)
- Moving test patterns including zone plate
- Loading of user-defined test patterns
- Ident, ST 352 payload ID and error generation

Fault Finding & Logging



Audio Generation

- Generation of up to 16 channels of audio
- Independent enabling of the 4 audio groups
 Selection of fixed or user-definable tones or audio sources
- Master level control
- Phase inversion per channel



Generator Timing

- User control of the timing of the generator output wrt Reference
- Line and pixel control



Screen Capture

- Useful for test documentation and reporting
- Capture of HDMI screen output to BMP
- Rx 2000 capture of right hand front panel LCD screen to BMP



Logging

- Record of detected events for video, audio, AES, Dolby, ANC and eye/Jitter
- Video Events include: input status, EDH/ CRC, TRS and CRC errors
- Audio Events include clip, quiet and mute with level and time thresholds
- Dolby Status includes Dolby DE CRC errors and frame timing outside the 'ideal range'



Event Log

- Record of the activation of user-configured triggers
- Trigger event time and date stamp
- User-selectable date stamp mark
- Network Time Protocol (NTP) linked realtime clock

Control Toolset



Remote Browser

- View and control the 1920 x 1080 instrument display over a TCP/IP interface with a standard browser
- Ideal for remote location checking, engineering support, and fault analysis before deploying engineers

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		00000000	0000000

Front Panel Simulation

- Rx2000 also provides a front panel simulator for remote operation via a web browser
- Allows access to key functions including frame capture, screen dumps, loudness files and logging files

IP Address 192	168.0.14 👻	Port 2100	Disconnect	Check All Commands	
Message to Send			Message Decelor	d,	
Conniand Type	MING GET_THEM_COUNT	1	Command Type	MSG RET TIEM VALUE	
Command ID	26		Connand ID	5	
Yake	0		Volue		
Index			Index		
Text		Send It	Test	[
od t Rep Bullio	PET VALLE Valuent				

Enhanced Remote Control

- Full control of unit via TCP/IP sockets
- All visual controls have an associated command
- Passive/slave connections

Rx 2000

4 channel analyzer/generator with monitoring via dual built-in screens & speakers

Scalable & flexible design

The top of the range Rx 2000 offers up to 4 channels of 2K/3G/HD/SD-SDI video/audio analysis and monitoring (dual inputs per analyzer), and can also provide signal generation. Up to 16 instruments can be presented simultaneously for video analysis and eye/jitter testing via an external display. Monitoring of the instruments and video can also be performed using dual built-in screens and audio speakers.

The Rx 2000 starter configuration includes a single channel video analyzer, with optional signal generation and eye/jitter analysis. Up to 3 more channels of video analysis/generation, or up to 12x AES audio analysis/generation, can be added with expansion modules.



Ordering

Choice of starter configurations		Options		
PHRX2000A	Rx 2000 (2RU) with 1x channel Analyzer module (HD/SD-SDI & embedded audio)	PHRXO-3G	3G plus advanced formats (422/444, YUV/RGB, 10/12-bit) + 2K-SDI	
	Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXM-DOLBY	Dual Dolby® decode, bit stream metadata analyzer and framing indication for Dolby DE, DD and D+	
PHRX2000AE PHRX2000AG	Rx 2000 (2RU) with 1 x channel Analyzer module (HD/SD-SDI & embedded audio) plus Eye/Jitter analysis Includes Closed Captions, Loudness monitoring and Audio Meters Rx 2000 (2RU) with 1 x channel Analyzer/Generator module (HD/SD-SDI & embedded audio) Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXO-BDA	Dolby® Bitstream analyzer (1 license supports up to 4 input modules)	
		PHRXO-BDG	Dolby® Bitstream generator (requires generator or AES module)	
		PHRXO-DATA	SDI data view/ANC packet analyzer	
		PHRXO-AVD	AV Delay Analysis	
PHRX2000AGE	Rx 2000 (2RU) with 1 x channel Analyzer/Generator module (HD/SD-SDI & embedded audio) plus Eye/Jitter analysis Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXO-GAMUT	Gamut Meters [Only available with A and AG modules]*	
		Accessories		
Multi-channel / AES expansion modules (add up to 3 per Px 2000)		PHRXM-ANA	Analog audio line level output converter	
PHRXM-A	1 x Analyzer expansion module (HD/SD-SDI & embedded audio)	PHSFP-RT30-1310	SFP optical transceiver 3G/HD/SD-SDI - Tx 1310nm, Rx 1260-1620nm	
		PHSFP-2T30-1310	SFP optical dual transmitter 3G/HD/SD-SDI - Tx 1310nm	
PHRXM-AE	1 x Analyzer expansion module (HD/SD SDL & omboddod audio) plus Evo/ littor analysis	PHSFP-2R30	SFP optical dual receiver 3G/HD/SD-SDI - Rx 1260-1620nm	
PHRXM-AG	1x Analyzer/Generator expansion module (HD/SD-SDI & embedded audio)	PHSFP-RT30-1550	SFP optical transceiver 3G/HD/SD-SDI - 50km, Tx 1550mm, Rx 1260-1620nm	
		Warranty		
PHRXM-AGE	1 x Analyzer/Generator expansion module (HD/SD-SDI & embedded audio) plus Eye/Jitter analysis	PHRX-3YEAR	3 Year Warranty**	
PHRXM-4AES	4 x AES audio analyzer/generator with AES routing expansion module	PHRX-5YEAR	5 Year Warranty**	
		Note: Rx 2000 is a modular solution, and other configurations are available. Please contact PHABRIX Sales for more information.		

* Upcoming software release **One year warranty included as standard

10 | Rx Series

Rx 1000

Compact, 4 channel analyzer/generator & monitoring solution

Scalable, compact design

The advanced Rx 1000 is a compact, 1RU version of the Rx 2000 without the dual built-in monitoring displays or speakers. It provides up to 4 channels of 2K/3G/HD/SD-SDI video/audio analysis and monitoring (dual inputs per analyzer), and also provides signal generation. Up to 16 instruments can be presented simultaneously for video analysis and eye/jitter testing via an external monitor.

The Rx 1000 starter configuration includes a single channel video analyzer, with optional signal generation and eye/jitter analysis. Up to 3 more channels of video analysis/generation, or up to 12x AES audio analysis/generation, can be added with expansion modules.



Ordering

Choice of starter configurations		Options		
PHRX1000A	Rx 1000 (1RU) with 1 x channel Analyzer module (HD/SD-SDI & embedded audio) Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXO-3G	3G plus advanced formats (422/444, YUV/RGB, 10/12-bit) + 2K-SDI	
		PHRXM-DOLBY	Dual Dolby® decode, bit stream metadata analyzer and framing indication for Dolby DE, DD and D+	
PHRX1000AE PHRX1000AG	Rx 1000 (1RU) with 1 x channel Analyzer module (HD/SD- SDI & embedded audio) plus Eye/Jitter analysis Includes Closed Captions, Loudness monitoring and Audio Meters Rx 1000 (1RU) with 1 x channel Analyzer/Generator module (HD/SD-SDI & embedded audio) Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXO-BDA	Dolby® Bitstream analyzer (1 license supports up to 4 input modules)	
		PHRXO-BDG	Dolby® Bitstream generator (requires generator or AES module)	
		PHRXO-DATA	SDI data view/ANC packet analyzer	
		PHRXO-AVD	AV Delay Analysis	
PHRX1000AGE	Rx 1000 (1RU) with 1 x channel Analyzer/Generator module (HD/SD-DI & embedded audio) plus Eye/Jitter analysis Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXO-GAMUT	Gamut Meters [Only available with A and AG modules]*	
		Accessories		
		PHRXM-ANA	Analog audio line level output converter	
Multi-channel / AES expansion modules (add up to 3 per Rx 1000) PHRXM-A 1 x Analyzer expansion module		PHSFP-RT30-1310	SFP optical transceiver 3G/HD/SD-SDI - Tx 1310nm, Rx 1260- 1620nm	
	(HD/SD-SDI & embedded audio)	PHSFP-2T30-1310	SFP optical dual transmitter 3G/HD/SD-SDI - Tx 1310nm	
PHRXM-AE	1 x Analyzer expansion module	PHSFP-2R30	SFP optical dual receiver 3G/HD/SD-SDI - Rx 1260nm-1620nm	
PHRXM-AG	(HD/SD-SDI & embedded audio) plus Eye/Jitter analysis 1x Analyzer/Generator expansion module (HD/SD-SDI & embedded audio)	PHSFP-RT30-1550	SFP optical transceiver 3G/HD/SD-SDI - 50km, Tx 1550nm, Rx 1260-1620nm	
		Warranty		
PHRXM-AGE	1 x Analyzer/Generator expansion module (HD/SD-SDI & embedded audio) plus Eye/Jitter analysis	PHRX-3YEAR	3 Year Warranty**	
		PHRX-5YEAR	5 Year Warranty**	
PHRXM-4AES	4 x AES audio analyzer/generator with AES routing expansion module	Note: Rx 1000 is a m Please contact PHAE	odular solution, and other configurations are available. 3RIX Sales for more information.	

* Upcoming software release

**One year warranty included as standard

Rx 500 2 channel analyzer/generator & monitoring solution

Expands from single to dual channel

Ideal for Quality Control applications, the Rx 500 is a single/dual channel 2K/3G/HD/SD-SDI video/audio analyzer and monitoring solution in a very compact 1/2 RU frame (dual inputs per analyzer). It supports dual inputs per analyzer and can also provide signal generation for video and audio. Up to 16 instruments can be presented simultaneously for video analysis and eye/jitter testing.

The Rx 500 starter configuration includes a single channel video analyzer, with optional signal generation and eye/jitter analysis.





Ordering

Choice of starter configurations		Options		
PHRX500A	Rx 500 (1/2 1RU) with 1 x channel Analyzer module (HD/SD-SDI & embedded audio) Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXO-3G	3G plus advanced formats (422/444, YUV/RGB, 10/12-bit) + 2K-SDI	
		PHRXM-DOLBY	Dual Dolby® decode, bit stream metadata analyzer and framing indication for Dolby DE, DD and D+	
PHRX500AE	Rx 500 (1/2 1RU) with 1 x channel Analyzer module (HD/SD-SDI & embedded audio) plus Eye/Jitter analysis Includes Closed Captions, Loudness monitoring and Audio Meters	PHRXM-BDA	Dolby® Bitstream analyzer (1 license supports up to 4 input modules)	
		PHRXO-BDG	Dolby® Bitstream generator (requires generator or AES module)	
PHRX500AG	Rx 500 (1/2 1RU) with 1 x channel Analyzer/Generator module (HD/SD-SDI & embedded audio) Includes Closed Captions, Loudness monitoring and Audio Meters			
		PHRXO-DATA	SDI data view/ANC packet analyzer	
		PHRXO-AVD	AV Delay Analysis	
PHRX500AGE	Rx 500 (1/2 1RU) with 1 x channel Analyzer/Generator module (HD/SD-SDI & embedded audio) <i>Plus Eye/Jitter analysis</i> <i>includes Closed Captions, Loudness monitoring and Audio</i> Motors	PHRXO-GAMUT	Gamut Meters [Only available with A and AG modules]*	
		Accessories		
Weters		PHRXM-ANA	Analog audio line leve output converter	
PHRXM-A	1 x Analyzer expansion module (HD/SD-SDI & embedded audio)	PHSFP-RT30-1310	SFP optical transceiver 3G/HD/SD-SDI - Tx 1310nm, Rx 1260- 1620nm	
		PHSFP-2T30-1310	SFP optical dual transmitter 3G/HD/SD-SD - Tx 1310nm	
PHRXM-AG	1x Analyzer/Generator expansion module	PHSFP-2R30	SFP optical dual receiver 3G/HD/SD-SD - Rx 1260-1620nm	
PHRXM-4AES	4 x AES audio analyzer/generator with AES routing expansion module	PHSFP-RT30-1550	SFP optical transceiver 3G/HD/SD-SD - 50km, Tx 1550nm, Rx 1260-1620nm	
		PHRXK1	19" rack mount fitting kit for 1 x Rx 500	
		PHRXK2	19" rack mount fitting kit for 2 x Rx 500	
		PHRXK5	Desktop Kit with adjustable feet and handles	

Warranty

PHRX-3YEAR PHRX-5YEAR

3 Year Warranty** 5 Year Warranty**

Note: Rx 500 is a modular solution, and other configurations are available. Please contact PHABRIX Sales for more information.

* Upcoming software release **One year warranty included as standard

Hardware Modules





PHRXM-A Dual input 3G/HD/SD SDI single analyzer





PHRXM-AG Single input 3G/HD/SD SDI single analyzer plus SDI generator



PHRXM-AE Dual input 3G/HD/SD SDI single analyzer with eye and jitter





PHRXM-AGE Single input 3G/HD/SD SDI single analyzer with eye and jitter plus SDI generator





PHRXM-4 AES Audio I/O 75 Ohm unbalanced





PHRXM-DOLBY Dual Dolby decoder Dolby E/D/D Plus (mounted on CPU card)





PHRXM-ANA Analog audio line level output convertor

Specifications

opeenications		Standard C	O ptional
Description	Rx 500	Rx 1000	Rx 2000
SD-SDI, HD-SDI as standard	•	•	•
Optional 3G-SDI (license)	0	0	0
Dual 16:9, 24 bit, 4.3" TFT, 480 x 272 pixels	N/A	N/A	•
OLED display	•	•	N/A
Front panel backlit navigation keypad	•	•	•
Front panel volume/gain control	•	•	•
Front panel headphone connector 6.3mm (1/4 inch) Stereo jack	•	•	•
Front panel USB 2.0 host port type A socket + 2 rear panel USB 2.0 ports	•	•	•
Internal loudspeaker	Beeper	Beeper	2 x 7w wide range
I/O Module slots (each supporting a range of audio/video modules)	2	4	4
Internal Dual Dolby® decoder module slot (option)	1	1	1
HDMI instrument output, 1920 x 1080, 4:4:4 RGB, Type A	•	•	•
SDI instrument output, 1920 x 1080, 4:2:2 YUV, BNC 75 Ohm	•	•	•
Basic SDI generator included as standard (replaces instrument output)	•	•	•
8 channel 48kHz PCM audio on HDMI and SDI Instrument outputs	•	•	•
Reference/VITC input, passive loop through, BNC 75 Ohm compensated	٠	•	٠
AES input AES 3-ID, SMPTE 276M-1995, 75 Ohm BNC	•	•	•
LTC input (via 26 pin high density 'D' Type socket)	•	•	•
8x GPI I/O (via 26 pin high density 'D' Type socket)	•	•	•
Stereo analog audio output, (via 26 pin high density 'D' Type socket)	•	•	•
Calibrated stereo balanced analog audio output (option module)	•	•	•
Ethernet remote control via browser, RJ45 connector, 10/100Base-T	•	•	•
IP sockets based remote control as standard	•	•	•
FPGA firmware/software upgrade via Ethernet/USB	•	•	•
Viewing angle tilt mechanism	N/A	N/A	•
Desktop mounting kit	٠	•	N/A
19" Rack-mount kit	1U (options)	1U (standard)	2U (standard)
10.5"/9.5" Rack-mount	0	N/A	N/A
Whisper quiet temperature controlled fan	1 x 40mm internal	2 x 40mm external	1 x 60mm external
Power consumption (variable on modules inserted)	24W typical 40W max	24W typical 70W max	27W typical 80W max
4 Pin XLR power connector, 12V nominal (9V-18V)	•	•	•
AC Power adaptor (included), 90-264VAC, 120W	•	•	•
Dimensions (width x height x depth) excluding ears & projections	210 x 44 x 170mm	440 x 44 x 170mm	440 x 88 x 150mm
Weight (chassis with CPU module and 1x AG option module fitted)	1.3 kg	2.0 kg	2.3 kg
1 year manufacturers warranty - 3 & 5 year warranty options available	•	•	•

Formats supported

SMPTE Standards Link (Content)	Interface	Resolution	Sampling Structure	Pixel Depth	Frame/Field Rate	Rx
ST 259 (ST 125)	SD (625i)	720 x 576	4:2:2 (YCbCr)	10	50i	٠
ST 259 (ST 125)	SD (525i)	720 x 485	4:2:2 (YCbCr)	10	59.94i	•
ST 292 (ST 296)	HD	1280 x 720	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97 25, 24p, 23.98p	•
ST 292 (ST 260)	HD	1920 x 1035	4:2:2 (YCbCr)	10	60i, 59.94i	•
ST 292 (ST 274)	HD	1920 x 1080	4:2:2 (YCbCr)	10	60i, 59.94i, 50i	•
ST 292 (ST 274)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	•
ST 292 (RP 211)	HD	1920 x 1080	4:2:2 (YCbCr)	10	30psF, 29.97psF, 25pSF, 24psF, 23.98psF	•
ST 292 (ST 2048-2)	HD	2048 x 1080	4:2:2 (YCbCr)	10	30p, 29.97p, 25p, 24p, 23.98p	•
ST 372 (ST 274)	Dual Link HD	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	0
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	0
ST 372 (ST 274)	Dual Link HD	1920 x 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i, 30psF, 29.97psF, 25pSF, 24psF, 23.98psF 30p, 29.97p, 25p, 24p, 23.98p	0
ST 372 (ST 274)	Dual Link HD	1920 × 1080	4:2:2 (YCbCr) 4:2:2:4 (YCbCrA)	12	60i, 59.94i, 50i, 30psF, 29.97psF, 25pSF, 24psF, 23.98psF 30p, 29.97p, 25p, 24p, 23.98p	0
ST 372 (ST 2048-2)	Dual Link HD	2048 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 48p, 47.95p	0
ST 372 (ST 2048-2)	Dual Link HD	2048 x 1080	4:4:4 (YCbCr) 4:4:4:4 (YCbCrA/RGBA)	10	30psF, 29.97psF, 25pSF, 24psF, 23.98psF, 30p, 29.97p, 25p, 24p, 23.98p	0
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	0
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, 29.97psF, 25p, 24p, 23.98p	0
ST 425-1 (ST 274)	3G Level A (1)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	0
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	0
ST 425-1 (ST 296)	3G Level A (2)	1280 x 720	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCA/RGBA)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p, 24p, 23.98p	0
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	0
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	0
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	0
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	0
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	0
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	0
ST 425-1 (ST 274)	3G Level B-DL (I)	1920 x 1080	4:2:2 (YCbCr)	10	60p, 59.94p, 50p	0
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	0
ST 425-1 (ST 274)	3G Level B-DL (II)	1920 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCr/RGBA)	10	60i, 59.94i, 50i, 30psF, 29.97psF, 25psF, 24psF, 23.98psF 30p, 29.97p, 25p, 24p, 23.98psF	0
St 425-1 (ST 2048-2)	3G Level B-DL (II)	2048 x 1080	4:4:4 (YCbCr/RGB) 4:4:4:4 (YCbCr/RGBA)	10	30psF, 29.97psF, 25psF, 24psF, 23.98psF, 30p, 29.97p, 25p, 25p, 24p, 23.98p	0
ST 425-1 (ST 274)	3G Level B-DL (III)	1920 x 1080	4:4:4 (YCbCr/RGB)	12	60i, 59.94i, 50i, 30p, 29.97p, 25p, 24p, 23.98p	0
ST 425-1 (ST 2048-2)	3G Level B-DL (III)	2048 x 1080	4:4:4 (YCbCr/RGB)	12	30psF, 29.97psF, 25psF, 24psF, 23.98psF, 30p, 29.97p, 25p, 24p, 23.98p	0
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	0
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	0
ST 425-1 (ST 296)	3G Level D-DS	2x (1280 x 720)	4:2:2 (YCbCr)	10	60p, 59.94p, 50p, 30p, 29.97p, 25p, 24p, 23.98p	•
ST 425-1 (ST 274)	3G Level B-DS	2x (1920 x 1080)	4:2:2 (YCbCr)	10	60i, 59.94i, 50i, 30psF, 29.97psF, 25psF, 24psF, 23.98psF, 30p, 29.97p, 25p, 24p, 23.98p	٠
ST 425-1 (ST 2048-2)	3G Level B-DS	2x (2048 x 1080)	4:2:2 (YCbCr)	10	60i, 59.94i, 50i, 30psF, 29.97psF, 25psF, 24psF, 23.98psF, 30p, 29.97p, 25p, 24p, 23.98p	•

Dimensions & installation

Rx 2000

Rx 500



Rx 1000



Single Rx 500 rack mount tray with cover (PHRXK1)

[19.000] 482.60



For more information about Rx Series of analyzers/generators, contact:

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