



Datasheet

X10 X20

appear.net
Version 2.5



LIMITLESS VIDEO NETWORK OVER IP

The Appear X10/X20 Platform is a dedicated solution for high speed video networking, enhanced IP security, video distribution and contribution. Designed for near limitless capacity, extensive video awareness, enhanced security, operational simplicity and exceptionally high reliability, the platform redefines video delivery.

With IP network technology and infrastructure evolving, the distribution of video is changing. Legacy infrastructure are being replaced by transmission over standard IP-based networks. With 10G and 100G IP infrastructures available, broadcasters seek ways to use the added capacity, primarily for internal uncompressed or lightly compressed video contribution.

Specifically designed for IP-centric operations, the X10/X20 chassis has a significant video processing capacity. 10G bi-directional IP interfaces provide firewall-grade IP security at every connection node. Operating at a minimum internal throughput of 140G, the new backplane extends Appear's tradition of patented redundancy options.

The X Platform supports conversion of uncompressed video from/to legacy SDI and SDI over IP with options to perform "light" compression/decompression using intra-codecs such as TICO, JPEG XS and JPEG2000 or full encoding/decoding using AVC or HEVC. With backplane latency of less than 1ms, universal applicability for virtually any video application is ensured, as is the implementation of both current and future IP video standards, including SMPTE 2110 and SMPTE 2022-6.

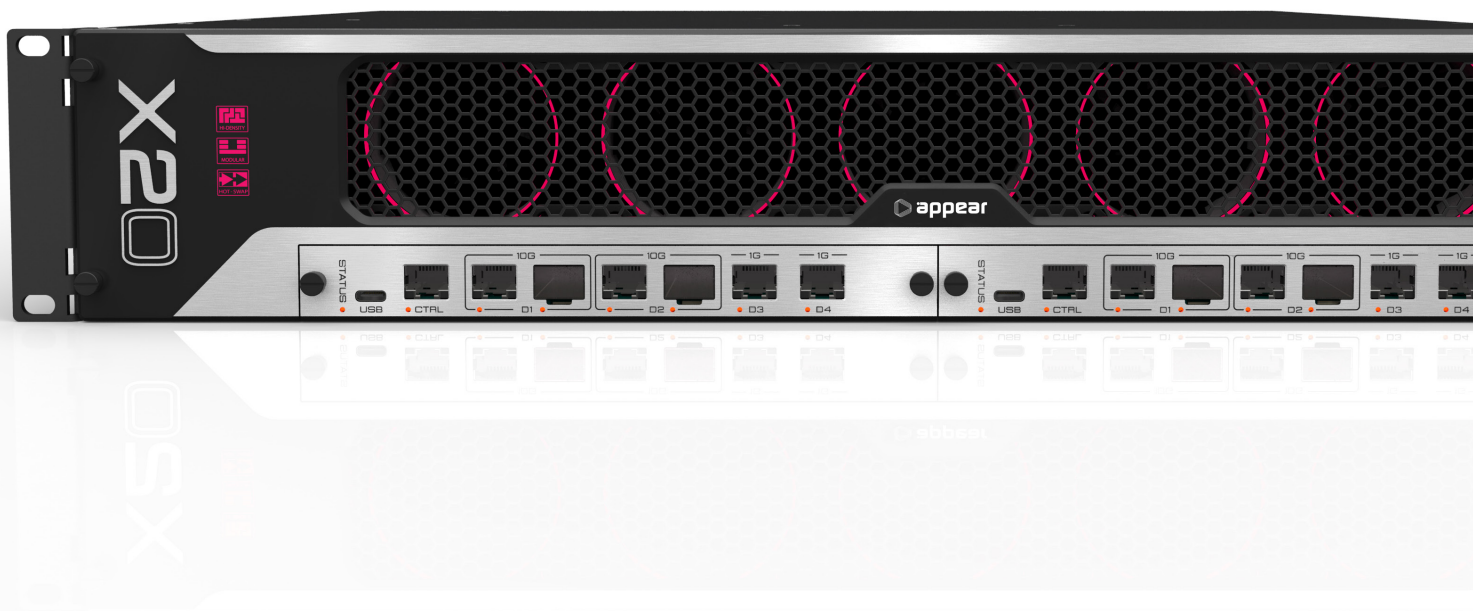


**«Near limitless capacity,
extensive video awareness,
enhanced security, operational
simplicity and exceptionally
high reliability»**





**«Advanced architecture designed to
save space, energy and resources»**



CHASSIS

The X Platform consists of a compact 1RU – X10 as well as a capacious 2RU – X20 option. Both chassis can be used independently, or in conjunction with Appear's widely deployed XC5000 and XC5100 chassis. Built around an in-house developed, high capacity bus architecture that connects all modules, the X Platform operates with dual hot-swappable power supplies, dual front-mounted control modules and six or twelve rear-mounted option slots. A –48VDC power supply option is also available.

Dual control modules can optionally be fitted to either model, and will operate in active/active redundancy mode with redundant backplanes to provide seamless recovery from many critical fault scenarios. All option modules mounted in the rear are interchangeable between the X10 and X20. All modules are hot-swappable (including power supplies and fans). The new software architecture enables different software versions to run on different modules, allowing new functionalities to be delivered to customers faster.

The product can be fitted with a range of input, processing, and output modules that enable bridging between commonly used legacy video platforms and an all IP infrastructure. With support for MPEG TS multiplexing, DVB scrambling/descrambling and dense power efficient AVC/HEVC encoding/decoding, the X Platform is ideal for video processing in legacy DVB networks such as cable, satellite, terrestrial and IPTV. The Control/Switch module and the Dual IP IO modules provide native 10G uni-directional and bi-directional port connectivity.

Service density can be defined up to 2,000 services in and out per module, while set-up and configuration is streamlined. The user interface offers multi-selection of channels or multiplexes enabling configuration changes on multiple of flows with a minimum number of operations. Extensive search capabilities allow the operator to easily locate groups, services, etc.

FEATURES

2RU – X20

- Modular configuration with up to 12 option slot boards
- WEB based configuration, LED indicators on PS and modules
- Forced air-cooling (front to back)
- Dual redundant hot-swappable PS
- Hot-swappable modules
- 100–240 V AC, 50/60 Hz
- –48VDC

1RU – X10

- Modular configuration with up to 6 option slot boards
- WEB based configuration, LED indicators on PS and modules
- Forced air-cooling (front to back)
- Dual redundant hot-swappable PS
- Hot-swappable modules
- 100–240 V AC, 50/60 Hz

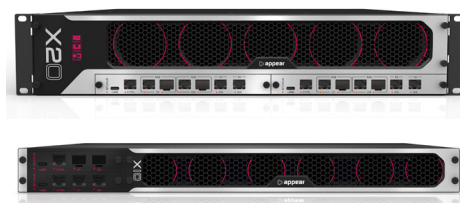
DIMENSIONS

2RU (X20)

19" x 2RU x 540 mm (440 x 88 x 540 mm) (w x h x d mm)

1RU (X10)

19" x 1RU x 540 mm (440 x 44 x 540 mm) (w x h x d mm)



The X20 and X10 use the same set of modules and same SW, although the Control/Switch module differs between the two.



**«Designed to meet all
challenges that a full IP-based
infrastructure presents»**



HIGHLIGHTS

The X Platform has been developed to exploit new opportunities driven by the increasing deployment of ultra-high speed IP networks within all areas of broadcasting. Designed to meet all challenges that a full IP-based infrastructure presents, the platform features:

HIGH SPEED

Multiple bi-directional 10G interfaces with the ability to route up to 140G of traffic internally.

DELAY

Low backplane latency (below 1ms) making overall contribution to delay negligible. Whenever delay buffers are required (such as IP de-jitter), buffer size and consequently delay is adjustable.

MPEG & NATIVE IP HANDLING

The ability to handle all commonly used video protocols provides a future proof solution. The X Platform is based on flexible programmable hardware, new standards not currently defined will be added when required.

AVC, HEVC, TICO, JPEG XS AND JPEG2000 COMPRESSION

All common compression technologies used in professional broadcasting are supported, making the X Platform adaptable to all operational requirements within contribution, remote production, video networking and distribution.

IP NETWORK SECURITY

A video centric, cost-effective, easy to deploy, high-capacity firewall feature that can monitor and regenerate traffic as required.

CAPACITY

Most modules support up to 4,000 (2,000 in and 2,000 out) streams / services per module and 10G of traffic.

MONITORING & CONTROL

A built-in management system to control a potentially vast array of linear and on-demand service traffic effectively, as traditional IPTV / OTT worlds merge. A wide range of external monitoring and control options including SNMP, Syslog & Prometheus support.

SDI TO IP

A high-density SDI input / output module supporting SMPTE 2110 and SMPTE 2022-6 enables bridging classical SDI based coax / fibre networks to IP.

ACCESS CONTROL

A new standard of access control, user management and IP security to secure access to critical network devices. A user account with four different access levels can be defined per user.

REDUNDANCY

Designed to be as reliable and failsafe as possible, even when used stand-alone. The uniquely efficient, built for purpose hardware design is engineered for high reliability and stability. Should an internal failure take place, a range of redundancy options can take effect to keep the chassis fully operational. Dual active - active control/switch module redundancy with internal seamless traffic switching can optionally be deployed within the chassis to make recovery from many critical errors totally seamless.

ENHANCED SECURITY

There are typically multiple locations within a modern broadcasting environment necessitating secure video interfaces between sites, especially when implemented using public networks. The high level of security needed must protect the different sites from outside attacks as well as protect the integrity of video transmission itself. Being a fully operational video firewall, the X Platform maintains tight security on its control layer, supporting many advanced features encompassing Authentication, Authorisation and Audit. Security is assured by Appear's own FPGA based IP packet forwarding mechanism and proprietary internal network structure.

Video-centric features provided in the X series include:

- Multicast forwarding (IGMP join and forward)
- Inspect and forward MPEG-2 TS packets (deep layer 5/6 packet inspection)
- De-multiplex MPEG-2 TS streams
- Encryption and decryption of video data
- Seamless network protection according to SMPTE 2022-7
- Encode and decode SMPTE 2022-1 supplementary FEC

OVERVIEW

- Modular
- Scalable
- Compact with multiple inputs/ outputs per module
- Advanced input analysis and status information
- Easy to configure from one common web GUI interface
- Hot swappable
- Wide range of optional modules
- Mix and match card types freely, and add as many as you need



MODULES

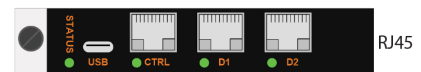
Control/Switch X10

Total capacity :	80 Gbps full duplex
Bitrate :	10 Gbps routing between modules in a chassis
Interface :	2 1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order)
Protocols :	IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag)
Data encapsulation :	TS over UDP/RTP, SDI over SMPTE 2022-6 / SMPTE 2110, AES67, L2TP (Output)
Scrambling/descrambling :	BISS2 Mode 1/E, BISS CA
TS Processing :	De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation
Clock Options :	Free running, PTP, GenLock*, GPS**

X20

Total capacity :	140 Gbps full duplex
Bitrate :	10 Gbps routing between modules in a chassis
Interface :	2 1/10G Base-T Ethernet or SFP+ 2x 1G Base-T Ethernet
Protocols :	IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag)
Data encapsulation :	TS over UDP/RTP, SDI over SMPTE 2022-6 / SMPTE 2110, AES67, L2TP (Output), Port data tunneling
Scrambling/descrambling :	BISS2 Mode 1/E, BISS CA
TS Processing :	De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation
Clock Options :	Free running, PTP, GenLock*, 10MHz, GPS**

* Must be selected at order. ** Future, requires hardware options



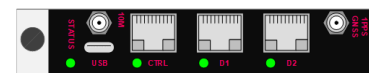
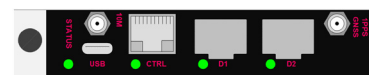
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SFP+



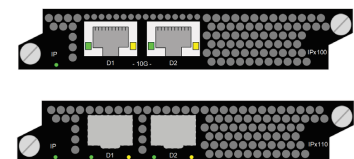
Switch modules without Genlock support



Switch modules with Genlock support

Dual 10G IP IO

Interface :	2 1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order)
Protocols :	IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag)
Data encapsulation :	TS over UDP/RTP, SDI over SMPTE 2022-6 / SMPTE 2110, AES67, L2TP (Output), SRT, Zixi
TS Processing :	De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation



DVB-S/S2X Input

Connectors :	4 x F 75 Ohm
Demodulators :	32 in blocks of 16 (each block has 2 RF inputs)
Satellite standards :	DVB-S EN 300 421, DVB-S2 EN 302 307 - 1, DVB-S2X EN 302 307 -2 Broadcast Services
Frequency range :	L-band (950 - 2150 MHz)
Modulation :	QPSK, 8PSK, 16APSK, 32APSK, 64 APSK, 128 APSK, 256 APSK
Symbol rate :	Up to 64 MBaud
Descrambling :	BISS 1 Mode 1/E, BISS2 Mode 1/E, BISS CA
TS Processing :	De-multiplexing, Service and PID filtering, PSI/SI regeneration



DVB-S/S2X Modulator

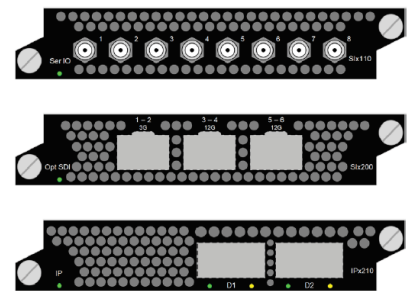
Number of modulators :	2
Interface per modulator :	1x SMA 50 Ohm output, 1x SMA 50 Ohm monitoring output, 1x SMA 50 Ohm input (redundancy)
Redundancy (optional) :	Relay switch on output for each modulator
Satellite standards :	DVB-S EN 300 421, DVB-S2 EN 302 307 - 1, DVB-S2X EN 302 307 -2 Broadcast Services
Frequency range :	IF and L-band (950 - 2150 MHz)
Modulation :	QPSK, 8PSK, 16APSK, 32APSK, 64 APSK, 128 APSK, 256 APSK
Symbol rate :	Up to 72 MBaud
Scrambling :	BISS 1 Mode 1/E, BISS2 Mode 1/E, BISS CA
TS Processing :	Multiplexing, PSI/SI re-generation



SDI/2110/2022-6 IO

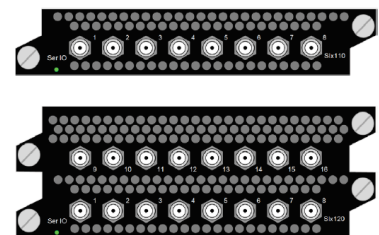
Connectors	: 8x HD BNC 75 Ohm (Slx110) 3x Video SFP (Non-MSA Dual rx/ Dual Tx) (Slx200) 2x QSFP (10GbE, 25GbE or 40GbE) (IPx210)
Video Format	: 12G-SDI (SMPTE 2082) 3G-SDI (SMPTE 424M) HD-SDI (SMPTE 292M) SD-SDI (SMPTE 259M)
Data flow	: Input or output
Codecs – encoding/decoding	: Uncompressed, JPEG XS, JPEG2000*
Video encapsulation	: SMPTE 2110-20, SMPTE 2022-6, TS

* Not supported on IPx210



ASI IO

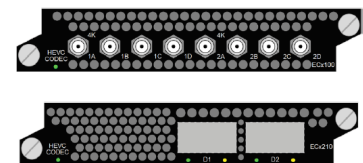
Connectors	: 8x HD BNC 75 Ohm 16x HD BNC 75 Ohm (Slx110/Slx120)
ASI Format	: 188 byte TS – spread and burst mode
Data flow	: Input or output
Video encapsulation	: TS
TS Processing	: De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation
Scrambling/descrambling	: BISS 2 Mode I/E : BISS CA



HEVC Encoder

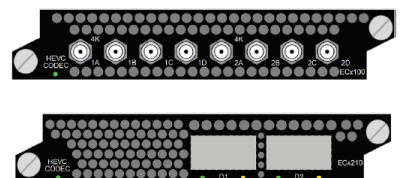
Video Input connectors	: 8x HD BNC 75 Ohm or 2x QSFP (10GbE, 25GbE or 40GbE)
Number of Services	: 2x UHD, 8xFHD, HD, SD
Video Input format	: 12G-SDI (SMPTE 2082) : 3G-SDI (SMPTE 424M) : HD-SDI (SMPTE 292M) : SD-SDI (SMPTE 259M)
Data encapsulation	: SDI over SMPTE 2022-6 : SDI over SMPTE 2110 with PTP
Codecs	: AVC and HEVC
Resolutions	: SD, HD, FHD, UHD (UHD only on HEVC)
Encoding mode :	8/10 bit, 4:2:0/4:2:2, Standard/Low delay/Ultra low delay
Audio leveling	: Long-term and short-term loudness leveling, peak limiting

Operational mode: Broadcast or ABR



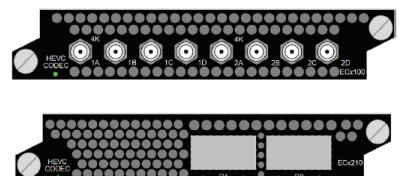
HEVC Transcoder

Number of Services	: Up to 2x UHD or 8xFHD, HD, SD
Decoder	: MPEG-2, AVC and HEVC
Encoder	: AVC and HEVC
Operation modes	: Combined Multiscreen and broadcast
Component	: Passthrough with PCR/PTS sync
Audio leveling	: Long-term and short-term loudness leveling, peak limiting



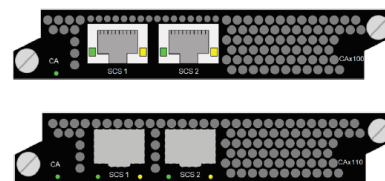
HEVC Decoder

Video output connectors	: 8x HD BNC 75 Ohm or 2x QSFP (10GbE, 25GbE or 40GbE)
Number of Services	: 2x UHD, 4xFHD, HD, SD
Video output format	: 12G-SDI (SMPTE 2082) : 3G-SDI (SMPTE 424M) : HD-SDI (SMPTE 292M) : SD-SDI (SMPTE 259M)
Data encapsulation	: SDI over SMPTE 2110 with PTP
Codecs	: MPEG 2, AVC and HEVC
Resolutions	: SD, HD, FHD, UHD (UHD only on HEVC)
Decoding Modes	: 8/10 bit, 4:2:0/4:2:2, Standard/Low delay/Ultra low delay



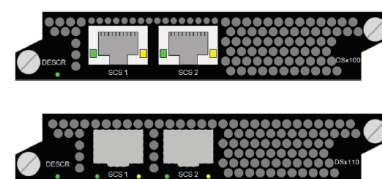
Scrambler

Scrambling capacity	: 2000 services/6 Gbit/s
Scrambling algorithm	: DVB-CSA v1 (48-bit) : DVB-CSA v2 (64-bit) : AES (128-bit)
Entropy reduction	: Yes for DVB-CSA v1 (Reduced to 48-bit)
CA system interface	: DVB simulcrypt compliant : BISS 1/2 Mode 1 : NISS 2 Mode 1
Simulcrypt scrambling	: Up to 8 CA systems
Simulcrypt interface	: 2 1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order)



Bulk Descrambler

Descrambling capacity	: 2000 services/6 Gbit/s (depends on crypto period)
Scrambling algorithm	: DVB-CSA (64-bit) : AES (128-bit)
CA systems	: Verimatrix, BISS 1 Mode 1/E, BISS 2 Mode 1/E
CA authentication interface	: 2 1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order)



SPECIFICATIONS

CONTROL/SWITCH MODULE – SWx100, SWx110, SWx120, SWx130, SWx200, SWx210

X10 Switch fabric	Total capacity	: 80 Gbps full duplex
	Bitrate	: 10 Gbps routing between modules in a chassis
	Placement	: Front loaded
	Interface	: 2 1/10G Base-T Ethernet or 2x1G SFP/10G SFP+ (Base-T or SFP must be selected at order)
X20 Switch fabric	Total capacity	: 140 Gbps full duplex
	Bitrate	: 10 Gbps routing between modules in a chassis
	Placement	: Front loaded
	Interface	: 2 1/10G Base-T Ethernet, SFP/SFP+, and 2x 1G Base-T Ethernet

Control/Switch module – common features for X10 and X20

Dataports	Operational mode	: Seamless Input (SMPTE 2022 7) : Cloned Output (SMPTE 2022-7) : Seamless Input and Cloned Output (SMPTE 2022-7 Full Duplex) : Single Input and Single Output (on separate interfaces) : Exclusive output (if D1 has link D2 is muted, D3 has link D4 is muted)
	Seamless buffer size (network path differential)	: Configurable up to 400ms
	Protocols	: IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag including PCP priority), DSCP (IP Priority flag)
	IO Data Rate	: 1/10Gbps Bi-directional
Control Interface	Interface	: 10/100/1000 Base-T Ethernet
	Built-in user interface	: Web (HTTPS)
	Protocols	: IPv4, IPv6, HTTPS, SSH, ICMP, ARP, LLDP
	External interface	: SNMP for alarms, JSON for configuration and status
Processing	Protocols	: UDP, RTP, SMPTE 2022-6, SMPTE 2110 VSF TR-03, VSF TR-04, AES67, L2TPv3 (Tx only)
	IP input de-jitter	: Yes, based on RTP timestamps or CBR bitrate
	IP input de-jitter buffer size	: Configurable up to 1500ms
	Maximum number of streams per port	: 2000 input and 2000 output streams
MPEG TS	Processing capacity	: 10 Gbps Bi-directional
	Scrambling/Descrambling	: BISS 2 Mode 1/E : BISS CA
	Key reference specification	: ISO/IEC 13818-1:2015, ETSI TS 102 034 V2.1.1 : SMPTE 2022-2, ETSI TR 101 211 V1.9.1
	Protocols	: UDP, RTP : Multicast, Unicast
	IP input de-jitter	: Yes, based on PCR timestamps or CBR bitrate
	IP input de-jitter buffer size	: Configurable up to 1500ms
	Maximum number of streams per port	: 2000 input and 2000 output streams
	Forward Error Correction	: SMPTE 2022-1
	Transport stream	: Single program (SPTS) and multi program (MPTS)
	MPEG TS processing capacity	: 6Gbps Bi-directional
	Maximum per-TS bitrate	: 3 Gbps
	Service filtering	: Yes
	Video formats	: MPEG-2, AVC, HEVC, JPEG XS, JPEG2000 (in MPEG2-TS)
	Multiplexing (MPTS output)	: Yes
	PCR regeneration	: Yes
	Tables Supported	: MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual)
	PSI/SI Table Regeneration	: Yes, based on input and operations performed
	Descrambling	: BISS 2 Mode 1/E : BISS CA
	Scrambling	: BISS 2 Mode 1/E : BISS CA

Table 1: Features and Options		
Clock Options	Chassis synchronisation	: Free Running (on internal clock) : PTP (SMPTE 2059-2 or ITU-T G.8275.2) : GenLock (only on switch modules SWx120, SWx130 and SWx210) : 10MHz (only on switch module SWx220) : GPS (Future hardware option)
Licensed Features	Forward Error Correction (SMPTE 2022-1) Seamless Input (SMPTE 2022-7) MPEG TS multiplexing (MPTS output) TS input analysis BISS 2 mode I/E scrambling/descrambling (per TS) BISS CA scrambling/descrambling (per service or TS)	
DUAL 10G IP IO MODULE – IPx100, IPx110		
Dataports	Interface	: 2 1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order)
	Operational modes	: Seamless Input (SMPTE 2022-7) : Cloned Output (SMPTE 2022-7) : Seamless Input and Cloned Output (SMPTE 2022-7 Full Duplex) : Single Input and Single Output (on separate interfaces) : Exclusive output (if D1 has link D2 is muted, D3 has link D4 is muted) : TS over SRT : TS over Zixi
	Seamless buffer size (network path differential)	: Configurable up to 400ms
	Protocols	: IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag including PCP priority), DSCP (IP Priority flag)
Processing	IO Data Rate	: 1/10Gbps Bi-directional
	Protocols	: UDP, RTP, SMPTE 2022-6, SMPTE 2110 VSF TR-03, VSF TR-04, AES67, L2TPv3 (Tx only)
	IP input de-jitter	: Yes, based on RTP timestamps or CBR bitrate
	IP input de-jitter buffer size	: Configurable up to 1500ms
SRT	Maximum number of streams per port	: 2000 input and 2000 output streams
	Processing capacity	: 10 Gbps Bi-directional
	Modes	: Caller/Listener/Rendezvous
	Scrambling	: AES
Zixi	Capacity	: Up to 32 flows, 100 Mbps per flow, 200Mbps total
	Modes	: "Connect" to/from Broadcaster
	Scrambling	: AES
	Capacity	: Up to 32 flows, 100 Mbps per flow, 200Mbps total
MPEG TS	FEC	: Yes
	Key reference specification	: ISO/IEC 13818-1:2015, ETSI TS 102 034 V2.1.1 SMPTE 2022-2, ETSI TR 101 211 V1.9.1
	Protocols	: UDP, RTP
		: Multicast, Unicast
	IP input de-jitter	: Yes, based on PCR timestamps or CBR bitrate
	IP input de-jitter buffer size	: Configurable up to 1500ms
	Maximum number of streams per port	: 2000 input and 2000 output streams
	Forward Error Correction	: SMPTE 2022-1
	Transport stream	: Single program (SPTS) and multi program (MPTS)
	MPEG TS processing capacity	: 6Gbps Bi-directional
	Maximum per-TS bitrate	: 3 Gbps
	Service filtering	: Yes
	Video formats	: MPEG-2, AVC, HEVC, JPEG XS, JPEG2000 (in MPEG2-TS)
	Multiplexing (MPTS output)	: Yes
	PCR regeneration	: Yes

Licensed Features	Tables Supported	: MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual)
	PSI/SI Table Regeneration	: Yes, based on input and operations performed
	Forward Error Correction (SMPTE 2022-1)	
	Seamless Input (SMPTE 2022-7)	
	MPEG TS multiplexing (MPTS output)	
	TS input analysis	
	SRT TX/RX connections	
	Zixi TX/RX connections	
SDI/2110/2022-6 IO MODULE – Six110, Six200, IPx210		
Connectors		: 8x HD BNC 75 Ohm (Six110)
		: 3x Video SFP (Non-MSA Dual rx/ Dual Tx) (Six200)
		: 2x QSFP (10GbE, 25GbE or 40GbE) (IPx210)
Operational modes	Software images	: SDI IO (No compression), 2022-6 reception/ transmission (Six110/Six120)
		: SDI/2110 in with JPEG XS SD/HD/UHD encoding embedded into 2110 transmission (Six110/IPx210) (also supports uncompressed SD/HD 2110 transmission)
		: 2110 reception with JPEG XS SD/HD/UHD decompression, SDI/2110 out (Six110/IPx210) (also supports uncompressed SD/HD 2110 reception)
		: SDI/2110 in with JPEG XS SD/HD/UHD encoding embedded into TS (Six110/IPx210)
		: TS reception with JPEG XS SD/HD/UHD decompression, SDI/2110 out (Six110/IPx210)
		: SDI in with JPEG2K encoding and TS out (Six110)
		: TS in with JPEG2K decoding and SDI out (Six110)
Data formats	SDI Video Format	: 12G-SDI (SMPTE 2082)
		: 12G-QUAD-2SI (SMPTE 425-5)
		: 12G-QUAD-SQD (SMPTE 425-1)
		: 3G-SDI (SMPTE 424M)
		: HD-SDI (SMPTE 292M)
		: SD-SDI (SMPTE 259M)
	Data encapsulation	: SDI over SMPTE 2022-6
		: SDI over SMPTE 2110 with PTP
SDI In/Out	Data flow	: Input or output (configurable)
	Key reference specification SD Resolution SD	: SMPTE 259M Resolution / Frame rates
		: 480i/29.97
		: 576i/25
	Key reference specification HD Resolution / Frame rates HD	: SMPTE 292M
		: 720p50/59.94
		: 1080i25/29.97
	Key reference specification FHD Resolution / Frame rates FHD	: SMPTE 424M
		: 1080p59.94/50
	Key reference specification UHD Resolution / Frame rates UHD	: SMPTE 2082
		: 2160p60/59.94/50
	Key reference specification AUDIO	: SMPTE 272M (SD), SMPTE 299M (HD/3G), AES67, SMPTE 2110-31
Encapsulation	Sample Rate AUDIO	: 48kHz, synchronous to video
	Video	: SMPTE 2110-20 (Uncompressed)
		: SMPTE 2110-22 (JPEG XS compressed)
		: SMPTE 2022-6 (Uncompressed)
	Audio	: SMPTE 2110-30 (Audio, Based on AES67),
		: SMPTE 2110-31 (Conformance Level B, 1-8 Audio per channel)
		: SMPTE 302 (JPEG2K only, AES3 or PCM)
Signal handling	Ancillary	: SMPTE 2110-40
	Signal loss	: Black picture, Freeze frame, Color bars,
		: Test generator
	Test Generator	: Black picture, Color bars, pathological picture
		: Text overlay
		: Moving element
		: Audio test tone on all audio tracks

JPEG XS Encode/Decode	Signal protection	: Input redundancy switching on TS packet boundaries.(JPEG XS TS decoder, 2002-6)
	Key reference specification:	: VSF_TR-08
	Number of SD/HD/UHD channels:	: 4 (maximum 2 UHD out of the 4) (Six110) : 6 (maximum 2 UHD out of the 6) (IPx210)
	Compression ratio	: from 1.8 to 40.0 (480i/576i) : from 3.1 to 40.0 (720p) : from 4.7 to 40.0 (1080i/1080p/2160p)
	Data encapsulation	: TS and 2110 with PTP
Licensed Features	Number of JPEG XS SD/HD encoders [0-4/6] Number of JPEG XS SD/HD decoders [0-4/6] Number of JPEG XS SD/HD/UHD encoders [0-2] Number of JPEG XS SD/HD/UHD decoders [0-2]	
ASI IO MODULE – Six110, Six120		
Connectors		: 8x HD BNC 75 Ohm (Six110) : 16x HD BNC 75 Ohm (Six120)
Operational modes	Software images	: ASI IO (Six110/Six120)
Data formats	ASI Format	: 188 byte TS – spread and burst mode
ASI In/Out	Key reference specification	: EN 50083-9 Annex B
	Maximum input bit-rate per port	: Up to 213.7 Mbit/s burst mode, 72 Mbit/s spread mode
	Maximum output bit-rate per port	: Up to 213.7 Mbit/s burst mode, 72 Mbit/s spread mode
	Number of MPEG services (sum all ports)	: Up to 2,000 services in and out per module
	Input signal protection	: Traffic policing, configurable maximum allowed input bitrate
	Input monitoring	: ETR290: Priority 1, Selected Priority 2
	Operational modes	: Input / Output – configurable per port : Cloned ASI out
	Transport stream	: Single program (SPTS) and multi program (MPTS)
	Service filtering	: Yes
	Video formats	: MPEG- 2, AVC, HEVC, JPEG2000 (in MPEG2-TS) and JPEG-XS
	Multiplexing (MPTS output)	: Yes
	PCR regeneration	: Yes
	Tables Supported	: MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual)
BISS	PSI/SI Table Regeneration	: Yes, based on input and operations performed
	Descrambling	: BISS 2 Mode 1/E : BISS CA
	Scrambling	: BISS 2 Mode 1/E : BISS CA
Licensed Features	MPEG TS processing Number of MPTS outputs BISS 2 mode 1/E scrambling/descrambling (per TS) BISS CA scrambling/descrambling (per service or TS)	

DVB-S/S2X INPUT – SRx100

Connectors	Number of connectors	: 4
	Connector	: F female, 75Ω
	Max number of transponders	: 32
	Number of transponders per input	: 1–16
	Input level	: -77 to -10dBm @16APSK-9/10, 30MBd
	Frequency range	: 950 – 2150MHz
	Spectrum inversion	: Auto
	LNB signaling	: 22kHz continuous tone and 0/13/18V DC, max 400mA
Demodulation	Standards	: DVB-S/S2/S2x
	FEC frame size	: Normal, Short
	Roll off	: 0.05 – 0.35
	Symbol rates, 8 transponders	: QPSK-16APSK 64MBd
		: 32APSK 51.5MBd
		: 64APSK 42.5MBd
		: 128APSK 36.5MBd
		: 256APSK 32MBd
	Symbol rates, 16 transponders	: QPSK 64MBd
		: 8PSK 59.9MBd
		: 16APSK 44.9MBd
		: 32APSK 35.9MBd
		: 64APSK 29.9MBd
	Symbol rates, 32 transponders	: QPSK 44.9MBd
		: 8PSK 29.9MBd
		: 16APSK 22.4MBd
		: 32APSK 17.9MBd
		: 64APSK 14.9MBd
Processing	Multistream	: ISI Filtering
	Number of MPEG services	: Up to 2000
	Descrambling	: BISS Mode 1/E and BISS 2 Mode 1/E
		: BISS CA
		: BISS CA
Licensed features	Service filtering	: Yes
	Input analysis	: Yes
	DVB-S de-modulation	
	DVB-S2 de-modulation	
	DVB-S/S2x de-modulation	
	BISS 1/2 Mode 1/2/E descrambling (per TS)	
	BISS CA descrambling (per service or TS)	

DVB-S/S2X MODULATOR – SMx100

Interfaces	Number of modulated carriers	: 2
	Outputs connectors	: 50Ω SMA + 50Ω SMA monitor per output
	Backup connectors	: 50Ω SMA per main output
DVB-S Coding and Modulation	Constellation	: QPSK
	FEC rates	: , 2/3, , 5/6, 7/8
	Symbol rate	: 0.1 – 72MBd
	Roll off	: 0.05 – 0.35
DVB-S2x Coding and Modulation	Constellation	: QPSK – 256-APSK
	Modulation mode	: CCM
	FEC rates	: All
	Frame length	: Short, Normal
	PL scrambling	: Configurable Gold index or root
	Symbol rate	: 0.1 – 72MBd
	Roll off	: 0.05 – 0.35
IF	Frequency range	: 70 – 200MHz
	Frequency accuracy	: 1.5ppm
	Output level	: -15 to 0dBm
	Output level accuracy	: 0.5dB
	Output level setting accuracy	: 1.0dB
	In-band flatness	: 0.1dB (typical)
	Return loss	: >18dB
	Spurious signal related	: < -65dBc/4kHz (typical) @5dBm, 256kBd
	Spurious neighbour transponder related	: < -50dBc/4kHz (typical) @0dBm

L-band	Spurious non-signal related	: < -80dBc/4kHz (typical) @5dBm
	Monitor port level	: -20dB relative to main output
	Frequency range	: 950 – 2150MHz
	Frequency accuracy	: 1.5ppm
	Output level	: -40 to 7dBm
	Output level accuracy	: 0.5dB
	Output level setting accuracy	: 1.0dB
	In-band flatness	: 0.2 dB (typical)
	Return loss	: >14dB
Transport Stream	Spurious signal related	: < -65dBc/4kHz (typical) @5dBm, 256kBd
	Spurious neighbour transponder related	: < -50dBc/4kHz (typical) @0dBm
	Spurious non-signal related	: < -80dBc/4kHz (typical) @5dBm
	Monitor port level	: -30dB relative to main output
	Scrambling	: BISS 1 Mode 1/E : BISS 2 Mode 1/E : BISS CA
	Multiplexing	: Yes
	PID mapping:	: Manual mapping of unreferenced PIDs
	PCR regeneration	: Yes
	Tables Supported	: MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual)
Additional features	PSI/SI Table Regeneration	: Yes, based on input and operations performed
	Output redundancy	: Automatic mute or switch to RF backup on error.
	Reverting or “switch once” mode	
	DC output	: 24V, max 500mA
	10MHz reference output	: 0dBm +- 2dB
	Carrier ID	: DVB
	Precorrection	: Static linear gain and group delay
	Number of DVB-S outputs	
	Number of DVB-S2 outputs	
Licensed Features	Number of DVB-S2x outputs	
	Precorrection	
	Carrier ID	
	BISS1/2 Mode 1/E scrambling (per TS)	
	BISS CA scrambling (per service or TS)	
	Output redundancy	
	24V DC and 10MHz reference output	
HEVC CODEC – ECx110, ECx210		
Common features		
Connectors	I/O	: 8x HD BNC 75 Ohm (converter to BNC available or 2x QSFP 10/25/40 GbE)
	SDI key reference specifications	: SMPTE 259M (SD) : SMPTE 292M (HD) : SMPTE 424M (FHD) : SMPTE 2082 (UHD), two connectors
	Data encapsulation	: SDI over SMPTE 2022-6 (ECx210 encoding only) : SDI over SMPTE 2110 with PTP (ECx210)
	UHD Input Formats	: Single connector over 12G SDI as SMPTE 2082 : Quad 3G SDI as SMPTE 425-1 four quadrants : Quad 3G SDI as SMPTE 425-5 two sample interleaved (input only)
	HEVC Codec software version (Selected at order)	: Broadcast encoder mode : ABR encoder mode : Transcoder mode : Decoder mode
	Test generator	: Black picture, Color bars, : Text overlay : Moving element : Audio test tone on all audio tracks : Lip sync test tone
Operational modes		

HEVC Codec – Broadcast Encoder Mode

Density modes	Normal and Low Latency	: HEVC/AVC: 2x UHD / 1x UHD + 4x FHD, HD, SD / 8x FHD/HD/SD
	Ultra Low Latency (ULL) AVC	: 2x UHD / 1x UHD + 4x FHD, HD, SD / 8x FHD/HD/SD
	Ultra Low Latency (ULL) HEVC	: 2x UHD / 1x UHD + 2x FHD, HD, SD / 4x FHD/HD/SD
Video Processing	HEVC Compression, Profiles and Max Level	: Main@Level 5.1
		: Main10@Level 5.1
		: Main422@Level 5.1
	AVC Compression, Profiles and Max Level	: Main@Level 4.2
		: High@Level 4.2
		: High10@Level 4.2
		: High422@Level 4.2
	Resolutions	: 3840x2160p60/59.94/50/30/29.97/25
		: 1920x1080p60/59.94/50
		: 1920x1080i29.97/25
		: 1280x720p60/59.94/50
		: 720x576i25
		: 720x480i29.97
	Color Space Handling	: Passthrough
	HDR Signalling	: Passthrough of PQ10, HDR10 and HLG
	Encode latency modes	: Normal AVC/HEVC – approx. ETE latency 1800ms
		: Low AVC – approx. ETE latency 1000ms
		: Low HEVC – approx. ETE latency 600ms
		: Ultra Low AVC – approx. ETE latency 400ms (GDR, Only pass thru audio)
		: Ultra low HEVC – approx. ETE 180ms (GDR, Only passthrough audio)
	Rate control modes	: CBR
	GOP Control	: Dynamic, Static, IBP, IP or I
		: GDR for ULL HEVC and AVC
	Colorimetry	: SDR, PQ10, HDR10, HLG
	Audio Processing Encode	: MPEG1 Layer2 (Stereo)
		: AAC LC (Stereo and 5.1)
		: HE-AACv1 (Stereo and 5.1)
		: HE-AACv2 (Stereo)
		: Dolby Digital (Stereo and 5.1)**
		: Dolby Digital Plus (Stereo, 5.1 and 7.1)**
		: Dolby E to any of above codecs**
Audio Levelling	Transcode	: Dolby Digital**
	Passthrough	: Dolby Digital Plus**
		: Dolby E**
		: Dolby ED2**
		: PCM
	Capacity per channel	: 8 x 2.0 audios in MPEG-1 Layer2, AAC-LC, HE-AACv1 or
		Dolby Digital (AC-3)
		: 6 x 2.0 audios in HE-AACv2 or Dolby Digital Plus (E-AC-3).
		: 4 x 2.0 Dolby E 2.0/5.1/7.1 transcodes to any other codec
		: 7 x DD/DD+ passthrough
		: 5 x Dolby E passthrough
		: 5.1 counts as three 2.0, 7.1 counts as 4 2.0 (please contact Appear for number of audios handled when combining the above codecs)
	Test Generator	: Black picture, Color bars, pathological picture
		: Text overlay
		: Moving element
		: Audio test tone on all audio tracks
Audio Levelling	Audio Level Adjustment	: +6/-10dB (1dB steps)
	Audio Lip Sync Adjustment	: -200/+500ms
	Long Term Loudness Levelling	: EBU-RI28 / ATSC A/85
	Short Term Loudness Levelling	: EBU-RI28 / ATSC A/85

	Peak Loudness Levelling	: Limits sample peaks based on the configured threshold
Ancillary data	: SCTE-104 to SCTE-35 conversion : Closed Caption (608/708) from Ancillary data (EIA-708-B, SMPTE 334-2) : VITC time code from ST12-M, PTP or NTP : ST2038 ancillary data with DID/SDID filtering options (SMPTE 334M) Slate insertion based on SCTE-104 triggers Redundancy: N+M module redundancy with SDI router control Test Generator for Video and Audio	
*Not applicable in ULL mode		
Licensed Features	AVC Encoding SD AVC Encoding SD/HD AVC/HEVC Encoding SD AVC/HEVC Encoding SD/HD AVC/HEVC Encoding SD/HD/UHD Low Delay Encoding Ultra low delay encoding 4:2:2 Encoding Extra stereo audio encoding (8 stereo audio default) Dolby Digital / Dolby Digital Plus encoding (per service)** Dolby E decoding (per service)** Long term loudness Short term loudness, includes support for long term Peak loudness limiter, includes long and short term loudness	
HEVC Codec – ABR Encoder Mode*		
Video Encoding module	Density	: Up to 2x UHD, 8 HD, 16 SD or 40 sub SD (or a combination)
JPEG XS Decode (ECx210) specs	Key reference	: VSF_TR-08
	Number of SD/HD/UHD channels	: 4 (maximum 2UHD)
	Data encapsulation	: TS
Video Processing	HEVC Compression	: Main@Level 5.1
	Tier	: Main and High
	AVC Compression	: Main@Level 4.2
	Profiles and Max Level	: Constrained baseline@Level4.2 : Main@Level4.2 : High@Level 4.2 : High10@Level 4.2
	Resolutions	: 3840x2160p59.94/50/29.97/25 (HEVC only) : 2560x1440p59.94/50/29.97/25 (HEVC only) : 1920x1080p59.94/50 : 11280x720p59.94/50 : 1024x576p59.94/50 : 1920x1080p29.97/25 : 1280x720p29.97/25 : 1024x576p29.97/25 : 848x480p29.97/25 : 768x432p29.97/25 : 640x360p29.97/25 : 512x288p29.97/25 : 480x270p29.97/25 : 400x224p29.97/25 : 320x180p29.97/25 : 256x144p29.97/25 : 720x576i25 : 720x480i29.97
	Encode latency modes	: AVC/HEVC– approx. ETE latency 1800ms
	Rate control modes	: CBR
	Test Generator	: Black picture, Color bars, pathological picture : Text overlay : Moving element : Audio test tone on all audio tracks

*: ECx210 only support JPEG XS compressed sources in ABR mode

Audio Processing	Passthrough	: Dolby Digital**
		: Dolby Digital Plus**
		: Dolby E**
		: Dolby ED2**
		: PCM
	Capacity	: 8
	Color Space Handling	: Passthru
	HDR Signalling	: PQ10, HDR10 and HLG (only for JPEG-XS TS input)
	Encode latency modes (AVC/HEVC)	: Normal – approx. 1800ms
	Rate control modes	: CBR
Audio Processing Encode	Frame rate conversion	: 60/59.94/50 can be reduced to 30/29.97/25 fps
		: Motion adaptive deinterlacing (maximum 4 inputs)
	Key Frame Alignment	: Frame accurate key frame alignment across all profiles
		: Fixed IDR to IDR distance.
	MPEG1 Layer2 (Stereo)	: AAC LC (Stereo and 5.1)
		: HE-AACv1 (Stereo and 5.1)
		: HE-AACv2 (Stereo)
		: Dolby Digital (Stereo and 5.1)**
		: Dolby Digital Plus (Stereo, 5.1 and 7.1)**
	Transcode	: Dolby E to any of above codecs**
	Passthrough	: Dolby Digital**
		: Dolby Digital Plus**
		: Dolby E**
		: Dolby ED2**
		: PCM
	Capacity per channel*	: 8 x 2.0 audios in MPEG-1 Layer2, AAC-LC, HEAACv1 or Dolby Digital (AC-3)
		: 6 x 2.0 audios in HE-AACv2 or Dolby Digital Plus (E-AC-3)
		: 4 x 2.0 Dolby E 2.0/5.1/7.1 transcodes to any other code
		: 7 x DD/DD+ passthrough
		: 5 x Dolby E passthrough
	Audio Level Adjustment*	: 5.1 counts as three 2.0, 7.1 counts as 4 2.0 (please contact Appear for number of audios handled when combining the above codecs)
		: +6/-10dB (1dB steps)
		: -200/+500ms
		: EBU-R128 / ATSC A/85
		: Loudness Levelling*
	Short Term Loudness Levelling*	: EBU-R128 / ATSC A/85
		: Limits sample peaks based on the configured threshold
		: Peak Loudness Levelling*
	Latency Adjustment	: -1500ms to 0ms, Test Generator for Video and Audio. N+M module redundancy for JPEG-XS TS input (ECx210)
Licensed Features	: AVC Encoding	
	: AVC/HEVC Encoding	
	: Extra stereo audio encoding (8 stereo audio default)	
	: Dolby Digital / Dolby Digital Plus decoding (per service)**	
	: Dolby Digital / Dolby Digital Plus encoding (per service)**	
	: Dolby E decoding (per service)**	
	: Long term loudness	
	: Short term loudness, includes support for long term	
	: Peak loudness limiter, includes long and short term loudness	

HEVC Codec – Transcoder Mode

Inputs	MPEG Transport Stream (TS)	: From any X Platform TS input module
Resource management	Resource configuration	: Automatic by a resource allocation engine. Max input rate 2x90 Mbit/s MPEG-2 / 2x160Mbps for AVC/HEVC inputs per module, all modules in a chassis treated as one processing pool. If required, resources from multiple modules can be combined to deliver resolutions for the same service.
Video Decoder	Module density	: 6 MPEG-2 HD/SD
		: 8 MPEG-4 AVC/HEVC HD/SD
		: 2 HEVC UHD
	MPEG-2 profiles	: MP@HL (HD) : MP@ML (SD)
	MPEG-4 AVC profiles	: Main Profile up to Level 4.2 (FHD)
		: High Profile up to Level 4.2 (FHD)
		: Hi 422 Profile up to Level 4.2 (FHD)
	HEVC profiles	: Main Profile up to Level 5.1 (UHD)
		: Main 10 up to Level 5.1 (UHD)
		: Main 422 10 up to Level 5.1 (UHD)
Video Encoding	SD 50Hz resolutions	: 720/704x576i25
	SD 60Hz resolutions	: 720/704x480i29.97
	HD 1080i resolutions	: 1920x1080i29.97/25
	HD 1080p resolutions	: 1920x1080p59.94/25
	HD 720p resolutions	: 1280x720p60/59.94/50
	Module Density	: Up to 2x UHD, 8 HD, 16 SD or 40 sub SD (or a combination)
		: Main@Level 5.1
		: Main10@Level 5.1
		: Main@Level 4.2
		: Constrained Baseline@Level 4.2
	HEVC Compression, Profiles and Max Level	: High@Level 4.2
		: High10@Level 4.2
		: 3840x2160p59.94/50/29.97/25 (HEVC only)
		: 2560x1440p59.94/50/29.97/25 (HEVC only)
		: 1920x1080p59.94/50
	Resolutions	: 1280x720p59.94/50
		: 1024x576p59.94/50
		: 1920x1080p29.97/25
		: 1280x720p29.97/25
		: 1024x576p29.97/25
		: 848x480p29.97/25
		: 768x432p29.97/25
		: 640x360p29.97/25
		: 512x288p29.97/25
		: 480x270p29.97/25
		: 400x224p29.97/25
		: 320x180p29.97/25
		: 256x144p29.97/25
		: 1920x1080i29.97/25 (Broadcast Profile only)
		: 720x576i25 (Broadcast Profile only)
	Color Space Handling	: Passthru
	HDR Signalling	: Passthru of PQ10, HDR10 and HLG
	Encode latency modes	: Normal – approx. 2sec
	Rate control modes	: CBR
	Frame rate conversion	: 60/59.94/50 can be reduced to 30/29.97/25 fps
		: Motion adaptive deinterlacing (maximum 4 inputs)
	Key Frame Alignment	: Frame accurate key frame alignment across all profiles
		: Fixed IDR to IDR distance.
Audio Decoder	Audio CODECS	: MPEG-1 Layer 2 (2.0)

Audio Encoder	Audio Decoder	Audio Downmix	: AAC-LC (2.0)
			: HE-AAC v1/2 (2.0)
			: Dolby Digital (2.0/5.1) / Dolby Digital Plus (2.0/5.1/7.1)**
			: Dolby E**
			: Multichannel audio (5.1 or 7.1) can be downmixed to 2.0 as part of transcode process.
	Audio CODECS	Audio Channel Modes	: MPEG-1 Layer 2
			: AAC-LC
			: HE-AAC v1/2
			: Dolby Digital / Dolby Digital Plus**
			: Pass through of all audio types
		AAC Data Encapsulation	: Stereo, Mono
			: ADTS or LATM selectable per encoded channel
			: +500ms /-200ms
			: +20/-20dB
			: Limited to 24 stereo (2.0) transcodes per module.
Audio Leveling	Long Term Loudness Levelling	: One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes	
		: One 7.1 transcode consumes resources equivalent to four stereo (2.0) transcodes	
		: EBU-R128 / ATSC A/85	
		: EBU-R128 / ATSC A/85	
		: Limits sample peaks based on the configured threshold	
Picture-in-Picture	Resolutions	: All available ABR resolutions	
	Codec	: MPEG-4 AVC and HEVC (ref coder specification above)	
VBI	Digital Program Insertion (DPI)	: SCTE35 passthrough	
	Pass-through	: I-frame insertion based on SCTE35 marker***	
Licensed Features	Digital Program Insertion (DPI)	Pass-through	: Components such as EBU Teletext and DVB Subtitling can be passed through.
			: Synchronization to video will be maintained
			: All available ABR resolutions
			: MPEG-4 AVC and HEVC (ref coder specification above)
			: SCTE35 passthrough
			: I-frame insertion based on SCTE35 marker***
			: Components such as EBU Teletext and DVB Subtitling can be passed through.
			: Synchronization to video will be maintained
			: All available ABR resolutions
			: MPEG-4 AVC and HEVC (ref coder specification above)

HEVC Codec – Decoder Mode

Video Processing	Density Modes	: 2x UHD / 1x UHD + 2x FHD, HD, SD / 4x FHD/HD/SD
	HEVC Decoder, Profiles and Max Level	: Main@Level 5.1
		: Main10@Level 5.1
		: Main422@Level 5.1
	AVC Decoder, Profiles and Max Level	: Main@Level 4.2
		: High@Level 4.2
		: High10@Level 4.2
		: High422@Level 4.2
	MPEG-2 Decoder, Profiles and Max Level	: MPEG2 MP@ML/HL (4:2:0 8 bit)
	Resolutions	: 3840x2160p60/59.94/50/30/29.97/25
: 1920x1080p60/59.94/50		
: 1920x1080i29.97/25		
: 1280x720p60/59.94/50		
: 720x576i25		
: 720x480i29.97		
Audio Processing	Maximum input bitrate	: 100Mbps per UHD or FHD/HD/SD pair
	Decode	: MPEG1 Layer2
		: AAC LC
		: HE-AACv1/v2
	Passthrough	: Dolby Digital (2.0/5.1) / Dolby Digital Plus (2.0/5.1/7.1)**
		: Dolby E**
		: Dolby Digital**
		: Dolby Digital Plus**
		: Dolby E**
		: Dolby ED2**
Capacity	: PCM	
	: 32x 2.0 decodes freely distributable*	
	: Up to 8x Decodes per UHD/FHD/HD	
	: Up to 4x Decodes per SD	
Ancillary Data	EN301775 Teletext to OP-47	
	ST2038 PID de-encapsulation to SDI	
	VITC Source	: Extracted from HEVC or AVC SEI
Other	VITC Output	: SMPTE 12M-2
	Clock Recovery Modes	: Locked to PCR in video
		: Video alignment
		: GenLock (only in combination with switch modules SWx120, SWx130 or SWx210)
		: Input Redundancy – near seamless switching between any two defined inputs.
Licensed Features	AVC Decoding SD	
	AVC Decoding SD/HD	
	AVC/HEVC Decoding SD	
	AVC/HEVC Decoding SD/HD	
	AVC/HEVC Decoding SD/HD/UHD	
	4:2:2 Decoding	
	Extra stereo audio decoding (8 stereo audio default)	
	Dolby Digital / Dolby Digital Plus decoding (per service)**	
	Dolby E decoding (per service)**	

SCRAMBLER – CAx100, CAx110

Interfaces		: 2 1/10G Base-T Ethernet or 2x1G SFP/10G SFP+ (Base-T or SFP must be selected at order)
Scrambling	Scrambling modes	: CA system : BISS 1 Mode 1 : BISS 2 Mode 1 : Fixed key
	Scrambling algorithm	: DVB-CSA v1 (48-bit) : DVB-CSA v2 (64-bit) : AES (128-bit)
	Entropy reduction	: Yes for DVB-CSA v1 (Reduced to 48-bit) : No for AES
	AES mode of operation	: ATIS IIF Default Scrambling Algorithm (IDSA) : DVB Common IPTV Software-oriented Scrambling Algorithm (DVB-CISSA) : AES-ECB1 / AES-ECB2 / AES-CBC1 : Irdeto AES-CBC1
	PVR support (trick mode)	: PES header in clear (leave a number of packets in clear after PES header)
	MPEG TS processing capacity	: 6Gbit/s
	Number of services per scrambler card	: 2000
	Video format	: MPEG-2, AVC, HEVC (in MPEG2-TS)
	Interface towards CA System	: Simulcrypt interface with optional backup connection
	Number of CA systems	: 8
	Maximum number ECM (sum all CA systems)	: 16000
	EMM insertion	: Yes
	EIS support	: Yes
	Tables Supported	: CAT generation

BULK DESCRAMBLER – DSx100, DSx110

Interfaces		: 2 1/10G Base-T Ethernet or 2x1G SFP/10G SFP+ (Base-T or SFP must be selected at order)
Descrambling	Descrambling modes	: CA system : BISS 1 Mode 1/E : BISS 2 Mode 1/E : Fixed key
	Supported CA system	: Verimatrix (Standard Security profile)
	Descrambling algorithm	: DVB-CSA (64-bit) : AES (128-bit)
	AES mode of operation	: ATIS IIF Default Scrambling Algorithm (IDSA) : DVB common IPTV Software-oriented Scrambling Algorithm (DVB-CISSA) : AES-ECB1 / AES-ECB2 / AES-CBC1 : Irdeto AES-CBC1
Transport stream	MPEG TS processing capacity	: 6Gbit/s
	Number of MPEG TS services	: 2000
	Video format	: MPEG-2, AVC, HEVC (in MPEG2-TS)

CHASSIS

Physical dimensions	X10 chassis	: 19" 1RU 540 mm (440 44 540 mm)
	X20 chassis	: 19" 2RU 540 mm (440 88 540 mm)
Module slots	Number of switch modules (front)	: 1 or 2 (active – active)
	X10 Number of modules (rear)	: 6
	X20 Number of modules (rear)	: 12
	Hot swap support	: Yes
Power supply	Power rating X10	: 750 W
	Power rating X20	
	Max Load	: U NOM 100 – 240 VAC / 50 – 60 Hz / 12 A : 1200 W @ 200 – 240 VAC / 800 W @ 100 – 200 VAC
		: U NOM 100 – 240 VAC / 50 – 60 Hz / 15 A 1500 W @ 200 – 240 VAC / 800 W @ 100 – 200 VAC : –48 to –60 VDC I max: 36.2 A Max Load: 1200 W, x2
Cooling	Redundancy	: Yes, dual hot-swappable PS
	Monitoring	: Via WEB GUI and LED indicators on PS
	X10 chassis	: Single fan tray with 6 fans
	X20 chassis	: Single fan tray with 5 fans
	Airflow direction	: Front to back
	Hot swap support	: Yes, complete fan tray

ENVIRONMENTAL CONDITIONS

Operational conditions	Temperature	: 0 to +40 °C
	Humidity	: 5–90% (non-condensing)
Storage	Temperature	: –20 to +70 °C
	Humidity	: 5–95% (non-condensing)
Safety standards	Electric safety	: IEC 60950-1
	EMC	: EN 55032, EN55024, EN61000-3-2, EN61000-3-3, FCC CFR 47 Part 15
	RoHS	: Compliant
	WEEE	: Compliant

* One 5.1 uses three 2.0 resources. One 7.1 uses four 2.0 resources

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*** Denotes a future software option

VERSION 2.4