
Techincal Specifications

# X10
# X20

appear.net

Version 2.9.2

appear

**«Simplifying the most complex live content production processing & delivery workflows.»**

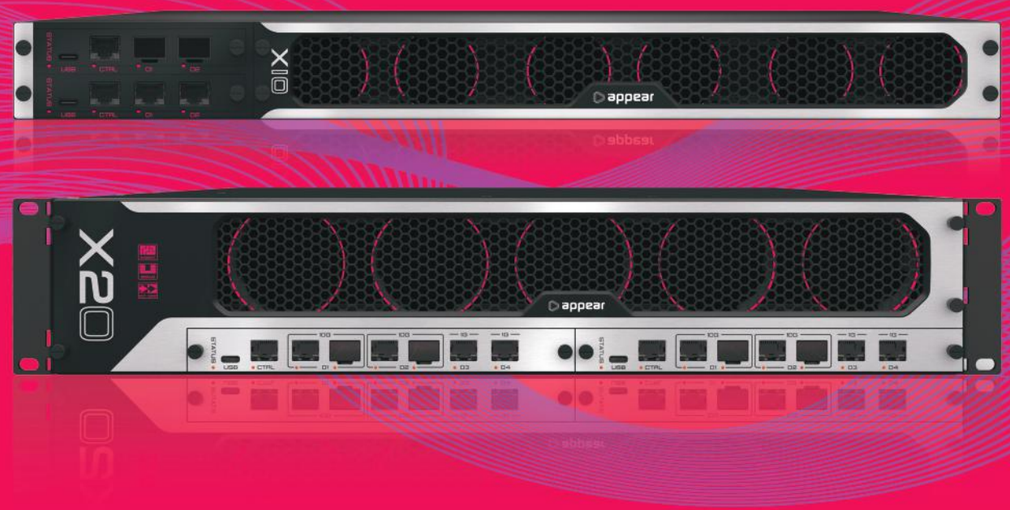
## Delivering a limitless video network over IP

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 solution's 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 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.



# 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, 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**
IP-GW modules support up to 4,000 streams per module. X20 can compress up to 96 HD channels per chassis.

**MONITORING & CONTROL**
A built-in management system to control all services in the unit. A wide range of external monitoring and control options including SNMP and 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. If an internal failure occurs, built-in redundancy options ensure the chassis remains fully operational. Optional dual active-active control and switch modules enable seamless recovery from critical errors.

# 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 configuration from a single common web GUI interface
- Hot swappable
- Wide range of optional modules
- Mix and match card types freely - add as many as you need, when you need them

# X Platform & Module Technical 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 |
| Placement | : Front loaded |
| Interface | : 21/10G 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 | : 21/10G Base-T Ethernet, SFP/SFP+, and 2x 1G Base-T Ethernet |

Control/Switch Module - Common Features for **X10** and **X20** 10G Card

| **Dataports** | |
|---|---|
| Operational mode | : Seamless Input (SMPTE 2022 7)<br>: Cloned Output (SMPTE 2022-7)<br>: Seamless Input and Cloned Output (SMPTE 2022-7 Full Duplex)<br>: Single Input and Single Output (on separate interfaces)<br>: Exclusive output (if D1 has link D2 is muted, D3 has link D4 is muted) |
| Seamless buffer size (network path differential) Protocols | : Configurable up to 400ms<br>: IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag including PCP priority), DSCP (IP Priority flag) |
| IO Data Rate | : 1/10 Gbps 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** | |
| Prometheus (for selected modules) Protocols | : UDP, RTP, SMPTE 2022-6, SMPTE 2110 VSF TR-03, VSF TR-04, AES67, L2TPv3 (Tx only) |
| IP input de-jitter | : Y, 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 |
| Processing capacity | : 10 Gbps Bi-directional |
| Scrambling/Descrambling | : BISS2 Mode 1/E<br>: BISS CA (service level descrambling) |
| **MPEG TS** | |
| 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<br>: Multicast, Unicast |
| IP input de-jitter | : Y, 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 | : 8Gbps Bi-directional |
| Maximum per-TS bitrate | : 3 Gbps |
| Service filtering | : Y |
| Video formats | : MPEG-2, AVC, HEVC, JPEG XS, JPEG2000 (in MPEG2-TS) |
| Multiplexing (MPTS output) | : Y |
| PCR regeneration | : Y |

Control/Switch Module - **X20 100G card**

| | |
|---|---|
| Tables Supported | : MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| PSI/SI Table Regeneration | : Y, based on input and operations performed |
| **Clock Options** | |
| Chassis synronisation | : Free Running (on internal clock)<br>: PTP (SMPTE 2059-2 or ITU-T G.8275.2)<br>: GenLock (Black Burst and Tri-Level Sync, PAL/NTSC)<br>(only on switch modules SWx120, SWx130 and SWx210) |
| **Licensed Features** | |
| Licensed Features | Features Forward Error Correction (SMPTE 2022-1)<br>Seamless Input (SMPTE 2022-7)<br>MPEG TS multiplexing (MPTS output)<br>TS input analysis<br>BISS2 mode 1/E scrambling/descrambling (per TS)<br>BISS CA scrambling/descrambling (per service or TS) |
| **Dataports** | |
| Operational mode | : 2 x QSFP28, Bi-directional, Optical only<br>: Seamless Input (SMPTE 2022 7)<br>: Cloned Output (SMPTE 2022-7)<br>: Seamless Input and Cloned Output<br>(SMPTE 2022-7 Full Duplex)<br>: Single Input and Single Output (on separate interfaces)<br>: Exclusive output (if D1 has link D2 is muted) |
| Seamless buffer size<br>(network path differential)<br>Protocols | : SMPTE ST 2022-7 Class A, B & D<br>: IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q<br>(VLAN tag including PCP priority), DSCP (IP Priority flag) |
| **Control Interface** | |
| IO Data Rate | : 10/25/40/100 Gbps Bi-directional |
| 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** | |
| Prometheus<br>(for selected modules) Protocols | : UDP, RTP, SMPTE 2022-6, SMPTE 2022-2 |
| IP input de-jitter | : Y, based on RTP timestamps |
| IP input de-jitter buffer size | : Configurable up to 100ms |
| Maximum number of streams per port | : 2000 input and 2000 output streams |
| Processing capacity | : 80 Gbps Bi-directional - concurrent input/output |
| **Clock Options** | |
| Chassis synronisation | : Free Running (on internal clock)<br>: PTP (SMPTE 2059-2 or ITU-T G.8275.2) |
| **Licensed Features** | |
| Licensed Features | : Seamless Input (SMPTE 2022-7) |

Dual 10G IPI O Module - **IPx100, IPx110**

| | |
|---|---|
| **Dataports** | |
| Interface | : 21/10G Base-T Ethernet or 1G SFP/10G SFP+<br>(Base-T or SFP must be selected at order) |
| Operational modes | : Seamless Input (SMPTE 2022-7)<br>: Cloned Output (SMPTE 2022-7)<br>: Seamless Input and Cloned Output<br>(SMPTE 2022-7 Full Duplex)<br>: Single Input and Single Output<br>(on separate interfaces)<br>: Exclusive output<br>(if D1 has link D2 is muted, D3 has link D4 is muted)<br>: TS over SRT<br>: TS over Zixi |
| Seamless buffer size<br>(network path differential)<br>Protocols | : Configurable up to 400ms<br>: 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 |
| **Processing** | |
| Protocols | : UDP, RTP, SMPTE 2022-6, SMPTE 2110, VSF TR-03,<br>VSF TR-04, VSF TR-07, VSF TR-08, AES67, L2TPv3 (Tx only) |
| IP input de-jitter | : Y, 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 |
| Processing capacity | : 10 Gbps Bi-directional |
| **SRT** | |
| Modes | : Caller/Listener/Multi-caller |
| Connections | : 128 |
| Total bit-rate<br>(sum of all connections) | : 6Gb/s maximum capacity for all connections |
| Bit-rate per connection | : Up to 8 connections not exceeding 1Gb/s per connection<br>or up to 128 connections not exceeding 250Mb/s<br>per connection |
| Max latency | : 1000ms |
| TS packages per IP frame | : 7 |
| Encryption/Decryption | : AES-128/256 |
| **Zixi** | |
| Modes | : "Connect" to/from Broadcaster |
| Scrambling | : AES |
| Capacity | : Up to 20 flows, 100 Mbps per flow, 200Mbps total |
| FEC | : Y |
| **MPEG TS** | |
| Key reference specification | : ISO/IEC 13818-1:2015, ETSI TS 102 034 V2.1.1<br>SMPTE 2022-2, ETSI TR 101 211 V1.9.1 |
| Protocols | : UDP, RTP |
| IP input de-jitter | : Multicast, Unicast |
| IP input de-jitter buffer size | : Y, based on PCR timestamps or CBR bitrate |
| Maximum number of streams per port | : Configurable up to 1500ms |
| Forward Error Correction | : 2000 input and 2000 output streams |
| Transport stream | : SMPTE 2022-1 |
| MPEG TS processing capacity | : Single program (SPTS) and multi program (MPTS) |
| Maximum per-TS bitrate | : 8Gbps Bi-directional |
| Service filtering | : 3 Gbps |
| Video formats | : Y |
| Multiplexing (MPTS output) | : MPEG-2, AVC, HEVC, JPEG XS, JPEG2000 (in MPEG2-TS) |
| PCR regeneration | : Y |
| Tables Supported | : MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| PSI/SI Table Regeneration | : Y, based on input and operations performed |
| **Licensed Features** | |
| Licensed Features | : Forward Error Correction (SMPTE 2022-1)<br>: Seamless Input (SMPTE 2022-7)<br>: MPEG TS multiplexing (MPTS output)<br>: TS input analysis<br>: SRT TX/RX connections<br>: Zixi TX/RX connections |

Electrical/Optical SDI IO Module - **SIx110, SIx120, SIx130, SIx200**

| | |
|---|---|
| **Connectors** | |
| Interface | : 8x HD BNC 75 Ohm (SIx110)<br>3x Video SFP (Non-MSA Dual rx/ Dual Tx) (SIx200) |
| **Operational modes** | |
| Software images | : SDI IO (No compression), 2022-6 reception/transmission (SIx110/SIx120/SIx130/SIx200)<br>: SDI in with JPEG XS SD/HD/UHD encoding embedded into 2110 transmission (SIx110/SIx120/SIx130) (also supports uncompressed SD/HD 2110 transmission)<br>: ST2110 reception with JPEG XS SD/HD/UHD decompression, SDI out (SIx110/SIx120/SIx130) (also supports uncompressed SD/HD 2110 reception)<br>: SDI in with JPEG XS SD/HD/UHD encoding embedded into TS transmission (SIx110/SIx120/SIx130/SIx200)<br>: TS reception with JPEG XS SD/HD/UHD decompression, SDI out (SIx110/SIx120/SIx130)<br>: SDI in with JPEG2K encoding embedded into TS transmission (SIx110)<br>: TS reception with JPEG2K decompression and SDI out (SIx110) |
| **Data formats** | |
| SDI Video Format | : 12G-SDI (SMPTE 2082)<br>: 12G-QUAD-2SI (SMPTE 425-5)<br>: 12G-QUAD-SQD (SMPTE 425-1)<br>: 3G-SDI (SMPTE 424M)<br>: HD-SDI (SMPTE 292M)<br>: SD-SDI (SMPTE 259M) |
| Data flow | : Input or output (configurable) |
| **SDI In/Out** | |
| Key reference specification SD<br>Resolution SD<br>Key reference specification HD<br>Resolution / Frame rates HD<br>Key reference specification FHD<br>Resolution / Frame rates FHD<br>Key reference specification UHD<br>Resolution / Frame rates UHD<br>Key reference specification AUDIO<br><br>Sample Rate AUDIO | : SMPTE 259M Resolution / Frame rates<br>: 480i/29.97: 576i/25<br>: SMPTE 292M<br>: 720p50/59.94: 1080i25/29.97'<br>: SMPTE 424M<br>: 1080p59.94/50<br>: SMPTE 2082<br>: 2160p60/59.94/50<br>: SMPTE 272M (SD), SMPTE 299M (HD/3G), AES67, SMPTE 2110-30/31<br>: 48kHz, synchronous to video |
| **Uncompressed** | |
| Key reference specification | : SMPTE 2110, SMPTE 2022-6 |
| Number of SD/HD/UHD channels | : 0 UHD<br>: 3 FHD<br>: 4/6 HD (2110/2022-6)<br>: 4/8(6 for SIx200)) SD (2110/2022-6) |
| Data encapsulation | : SMPTE 2022-6<br>: SMPTE 2110-20 |
| **JPEG XS Encode/Decode** | |
| Key reference specification | : VSF_TR-07, VSF_TR-08 |
| Number of SD/HD/UHD channels | : 4 (maximum 2 UHD out of the 4)<br>: SIx130 - 8 (maximum 2 UHD out of the 8) |
| Compression ratio | : from 1:1.8 to 1:40.0 (480i/576i)<br>: from 1:3.1 to 1:40.0 (720p)<br>: from 1:4.7 to 1:40.0 (1080i/1080p/2160p) |
| Audio | : 16 ch (8 Stereo) per channel |
| Data encapsulation | : TS (VS_TR-07) and 2110 with PTP (VS_TR-08) |
| **JPEG2K HD Encode/Decode** | |
| Key reference specification | : VSF-TR01 |
| Number of HD channels | : 4 |
| Bandwidth | : 20 – 400 Mbps |
| Audio | : 20bit audio, 8 Stereo pairs per service carried in SMPTE 302 |
| Ancillary data | : Transparent |
| MPEG TS Descriptors | : JP2K Video, Audio registration, ANC Data |
| Encapsulation mode | : ITU-T H.222.0/Amd.5 |
| **Licensed Features** | |
| Licensed features | Number of JPEG XS SD/HD encoders [0-4], SIx130 [0-8]<br>Number of JPEG XS SD/HD decoders [0-4], SIx130 [0-8]<br>Number of JPEG XS SD/HD/UHD encoders [0-2]<br>Number of JPEG XS SD/HD/UHD decoders [0-2]<br>Number of JPEG2K SD/HD encoders [0-4]<br>Number of JPEG2K SD/HD decoders [0-4] |

IP Uncompressed IO Module - **IPx210**

| | |
|---|---|
| **Connectors** | |
| Interface | : 2x QSFP<br>: 1x40G with QSFP<br>: 4x10G with QSFP breakout<br>: 1x10G SFP+ with adapter<br>: 1x25G SFPO28 with adapter RS/FS FEC support |
| **Operational modes** | |
| Software Images | : 2110 in with JPEG XS SD/HD/UHD encoding embedded into 2110 transmission (also supports uncompressed SD/HD 2110 transmission)<br>: 2110 reception with JPEG XS SD/HD/UHD<br>: Decompression, 2110 out (also supports uncompressed SD/HD 2110 reception)<br>: 2110 in with JPEG XS SD/HD/UHD encoding embedded into TS transmission.<br>: TS reception with JPEG XS SD/HD/UHD decompression, 2110 out |
| **Data formats** | |
| SDI Video Format | : 12G-SDI (SMPTE 2082)<br>: 12G-QUAD-2SI (SMPTE 425-5)<br>: 12G-QUAD-SQD (SMPTE 425-1)<br>: 3G-SDI (SMPTE 424M)<br>: HD-SDI (SMPTE 292M)<br>: SD-SDI (SMPTE 259M)<br>: Input or output (SW Image dependent) |
| **Uncompressed** | |
| Key reference specification | : SMPTE 2110<br>: 0 UHD<br>: 3 FHD<br>: 4 SD/HD |
| Data encapsulation | : SMPTE 2110-20 |
| **JPEG XS Encode/Decode** | |
| Key reference specification | : VSF_TR-07, VSF_TR-08 |
| Number of SD/HD/UHD channels | : 6 (maximum 2 UHD out of the 6 - Encoder)<br>: 6 (max 2 UHD or 1 UHD & 4HD from the 6 - Decoder) |
| Compression ratio | : from 1:1.8 to 1:40.0 (480i/576i)<br>: from 1:3.1 to 1:40.0 (720p)<br>: from 1:4.7 to 1:40.0 (1080i/1080p/2160p) |
| Audio | : 16 ch (8 Stereo) per channel |
| Data encapsulation | : TS (VS_TR-07) and 2110 with PTP (VS_TR-08) |
| **NMOS** | |
| Interface specification | : IS-04<br>: IS-05<br>: Via backplane or in-band via dataports |
| NMOS Message PAth | : In-Band (data ports on ECx210, port 8001), or Out-of-Band via CTRL port on SWx module (port 810x where x is the slot position) |
| NMOS Registry configuration | : Off, Manual, DNS-SD or mDNS (In-band only) |
| NMOS Labelling | : Automatic or Manual configuration |

SI IO Module -
**SIx110, SIx120, SIx130**

| IP | |
|---|---|
| Protocols | : UDP, RTP<br>: Multicast, Unicast<br>: IGMPV2/V3<br>: SSM (Source specific filtering)<br>: LLDP |
| **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 |
| **Licensed Features** | |
| Licensed features | Number of JPEG XS SD/HD encoders [0-6]<br>Number of JPEG XS SD/HD decoders [0-6]<br>Number of JPEG XS SD/HD/UHD encoders [0-2] |

| Connectors | |
|---|---|
| Interface | : 8x HD BNC 75 Ohm (SIx110/SIx130)<br>: 16x HD BNC 75 Ohm (SIx120) |
| **Operational Modes** | |
| Software images | : ASI IO (SIx110/SIx120/SIx130) |
| **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 |
| Input redundancy | : Switches to a redundant input in case the primary input is faulty (or disappears).<br>: The swich can be near seamless if the two sources are identical. |
| Transport stream | : Single program (SPTS) and multi program (MPTS) |
| Service filtering | : Y |
| Video formats | : MPEG- 2, AVC, HEVC, JPEG2000 (in MPEG2-TS) |
| Multiplexing (MPTS output) | : Y |
| PCR regeneration | : Y |
| Tables Supported | : MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| PSI/SI Table Regeneration | : Y, based on input and operations performed |
| **Licensed Features** | |
| Licensed features | MPEG TS processing number of MPTS outputs |

DVB-S/S2X –
**SR-100**

| Connectors | |
|---|---|
| Number of connectors | : 4 |
| Connector | : F female, 75 Ω |
| 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<br>: 32APSK 51.5MBd<br>: 64APSK 42.5MBd<br>: 128APSK 36.5MBd<br>: 256APSK 32MBd |
| Symbol rates, 16 transponders | : QPSK 64MBd<br>: 8PSK 59.9MBd<br>: 16APSK 44.9MBd<br>: 32APSK 35.9MBd |
| Symbol rates, 32 transponders | : QPSK 44.9MBd<br>: 8PSK 29.9MBd<br>: 16APSK 22.4MBd<br>: 32APSK 17.9MBd |
| Multistream | : ISI Filtering |
| **Processing** | |
| Number of MPEG services | : Up to 2000 |
| Descrambling (service level) | : BISS1 Mode 1/E<br>: BISS2 Mode 1/E<br>: BISS CA |
| Service filtering | : Y |
| Input analysis | : Y |

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 |
| Spurious non-signal related | : < -80dBc/4kHz (typical) @5dBm |
| Monitor port level | : -20dB relative to main output |

## L-band

| | |
|---|---|
| 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 |
| 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 |

## Transport Stream

| | |
|---|---|
| Scrambling | : BISS1 Mode 1/E<br>: BISS2 Mode 1/E<br>: BISS CA |
| Multiplexing | : Y |
| PID mapping | : Manual mapping of unreferenced PIDs |
| PCR regeneration | : Y |
| Tables Supported | : MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| PSI/SI Table Regeneration | : Y, based on input and operations performed |

## Additional Features

| | |
|---|---|
| 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 |

## Licensed Features

| | |
|---|---|
| Licensed features | Number of DVB-S outputs<br>Number of DVB-S2 outputs<br>Number of DVB-S2x outputs Precorrection<br>Carrier ID<br>BISS1/2 Mode 1/E scrambling (per TS)<br>BISS CA scrambling (per service TS)<br>Output redundancy<br>24V DC and 10MHz reference output |

HEVC Codec –
**ECx110, ECx210**
Common Features

## Connectors

| | |
|---|---|
| I/O | : 8x HD BNC 75 Ohm<br>(converter to BNC available or 2x QSFP 10/25/40 GbE |
| SDI key reference specifications | : SMPTE 259M (SD)<br>: SMPTE 292M (HD)<br>: SMPTE 424M (FHD)<br>: SMPTE 2082 (UHD), two connectors |
| Data encapsulation | : SDI over SMPTE 2022-6 (ECx210 encoding only)<br>: SDI over SMPTE 2110 with PTP (ECx210) |
| UHD Input Formats | : Single connector over 12G SDI as SMPTE 2082<br>: Quad 3G SDI as SMPTE 425-1 four quadrants<br>: Quad 3G SDI as SMPTE 425-5 two sample interleaved (input only) |

## Operational Modes

| | |
|---|---|
| HEVC Codec software version (Selected at order) | : Broadcast encoder mode<br>: ABR encoder mode<br>: Transcoder mode<br>: Decoder mode |

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<br>: 2x UHD / 1x UHD + 4x FHD, HD, SD / 8x FHD/HD/SD |
| Ultra Low Latency (ULL) AVC 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<br><br>AVC Compression Profiles and Max Level | : Main@Level 5.1<br>: Main10@Level 5.1<br>: Main422@Level 5.1<br>: Main@Level 4.2<br>: High@Level 4.2<br>: High10@Level 4.2<br>: High422@Level 4.2 |
| Resolutions | : 3840x2160p60/59.94/50/30/29.97/25<br>: 1920x1080p60/59.94/50<br>: 1920x1080i29.97/25<br>: 1280x720p60/59.94/50<br>: 720x576i25<br>: 720x480i29.97<br>: Motion adaptive deinterlacing for Max 4 inputs |
| Rescale, deinterlace | : Interlacing for max 8 inputs<br>: Double/halving framerate 25<>50, 29.97<>59.94, 30<>60<br>: Full Rescaling matrix between FHD/HD/SD (except 480i29.97) for max 4 inputs<br>: Passthrough |
| Color Space Handling | : Passthrough of PQ10, HDR10 and HLG |
| HDR Signalling | : Normal AVC/HEVC– approx. ETE latency 1800ms |
| Encode latency modes | : Low AVC– approx. ETE latency 1000ms<br>: Low HEVC– approx. ETE latency 600ms<br>: Ultra Low AVC – approx. ETE latency 400ms (GDR, Only pass thru audio)<br>: Ultra low HEVC - approx. ETE 180ms (GDR, Only pass thru audio) |
| Rate control modes | : CBR |
| GOP Control | : Dynamic, Static, IBP, IP or I<br>: GDR for ULL HEVC and AVC |
| Colorimetry | : SDR, PQ10, HDR10, HLG |
| Audio Processing Encode | : MPEG1 Layer2 (Stereo)<br>: AAC LC (Stereo and 5.1)<br>: HE-AACv1 (Stereo and 5.1)<br>: HE-AACv2 (Stereo)<br>: Dolby Digital (Stereo and 5.1)**<br>: Dolby Digital Plus (Stereo, 5.1 and 7.1)** |
| Transcode | : Dolby E to any of above codecs** |
| Passthrough | : Dolby Digital**<br>: Dolby Digital Plus**<br>: Dolby E**<br>: Dolby ED2**<br>: PCM |
| Capacity per channel | : 8 x 2.0 audios in MPEG-1 Layer2, AAC-LC, HE-AACv1 or Dolby Digital (AC-3)<br>: 6 x 2.0 audios in HE-AACv2 or Dolby Digital Plus (E-AC-3)<br>: 4 x Dolby E 2.0/5.1/7.1 transcodes to any other codec<br>: 8 x DD/DD+ passthrough<br>: 8 x Dolby E passthrough |

Test Generator for Video and Audio
(Please contact Appear for number of audios handled when combining the above codecs, 5.1 and 7.1 channel modes, up-/down mixing or other features like loudness leveling)

| | |
|---|---|
| Audio Level Adjustment | : +20/-20dB (1dB steps) |
| Audio Lip Sync Adjustment | : -200/+500ms |
| Audio Leveling Long Term Loudness Leveling | : EBU-R128 / ATSC A/85 |
| Short Term Loudness Leveling | : EBU-R128 / ATSC A/85 |
| Peak Loudness Leveling | : Limits sample peaks based on the configured threshold |
| **Ancillary data** | |
| Extraction | In-band SDI/ST2022-6/ST2110-40 data<br>: DPI (SCTE-104), Closed Caption (CEA-608/708), VITC (SMPTE-12M), Teletext (OP-47, SMPTE 2031, VBI)<br>Out-of-band data<br>: SCTE-104 data as TCP via Control Port of the IP-GW Switch module<br>: NTP/PTP time via backplane for AVC/HEVC Timecode |
| Processing and Output | : Pass through of all incoming ancillary data as SMPTE 2038 on one PID<br>: Conversion of DPI from SCTE 104 to SCTE-35 Multiple PID indexes are supported on input and output<br>: Conversion of VITC/NTP/PTP to Timecode in AVC/HEVC stream as Supplemental Enhancement Information (SEI) messages<br>: Conversion of Teletext from VBI/OP47/SMPTE 2031 to EN 301 775 EBU Teletext<br>: Conversion of subtitling from OP47/SMPTE 2031 to DVB Subtitling<br>: Conversion of Closed Caption from CEA-708 (carrying 608 and 708 data) to CC in AVC/HEVC stream as Supplemental Enhancement Information (SEI) messages<br>: Option to let SCTE-104 messages triggering Slate Insertion in the encoded AVC/HEVC video<br>Slate insertion based on SCTE-104 triggers |
| **Redundancy** | |
| Input Redundancy | : Seamless, ST2022-7, for ST2110 and ST2022<br>: Alternative input (near seamless) for ST2022-6 |
| N+M Redundancy | : Handles scenarios where a SDI Encoder board disappears from the backplane (reboot, removed etc) by controlling SDI Routers |
| SDI Router support | : Nevion VikinX, BlackMagic Videohub, Broadcast Solutions 'hi' + all routers using SWP-08 protocol |
| **NMOS (ECx210)** | |
| *Not applicable in ULL mode | : IS-04 |
| Interface specification | : IS-05<br>: Via backplane or in-band via dataports |
| NMOS Message path | : In-Band (data ports on ECx210, port 8001), or Out-of-Band via CTRL port on SWx module (port 810x where x is the slot position) |
| NMOS Registry configuration | : Off, Manual, DNS-SD or mDNS (In-band only) |
| NMOS Labelling | : Automatic or Manual configuration |
| **PTP (ECx210)** | |
| Protocols | : UDP, RTP |
| **IP (ECx210)** | |
| IP (ECx210) | : Multicast, Unicast<br>: IGMPV2/V3<br>: SSM (Source specific filtering)<br>: LLDP |

HEVC Encoder –
**ABR Encoder Mode**

| | |
|---|---|
| **Licensed Features** | |
| Licensed features | AVC Encoding SD<br>AVC Encoding SD/HD<br>AVC/HEVC Encoding SD<br>AVC/HEVC Encoding SD/HD<br>AVC/HEVC Encoding SD/HD/UHD<br>Low Delay Encoding<br>Ultra low delay encoding<br>4:2:2 Encoding<br>Extra stereo audio encoding (8 stereo audio default)<br>Dolby Digital / Dolby Digital Plus encoding (per service)**<br>Dolby E decoding (per service)**<br>Long term loudness<br>Short term loudness, includes support for long term<br>Peak loudness limiter, includes long and short term loudness |
| **Video Encoding Module** | |
| Density | : Up to 2x UHD, 8 HD, 16 SD or 40 sub SD (or a combination) |
| **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<br>: Mian@Level4.2<br>High@Level 4.2<br>: High10@Level 4.2 |
| Resolutions | : 3840x2160p59.94/50/29.97/25 (HEVC only)<br>: 2560x1440p59.94/50/29.97/25 (HEVC only)<br>: 960x540p59/p50/p29/p25<br>: 1920x1080p59/p50/p29/p25<br>: 1280x720p59/p50/p29/p25<br>: 1024x576p59/p50/p29/p25<br>: 1920x1080p59/p50/p29/p25<br>: 1280x720p59/p50/p29/p25<br>: 1024x576p59/p50/p29/p25<br>: 848x480p59/p50/p29/p25<br>: 768x432p59/p50/p29/p25<br>: 640x360p59/p50/p29/p25<br>: 512x288p59/p50/p29/p25<br>: 480x270p59/p50/p29/p25<br>: 400x224p59/p50/p29/p25<br>: 320x180p59/p50/p29/p25<br>: 256x144p59/p50/p29/p25 |
| Encode latency modes | : Normal latency – approx. 1800ms |
| Rate control | : CBR, CVBR |
| GOP Control | :Static & Dynamic (scene change detection) |
| Test generator for video and audio | |
| Color Space Handling | : Passthrough |
| HDR Signalling | : PQ10, HDR10 and HLG (only for JPEG-XS TS input) |
| Encode latency modes (AVC/HEVC) | : Normal – approx. 1800ms |
| Rate control modes | : CBR |
| Frame rate conversion | :60/59.94/50 can be reduced to 30/29.97/25 fps<br>: Motion adaptive deinterlacing (maximum 4 inputs) |
| Key Frame Alignment | : Frame accurate key frame alignment across all profiles<br>: Fixed IDR to IDR distance. |
| **Audio Processing** | |
| Encode | : MPEG1 Layer2 (Stereo)<br>: AAC LC (Stereo and 5.1)<br>: HE-AACv1 (Stereo and 5.1)<br>: HE-AACv2 (Stereo)<br>: Dolby Digital (Stereo and 5.1)**<br>: Dolby Digital Plus (Stereo, 5.1 and 7.1)** |
| Transcode | : Dolby E to any of above codecs** |

| | |
|---|---|
| Passthrough | : Dolby Digital**<br>: Dolby Digital Plus** |
| Capacity per channel* | : 8 x 2.0 audios in MPEG-1 Layer2, AAC-LC, HEAACv1 or Dolby Digital (AC-3)<br>: 6 x 2.0 audios in HE-AACv2 or Dolby Digital Plus (E-AC-3)<br>: 4 x Dolby E 2.0/5.1/7.1 transcodes to any other code<br>: 8 x DD/DD+ Passthrough |
| (Please contact Appear for number of audios handled when combining the above codecs, 5.1 and 7.1 channel modes, up-/downmixing or other features like loudness leveling) | |
| Audio Level Adjustment | : +20/-20dB (1dB steps) |
| Audio Lip Sync Adjustment | : -200/+500ms |
| **Audio Leveling** | |
| Long Term | : EBU-R128 / ATSC A/85 |
| Loudness Leveling | |
| Short Term Loudness Leveling | : EBU-R128 / ATSC A/85 |
| Peak Loudness Leveling | : Limits sample peaks based on the configured threshold |
| Latency Adjustment | : -1500ms to 0ms |
| **Redundancy** | |
| Input Redundancy | : Seamless, ST2022-7, for JPEG-XS TS input |
| N+M Redundancy | : Handles scenarios where a ABR Encoder board with JPEG-XS TS inputs disappears from the backplane (reboot, removed etc) |
| **Ancillary** | |
| Ancilliary data | : Conversion of DPI from SCTE 104 to SCTE 35<br>: Multiple PID indexes supported on input & output<br>: Conversion of teletext from VBI/OP47/SMPTE 2031 to EN 301 775 EBU Teletext |
| **Licensed Features** | |
| Licensed features | : AVC Encoding<br>: AVC/HEVC Encoding<br>: Extra stereo audio encoding (8 stereo audio default)<br>: Dolby Digital / Dolby Digital Plus encoding (per service)**<br>: Dolby E decoding (per service)**<br>: Long term loudness<br>: Short term loudness, includes support for long term<br>: 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. 2 x 160Mbps per card. Maximum 100Mbps TS per channel for HEVC and AVC. Maximum 80Mbps TS for MPEG-2. All modules in a chassis treated as one processing pool. If required, resources fom multiple modules can be combined to deliver resolutions for the same service |
| **Video Decoder** | |
| Module Density | : 6 MPEG-2 HD/SD<br>: 8 MPEG-4 AVC/HEVC HD/SD<br>: 2 HEVC UHD |
| MPEG-2 Profiles | : MP@HL (HD)<br>: MP@ML (SD) |
| MPEG-4 AVC profiles | : Main Profile up to Level 4.2 (FHD)<br>: High Profile up to Level 4.2 (FHD)<br>: Hi 422 Profile up to Level 4.2 (FHD) |
| HEVC profiles | : Main Profile up to Level 5.1 (UHD)<br>: Main 10 up to Level 5.1 (UHD)<br>: Main 422 10 up to Level 5.1 (UHD) |
| 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 |
| **Ancillary Data** | |
| Extractions | : In-band SDi DPI (SCTE 104), Teletext (OP-47, SMPTE-2031, VBI) |
| Processing & Output | : Conversion of DPI from SCTE-104 to SCTE-35, Multiple PIDs are supported in input and output<br>: Conversion of Teletext from VBI/OP-47/SCTE2031 to EN301 775 EBU Teletext |
| **Video Encoding** | |
| Module Density | : Up to 2x UHD, 8 HD, 16 SD or 40 sub SD (or a combination) |
| HEVC Compression | : Main@Level 5.1 |
| Profiles and Max Level | : Main10@Level 5.1 |
| AVC Compression | : Main@Level 4.2 |
| Profiles and Max Level | : Constrained Baseline@Level 4.2<br>: High@Level 4.2<br>: High10@Level 4.2 |
| Resolutions | : 3840x2160p59.94/50/29.97/25 (HEVC only)<br>: 2560x1440p59.94/50/29.97/25 (HEVC only)<br>: 960x540p29.97/95<br>: 1920x1080p29.97/95<br>: 1280x720p29.97/95<br>: 1024x576p29.97/95<br>: 1920x1080p29.97/95<br>: 1280x720p29.97/95<br>: 1024x576p29.97/95<br>: 848x480p29.97/95<br>: 768x432p29.97/95<br>: 640x360p29.97/95<br>: 512x288p29.97/95<br>: 480x270p29.97/95<br>: 400x224p29.97/95<br>: 320x180p29.97/95<br>: 256x144p29.97/95<br>: 1920x1080i29.97/25(Broadcast Profile only)<br>: 720x576i25 (Broadcast Profile only) |
| Color Space Handling | : Passthrough |
| HDR Signalling | : Passthrough of PQ10, HDR10 and HLG |
| Encode latency modes | : Normal – approx. 2sec, Low - approx 1sec |
| Rate control modes | : CBR and CVBR (Capped VBR) |
| Frame rate conversion | : 60/59.94/50 can be reduced to 30/29.97/25 fps<br>: Motion adaptive deinterlacing (maximum 4 inputs) |
| Key Frame Alignment | : Frame accurate key frame alignment across all profiles<br>: Fixed IDR to IDR distance. |
| **Audio Decoder** | |
| Audio CODECS | : MPEG-1 Layer 2 (2.0)<br>: AAC-LC (2.0)<br>: HE-AAC v1/2 (2.0)<br>: Dolby Digital (2.0/5.1) / Dolby Digital Plus (2.0/5.1/7.1)**<br>: Dolby E** |
| Audio Downmix | : Multichannel audio (5.1 or 7.1) can be downmixed to 2.0 as part of transcode process. |
| **Audio Encoder** | |
| Audio CODECS | : MPEG-1 Layer 2<br>: AAC-LC<br>: HE-AAC v1/2<br>: Dolby Digital / Dolby Digital Plus**<br>: Passthrough of all audio types |
| Audio Channel Modes | Stereo, Mono |
| AAC Data Encapsulation | : ADTS or LATM selectable per encoded channel |

| | |
|---|---|
| Audio Lipsync Adjustment | : -150 to 500ms |
| Audio Level Adjustment | : +20/-20dB |
| Audio Transcode Capacity | : 24 stereo (2.0) transcodes per module.<br>: One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes<br>: One 7.1 transcode consumes resources equivalent to four stereo (2.0) transcodes |
| **Audio Leveling** | |
| Long Term Loudness Leveling | : EBU-R128 / ATSC A/85 |
| Short Term Loudness Leveling | : EBU-R128 / ATSC A/85 |
| Peak Loudness Leveling | : Limits sample peaks based on the configured threshold |
| Latency Adjustment | : -1500ms to 0ms, Audio can be output on all profiles |
| **ABR Lader** | |
| Resolutions | : All available ABR resolutions |
| Codec | : MPEG-4 AVC and HEVC (ref coder specification above) |
| **Logo Insertion** | |
| Logo | : PNG file upload and positioned on screen |
| **Ad-Insertion** | |
| ESAM (Event Signalling and Management) | : Conditioned SCTE-35 messages with communication to POIS server (Placement Opportunity Information Service) |
| Digital Program Insertion (DPI) | : SCTE35 passthrough<br>: IDR-frame insertion based on SCTE35 marker*** |
| **Passthrough** | |
| PID and SEI data passthrough | : Components such as EBU Teletext and DVB TTML Synchronization to video will be maintained Passthrough of SEI data as Closed Captioning and HDR data |
| **Redundancy** | |
| N+M redundancy | : Handles scenarios when a transcoder board disappears from the backplane (reboot, removed, dead) |
| Input redundancy | : Switches to a redundant input in case the primary input is faulty (or disappears)<br>: The swich can be near seamless if the two sources are identical |
| **Licensed Features** | |
| Licensed features | AVC Encoding<br>AVC/HEVC Encoding<br>Extra stereo audio encoding (8 stereo audio default)<br>Dolby Digital / Dolby Digital Plus decoding (per service)**<br>Dolby Digital / Dolby Digital Plus encoding (per service)**<br>Dolby E decoding (per service)**<br>Long term loudness<br>Short term loudness, includes support for long term<br>Peak loudness limiter, includes long and short term loudness |

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<br>: Main10@Level 5.1<br>: Main422@Level 5.1 |
| AVC Decoder, Profiles and Max Level** | : Main@Level 4.2<br>: High@Level 4.2<br>: High10@Level 4.2<br>: 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<br>: 1920x1080p60/59.94/50<br>: 1920x1080i29.97/25<br>: 1280x720p60/59.94/50<br>: 720x576i25<br>: 720x480i29.97 |

**PLEASE NOTE - The maximum number of frames supported is limited to log2_max_frame_num_minus4 range 0-11, not 0-12 as stated in the H264 recommendation

| | |
|---|---|
| Maximum video input bitrate | : 100Mbps per UHD or FHD/HD/SD, total of 160Mbps or FHD/HD/SD for pair of Decoders |
| **Audio Processing** | |
| Decode | : MPEG1 Layer2<br>: AAC LC<br>: HE-AACv1/v2<br>: Dolby Digital (2.0/5.1) / Dolby Digital Plus (2.0/5.1/7.1)**<br>: Dolby E** |
| Passthrough | : Dolby Digital**<br>: Dolby Digital Plus**<br>: Dolby E**<br>: Dolby ED2**<br>: PCM |
| Capacity | : 32x 2.0 decodes freely distributable*<br>: Up to 8x Decodes per UHD/FHD/HD<br>: Up to 4x Decodes per SD |
| Audio Lip-sync adjustment | : Normal latency: -150 to 500ms<br>: Ultra low and low latency: 0-500ms |
| **Ancillary Data** | |
| Extraction from AVC/HEVC/MPEG2 | : EN 301 775 Teletext PID<br>: Closed Caption from Supplemental Enhancement Information (SEI) messages<br>: SCTE-35 PIDs (multiple input PIDs are supported)<br>: SMPTE 2038 PID |
| Processing & output in SDI/ST2110-40 | : Conversion of EN 301 775 Teletext to OP-47 (including subtitling and teletext)<br>: Conversion of Closed Caption from SEI to CEA 708 (carring 608/708 data)<br>: Conversion of AVC/HEVC time code from SEI to VITC, SMPTE-12M<br>: Conversion of (multiple) SCTE-35 PIDs to SCTE-104 data<br>: Generation of Video Payload Identifier, VPID, SMPTE 352M with correct resolution and colour information.(SDI only)<br>: De-encapsulation of ancillary data wrapped in SMPTE 2038 PID (passing through unaltered data, line position information and VPID, SMPTE-12M) |
| **Other** | |
| Clock Recovery Modes | : Locked to PCR in video<br>: Video alignment<br>: Genlock (PAL/NTSC Black Burst signal) (only in combination with switch modules SWx120, SWx130 or SWx210) |
| Input Redundancy | : Switches to a redundant input in case the primary input is faulty (or disappears)<br>: The swich can be near seamless if the two sources are identical. |
| **NMOS (ECx210)** | |
| Interface specification | : IS-04<br>: IS-05 |
| **PTP (ECx210)** | |
| | : Via backplane or in-band via dataports |
| Protocols | : UDP, RTP<br>: Multicast, Unicast<br>: IGMPV2/V3<br>: SSM (Source specific filtering)<br>: LLDP |
| **Licensed Features** | |
| Licensed features | AVC Decoding SD<br>AVC Decoding SD/HD<br>AVC/HEVC Decoding SD<br>AVC/HEVC Decoding SD/HD<br>AVC/HEVC Decoding SD/HD/UHD<br>4:2:2 Decoding<br>Extra stereo audio decoding (8 stereo audio default)<br>Dolby Digital / Dolby Digital Plus decoding (per service)**<br>Dolby E decoding (per service)** |

Scrambler –
**CAx100, CAx110**

| Interfaces | |
|---|---|
| Interfaces | : 2 1/10G Base-T Ethernet or 2x1G SFP/10G<br>SFP+ (Base-T or SFP must be selected at order) |
| **Scrambling** | |
| Scrambling modes | : CA system<br>: BISS1 Mode 1<br>: Fixed key |
| Scrambling algorithm | : DVB-CSA v1 (48-bit)<br>: DVB-CSA v2 (64-bit)<br>: AES (128-bit) |
| Entropy reduction | : Y for DVB-CSA v1 (Reduced to 48-bit)<br>: N No for AES |
| AES mode of operation | : ATIS IIF Default Scrambling Algorithm (IDSA)<br>: DVB Common IPTV Software-oriented<br>: Scrambling Algorithm (DVB-CISSA)<br>: AES-ECB1 / AES-ECB2 / AES-CBC1<br>: Irdeto AES-CBC1 |
| PVR support (trick mode) | : PES header in clear<br>(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 | : Y |
| EIS Support | : Y |
| Tables Supported | : CAT Generation |
| **Licensed Features** | |
| Licensed features | : Number of scrambled services |
| Licensed features | : Number of CA systems |

Bulk Descrambler –
**DSx100, DSx110**

| Interfaces | |
|---|---|
| Interfaces | : 2 1/10G Base-T Ethernet or 2x1G SFP/10G SFP+<br>(Base-T or SFP must be selected at order) |
| **Descrambling** | |
| Descrambling modes | : CA system<br>: BISS1 Mode 1/E (service level)<br>: BISS2 Mode 1/E (service level)<br>: Fixed key |
| Supported CA system | : Verimatrix (Standard Security profile) |
| Descrambling algorithm | : DVB-CSA (64-bit)<br>: AES (128-bit) |
| AES mode of operation | : ATIS IIF Default Scrambling Algorithm (IDSA)<br>: DVB common IPTV Software-oriented<br>: Scrambling Algorithm (DVB-CISSA)<br>: AES-ECB1 / AES-ECB2 / AES-CBC1<br>: 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) | : 8 |
| X20 Number of modules (rear) | : 12 |
| Hot swap support | : Y |
| **Power Supply** | |
| Power rating X10 | : 750W |
| Power rating X20 | |
| Max Load | : U NOM 100 - 240 VAC/50 - 60 Hz/12 A<br>: 1200 W @ 200 - 240 VAC/800 W @ 100 - 200 VAC<br>: U NOM 100 - 240 VAC/50 - 60 Hz/15 A<br>: 1500 W @ 200 - 240 VAC/800 W @ 100 - 200 VAC<br>: -48 to -60 VDC I max: 36.2 A<br>: Max Load: 1200 W, x2 |
| Redundancy | : Y, dual hot-swappable PS |
| **Cooling** | |
| X10 chassis | : Single fan tray with 6 fans |
| X20 chassis | : Single fan tray with 5 fans |
| Airflow direction | : Front to back |
| Hot swap support | : Y, 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 | : IEC62368-1 |
| EMC | : EN 55032, EN55035 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
** Dolby Audio™. Dolby, Dolby Audio, and the double-D symbol are trademarks of Dolby Laboratories
*** Denotes a future software option

This product must not be disposed of with other household waste. According to the WEEE-directive, everyone that sells electrical and elec-tronic products shall ensure that the same products are disposed of in an environmentally sound manner. Appear TV is a member of Elretur AS, a Norwegian nationwide take-back company for the collection, recycling and environmentally sound processing of scrapped electrical and electronic equipment. In accordance with local requirements you may return this product to Appear TV AS, Lilleakerveien 2b, 0283 Oslo, Norway, and we will free of charge accept your waste equipment for recycling. You may also choose to return this product to a collection point for the recycling of waste electrical and electronic equipment in your municipality. If this product is purchased outside Norway, you may contact your local reseller to enquire about local collection points for recycling of this product, as applicable.


Appear
Po Box 8 Lilleaker
No-0216 Oslo
Norway

Tel: +47 24 11 90 20
Email: info@appear.net
Web: www.appear.net