Technical Specifications

XC5000
XC5100

appear.net

Version 4.8

appear

SYSTEM OF CHOICE FOR PROFESSIONAL OPERATORS

Appear is dedicated to providing world class equipment that enable operators to deliver professional broadcast services at the highest possible quality. Our portfolio is built around modular platforms hosting a wide selection of interoperable modules that give unparalleled configuration possibilities. Through its clever and robust design, the integrated architecture offers superior reliability that can meet even the most demanding operator requirements.

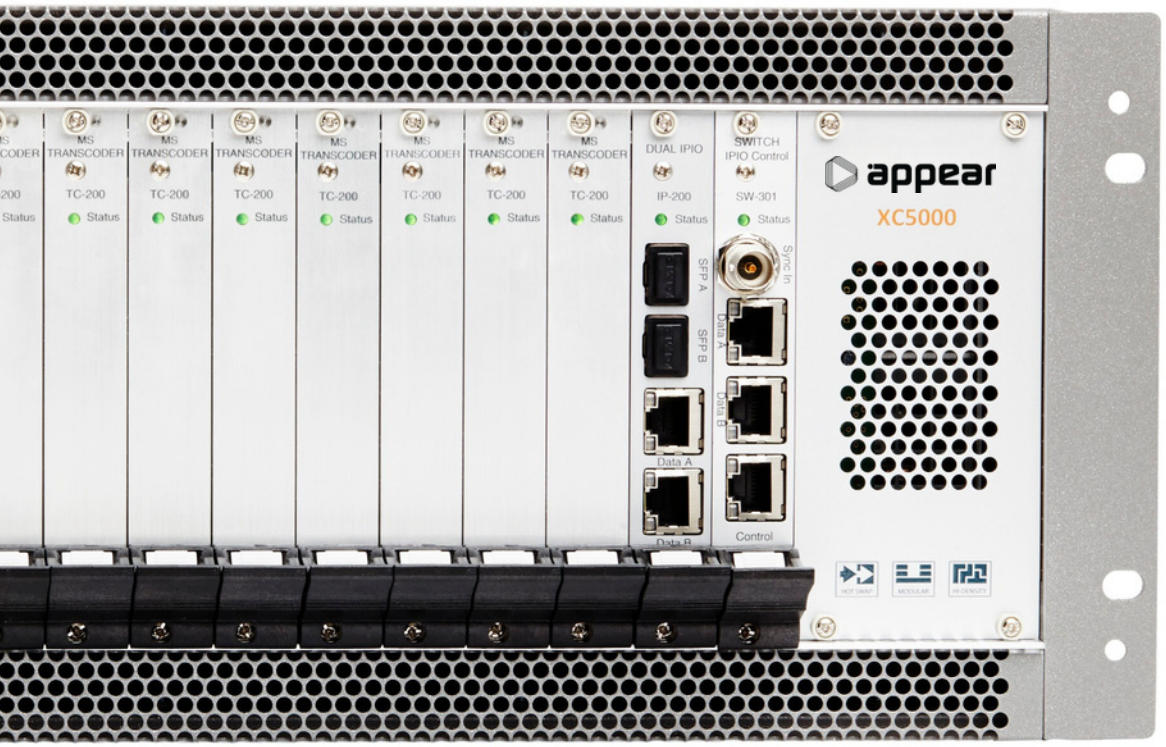
A key feature of the products is the ability to accommodate customers preferred system architectures while reducing complexity. It is possible to build an entire broadcast system within a single chassis or distribute it between several discreet stages or distributed architectures. Appear's deep understanding of the market and close co-operation with operators in the design of products ensures the ability to provide optimal solutions for a wide array of fixed or wireless networks. Our philosophy greatly reduces the cost of ownership and ensures that operators can simultaneously handle legacy challenges and evolve through the introduction of brand new services.

Appear's XC5000 and XC5100 are our latest generation carrier grade platforms with 4RU and 1RU chassis options of unmatched power and versatility. There are no restrictions even for the most intensive processing requirement. Both units feature uprated dual-redundant and hot swappable power supplies, increased cooling, enhanced redundancy and a number of other features.

An advanced user friendly GUI offers an intuitive and comprehensive management of the many features of the system. The exhaustive multi-level alarm system, together with the easiness for integration to 3rd party management systems, enables full automatic control. The possibility of centralized monitoring simplifies deployment and streamlines maintenance.

Appear classifies its modules into different categories depending on the functionality. These include switching, input for content aggregation, compression, processing, output and decoding modules. All modules can be combined freely to provide the desired functionality. The latest innovations include the possibility to deliver and convert both analog and digital broadcast services, from point to point, or from point to multipoint and in any format to any screen.

«Complete solutions for every major broadcast segment››



AWARD WINNING REDUNDANCY

Appear's intelligent redundancy software provides seamless integration between broadcast equipment and IP networks. It protects every stage and provides automatic backup in case of service stream failure at input, protection from internal failures, and intermittent or permanent data losses within distribution networks without requiring complex control software.

Appear's redundancy solution is unique in being the only solution in the IP television market to take a holistic view of operation and network management. Redundancy configuration is simplified and automated, and operational routines are significantly reduced. The integrated redundancy solutions offer operators compelling quality of service benefits and improved network reliability. The individual elements of this integrated solution are further described below. For more detailed information please contact Appear.

Input redundancy
The Appear system is equipped with an advanced input redundancy switching mechanism. Any output service can be configured to have a backup service from a different input TS regardless of input type. Input switching can also be performed on TS level using 'input port redundancy'.

Redundancy switching can be set to automatic or manual. In automatic mode it is possible to choose from the following switching modes: Once (switch and stop), Floating or Reverting.

Seamless IP input redundancy (License)
The Appear Seamless IP Switch module makes it possible to achieve seamless IP input redundancy switching between two distribution networks. The Seamless IP Switch combines an innovative alignment technique
with a fast acting data switch making it possible to reconstruct a perfect outgoing stream even from two imperfect network feeds.

The Seamless IP Switch can regenerate the traffic received via two networks, so that both networks are used 100% of the time to back each other up. Using the data provided by both networks simultaneously, rather than just one, enables dramatic improvements in QoS.

Internal Redundancy (4RU chassis feature)
By using Appear's Internal Redundancy feature, all critical single points of failure in the 4RU chassis are eliminated. This clever mechanism facilitates configurations with redundant switch modules, redundant backplanes, redundant IP inputs, redundant MMI (i.e. management & control) as well as redundant power supplies. In case of input, switch or MMI failure, all output modules or decoder modules will switch backplane and log into the other MMI where it will receive the services from the backup inputs and switch.

By having 1+1 redundancy on inputs and switch modules, all components of the chassis are backed up, except for the decoder and output modules which normally handle a subset of the available channels. In case of failure of decoder or output modules, they can easily be hot-swapped, and the affected services will be up and running in seconds.

N+M redundancy (4RU chassis feature) (License)
The Appear self-managed N+M redundancy for encoding and transcoding provides a powerful option for broadcasters needing the economies
of N+M compression redundancy without the expense, complexity and long term reliability concerns of a conventional NMS. Rather than relying on external PC hardware, Appear have integrated the redundancy control into the built in management system thus simplifying system configuration eliminating integration and operational issues between HW and management PC. It is the perfect method for creating the intelligent 'device islands' that are increasingly being favored by broadcasters when architecting new solutions.

The encoders and transcoders will be the only items within the chassis in N+M configuration. Everything else will be 1+1. This includes any input and output ports, all control and management functions, the backplane and the power supplies. Each 4RU chassis will be equipped with backup encoder or transcoder module(s) capable of providing module level replacement for any of the active encoders or transcoders within the chassis. Multiple redundancy groups can be combined in the chassis by automatically creating groups of encoders and transcoders. For encoding, the redundant control modules can drive a (HD)SDI video router directly

IP Output redundancy (License)
The IP output redundancy system presents a network with multiple sources from which it is possible to obtain the same service. Should the service
from one source be corrupted, the network can receive the service from another source. The redundancy solution is service based (multicast based) where the same service will be available for two or more sources. As long as all sources with the same channel have the same IP source address, the network will route just a single copy of the multicast stream forward to the receiver based on routing cost. In the event of a service issue within, or prior to, the Appear chassis, the IP output module exploits standard IP protocols to trigger external routers to switch to secondary sources. The "Monitor-in-out" functionality may be used for those networks not utilizing routing protocols.

Where full redundancy is not required, partial redundancy strategies can be implemented. Systems can be configured to provide full redundancy of only selected premium or 'must-carry' services. Operators can then choose not to replicate the input and descrambling functions of lower priority services, but still equip the chassis with multiple IP output modules to provide limited fault tolerance.

TECHNICAL SPECIFICATIONS

Switch Module SW-200 (No IP IO) SW-301, SW-401 SW-310, SW-410	Bitrate Placement	: Gbit/s routing between modules in a chassis : 1 slot wide (4RU switch module must be placed in slot 0; redundant module in slot 17)
	IP Input/Output	
	Interface	: 2 × 10/100/1000 Base-T Ethernet or SFP : Optical SFP (class 1 laser product)
	Maximum data rate per port	: Up to 850 MBit/s per port TS rate
	Maximum number of services per port	: 250
	Data format	: UDP/RTP Multicast/Unicast
	Transport stream	: SPTS and MPTS
	Service filtering	: Yes
	Video format	: Transport stream; MPEG-2, MPEG-4, HEVC
	IP Input	
	IP de-jittering	: PCR or CBR
	Forward Error Correction	: SMPTE 2022-1 250 input streams per data port
	IP Output	
	Multiplexing	: Yes (licensed)
	Forward Error Correction	: SMPTE 2022-1 250 output streams per data port
	Tables Supported	
	- PSI	: PAT, PMT, CAT
	- SI	: SDT, NIT, EIT pf , TOT, TDT, BAT, AIT
	- PSIP	: MGT, TVCT, CVCT
	Reference Clock	
	Frame Synchronization Input (Genlock)	: Accepts black burst and Tri-Level reference signal.*
	Internal Clock Reference	: 10 MHz
	MMI Clock Syncronization	: Yes (SW-310, SW-410 only)
	Management	
	Interface Built- in user interface External interface	: 10/100/1000 Base-T Ethernet : Web : SNMP for alarms, SOAP for configuration and status
	* If SDI reference signal support is needed, contact your sales representative.	
	Licenced features	
	Out	: 2xIP In, 1xIP In/1xIP Out, 2xIP Out, Seam. IP In, Cloned IP : FEC in, FEC out, FEC in/out : Multiplexing : IP Out Redundancy
Clock Reference **CK-100**	**GPS reference input**	
	Antenna connector	: SMA female
	Impedance	: 50 Ω
	1pps timing accuracy	: < 100 ns RMS
	Active Antenna Voltage output	: 0V, 3.3V(default) or 5V
	Internal reference hold-over	: ≤1us in 4 hrs @ΔT= 0˚C
	1pps reference input	
	Number of input ports	: 1
	Input connector type	: BNC female
	Impedance	: TTL or 50 Ω
	Input level 1pps (1Hz)	: TTL
	Internal reference hold-over	: ≤1us in 4 hrs @ΔT= 0˚C
	Licenced features	: GPS receiver, OCSO oscillator, OCXO oscillator (stability 0.2ppb/day)

COMMON INPUT SPECIFICATIONS

All Input Modules	Transport stream	: SPTS and MPTS
	Service filtering	: Yes
	Video format	: Transport stream, MPEG-2/4 (H264) and HEVC

INPUT INTERFACE SPECIFICATIONS

Dual IP IO **IP-200/IP-300**	**IP Input/Output**	
	Interface	: 2×10/100/1000 Base-T Ethernet and SFP
	Operational mode	: The module can be configured to; - 1 input and 1 output - Seamless (Hitless) IP in - Cloned IP out - Dual IP in - Dual IP out
	Maximum data rate per port	: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1×IPIN + 1×IPOUT : Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode
	Maximum number of services per port	: 250
	Data format	: UDP/RTP Multicast/Unicast
	IP Input	
	IP de-jittering	: Yes, based on PCR or CBR
	Forward Error Correction	: SMPTE 2022-1 250 input streams per data port
	IP Output	
	Multiplexing	: Yes
	Forward Error Correction	: SMPTE 2022-1 250 output streams per data port
	Lisenced features	: Seamless input, Cloned IP Out : FEC in, FEC out, FEC in/out : Multiplexing : IP output redundancy
ASI Input **AI-110**	Key reference specification	: EN 50083-9 : BNC female, 75Ω
	Connector	: 4
	Number of inputs per module	: Up to 213.7Mbit/s (burst)
	Maximum bit-rate per port	
DVB-S/S2X input **SR-120**	Key reference specification	: EN 300 421, EN 302 307 part 1 and 2
	Connector	: F female, 75Ω
	Number of inputs per module	: 4
	Frequency range	: 9 50 –21 50 M H z
	Acquisition range	: Auto, 0.15MHz, 1MHz, 2MHz, 2.5MHz, 5MHz
	Input level	: -79 to -20 dBm (16-APSK, 9/10 code rate)
	DVB-S Constellation DVB-	: QPSK
	S2 Constellation DVB-	: QPSK, 8PSK, 16APSK, 32APSK
	S2X Constellation	: QPSK, 8PSK, 16APSK, 32APSK
	Symbol rate DVB-S/S2/S2X	: 1–4 5 MSym/s (1-3 9 . 9 MSym/s for 3 2-APSK)
	Decoding DVB-S2/S2X	: LDPC and BCH
	FEC DVB-S	: 1/2, 2/3, 3/4, 5/6, 7/8
	FEC DVB-S2 QPSK	: 1/4, 13/45, 1/3, 2/5, 9/20, 1/2, 11/20, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
	FEC DVB -S2 8PSK	: 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 5/6, 8/9, 9/10
	FEC DVB-S2 8APSK	: 5/9, 26/45
	FEC DVB-S2 16APSK	: 5/9, 8/15, 1/2, 26/45, 3/5, 28/45, 23/36, 2/3, 25/36, 13/18, 3/4, 7/9, 4/5, 5/6, 77/90, 8/9, 9/10
	FEC DVB-S232APSK	: 2/3, 3 2/4 5, 11/1 5, 3/4, 7/ , 4/5, 5/6, 8/9, 9/10
	Roll off DVB-S	: Auto, 0.35
	Roll off DVB-S2	: Auto, 0.20, 0.25, 0.35
	Roll off DVB-S2X	: Auto, 0.05, 0.10, 0.15, 0.20, 0.25, 0.35
	Spectrum inversion	: Auto, Normal, Inverted

	DVB-S2 FEC frames	: Normal frames
	LNB voltage	: 0/13/18 Volt
	Maximum LNB supply current	: 400 mA
	LNB signaling	: LNB voltage + 22kHz continuous tone : 1 per input port
	Multiple streams	: 1 PLP per port
	T2MI De-encapsulation	
	Licenced features	: DVB-S2 demodulation : DVB-S2X demodulation : T2MI de-encapsulation
DVB-T/T2 input **TR-210, TR-211**	Number of DVB-T/T2 inputs per module	: 4
	Input connector	: F-female, 75 Ω
	Input connector configurations	: 1 F connector internally split or 4 F connectors
	Input frequency range	: 47–862 MHz
	Input level range channel)	: - 80 to -10 dBm (at T2, 8MHz, 256 QAM, 3/5, gaussian
	Minimum return loss	: 10 dB
	DVB-T	
	Key reference specification	: ETSI EN 300744 , Nordig 2.0
	FFT Size	: 2k, 8k
	Guard Intervals	: 1/4, 1/8, 1/16, 1/32
	FEC code rate	: 1/2, 2/3, 3/4, 5/6, 7/8
	Constellation	: QPSK, 16-QAM, 64-QAM
	Channel bandwidth	: 6, 7, or 8 MHz
	Hierarchy stream	: High and Low priority
	Hierarchy mode	: All
	Spectral inversion	: Automatic
	DVB-T2	
	Key reference specification	: ETSI EN 302755, Nordig 2.1
	FFT Size	: 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended
	Guard Interval	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
	FEC frame	: Normal (6 4 k), Short (1 6 k)
	FEC code rate (P L P)	: 1/2 , 3/5 , 2/3 , 3/4 , 4/5 , 5/6
	Constellation (PLP)	: QPSK, 16-QAM, 64-QAM, 256-QAM
	Channel bandwidth	: 5 , 6 , 7 o r 8 M H z
	Pilot pattern	: P1–P8
	SISO and MISO transmission	: Yes
	Single and Multiple-PLPs	: Yes
	Spectral inversion	: Automatic
	Rotated constellation	: Automatic
	Licenced features	: DVB-T2 demodulation
DVB-C Input	Key reference specification	: EN 300 429, ITU-T J83 annex A, and C
CR-200	Key reference specifications	: EN 300 428, ITU-T J83 annex A/B/C
	Connector	: F-type female 75 ohm
	Number of inputs per module	: 16 independent tuner/demodulators
	Number of input ports	: 1 (internal splitter feeding 16 tuners)
	Frequency range	: 47-1000 MHz
	Channel bandwidth	: 6, 7 and 8 MHz
	QAM mode	: 4, 16, 32, 64, 256 QAM
	Symbol rate	: 1-7.2 Mbaud
	Spectrum inversion	: Automatic
	Input power level	: -20 to -65 dBm (@256QAM, 6.9Ms/s)

TR-500	Key reference specs	: ATSC A/53, A/321, A322, A330
	Number of inputs per module	: 4
	Connector	: F-female, 75 ohm
	RF input level	: -82 - 0 dBm (TBD)
	Frequency range	: 50 – 1002 MHz
	Size	: 1 slot wide
ATSC 1.0	Modulation	: 8-VSB
	Bandwidth	: 6 MHz
	Code rate	: 2/3
*ATSC 3.0**	Modulation	: OFDM
	FFT sizes	: 8K, 16K and 32K
	Bandwidth	: 6, 7 or 8 MHz
	Modulation and coding	: All mandatory modulation and coding combinations
		: Single and Multiple PLPs
ISDB-T/SBTVD-T	Key reference specification	: ARIB STD-B31
TR-401	Channel bandwidth	: 6, 7 and 8 MHz
	RF Input specification	
	Number of inputs per module	: 4 independent tuner/demodulators
	Number of input ports	: 1 (internal splitter feeding the 4 tuners)
	Connector	: F female, 75Ω
	Frequency range	: 50–860 MHz
	Input power level	: -10 dBm to -76 dBm (QPSK, 2/3)
		: -10 dBm to -95dBm (64 QAM, 7/8)
	Return loss	: 10dB
	Demodulation	: DQPSK, QPSK, 16QAM, 64QAM
	FEC	: 1/2, 2/3, 3/4, 5/6, 7/8, Automatic
	Spectrum inversion	: Automatic
SRT		
IP-202	**SRT Input/Output**	
	Interface	: 2×10/100/1000 Base-T Ethernet and SFP
	Operational mode	: 1 data port input and 1 data port output
	Maximum data rate in total	: Up to 35 Mbit/s
	Maximum number of services per port	: Limited by total throughput
	Transmission modes	: Caller, Listener and Rendezvous
	Encryption	: AES 128, AES 192, AES 256
	Data format	: SRT
	SRT Input	
	IP de-jittering	: Yes, based on PCR or CBR (after SRT de-encapsulation)
	Receive latency	: Configurable retransmission buffer size, 0 – 8000 ms
	SRT Output	
	MPEG-TS output	: Only SPTS
	Licensed features	: SRT Input, SRT Output

** Future support, please contact Appear for more information.*

ENCODING/TRANSCODING SPECIFICATIONS

Universal Encoder - High VQ Broadcast

EC-400

Density

Number of channels per module	: Up to 1 HD or 2 SD

Video Input

HD Res./Framerates (SMPTE 292M)	: 1080i – 29.97 fps or 25 fps
	: 720p – 59.94 fps or 50 fps
SDRes./Framerates (SMPTE 259M)	: 480i – 29.97 fps
	: 576i – 25 fps

Audio Inputs

Embedded Audio	: SMPTE 272M (SD), SMPTE 299M (HD)
	: Sample rate 48kHz, synchronous to video

Video Encoder

Architecture	: Dual Pass with look ahead
MPEG-2 profiles	: MP@HL (H D) up to 60 Mbps
	: MP@ML (SD) up to 16Mbps
MPEG -4 AVC profiles	: MP@L4.2, HP@L4.2 (HD) up to 55Mbps
	: MP@L3.1, HP@L3.1 (SD) up to 16Mbps
Rate Control Modes	: Constant Bit Rate (CBR)
	: Capped VBR (CVBR) with QP target
	: Statistical Multiplexing
GOP structure	: Dynamic with Scene Change Detection and Adaptive GOP structure.
Clock Modes	: Locked to HDSDI/SDI input
Aspect Ratio Control	: Manual, WSS, Video Index or AFD Codes
PCR PID	: PCR on Video PID or as separate PID
End-to-end Encoder Delay	: Typical 5000ms (4000ms reduced delay mode)

Audio Encoder

Number of encoded stereo pairs per main video : 8

Audio CODECS	: MPEG-1 Layer 2
	: AAC-LC (2.0, 5.11))
	: HE-AAC v1 (2.0, 5.11))
	: HE-AAC v2
	: Dolby® Digital2)
	: Dolby® Digital Plus3)
	: Dolby® Digital/Dolby® Digital Plus pass-through
Audio Channel Modes	: Stereo, Mono and Dual Mono, 5.11) and 7.1 (Dolby® Digital/Dolby® Digital Plus only)
	: Stereo, Mono and Dual Mono, 5.11) and 7.1 (Dolby®
AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
Audio Lipsync Adjustment	: +500ms / -200ms
Audio Level Adjustment	: +6/-10dB

Automatic Audio Levelling

Key specification	: EBU TECH 3344 (Service Loudness – EBU R128)
Number of stereo	: 24
Target Level	: -1 8 LU FS to -31 LU FS (re c . -23 LU FS)
Initial Adjustment	: -20 dB to 20 dB
Max. Adjustment step (per day)	: 0.5 dB

Picture-in-Picture

Density	: One PiP available for each main channel
Codec	: MPEG-4 AVC BP or MP
Bitrate	: Min 96kbps, Max 500kbps (CBR)
Resolutions	: 320x240, 192x192, 176x144, 128x96
GOP Size	: Configurable independent of main channel

Video Pre-processing

Inverse Telecine Detection	: Detect if input is 3:2 pull down and omit repeated fields.
De-blocking Filter	: Adjustable
Motion Compensated Temporal Filter (MCTF)	: Adjustable

WSS Blanking	: Removal of line 23 WSS from active video
Video Re-scaling	
Horizontal Rescaling	: From 1920 to 1440, 1280 or 960 : From 1280 to 960 or 640 : From 720 to 704, 640, 544, 528, 480 or 352
Down Conversion HD to SD	: Including aspect ratio conversion, letter-/pillar boxing
Up Conversion SD to HD	: Including aspect ratio conversion, letter-/pillar boxing and deinterlacing.
Frame Rate Conversion	: From 59.94 fps to 59.94/29.97 fps : From 50 fps to 50/25 fps : From 29.97 fps to 59.94/29.97 fps : From 25 fps to 50/25 fps : Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output.
Logo Insertion	
Maximum Size	: 192 x128 (SD) : 360x180 (HD 720P) : 480x270 (HD 1080i)
Positioning	: User selectable (pixel accuracy)
File format	: PNG (8-bit ARGB) file per encoded channel
Ancillary Data and VBI	
Teletext processing	: Extracted from VANC OP47, SMPTE-2031 or VBI and trans-coded to EN 301755.
Closed Captioning (EIA 608/EIA 708)	: Extracted from VANC and injected into video stream.
Digital Programme Insertion (DPI)	: SCTE104 triggers extracted from VANC and transcoded to SCTE35 TS triggers.
Active Format Description (AFD)	: Extracted from VANC SMPTE 2016 and injected into video stream.
Dolby® E metadata	: External Dolby® E metadata extracted from VANC SMPTE 2020 used for Dolby® Digital/Dolby® Digital Plus encoding configuration.
Wide Screen Signalling (WSS)	: Extracted from VBI line 23 or VANC SMPTE 2031 and trans-coded to EN 301755
Video Programming System (VPS)	: Extracted from VANC SMPTE 2031 and transcoded to EN 301755
Video Inserted Time Code (VITC)	: Extracted from VANC SMPTE-RP188 and injected into video stream.

Auxillary Data Injection
EBU Subtitling, DVB Subtitling, PIDs can be added to service through an Appear TV Input Interface (e.g. ASI, IP). PTS can be restamped for DVB subtitling.

Subtitling conversion	: Conversion from EBU Subtitling to DVB Subtitling
Statistical Multiplexing	
Statmux Controller	: Local within chassis
Max. Number of Groups per chassis	: Maximum 16, one per encoder/transcoder module
Max. Number of Services within group	: 32
Licensed Features	: Number of Encoder Channels HD : Number of Encoder Channels SD : Statistical Multiplexing - Number of Channels : MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs : Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs4) : Dolby® E Decode - Number of channels : Subtitle transcoding from TTX to DVB : OSDM : Automatic Audio Levelling : Subtitle PTS re-stamping

1) AAC-LC/HE-AAC v1 5.1 support in future release
2) Dolby® Digital also known as AC-3
3) Dolby® Digital Plus also known as E-AC-3

Universal Encoder - Dense

EC-400

Density

Number of channels per module	: Up to 4 HD or 4 SD

Video Input

HD Resolutions/Frame rates (SMPTE 292M)	: 1080i – 29.97Hz or 25Hz
	: 720p – 59.97Hz or 50Hz
SD Resolutions/Frame rates (SMPTE 259M)	: 480i – 29.97Hz
	: 576i – 25 Hz

Audio Inputs

Embedded Audio	: SMPTE 272M (SD), SMPTE 299M (HD) Sample rate 48kHz, synchronous to video PCM or Dolby® Digital/Dolby® Digital Plus

Video Encoder

Architecture	: Single Pass with look ahead
MPEG-2 profiles	: MP@HL(H D) up to 60 Mbps
	: MP@ML (SD) up to 16Mbps
M P EG -4 AVC profiles	: MP@L4. 2, HP@L4.2 (H D) up to 55 Mbps
	: MP@L3.0, HP@L3.0 (SD) up to 16Mbps
Rate Control Modes	: Constant Bit Rate (CBR)
	: Capped VBR (CVBR) with QP target
	: Statistical Multiplexing
GOP structure	: Dynamic with Scene Change Detection and Adaptive GOP structure.
Clock Modes	: Locked to HDSDI/SDI input or to local clock
Aspect Ratio Control	: Manual, WSS, Video Index or AFD Codes
PCR PID	: PCR on Video PID or as separate PID
End-to-end Encoder Delay	: Video Quality optimized for 4500ms (3000ms reduced delay)

Audio Encoder

Number of encoded stereo pairs per main video	: 8 [4)]
Audio CODECS	: MPEG-1 Layer 2
	: AAC-LC
	: HE-AAC v1
	: HE-AAC v2
	: Dolby® Digital2) 2.0 and 5.1
	: Dolby® Digital Plus3) 2.0, 5.1 and 7.1
Audio Channel Modes	: Convert Dolby® Digital Plus to Dolby® Digital Dolby® Digital / Dolby® Digital Plus Pass-thru
AAC Data Encapsulation	: Multichannel, Stereo, Mono, Dual Mono
Audio Lipsync Adjustment	: ADTS or LATM selectable per encoded channel
Audio Level Adjustment	: +500ms / -200ms
	: +6/-10dB

Automatic Audio Levelling

Key specification	: EBU TECH 3344 (Service Loudness – E B U R1 28)
Number of stereo	: 24
Target Level	: -1 8 LU FS to -31 LU FS (re c . -23 LU FS)
Initial Adjustment	: -20 dB to 20 dB
Max. Adjustment step (per day)	: 0.5 dB

Video Pre-processing

WSS Blanking	: Removal of line 23 WSS from active video

Picture-in-Picture

Density	: One PiP available for each channel
Codec	: MPEG-4 AVC BP or MP
Bitrate	: Min 96kbps, Max 500kbps (CBR)
GOP Size	: Configurable independent of main channel
Resolutions	: 320x240, 192x192, 176x144, 128x96, 96x96

Video Re-scaling

Horizontal Rescaling	: From 1920 to 1440, 1280 or 960
	: From 1280 to 960 or 640

4) One 5.1 encode uses resources of 3x stereo pairs. One 7.1 encode uses resources of 4x stereo pairs

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	: From 720 to 704, 640, 544, 528
Down Conversion HD to SD	: Including aspect ratio conversion, letter-/pillar boxing
Up Conversion SD to HD	: Including aspect ratio conversion, letter-/pillar boxing and de-interlacing.
Frame Rate Conversion	: From 59.94 fps to 59.94/29.97 fps
	: From 50 fps to 50/25 fps
	: From 29.97 fps to 59.94/29.97
	: From 25 fps to 50/25 fps
	: Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output.
Logo Insertion	
Maximum Size	: 192 x128 (S D)
	: 360x180 (HD 720P)
	: 480x270 (HD 1080i)
Positioning	: User selectable (pixel accuracy)
File format	: PNG (8-bit ARGB) file per encoded channel
Ancillary Data and VBI	
Teletext processing	: Extracted from VANC OP47, SMPTE -2031 or VBI and transcoded to EN 301755.
Closed Captioning (EIA 608/EIA 708)	: Extracted from VANC and injected into video stream.
Digital Programme Insertion (DPI)	: SCTE104 triggers extracted from VANC and transcoded to SCTE35 TS triggers
Active Format Desctription (AFD)	: Extracted from VANC SMPTE 2016 and injected into video stream.
Dolby® Metatdata	: SMPTE 2020 metadata extracted from VANC and injected into audio stream.
Wide Screen Signalling (WSS)	: Extracted from VBI line 23 or VANC SMPTE 2031 and transcoded to EN 301755
Video Programming System (VPS)	: Extracted from VANC SMPTE 2031 and transcoded to EN 301755
Video Inserted Time Code (VITC)	: Extracted from VANC SMPTE-RP188 and injected into video stream.
Auxillary Data Injection	
Subtitling insertion	: EBU Subtitling, DVB Subtitling. Teletext subtitling PIDs can be added to service through an Appear TV Input interface (e.g. ASI, IP). PTS can be re-stamped.
Subtitling conversion	: Conversion from EBU Subtitling to DVB Subtitling
Statistical Multiplexing	
Statmux Controller	: Local on a Universal Encoder or Transcoder module
Maximum Number of Groups per chassis	: Maximum16, one per encoder/transcoder module
Maximum Number of Services within group	: 32
Licensed Features	: Number of Encoder Channels HD
	: Number of Encoder Channels SD
	: Statistical Multiplexing - Number of Channels
	: MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs
	: Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs4)
	: Dolby® E Decode - Number of channels
	: Subtitle transcoding from TTX to DVB
	: OSDM
	: Automatic Audio Levelling
	: Subtitle PTS re-stamping

5) For complete table please contact Appear.

Universal Encoder - MS/OTT **EC-400**	Input Ports Input Format	: 2xHDSDI/4xSDI, 4 BNC 75 Ω : SMPTE 292M (HDSDI), SMPTE 259M (SDSDI)
	Video Pre-processing	
	WSS Blanking	: Removal of line 23 WSS from active video
	Video Encode	
	MPEG -4 AVC Profiles	: High profile up to HP@L4.0 : Main profile up to MP@L4.0 : Base profile up to BP@L4.0
	HD and sub HD resolutions [5]	: 1920 x 1080i @ 29.97,25 fps : 1920 x 1080p @ 29.97,25 fps : 1280 x 720p @ 59.94,50 fps : 1280 x 720p @ 29.97,25 fps : 960 x 540p @ 29.97,25 fps : 852 x 480p @ 29.97,25 fps : 640 x 360p @ 29.97,25 fps : 480 x 270 p @ 29.97, 25 fps : 41 6 x 240p @ 29 .97 fps
	SD and sub SD resolutions [5]	: 320 x 180p @ 29.97/14.985, 25/12.5 fps : 720 x 576i @ 25/1 2.5 fps : 720 x 480i @ 29 .97/14 .985 fps : 640 x 480p @ 29 .97,25 fps : 640 x 360 p @ 29 .97,25 fps : 544 x 416 p @ 29 .97,25 fps : 480 x 360 p @ 29 .97,25 fps : 480 x 270 p @ 29 .97,25 fps : 416 x 24 0 p @ 29 .97 fps : 400 x 224 p @ 29 .97,25 fps : 400 x 300 p @ 29.97,25 fps : 384 x 216 p @ 29.97,25 fps : 352 x 288p @ 25 fps : 320 x 240p @ 29.97/14 .985,25/1 2.5 fps : 320 x 180p @ 29.97,25 fps : 240 x 180p @ 29.97/14.985, 25/12.5 fps
	Frame rate conversion	: From 60/59.94/50 reduced to ½, ¼ : From 50 reduced to ½ or ¼ : From 30/29.97/50 reduced to ½
	De-interlacing Scene change detection GOP structure Number of output profiles	: Interlaced to progressive conversion : Yes, insertion of P frame : Dynamic : Ranging from 4x HD to 28 sub SD per module, depending on complexity of profiles
	Audio Encode	
	AAC-LC HE-A AC v1 HE-A AC v 2 Sample rates Number of channels per video source	: Modes: 2.0, Bit rates: 32 – 384kbps : Modes: 2.0, Bit rates: 32 - 192kbps : Modes: 2.0, Bit rates: 32 - 96kbps : 32, 48kHz : 2 (Audio resources can be combined.)
	Reformatting/ Rescaling	
	Format conversion	: From HD to sub SD
	Aspect Ratio Control	
	Aspect Ratio Modes	: Transparent Input to Output (Controlled by AFD), Manual 4:3 or 16:9
	Ancillary Data and VBI	
	Closed Captioning (EIA 608/EIA 708)	: Extracted from VANC and injected into video stream.
	Active Format Desctription (AFD) video stream.	: Extracted from VANC SMPTE 2016 and injected into

1) One 5.1 encode uses resources of 3x stereo pairs. One 7.1 encode uses resources of 4x stereo pairs
2) Dolby® Digital also known as AC-3
3) Dolby ® Digital Plus also known as E-AC-3

Universal Transcoder - High VQ Broadcast

TC-400

Densitiy	
Total Number of Video Transcodes	: Up to 1x HD or 2x SD channels
Video Decoder	
MPEG-2 profiles	: MP@HL, 1Mbps – 80Mbps
	: MP@ML, 600kbps – 15Mbps
H.264 profiles	: MP@L4.2, 500kbps – 55Mbps
	: HP@L4.2, 1Mbps – 55Mbps
	: MP@L3.2, 300kbps – 16Mbps : HP@L3.2, 300kbps – 16Mbps
	: High 4:2:2@L4.2, 4.5Mbps - 80Mbps CABAC/100Mbps
SD 50Hz resolutions	: 720/704/640/544/528/480/352 x 576i25
SD 60Hz resolutions	: 720/704/640/544/528/480/352 x 480i30/29.97
HD 1080i resolutions	: 1920/1440/1280/960 x 1080i30/29.97/25
HD 720p resolutions	: 1280/960/640 x 720p60/59.94/50
Audio Decoder	
Audio CODECS	: MPEG-1 Layer 2 :AAC-LC
	: HE-AAC v1
	: HE-AAC v2
	: Dolby® Digital / Dolby® Digital Plus
	: Dolby® E
Audio Downmix	: 5.1 to 2.0 for AAC and Dolby®
Video Encoder	
MPEG-2 profiles	: MP@HL, 1Mbps – 80Mbps
	: MP@ML, 600kbps – 15Mbps
H.264 profiles	: MP@L4.2, 500kbps – 55Mbps
	: HP@L4.2, 1Mbps – 55Mbps
	: MP@L3.2, 300kbps – 16Mbps
	: HP@L3.2, 300kbps – 16Mbps
Rate Control Modes	: Constant Bit Rate (CBR)
	: Statistical Multiplexing
GOP structure	: Dynamic with Scene Change Detection and Adaptive GOP structure.
Aspect Ratio Control	: Manual, Transparent input to output
PCR PID	: PCR on Video PID or as separate PID
End-to-end Encoder Delay	: Typically 5500ms (4500ms reduced delay mode)
Picture-in-Picture	
Bitrate	: Min 96kbps, Max 500kbps (CBR)
Audio Encoder	
Audio CODECS	: MPEG-1 Layer 2
	: AAC-LC
	: HE-AAC v1
	: HE-AAC v2
	: Dolby® Digital
	: Dolby® Digital Plus
	: Pass though of all audio types
Audio Channel Modes	: Stereo, Mono, 5.1 and 7.1
AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
Audio Lipsync Adjustment	: +500ms /-200ms
Audio Level Adjustment	: +6/-1 0 d B
Audio Transcode Density	: Maximum 6 stereo transcodes per video, limited to 8 transcode 5.1 per module. One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes.
Automatic Audio Levelling	
Key specification	: EBU TECH 3344(Service Loudness – EBU R128)
Number of stereo	: 24
Target Level	: -1 8 LU FS to -31 LU FS (rec. -23 LU FS)
Initial Adjustment	: -20 dB to 20 dB
Max. Adjustment step (per day)	: 0.5 dB

Picture-in-Picture

Codec	: MPEG-4 AVC MP
Bitrate	: Min 96kbps, Max 400kbps (CBR)
Resolutions	: 192x192, 176x144, 128x96, 96x96
GOP Size	: Configurable independent of main channel

Video Re-scaling

Down Conversion HD to SD	: Including aspect ratio conversion, letter-/pillar boxing
Up Conversion SD to HD	: Including aspect ratio conversion, letter-/pillar-boxing and de-interlacing.
Frame Rate Conversion	: From 60 fps to 60/30 fps
	: From 59.94 fps to 59.94/29.97 fps
	: From 50 fps to 50/25 fps
	: From 30 fps to 60/30 fps
	: From 29.97 fps to 59.94/29.97
	: From 25 fps to 50/25 fps
	: Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output.

Logo Insertion
Maximum Size : 192 x128 (S D)
: 360x180 (HD 720P)
: 480x270 (HD 1080i)
Positioning : User selectable (pixel accuracy)
File format : PNG (8-bit ARGB) file per encoded channel

Subtitling
Subtitling conversion : Conversion from EBU Subtitling to DVB Subtitling
DVB/EBU Subtitling burn in : Yes, burned into Transcoded Video

Auxillary Data
Pass Through : All auxillary data components (EBU Subtitling, DVB Sub titling, Teletext etc.). Lipsync to video is maintained.
Generation : EBU Subtitling, DVB Subtitling, Teletext subtitling PIDs
from a generator can be added in the mux output

Video Processing
WSS Blanking : Line 23

Statistical Multiplexing
Statmux Controller : Local within chassis. (Management module.)
Maximum # Groups : Max 16, one group per encoder/transcoder module.
Maximum # Services within group : 32

Licensed Features
: Number of Encoder Channels HD
: Number of Encoder Channels SD
: Statistical Multiplexing - Number of Channels
: MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs
: Dolby® Digital/Dolby® Digital Plus Decode - Number of Stereo Pairs
: Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs
: Dolby® E Decode - Number of channels
: Subtitle transcoding from TTX to DVB
: OSDM
: Automatic Audio Levelling
: 4:2:2 10bit decoding

Universal Transcoder - Dense Broadcast Mode

TC-400

Density
Total Number of Video Transcodes : Up to 4x HD or 16x SD channels per module

Video transcoder consists of four blocks each capable of
: 1x HD transcode with PiP OR
: 4x SD transcode without PiP OR
: 3x SD transcode with PiP OR
: 1x HD/SD transcode with PiP and up/downconv.

Each block can be configured independently.

Video Decoder
MPEG-2 profiles : MP@HL (HD)
: MP@ML (SD)
MPEG -4 AVC profiles : MP@ L4.2, HP@ L4.2 (H D)
: MP@L3.0, HP@ L3.1 (SD)
SD resolutions : 720/704/640/544/528/480/352 x 576i25
: 720/704/640/544/528/480/352 x 480i29.97 fps
HD 1080i resolutions : 1920/1440/1280/960 x 1080i30/29.97/25 fps
HD 720p resolutions : 1280/960/640 x 720p60/59.94/50 fps

Audio Decoder
Audio Codecs : MPEG1 Layer 2 (2.0)
: AAC-LC (2.0)
: HE-AACv1 (2.0)
: HE-AACv2 (2.0)
: Dolby® Digital (2.0/5.1)/Dolby® Digital Plus (2.0/5.1/7.1)

Audio Downmix	: Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of transcode process.
Video Encoder	
MPEG-2 profiles	: MP@HL (HD) : MP@ML (SD)
M P EG -4 AVC profiles	: MP@L4.1 , HP@L4.1 (H D) : MP@L3.1, HP@L3.1 (SD)
Rate Control Modes	: Constant Bit Rate (CBR) : Capped VBR (CVBR) with QP target : Statistical Multiplexing (in future release)
GOP structure	: Dynamic with Scene Change Detection and Adaptive GOP structure
Aspect Ratio Control	: Manual, Transparent input to output
PCR PID End-to- end Encoder Delay	: PCR on Video PID or as separate PID : Typically 5000ms (3500ms reduced delay mode)
Audio Encoder	
Audio CODECS	: MPEG-1 Layer 2 : AAC-LC : HE-AAC v1 : HE-AAC v2 : Dolby® Digital (TC-400) : Dolby® Digital Plus (TC-400)
Audio Channel Modes	: Pass though of all audio types : Stereo, Mono
AAC Data Encapsulation	: 5.1 and 7.1 (TC-400)
Audio Lipsync Adjustment	: ADTS or LATM selectable per encoded channel
Audio Level Adjustment	: +500ms /-200ms
Audio Transcode Density to 24 stereo transcodes per module.	: +6/-1 0 d B : **TC-400 -** Max 6 stereo transcodes per video, limited
Number of audio per channel	: **TC-200 -** Maximum 4 stereo transcodes per video, limited to 6 stereo transcodes per pair of video ranscoder blocks. : One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes : Max 6
Automatic Audio Levelling	
Key specification	: EBU TECH 3344 (Service Loudness – EBU R128)
Number of stereo	: 24
Target Level	: -1 8 LU FS to -31 LU FS (rec . -23 LU FS)
Initial Adjustment	: -20 dB to 20 dB
Max. Adjustment step (per day)	: 0.5 dB
Picture-in-Picture	
Codec	: MPEG-4 AVC MP
Bitrate	: Min 96kbps, Max 400kbps (CBR)
Resolutions	: 320x240,192x192, 176x144, 128x96, 96x96
Video Re-scaling	
Down Conversion HD to SD	: Including aspect ratio conversion, letter-/pillar boxing
Up Conversion SD to HD	: Including aspect ratio conversion, letter-/pillar-boxing and de-interlacing.
Frame Rate Conversion	: From 60 fps to 60/30 fps : From 59.9 4 fps to 59.94/29.97 fps : From 50 fps to 50/25 fps : From 30 fps to 60/30 fps : From 29.97 fps to 59.94/29.97 fps : From 25 fps to 50/25 fps : Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output
Logo Insertion	
Maximum Size	: 192 x128 (S D) : 360x180 (HD 720P) : 480x270 (HD 1080i)

7) For complete table please contact Appear.

	Positioning	: User selectable (pixel accuracy)
	File format	: PNG (8- bit ARGB) file per encoded channel
	Subtitling	
	Subtitling conversion	: Conversion from EBU Subtitling to DVB Subtitling
	DVB/EBU Subtitling burn in	: Burned into Transcoded Video. Restricted to 4 channels per module
	Auxillary Data	
	Auxillary data components (EBU Subtitling, DVB Subtitling, Teletext etc.) that are passed through Lipsync to video are maintained.	
	Video Processing	
	WSS (line 23) blanking	: Yes
	Statistical Multiplexing (Not supported in initial release)	: Local within chassis.
	Statmux Controller	: Maximum 16, one per encoder/transcoder module.
	Maximum # Groups	: 32
	Maximum # Services within group	
	Licensed Features	: Video Transcode capacity in steps of blocks capable of 1xHD/4xSD
		: High Density Mode (dense-sd for 4xSD per block)
		: Statistical Multiplexing - Number of Channels
		: MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs
		: Dolby® Digital/Dolby® Digital Plus Decode - Number of Stereo Pairs
		: Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs
		: Subtitle transcoding from TTX to DVB
		: OSDM
		: Automatic Audio Levelling
	Mediaroom:	: Approved
Universal Transcoder - MS/OTT		
TC-400	Number of input channels	: Up to 4 HD channels
	Video Decoder	: Ranging from MP@ML (SD) to MP@HL (HD)
	MPEG -2 profiles	: up to HP@L4.2
	MPEG -4 AVC profiles	: up to MP@L4.2
		: up to BP@ L4 .1
	Audio Decoder	
	Input format	: MPEG-1 Layer 2. Modes: 1.0 (mono), 2.0 (stereo)
		: AAC-LC. Modes: 2.0, 5.1 (downmixed to 2.0)
		: HE-AAC v1/2. Modes: 2.0, 5.1 (downmixed to 2.0)
		: Dolby ® Digital (AC-3)
		: Modes : 2.0, 5 .1 (downmixed to 2.0)
		: Dolby® Digital Plus (E-AC-3)
		: Modes: 2.0, 5.1, 7.1 (downmixed to 2.0)
	Pass-through	: MPEG1 Layer II
		: AAC-LC
		: HE-AACv1/2
		: Dolby ® Digital (AC-3)
		: Dolby ® Digital Plus (E -AC-3)
	Video Encode	
	MPEG-4 AVC Profiles	: up to HP@4 .0
		: up to MP@4 . 0
		: up to BP@4 .0
	Resolutions @ 59.94 fps or 50.00 fps8)	: 720p › 1280, 960, 854
	Resolutions @ 29.97 fps or 25.00 fps8)	: 1080p › 1920, 1440, 1280, 960, 720, 640
		: 720p › 1280, 960, 854
		: 640p › 960
		: 576p › 1024, 768, 720, 3529)
		: 540p › 960
		: 480p › 854, 720, 640, 352

8) For complete table please contact Appear.
9) 352 only available for 25 fps

Resolutions @ 14.99 fps or 12.50 fps8)	: 432p › 768 : 360p › 640, 480 : 320p › 480 : 288p › 512 : 270p › 480, 360 : 256p › 144 : 240p › 320 : 216p › 384 : 180p › 320 , 240 : 640p › 960 : 576 p › 1 024, 768, 720, 352 : 480p › 854, 720, 640, 352 : 432p › 768 : 360p › 640, 480 : 320p › 480 : 288p › 512 : 270p › 480, 360 : 256p › 144 : 240p › 320 : 216p › 384 : 180p › 320, 240
Frame rate conversion	: From 60/59.94/50 reduced to ½, ¼ : From 50 reduced to ½ or ¼ : From 30/29.97/50 reduced to ½
Number of profiles	: Ranging from 4 × HD to 28 × sub SD per module, de pending on complexity of profiles
Key Frame Alignment	: Frame accurate key frame alignment across all pro-files.
GOP control	Fixed IDR to IDR distance. : Dynamic GOP structure with Scene Change Detection
Picture-in-Picture	
Bitrate	: Min 96kbps, Max 500kbps (CBR)
Audio Encode	
Capacity	: Up to 8 per module
Output format	: AAC-LC. Modes: 2.0, Bitrates: 32–384 kbps : HE-AAC v1. Modes: 2.0, Bit rates: 32–192kbps : HE-AAC v2. Modes: 2.0, Bit rates: 32–96kbps
Sample rates	: 32, 48kHz
Reformatting/Rescaling	
De-interlacing	: Interlaced to progressive conversion
Format conversion	: From HD to sub SD
Aspect Ratio Control	
Aspect Ratio Modes	: Transparent Input to Output, Manual 4:3 or 16:9
AFD Modes	: Generated based on incoming AFD and format conversion
VBI	
Digital Programme Insertion (DPI)	: SCTE35 passthrough : I-frame insertion based on SCTE35 marker
Pass-through	: Components such as EBU Teletext and DVB Subtitling can be passed through. Synchronization to video will be maintained.
Closed Captioning	: EIA-608n and EIA-708 passed through.
Subtitling	
DVB Subtitling burn in	: Yes, burned into Transcoded Video
Licensed Features	: Dolby® Digital/Dolby® Digital Plus Decode

PROCESSING MODULES SPECIFICATIONS

Bulk Descrambling **BD-100**	Interface	: SW based smart card
	CA system support	: Please contact Appear*
	BISS support	: Mode 1, Mode E
	Maximum data rate	: Up to 850 MBit/s
	Number of services per module	: 250
	Scrambling algorithms	: DVB-CSA and AES
	Licensed Features	: Number of descrambled channels : BISS, Verimatrix, Latens
SIM Bulk Descrambling **BD-200**	Interface	: SIM based smart card
	Number of SIM card readers	: 8 in front and 8 behind front plate (Only 8 in front can be replaced while in operation)
	CA system support	: Conax, Cryptoguard
	BISS support	: Mode 1, Mode E
	Maximum data rate	: Up to 850 MBit/s
	Number of services per module	: 250
	Scrambling algorithms	: DVB-CSA and AES
	Licensed Features	: Number of descrambled channels : Conax
DVB Descrambling **DS-101**	Interface	: DVB Common Interface
	CA system support*	: BetaCrypt, Conax, Cryptoworks, Irdeto, Mediaguard, Viaccess, NDS Viasat, Nagra
	Number of services per CAM	: 10 (requires multi service CAM)
DVB Descrambling gen. 2 **DS-110**	Interface	: DVB Common Interface
	CA system support*	: BetaCrypt, Conax, Cryptoworks, Irdeto, Mediaguard, Viaccess, NDS Viasat, Nagra, Panaccess
	Maximum data rate per CAM	: 100 Mbps
Pro Descrambler **DS-120**	Interface	: DVB Common Interface
	CA system support**	: Sky UK - NDS ProCAM
	Maximum data rate per CAM	: 100Mbps
Scrambling **CA-100**	Scrambling algorithm	: DVB-CSA and AES
	Maximum data rate	: Up to 850 MBit/s
	Fixed Key Scrambling	: BISS, BISS-E, BISS2, BISS2-E
	Number of services per scrambler card	: 250 (depending on SW license)
	Video format	: Transport stream; MPEG-2, MPEG-4, HEVC
	Interface towards CA System	: Simulcrypt interface
	Number of CA systems	: 4 CA systems simultaneously
	EMM	: Yes
	Entropy reduction	: Yes for DVB No for AES
	Licensed Features	: Number of descrambled channels : PVR assist
EPG **EP-200**	Ingest	: EIT table from any port, XMLTV
	Output	: Re-generated EIT table
Audio Processor **AP-100**	**Density**	
	Number of stereo channels	: 32 : 5.1 uses 3x stereo pairs and 7.1 uses 4x stereo pairs : Maximum of 20 MP3 audio encoded stereo channels
Audio Encoder Inputs		
	Number of SDI/HSDI inputs	: 4

* Appear aims to integrate with all major CA providers. Please contact Appear for an updated list of integrated CA systems.
** Sky must authorize the usage of this module for descrambling with their NDS ProCAMs

Number of stereo audio per SDI Input	: 8
Embedded Audio	: SMPTE 272M (SD), SMPTE 299M (HD)
	: Sample rate 48kHz, synchronous
Number of AES67 inputs	: 1 - 32
Audio Transcoder Inputs	
Number of MPEG TS inputs	: 1 - 32

Audio Decoding (Transcoding Mode)

Audio Codecs	: MPEG-1 Layer 2 (2.0)
	: AAC-LC (2.0, 5.1)
	: HE-AACv1 (2.0, 5.1)
	: HE-AACv2 (2.0)
	: Dolby® Digital (2.0, 5.1)
	: Dolby® Digital Plus (2.0, 5.1, 7.1)
Audio Downmix	: Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of transcode process if output is set to 2.0.

Audio Encoding (All Modes)

Audio Codecs

	Bitrate minimum/maximum (at 48 kHz)			
Mono (kbps) Stereo (kbps)	5.1	7.1		
MPEG-1 Layer 2	32 / 192	64 / 384	N/A	N/A
MPEG-1 Layer 3 (MP3) 32 / 320	32 / 320		N/A	N/A
AAC-LC	32 / 192	64 / 384	192/640	N/A
HE-AAC v1	32 / 96	48 / 192	112/512	N/A
HE-AAC v2	N/A	32 / 96	N/A	N/A
Dolby® Digital	56/640	96/640	224/640	N/A
Dolby® Digital Plus	32/1024	96/1024	192/1024	384/1024

Audio Channel Modes	: Stereo and Mono
	: 5.1 and 7.1
Sample Rates	: 48 kHz input
	: 48 kHz output, 16 kHz output (MP3 only)
Audio Level Adjustments	: +6 / -10 dB
Audio Lipsync Adjustment	: +500ms /-200ms(
PCR	: Common PCR (On separate PID)
	: Embedded in audio PID

Automatic Audio Levelling

Key specification	: EBU TECH 3344 (Service Loudness – EBU R128)
Number of stereo	: 24
Target Level	: -1 8 LU FS to -31 LU FS (re c . -23 LU FS)
Initial Adjustment	: -20 dB to 20 dB
Max. Adjustment step (per day)	: 0.5 dB

Audio Encoder TS processing

PSI/SI	: PMT generation signaled as radio service
	: SDT Generation

Licensed Features

: Audio Encoder
: Audio Transcoder
: MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs
: Number of Dolby® Digital Plus Decode stereo pairs
: Number of Dolby® Digital Plus Encoder stereo pairs
: Dolby® E Decode - Number of channels
: MPEG - 1 Layer 3 (MP3) Encode - Number of Stereo Pairs
: AES67 Input

COMMON OUTPUT SPECIFICATIONS

All Output Modules	Key reference specification	: ETSI TR 101 211 V1.9.1, ISO IEC 13818-1
	Multiplexing	
	Video format	: Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC
	PCR regeneration	: Yes
	PSI/SI	
	Function	: PSI/SI regeneration based on input and operations performed on the signal
	Pass-through of scrambled services	
	PSI/SI handling	: Yes, on TS level. For SPTS output only
	Tables Supported:	: Automatically regenerated
	PSI	: PAT, PMT, CAT
	SI	: SDT, NIT, EITpf ,TOT, TDT, BAT, AIT
	PSIP	
	Function	: PSIP input analysis
	Tables Supported:	
	PSI	: PAT, PMT, CAT
	PSIP	: MGT, TVCT,CVCT

OUTPUT MODULE SPECIFICATIONS

Dual IP IO **IP-200/IP-300**	**IP Input/Output**	
	Interface	: 2×10/100/1000 Base-T Ethernet and SFP
	Operational mode	: The module can be configured to; - 1 input and 1 output - Seamless (Hitless) IP in - Cloned IP out - Dual IP in - Dual IP out
	Maximum data rate per port	: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1×IPIN+1×IPOUT : Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode
	Maximum number of services per port	: 250
	Data format	: UDP/RTP Multicast/Unicast
	Transport stream	: SPTS and MPTS
	Service filtering	: Yes
	Video format	: Transport stream, MPEG-2/4 (H264) and HEVC
	IP Input	
	IP de-jittering	: Yes, based on PCR or CBR
	Forward Error Correction	: SMPTE 2022-1 250 input streams per data port
	IP Output	
	Forward Error Correction	: SMPTE 2022-1 250 output streams per data port
	Licensed Features	: Seamless IP In, Cloned IP Out : Multiplexing : FEC in, FEC out, FEC in/out : IP Out Redundancy
ASI Output **AO-110**	Key reference specification	: EN50083-9
	Connectors	: 4 BNC female, 75Ω
	Number of outputs per module	: 4 different Transport Streams
	Maximum bit-rate per port	: burst mode: 213.7Mbit/s spread mode: 72Mbit/s
	Transport stream output	: SPTS and MPTS
	Number of services per card	: 250 (sum of all 4 ports)
	Output format	: Constant bit-rate

QAM Output
CM-201, CM301
CM-210, CM310

Key reference specifications	: EN 300 429, ITU J.83.ABC
Interface	: 2 x F connector female, 75Ω
Number of Carriers	: 3 & 4 per group (adjacent channels)
Number of QAM frequencies per module	: Up to 16 channels in 4 groups, 8 per port
Modulation	: 16 / 32 / 64 / 128 / 256 - QAM
Symbol rate	: 4.48 to 7.00 Mbaud (Annex A & C)
Frequency range	: 47 - 862 Mhz (CM-201, CM-301)
	: 47 - 1000 Mhz (CM-210, CM-310)
Spectrum Inversion	: User selectable
Test Mode	: CW
Channel spacing	: 5, 6, 7, 8 MHZ (12Mhz available for 3 carrier groups)
Frequency step size	: 1 Hz
Frequency stability	: 2 ppm
Output level	: -12 to +2.2 dBm per carrier
Output level stability	: ±0.5 dB
Output level adjustment step size (GUI)	: 0.1 dB
MER	: > 42 dB
Return loss	: typ > 16 dB
Spurious	: typ < -60dBc

DVB-S/S2X Modulator
SM-300

Key reference specification	: EN 300 421, EN 302 307 part 1 and 2
Number of DVB-S/S2X carriers per module	: 2
Spectrum inversion	: User selectable
Precorrection	: Static linear pre-correction
Carrier ID	: DVB,NIT
DC output	: 24 Volt
Maximum DC output current	: 500 mA
10MHz reference output	: 0 dBm ± 2dB

DVB-S Coding and Modualtion

Constellation	: QPSK
Modulation mode	: Constant
FEC outer	: Reed-Solomon
FEC inner	: Viterbi
Code rates	: 1/2, 2/3, 3/4, 5/6, 7/8
Symbol rate	: 0.1–68 MSym/s
Roll off DVB-S	: 0.35

DVB-S2X Coding and Modualtion

Constellation	: QPSK, 8PSK, 16APSK, 32APSK
Modulation mode	: CCM
FEC	: BCH/LDPC
Code rates DVB-S2X QPSK	: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
Code rates DVB-S2X 8PSK	: 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 5/6, 8/9, 9/10
Code rates DVB-S2X 8APSK	: 5/9, 26/45
Code rates DVB-S2X 16APSK	: 5/9, 8/15, 1/2, 26/45, 3/5, 28/45, 23/36, 2/3, 25/36, 13/18, 3/4, 7/9, 4/5, 5/6, 77/90, 8/9, 9/10
Code rates DVB-S2X 32APSK	: 2/3, 32/45, 11/15, 3/4, 7/9, 4/5, 5/6, 8/9, 9/10
Code rates DVB-S2X 64APSK	: 5/6, 4/5, 7/9, 11/15, 32/45-L
Code rates DVB-S2X 128APSK	: 3/4, 7/9
Code rates DVB-S2X 256APSK	: 3/4, 2/3-L, 11/15-L, 29/45-L, 31/45-L, 32/45
Frame length	: Normal, Short
Gold scrambling sequence	: 0-6
Symbol rate	: 0.1–68 MSym/s
Roll off	: 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35
Gold scrambling sequence	: 0—6

IF

Frequency range	: 70-200 MHz
Main output connector	: F-type female, 75 Ω
Monitoring output connector	: SMA female, 50 Ω
Output level	: -15 to 0 dBm
Output level stability	: ± 0.5 dB
Output level accuracy	: ± 0.5 dB

Frequency stability	: 2 ppm
Return loss	: >18 dB
Spurious modulated signal	: < -65 dBc/4kHz (@ symbol rate ≥ 256 kbaud)
Spurious carrier wave In-band flatness	: < -60 dBc/4kHz (typical) : typ < ± 0.1 dB
Monitoring ports level	: -40 dBm
Monitoring ports return loss	: >20dB

L-band

Frequency range	: 950-2150 MHz
Main output connector	: SMA female, 50 Ω
Monitoring output connector	: F-type female, 75 Ω
Output level	: -40 to 7 dBm
Output level stability	: ± 0.5 dB
Frequency accuracy	: 2 ppm
Return loss	: >14 dB
Spurious modulated signal	: < -65 dBc/4kHz (@ symbol rate ≥ 256 kbaud)
Spurious carrier wave In-band flatness	: < -60 dBc/4kHz : typ < ± 0.2 dB
Monitoring ports level	: -40 dBm
Monitoring ports return loss	: >10dB

Licensed Features

: Number of carriers
: DVB-S2 modulation
: VB-S2X modulation Broadcast
: DVB-S2X modulation professional
: 10MHz and 24V DC output

ISDBT - Modulator

CM-500

Key reference specification	: ARIB STD-B31, ARIB STD-B10
Interface	: 2 × F connector female, 75 Ω
Number of ISDBT carriers per module	: 8, 2 per group (adjacent channels)
Carrier spacing	: 6-31 MHz
Frequency range	: 47–862 MHz
Spectrum inversion	: User selectable
Test mode	: CW
Frequency step size	: 1 Hz
Frequency stability	: 2 ppm
Output level	: -10 to +2.2dBm per carrier
Output level stability	: ± 0.5 dB
Output level adjustment step size (GUI)	: 0.1 dB
MER	: > 42 dB
Return loss	: >16 dB
Spurious	: typ < -60 dBc

ISDB-T Coding and Modulation*

Modulation	: QPSK, 16QAM, 64 QA
Transmission mode	M : Mode 3 (8K FFT)
Time interleaving	: 0
Hierarchical transmission	: no
Guard interval	: 1/4, 1/8, 1/16, 1/32
Code rate	: 1/2, 2/3, 3/4, 5/6, 7/8
Bandwidth	: 6, 7, 8 MHz

Multiplexing

Video format	: Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC
PCR regeneration	: Yes

PSI/SI

Function	: PSI/SI regeneration based on input and operations performed on the signal. ARIB and ABNT compliant PSI/SI generation
PSI/SI handling	: Automatically regenerated

	Tables Supported	
	PSI	: PAT, PMT, CAT
	SI	: SDT, NIT, EITpf ,TOT, TDT, BAT, AIT
	Pass-through of scrambled services	: Yes, on TS level. For SPTS output only
	PSIP	
	Function	: PSIP input analysis
	Tables Supported:	
	PSI	: PAT, PMT, CAT
	PSIP	: MGT, TVCT,CVCT
	Licensed Features	Number of carriers
DVB-T2 Gateway IP **IP-201**	Connectors	: 2 × 10/100/1000 Base-T Ethernet output or 2× Optical SFP (class 1 laser product)
	Number of MPTS's with MIP	: 4
	Number of T2MI streams	: 4
	Maximum data rate	: Up to 850 MBit/s
	Output mode	: CBR
	Data format	: UDP/RTP Multicast/Unicast
	Support for cloned output	: Yes
	Forward Error Correction	: SMPTE 2022-1 (Licensed)
	Re-multiplexing	: See common output module specifications
	DVB-T MIP inserter	
	Key specification	: ETSI EN 300 744, ETSI TS 101 191
	Relative timestamps	: <1s
	DVB-T2 T2MI	
	Key reference specifications	: EN50083-9, ETSI EN 302 755, ETSI TS 102 773
	T2 version	: 1.1.1, 1.2.1 and 1.3.1
	System redundancy	: 1+1 protection on unit with T2MI frame (licensed) Output redundancy based on OSPF (licensed) Network level redundancy (licensed)
	Regionalization	: Yes. Please contact Appear TV for more information
	T2MI signaling	: T2MI is signaled in PSI/SI as a data service
	Clock modes	: Relative Timestamps <1s (SFN) and Null timestamps (MFN)
	PAPR	: TR and ACE (global on/off)
	MISO/SISO	: Yes
	Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
	FFT sizes	: 1k, 2k, 4k, 8k, 8k extended, 16k,16k extended, 32k, 32k extended
	Pilot Patterns	: P1 – P8
	L1 Constellations	: QPSK, 16-QAM, 64-QAM, BPSK
	Bandwidth	: 1.7, 5, 6, 7, 8, 10MHz
	DVB-T2 PLP support	: 240 in total between all T2MI streams
	Number of PLPs	: HEM, constant bit-rate
	PLP mode	: 1 and 2
	PLP types	: Within a T2 frame and across multiple T2 frames
	TI types	: FEC blocks, TI blocks, TI frames and TI type
	Automatic calculation	: Normal (64k), Short (16k)
	FEC frame	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
	FEC code rate	: QPSK, 16-QAM, 64-QAM, 256-QAM
	Constellations	: Yes
	Rotated constellations	: Yes
	ISSY supported	
	Licensed Features	: IP Out Redundancy, T2MI sync+IP Redundancy : T2MI : Multi PLP, Regional PLP : FEC out

SRT

IP-202

SRT Input/Output	
Interface	: 2×10/100/1000 Base-T Ethernet and SFP
Operational mode	: 1 data port input and 1 data port output
Maximum data rate in total	: Up to 35 Mbit/s
Maximum number of services per port	: Limited by total throughput
Transmission modes	: Caller, Listener and Rendezvous
Encryption	: AES 128, AES 192, AES 256
Data format	: SRT
SRT Input	
IP de-jittering	: Yes, based on PCR or CBR (after SRT de-encapsulation)
Receive latency	: Configurable retransmission buffer size, 0 – 8000 ms
SRT Output	
MPEG-TS output	: SPTS
Licensed features	: SRT Input, SRT Output

DECODER SPECIFICATIONS

MPEG - 2/4 Decoder with SDI/HDSDI out
DE-401

Number of decoded channels	: 2 per module
Connector	: 2 SDI/HDSDI 75Ω BNC per channel
Output format	: SMPTE 292 (HD-SDI), 259M (SD-SDI)
Embedded audio	: SMPTE 272M (SD), 299M (HD)
Video Decoding	
MPEG-2 profiles	: MP@HL (HD) MP@ML (SD)
MPEG-4 AVC profiles	: MP@L4, HP@L4 (HD) MP@L3, HP@L3 (SD)
Aspect Ratio Conversion	: Off, Letterbox, Panscan
Frame Synchronization (Genlock)	: Accepts PAL and NTSC black burst, 720p50/59.94/60 and 1080i50/59.94/60 tri-level reference signals. (HW option). If SDI reference signal support is needed, contact your sales representative.
Audio Decoding	
Number of stereo pairs per video	: 2
Codecs	: MPEG-1 Layer 1 and 2 (Musicam) : MPEG-2 Layer 2, MPEG4 AAC-LC : MPEG4 AACplus (HE-AAC, AAC+SBR) v1 and v2 : Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF) (HW option) : Conversion from Dolby® Digital Plus to Dolby® Digital at a fixed bitrate of 640 Kbit/s (HW option) : Dolby® Digital pass-through (Limited to 1 per service)
VBI/VANC/DVB sub Processing	
DVB subtitling according to	: EN 300 743 v1.3.1
Wide Screen Signaling (WSS)	
Input	: EN 301 775 v1.2.1
Output	: EN 300 294/ SMPTE 2031 (Composite decoder ITU-RBT .653-3 system B only)
World standard teletext (WST/EBU)	
Input	: EN 301 775 v1.2.1
Output	: ITU-R BT .653-3 (System B only), SMPTE 2031
Video Programming System (VPS)	
Input	: EN 301 775 v1.2.1
Output	: EN 300 231, SMPTE 2031
Teletext Subtitling (OSD)	: Supported, OP-47
VITS (Vertical Interval Test Signal)	: ITU-T J.63. Sin(x)/x on line 281 (525 lines) or 335 (625 lines)
Digital Program Insertion (DPI)	
Input	: SCTE 35
Output	: SCTE 104
Active Format Description (AFD)	
Input	: ETSI TS 101 154
Output	: SMPTE 2016-3-2009
Licensed Features	: HD : Genlock : OSDM
Linearity	: Dolby® Digital/Dolby® Digital Plus Decode
'THD+N	: ±0.5dB (20-20kHz) : typ 70dB (at 9dBu)
Licensed Features	: HD : Radio Mode : Genlock : OSDM : Dolby® Digital/Dolby® Digital Plus Decode

CHASSIS

XC5000	Physical dimensions	: 19" × 4RU × 400mm (440 × 177 × 400 mm)
	Power supply	
	Power	: 800 Watt
	Input voltage	: 100-240 V AC, 50/60 Hz : optional: -48V DC
	Redundancy	: Yes, dual hot swappable PS
	Monitoring	: Via WEB GUI and LED indicators on P S
	Cooling	
	Fans	: 4 fans
	Hot swap of fans	: Yes, fans are independently hot swappable
	Airflow direction	: Front to back
XC5100	Physical dimensions	: 19" × 1RU × 480mm (440 × 44 × 480 mm)
	Power supply	
	Power	: 400 Watt
	Input voltage	: 100-240 V AC, 50/60 Hz : optional: -48V DC
	Redundancy	: Yes, dual hot swappable PS
	Monitoring	: Via WEB GUI and LED indicators on P S
	Cooling	
	Fans	: 6 fans
	Hot swap of fans	: Yes, common fan module with all 6 fan s
	Airflow direction	: Front to back

ENVIRONMENTAL CONDITIONS

Operational conditions	Temperature	: 0 to +40 °C
	Humidity	: 5–95% (non-condensing)
Storage	Temperature	: -20 to +70 °C
	Humidity	: 0 to 90% (non-condensing)
Electrical safety	IEC62368-1	
EMC	EN 55032, EN55013, EN50083-2, EN 55024, EN61000-3-2, EN61000-3-3, FCC CFR 47 Part 15	
RoHS	Compliant	
WEEE	Compliant	

This product must not be disposed of with other household waste. According to the WEEE-directive, everyone that sells electrical and electronic 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

HI-DENSITY

MODULAR

HOT - SWAP

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