Datasheet

XC 5000
XC 5100

appear.net

Version 4.5

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.»

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

CHASSIS

Appear offers two different chassis: the 4RU XC5000 chassis which can hold 16 modules and the 1RU XC5100 chassis which can hold 6 modules. In addition, each of the chassis houses a switch and management module that can be equipped with dual IP I/Os. Both chassis variants have dual-redundant and hot swappable power supplies. Each unit with its hot swappable modules allows for various redundancy scenarios.

Any of the modules listed under the Input, Encoding/Transcoding, Processing, Output and Decoder sections can be combined into the same chassis. Only chassis space or total throughput will limit the number of modules that can be fitted. The chassis has been designed for a throughput of 850 Mbit/s of MPEG TS data and 250 services. In selected configurations, capacity can be increased to 1700 Mbit/s and 500 services (please contact Appear for more information).

The 4RU chassis has four independent fan modules that operate and are monitored independently. The four fan modules are identical and support hot-swap. The 1RU chassis has one preassembled fan module consisting of 6 fans. The fan module is hot-swappable as one complete module. The internal temperature is monitored and if a fan fails, the remaining fans will compensate by increasing the speed.

FEATURES

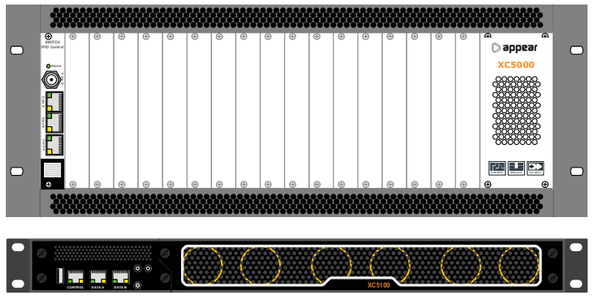
4RU - XC5000
- Modular configuration with up to 16+2 board positions
- WEB based configuration, SNMP Alarms, SOAP/XML interface
- Forced air-cooling (front to back)
- Dual redundant hot-swappable power supply
- Remote reset of power
- 4 individually monitored hot-swappable fans
- Hot-swappable modules
- 100-240V AC or -48V DC power

1RU - XC5100
- Modular configuration with up to 6+1 board positions
- WEB based configuration, SNMP Alarms, SOAP/XML interface
- Forced air-cooling (front to back)
- Dual redundant hot-swappable power supply
- Remote reset of power
- Swappable fan module
- Hot-swappable modules
- 100-240V AC or -48V DC power

DIMENSIONS

4RU (XC5000)
440 ×177 ×400 (w × h × d mm)

1RU (XC5100)
440 ×44 ×480 (w × h × d mm)



The XC5000 and XC5100 use the same set of modules and same SW, but the front plates are different.

The modules can therefore not be interchanged between XC5000 and XC5100.

Module plate for XC5000

Module plate for XC5100

«Hardware-managed redundancy for unbeatable speed and long-term reliability»

SWITCH MODULES

The switch module is used to enable MPEG traffic distribution within the chassis and provides the Man Machine Interface (MMI), enabling configuration and management of the chassis.

The XC5000 chassis has dedicated positions for the switch module in slot 0 with an optional (for selected configurations) redundant switch module in slot 17. The switch module can be equipped with two independent IP IO ports as an option. The XC5100 chassis provides an integrated switch module in the front with IP IO as standard. The switch module for XC5100 is functionally identical to the switch module used in the larger XC5000 chassis, but has a different hardware layout.

At least one switch module is required in all chassis. In addition to being the active part of the internal backplane, the switch module provides the central control and management interface. When equipped with two IP IO data ports, reception or streaming of MPEG compliant transport streams over UDP/RTP is supported by the module. Each port operates independently and can be configured as either IP in or IP out supporting full 850 Mbit/s TS data rate and up to 250 MPEG services. The switch module can be provided with either RJ45 connectors or SFP connectors on the two data ports. When equipped with two data ports, the module also includes a BNC port used for clock reference (Genlock). The switch module is hot-swappable for easy maintenance.

The Switch IP IO MMI module can also be ordered to include a GPS receiver for terrestrial SFN applications. For the XC5000, this is a separate module that must be placed in slot 1, while for XC5100, it is an add-on module for the switch module. One SMA connector for connecting either a GPS antenna or a 1 PPS reference is then available. It is also possible to order without the GPS radio module so that it just provides a high stability oscillator providing locking to a 1 PPS or 10MHz reference signal.

SWITCH MODULES FOR XC5000

Switch Module with Management

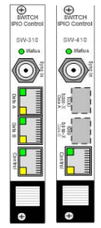
SW-200

- Gbit/s routing between modules in a chassis
- Enables WEB management
- 10/100/1000BaseT management port (RJ45)
- 1 slot wide

Switch Module with Management and IPIO

SW-301, SW-310 & SW-401, SW-410

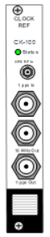
- Gbit/s routing between modules in a chassis
- 2 × Gbit RJ45 or SFP input or output port for data
- Frame Synchronization input (genlock)
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast
- Supports reception of MPTS and SPTS
- Supports streaming of MPTS and SPTS
- Supports seamless (hitless) input redundancy and cloned output
- Multiplexing on output with PSI/SI regeneration (license)
- Service filtering
- FEC encoding and decoding (license)
- Enables WEB management
- 10/100/1000 BaseT management port (RJ45)
- 1 slot wide



Clock Reference Module

CK-100

- GPS antenna input
- 1 pps input reference
- 10 MHz test output
- 1 pps test output
- 1 slot wide



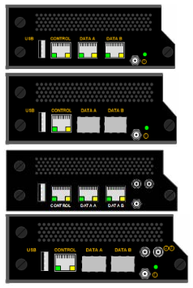
SWITCH MODULES FOR XC5100

Switch Module with Management

- Gbit/s routing between modules in a chassis
- Enables WEB management
- 10/100/1000BaseT management port (RJ45)

Switch Module with Management and Dual IPIO

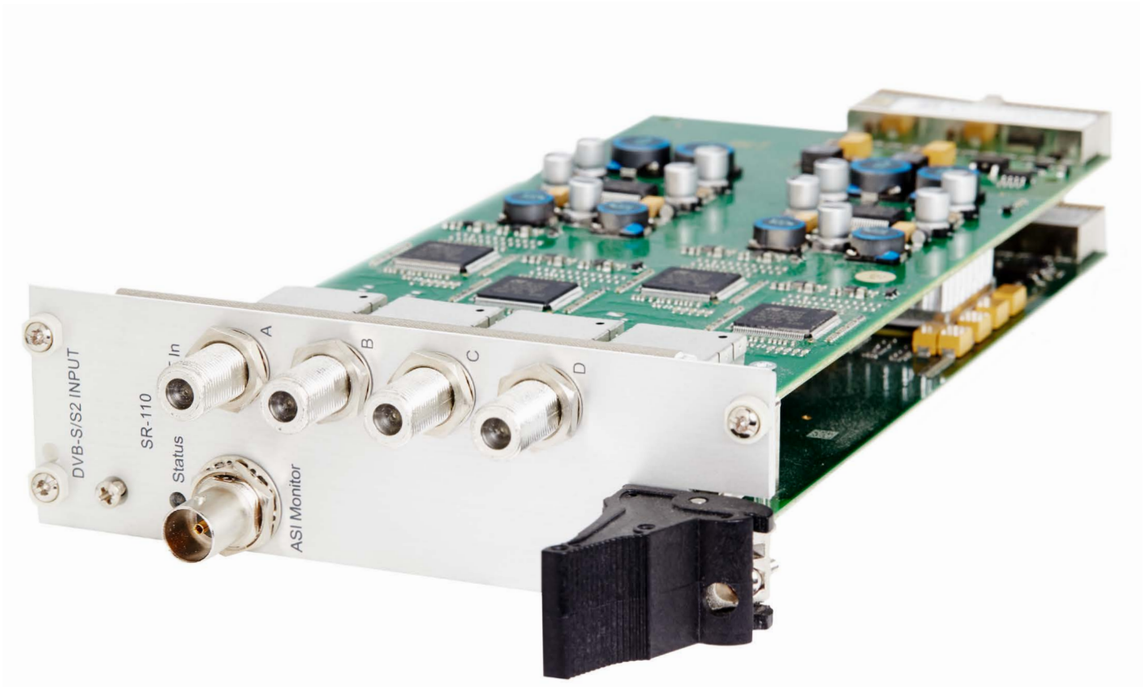
- Gbit/s routing between modules in a chassis
- 2 × Gbit RJ45 or SFP input or output port for data
- Frame Synchronization input (genlock)
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast
- Supports reception of MPTS and SPTS
- Supports streaming of MPTS and SPTS
- Supports seamless (hitless) input redundancy and cloned output
- Multiplexing on output with PSI/SI regeneration (license)
- Service filtering
- FEC encoding and decoding (license)
- Enables WEB management
- 10/100/1000 BaseT management port (RJ45)
- Optional GPS Receiver



MPEG INPUT MODULES

Appear has a wide range of input modules making it the most effective content aggregation solution on the market. An input module analyzes incoming transport streams and extracts selected MPEG services from the desired physical input interface (eg. ASI, IP, DVB-S/S2, DVB-S/S2X, DVB-C, DVB-T/T2, ISDB-T and 8VSB). Each input module type is based on embedded hardware design offering high density and reliability. The ability to mix input types freely within a chassis enables multiple MPEG transport streams originating from a variety of sources to be received and processed in parallel. Received signals can be demodulated, de-multiplexed and distributed to other modules inside the chassis via the backplane.

A wide range of input modules are available including IP, ASI, DVB-S/S2, DVB-S/S2X, DVB-C, DVB-T/T2, ISDB-T and 8VSB. The chassis supports any combination of input modules limited only by available slot space. Each input module is designed to receive up to 850Mbit/s of MPEG TS rate or 250 services. In re-multiplexing mode, all services are de-multiplexed by the input module before passed onto the backplane. Unused services are blocked by the input module to avoid propagating them further, which increases efficiency. The full content of an input port can be mapped transparently to an output port with the option to perform PID filtering or service filtering.



FEATURES

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

INPUT MODULES

Dual IP IO

IP-200

- 2 × Gbit RJ45 or SFP input port for data (or 1×in and 1×out)
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast
- Supports reception of MPTS and SPTS
- Supports seamless (hitless) input redundancy
- Service filtering
- Supports FEC (SMPTE 2022) (license)
- Input analysis
- 1 slot wide

ASI Input

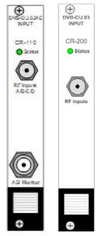
AI-110

- 4 × ASI inputs
- 4 × BNC connectors
- 213 Mbit/s Burst mode or 72 Mbit/s Spread mode per input
- Supports reception of MPTS and SPTS
- Service filtering
- Input analysis
- 1 slot wide

DVB-C Input

CR-110 / CR-200

- 4 × QAM (CR-110) or 16 x QAM (CR-200) receivers per module
- 1 F-type, 75 ohm female input port
  (all channels on one input cable)
- Standard EN 300 428, ITU-T J83 Annex A/C (CR-110)
- Standard EN 300 428, ITU-T J83 Annex A/B/C (CR-200)
- Frequency range 47 - 862 Mhz (CR-110)
- Frequency range 47 - 1000 MHz (CR-200)
- Service filtering
- Input analysis
- ASI monitoring port (CR-110 only)
- 1 slot wide



ISDB-T Input

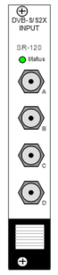
TR-401

- 4 x ISDB-T receivers per module
- 1 F-type, 75 ohm female input port
  (all 4 channels on one input cable)
- Frequency range 47-860 MHz
- Service filtering
- Input analysis
- 1 slot wide

DVB-S/S2X Input

SR-120

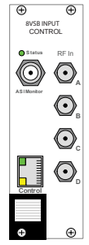
- 4 × DVB-S/S2/S2X inputs, 1 F connector per input
- Satellite standards:
  DVB-S EN 300 421
  DVB-S2 EN 302 307 – 1
  DVB-S2X EN 302 307 -2, Broadcast Services
- Frequency range 950 – 2150 MHz
- Constellation: QPSK, 8PSK, 16APSK, 32APSK
- Symbol rate:
  DVB-S/S2/S2X: 1-45 MSym/s for QPSK, 8PSK, 16APSK
  1-39.9 MSym/s for 32-APSK
- FEC: According to EN300421 & EN302307 part 1 & part 2 for Broadcast services
- Supports multistream reception
- Service filtering
- Input analysis
- 1 slots wide



8VSB Input

TR-300

- 4 × 8VSB Inputs
- 4 × F connectors
- Frequency range 50 - 860 MHz
- ASI monitoring port
- Service filtering
- 2 slots wide



DVB-T/T2 Input

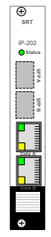
TR-210, TR-211

- 4 × DVB-T/T2 receivers per module.
- Input ports option:
  - 1 × F connector, signal is split and distributed internally
  - 4 × F connectors, one per demodulator
- Frequency range 47 - 862 MHz
- Carrier mode:
  - DVB-T: 2k, 8k
  - DVB-T2: 1k, 2k, 4k, 8k, 16k, 32k
- Modulation:
  - DVB-T: QPSK, 16QAM, 64QAM
  - DVB-T2: QPSK, 16QAM, 64QAM, 128QAM, 256QAM
- Service filtering on input
- Input analysis
- 1 slot wide

SRT

IP-202

- 2 × Gbit RJ45 or SFP ports for data (1×in and 1×out)
- Secure transmission over the Internet
  - Encryption algorithms: AES 128, AES 192, AES 256
- Reliable transmission over the Inter net
  - Retransmission mechanism on packet loss
  - Configurable latency buffer for retransmissions
- Two operational modes:
  - SRT input
  - SRT output
- Transmission modes: Caller, Listener and Rendezvous
- 35 Mbit/s throughput
  (Number of services limited by bandwidth)
- 1 slot wide



UNIVERSAL ENCODER & TRANSCODER

Linear Broadcast

In order to optimize the performance of their networks, it is essential for professional broadcasters to deploy the latest advances in compression technology. Whether the aim is to add new channels to existing multiplexes or provide genuine video quality improvements, operators should always strive to utilize the best in class technology to offer superior viewing experience whilst improving bandwidth efficiency.

Appear has developed an encoding/transcoding solution providing leading class performance for video quality and channel density on a specifically designed module targeting a wide range of applications. This allows users to maintain the best possible quality of service in combination with low power consumption and integrated multi-level redundancy.

The immense computational power of the platform runs all-new and highly evolved encoding algorithms, boosting performance to the limit for both AVC and MPEG2 video. The highly programmable and flexible audio encoder offers high density per channel and includes Dolby® codecs, making this one of the most powerful encoder platforms on the market.

A brand new architecture offers full flexibility for configuration, with adaptable application modes. The Universal Encoder and Universal Transcoder module can operate in either a High Video Quality mode, or alternatively in high density broadcast mode. Channel density is significantly increased with a small adjustment in performance whilst Multiscreen mode enables operators to increase content reach to multiple media devices in the fixed and mobile domain.

The new second generation statistical multiplexing provides ultra-fast refresh rate from a multi-pass look-ahead design minimizing inherent latency. Mixed encoder/ transcoder populations can be used within the platform supporting several single or mixed format SD/HD statistical multiplexing groups so that low-bitrate encoding can be applied to specific services within any given group.

All new Universal Encoder/Transcoder modules can be used in new or existing XC5000 or XC5100 Series platforms and can work in combination with any other modules from Appear's comprehensive range.

Multiscreen (OTT):

Increased internet access together with more powerful computers, integrated TVs, tablets and mobile phones makes it possible for consumers to receive video content from broadcasters anywhere, at any time and on any screen. This introduces new challenges for content and network infrastructure providers who need to offer a wide range of different distribution formats with the best possible live video experience regardless of the distribution networks and viewing devices that are being used.

The latest innovative Universal Encoder/Transcoder running in Multiscreen mode from Appear enables broadcasters and IP network operators to provide high quality multiscreen services. The transcoder module supports MPEG-2/4 TS input and transcodes to multiformat MPEG-4 TS output with IDR alignment. The encoder module accepts SDI/HDSDI inputs directly, and encodes these into multiple profiles as a single pass, avoiding the need to concatenate compression stages which always causes inefficiencies and reduces VQ. The unique architecture delivers significant VQ and efficiency benefits for all real-time applications.

Appear now offers a truly optimized OTT solution capable of accepting any input signal format. These benefits are magnified further by a modular architecture that lets you fit encoding or transcoding options freely according to actual need. The Appear Multiscreen encoder/transcoder simultaneously prepares multiple signals from any source in any format for distribution to high definition televisions, high resolution computers and low resolution web and mobile devices.

The highly programmable functions include input service replication, resolution change, interlaced to progressive conversion, rescaling and key frame alignment. The end result provides key-frame aligned outputs in transport stream format with the required metadata to support either IPTV distribution directly, or interface with the customers preferred packagers to perform segmentation.

The proven ability to interface with several leading segmenters/originserver is another major feature of the Appear solution. It enables customers to freely create a best of breed solution, combining best in class compression with their choice of latest features such as targeted advertising and common encryption with MPEG DASH.

FEATURES

- Modular
- Exceptional video quality
- Compact HW based encoding/transcoding
- Supports MPEG-2 and MPEG-4 SD and HD
- Power and space efficient
- Scalable
- Segmentation agnostic: Can be used with customers having existing segmentation infrastructure
- Complete: Use with other modules to build a complete solution within a chassis
- Can be used to create hybrid broadcast / OTT capable platforms

ENCODING/TRANSCODING MODULES

Encoder -RF input

AC-200

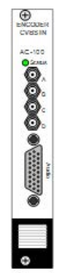
• Encodes up to 2 SD + PIP or 4 SD channels
• 4 F 75Ω input connectors, one per service
• Input frequency range 47-862MHz
• PAL B/G, PAL I and SECAM D/K input*
• MPEG-2 and MPEG 4 SD encoding
• Operates in two encoder rate control modes:
  - Constant bit-rate (CBR)
  - Capped variable bit-rate (CVBR)

*Other TV standards can be supported upon request

Analogue Encoder

AC-100

• Encodes up to 2 SD + PIP or 4 SD channels
• 4 HD BNC with composite video input
• 25 pin mini D-sub for audio:
  - 4 balanced analogue audio
  - 2 AES/EBU audio
• MPEG-2 and MPEG 4 SD encoding
• Constant bit-rate (CBR)
• Capped variable bit-rate (CVBR)
• Logo insertion
• 1 slot wide



Universal Transcoder - Multiscreen (OTT)

TC-400

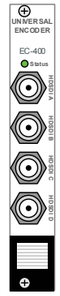
- Transcodes up to four services into multiple profiles
- Transcodes single service into 4 HD or 28 sub SD profiles
- Profile range from 1920×1080p to 240×180p*
- Resolution conversion
- Frame rate reduction
- GOP alignment
- Audio transcoding
- 1 slot wide

*For complete list of available profiles, please contact Appear TV

Universal Encoder - Multiscreen (OTT)

EC-400

- Encodes up to four services into multiple profiles
- 4xSDI or 2xHDSDI input with embedded audio
- Supports an extensive range of resolutions and frame-rates from full 720p60/50 HD down to 144p15/12.5
- Resolution conversion
- Dynamic Encoder GOP Control Modes
- Key frame alignment
- Audio encoding
- 1 slot wide



Universal Transcoder – High VQ Broadcast

TC-400

- Transcodes up to:
  - -1 HD with PIP
  - -2 SD with PIP
- Full decode and re-encode
- Optional H.264 4:2:2 8bit/ 10bit decoding
- Resolution conversion
- MPEG-1, AAC and Dolby® audio transcoding
- Component pass-through
- Operates in 3 different Encoder Rate Control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
- Automatic Audio Levelling
  - Service Loudness
- 1 slot wide

Universal Encoder – High VQ Broadcast

EC-400

- Encodes 1 HD or 2 SD into MPEG-2 or MPEG-4
- SDI/HDSDI input with embedded audio
- 2 BNC, 75 ohm female input ports (plus 2 unused BNC)
- Operates in three encoder rate control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
- Resolution conversion
- Picture in Picture
- Logo insertion
- Advanced audio encoding with support for all common audio codecs
- Automatic Audio Levelling
  - Service Loudness
- 1 slot wide

Universal Transcoder - Dense Broadcast

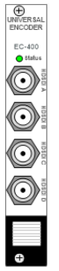
TC-200, TC-400

- Transcodes up to:
  - 4 HD with PIP
  - 12 SD with PIP
  - 16 SD no PIP
- Full decode and re-encode
- Audio transcoding
- Component pass-through
- Operates in 3 different Encoder Rate Control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
- Mediaroom approved
- Automatic Audio Levelling
  - Service Loudness
- 1 slot wide

Universal Encoder – Dense Broadcast

EC-400

- Encodes 4 HD or 4 SD into MPEG-2 or MPEG-4
- SDI/HDSDI input with embedded audio
- 4 BNC, 75 ohm female input ports
- Operates in three encoder rate control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
- Resolution conversion
- Picture in Picture
- Logo insertion
- Advanced audio encoding with support for all common audio codecs
- Automatic Audio Levelling
  - Service Loudness
- 1 slot wide



PROCESSING MODULES

Descrambling and Scrambling

Appear provides two types of descramblers: CAM-based (DVB-Common Interface) and bulk descrambling. The CAM based descrambler module is integrated with professional CAM modules from vendors such as SMIT, SmarDTV, Aston etc. and supports descrambling of up to 10 services per CAM. The bulk descrambler is aimed at software-based CA systems or CA vendors open for an embedded integration. It is used for the descrambling of multiple services protected by one or more CA systems and offers very high descrambling density of up to 250 services per module, making it an efficient, space and energy saving solution. The scrambler module supports both DVB CSA and all common flavors of AES scrambling algorithms. The scrambler module is fully simulcrypt compliant and has been integrated with all major CA vendors.

EPG and audio leveling

The Electronic Program Guide (EPG) module allows a network operator to receive several channel bouquets from multiple sources and reuse the existing EPG information. The EPG will receive EIT tables from any available input automatically and filter out unused services and re-generate the EIT schedule to reflect the current channel lineup for the selected network. For channels without EPG information on air, the information can be imported via a dedicated IP interface using XMLTV format.

Appear's audio leveling simplifies the process of changing the audio levels of hundreds of channels by eliminating the need to decode and re-encode these TV and radio channels prior to transmitting them. The solution lets operators tune the audio level of up to 250 audio tracks individually, within the MPEG domain. The audio leveling module supports MPEG-1 layer 1 or 2 audio with an adjustment range of ±30dB.

FEATURES

- Modular
- Customizable to specific operator demands
- High density
- Provides integrated functionality normally requiring separate chassis or servers
- Powerful MPEG processing with high throughput

PROCESSING MODULES

Bulk Descrambler

BD-100

- Descrambles up to 250 services (850 Mbit/s)
- Integrated with soft clients for ECM handling (no smart card required)
- Support for both DVB-CA and AES descrambling
- Integrated with Verimatrix and Latens
- BISS descrambling
- 1 slot wide

SIM Bulk Descrambler

BD-200

- Descrambles up to 250 services (850 Mbit/s)
- Smart Card based descrambling (SIM)
- 16 SIM readers; 8 in front and 8 behind the front
- Support for both DVB-CA and AES descrambling
- Integrated with Conax and Cryptoguard
- BISS descrambling
- 2 slot wide

Scrambler

CA-100

- DVB CA compliant scrambling (CSA) and AES compliant scrambling
- Scrambles up to 250 services, maximum 850 Mbit/s
- Supports scrambling of MPEG-2, MPEG-4 and HEVC
- DVB Simulcrypt compliant
- 10/100/1000BaseT IP interface towards CA system (RJ45)
- Handles up to 250 ECMs
- 1 slot wide

Descrambler

DS-101

- 2 × DVB Common interface
- Descrambling of 10 services per CAM (depends on common interface)
- Support for all major CA systems and CAMs
- 1 slot wide

Descrambler gen. 2

DS-110

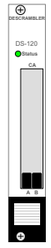
- 2 × DVB Common interface
- Number of services limited by CAM
  - Tested successfully with CAM up to 32 services
- Multiplexing support before CAM
  - Single CAM can descramble from multiple input sources
- 100 Mbit/s throughput per CAM
- Transparent mode descrambling (for monitoring purpose)
- Support for all major CA systems and CAMs
- 1 slot wide

Pro Descrambler

DS-120

- 2 × DVB Common interface for Sky/NDS ProCAMs
- Number of services limited by CAM
- Multiplexing support before CAM
  - Single CAM can descramble from multiple input sources
- 100 Mbit/s throughput per CAM
- Transparent mode descrambling (for monitoring purpose)
- 1 slot wide

** Special approval required. Please contact Appear TV.*



EPG

EP-200

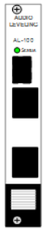
- Re-generation of EIT schedule on selected output ports
- Gathers EIT information from all input ports
- EPG data is filtered and regenerated to reflect new channelplan
- Supports multiple of networks
- Configurable play out rate with prioritization
- Configurable period to be played out
- EPG synchronization between multiple ATV units
- 1 slot wide

Digital Audio Leveling

AL-100

- For equalisation of audio in TV and Radio services within a digital head-end
- Audio volume control in an MPEG domain
- Audio leveling of 250 channels
- Supports MPEG 1, layer 1 / 2 audio
- Adjustment range ± 30 dB
- 1 slot wide

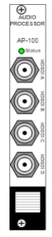
Note: For Dynamic audio leveling (Interface options), please contact Appear TV.



Audio Processor

AP-100

- Two operational modes: Audio Encoder and Audio Transcoder
- Audio Encoder: Encodes up to 32 stereo channels
  - 4x SDI/HD-SDI input with embedded audio
  - 4x BNC, 75 Ohm female input ports
  - 8 stereo audio tracks per SDI/HD-SDI feed
  - AES67 input support via backplane
- Audio Transcoder: Transcodes up to 32 stereo channels
  - MPEG-TS input via backplane
  - Maintain PCR/PTS synchronization to video
- Audio codec support: MPEG1L2, AAC-LC, HE-AAC v1, HE-AAC v2 and Dolby Digital/Dolby Digital Plus
- Audio channel modes: Stereo and Mono
- Audio Level Adjustment , +6/-10dB
- Automatic Audio Levelling: Service Loudness (not supported for Dolby)
- 1 slot wide



MPEG OUTPUT MODULES

Appear offers a large number of different output modules that can be used in various applications. All output modules have powerful MPEG multiplexing and PSI/SI/PSIP capabilities to enable operators to maximize the potential of their network. Each output module has been designed to support 850 Mbit/s transport stream data-rate and 250 services.

IP and ASI output

The IP output module is a high capacity module with full multiplexing and PSI/SI regeneration targeted at linear broadcasting. The IP output modules support any combination of MPTS and SPTS as long as the total number of services is less than 250 and the total transport stream bit-rate is less than 850 Mbit/s. Each output port supports IPv4, IPv6, source specific multicast, generation of FEC according to SMPTE 2022 and Appear's unique IP output redundancy solution.

For legacy systems an ASI output module with 4 independent ASI outputs is available. Each ASI output supports up to 213 Mbit/s in burst mode or 72 Mbit/s in spread (byte) mode.

Modulated output

All Appear's modulated output modules are based on a full digital modulation and up-conversion architecture developed in house to provide the best possible output quality. Appear TV's leading edge DVB-T/T2 modulator is fully frequency agile for terrestrial transmitters, MMDS systems or for DVB-T/T2 modulation into cable networks. This high density modulator is capable of producing up to 4 DVB-T or 2 DVB-T2 modulated channels, offering more throughput and improved error resiliency. For terrestrial operation, the modulator supports SFN with either MIP TS or T2MI as input .

Appear's advanced DVB-S/S2/S2x modulator is a fully frequency agile modulator aimed at modulating SD/HD services on to satellite. This high density modulator is capable of producing up to 2 DVB-S or DVB-S2 modulated channels. The solution offers broadcasters a higher rack density and lower power consumption, compared to alternative solutions and comes with advanced functionality like pre-compensation. The DVB-S/S2/S2x modulator is available in two different output configurations: IF or L-band.

Appear's compact QAM solution generates 16 QAM frequencies for cable networks. The module supports both full re-multiplexing and transparent mapping with optional NIT replacement and PID/Service blocking making it one of the most versatile QAM modulation solutions for linear broadcasting on the market. Appear's QAM solution is ideal for regional cable head-ends where additional processing are required like service filtering, local re-multiplexing, local encoding, SI regeneration, EPG regeneration, etc.

Terrestrial GW solutions

The gateway module transforms an Appear chassis into a complete solution for DVB-T and T2. It combines the MPEG multiplexing, PSI/SI generation and gateway roles into a single module. Combining this with modules to perform encoding, transcoding and scrambling enables a unique integrated head-end design eliminating the need for a traditional multiple box approach with the added complexity. The Appear gateway module supports DVB-T with MIP timestamp insertion or DVB-T2 T2MI encapsulation with SFN timestamps together with multi PLP support. The terrestrial gateway module is available with ASI or IP outputs and can support up to 4 separate gateways per module (2 on ASI out). Integrated redundancy schemes are available to go beyond what is commonly available today and provide seamless protection of the distribution chain as well as the SFN network.

FEATURES

- Modular
- Integrated
- Scalable
- High density
- Flexible
- Seamless redundancy options
- Intelligent, automatic redundancy solutions
- Powerful multiplexing with high throughput
- Integrated multiplexing & PSI/SI re-generation

OUTPUT MODULES

Dual IP IO

IP-200

- 2 × Gbit output port for data (or 1×in and 1×out)
- 10/100/1000BaseT (RJ45) or SFP output
- Up to 850 Mbit/s per data port TS
- Supports UDP/RTP Multicast/Unicast
- Supports streaming of MPTS and SPTS
- Supports cloned output
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- Supports FEC (SMPTE 2022) (license)
- 1 slot wide

ASI Output

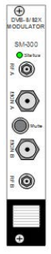
AO-110

- 4 × ASI outputs
- 4 × BNC connectors
- 213 Mbit/s Burst mode or 72 Mbit/s Spread mode per output
- 4 different multiplexed outputs
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- 1 slot wide

DVB-S/S2X modulator

SM-300

- 2 DVB-S/S2/S2x modulated carriers per module
- Output connectors:
  - -IF › 1 × 75Ω F connector + 1 × 50Ω SMA for monitoring per output
  - -L-band › 1 × 50Ω SMA connector + 1 × 75Ω F for monitoring per output
- Satellite standards:
  - -DVB-S EN 300 421
  - -DVB-S2 EN 302 307 – 1
  - -DVB-S2X EN 302 307 -2, Broadcast Services
- Output options:
  - -IF › 50-200 MHz
  - -L-band › 950-2150 MHz
- Modulation:
  - -DVB-S › QPSK
  - -DVB-S2X › QPSK, 8-PSK, 16/32/64/128/256-APSK
- Symbol rate: 0.1-68 Mbaud
- 24V DC and 10MHz reference output
- DVB Carrier ID, NIT Carrier ID
- Linear static precorrection
- Supports multiplexing and transparent pass-through



DVB-T/T2 Terrestrial Modulator

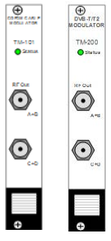
TM-300

- 2 DVB-T2 or 2 DVB-T independent outputs
- 1 × BNC connector + 1 × BNC for monitoring per output
- Monitoring ports for each output
- VHF/UHF, 50 Ω BNC, 47-862 MHz
- Output levels: -15 to 0 dBm
- Supports multiplexing and transparent pass-through (mode A)
- Support for SFN (ETSI TS 102 733 T2-MI)
- Support for multiple PLPs
- Supports multiplexing and transparent
- PSI/SI regeneration
- 1 slot wide

DVB-T/T2 Cable Modulator

TM-101, TM-200

- 4 DVB-T modulators (TM-101)
- 2 DVB-T/T2 modulators (TM-200)
- Connectors:
  - - TM-101 › 2 × 75 Ω F connector (2 x frequencies per output)
  - - TM-200 › 2 × 75 Ω F connector (1 x frequencies per output)
- Full digital modulation and up-conversion
- 5, 6, 7, 8 MHz bandwidth
- Frequency range 47-862 MHz, fully agile
- Output levels: -12 to 2.2 dBm
- PSI/SI regeneration
- 1 slot wide



QAM Modulator

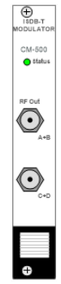
CM-201, CM-301, CM-210, CM-310

- 16 QAM modulators, 4 and 4 paired
- 2 × 75 Ω RF output (EN/IEC 60728-5) - F connector
- Full digital modulation and up-conversion
- DOCSIS 3.0 RF compliant
- 16 / 32 / 64 / 128 / 256 QAM modulation
- Frequency range of 47 – 1000 MHz
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- ITU-TJ83. Annex A/B/C
- 1 slot wide

ISDB-T Modulator

CM-500

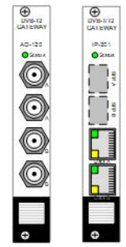
- 8 ISDB-T modulated carriers per module
- 2 × 75 Ω RF output - F connector
- Full digital modulation and up-conversion
- DOCSIS 3.0 RF compliant
- QPSK, 16QAM, 64 QAM modulation
- Frequency range of 47 – 862 MHz
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- Relevant Standards:
- ARIB STD-B31
- ARIB STD-B10
- 1 slot wide



DVB-T/T2 GW

AO-120, IP-201

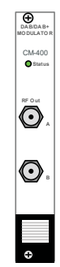
- IP or ASI out options:
  - -10/100/1000 BaseT (RJ45) or SFP output on IP
  - - 2 × (1+1) ASI out
- Supports DVB-T MIP insertion and DVB-T2 T2MI generation
- 4 independent gateways per module (2 for T2MI on ASI out)
- Supports up to 240 PLPs
- Regionalization options
- PAPR and MISO support
- Full (Re-)multiplexing support (per PLP)
- PSI/SI regeneration
- Supports SMPTE 2022 FEC (license)
- 1 slot wide



DAB/DAB+ Modulator

CM-400

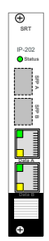
- Standards DAB/DAB+
- EDI input
- 8 x DAB/DAB+ modulated carriers
- Frequency range 174-300 MHz
- Output level -4 dBm to -15 dBm
- 1 slot wide



SRT

IP-202

- 2 × Gbit RJ45 or SFP ports for data (1×in and 1×out)
- Secure transmission over the Internet
  - - Encryption algorithms: AES 128, AES 192, AES 256
- Reliable transmission over the Inter net
  - - Retransmission mechanism on packet loss
  - - Configurable latency buffer for retransmissions
- Two operational modes:
  - - SRT input
  - - SRT output
- Transmission modes: Caller, Listener and Rendezvous
- 35 Mbit/s throughput (Number of services limited by bandwidth)
- 1 slot wide



END TO END TERRESTRIAL SOLUTIONS

Appear offers the most integrated, powerful and flexible range of DVB-T2 solutions. The compact modular approach makes it possible to provide complete head-ends consisting of content acquisition, premium compression with statistical multiplexing, DVB-T2 gateways, and modulation in single or multiple units to provide an end to end solution.
Terrestrial signals for DVB-T2 can be distributed via satellite, ASI or IP to transmitter sites where regional processing is performed before being delivered to the transmitter. In addition Appear can provide a complete low-power transmitter solution with all necessary components integrated into a compact 1RU chassis if applicable. All components are developed in house, giving customer's access to our design level expertise with the added benefit of being able to customize the solution to meet specific customer requirements.

The solution offers many highly distinctive features including a new option for providing regionalization using the 'common PLP' mechanism, an integrated seamless DVB-T2 gateway redundancy option and sophisticated seamless IP packet re-construction to dramatically increase signal distribution robustness over IP links. Because the entire solution is modular, Appear TV offers the market an easy to manage, easy to upgrade, ultra-compact solution that provides the best possible standards of technical performance whilst consuming a fraction of the space and power of competing systems.

DVB-T2 Integrated Multiplexer and DVB-T2 Gateway Module
Appear has improved upon typical DTT architectures that rely on multiple boxes and complex NMS to provide an integrated solution. In contrast, Appear solutions are optimally integrated from the beginning. Appear gateway module is an integrated MPEG multiplexer, PSI/SI generator and DVB-T2 gateway on a single slot.

The advanced Appear DVB-T2 gateway module is representative of Appear's modular approach enabling operators to combine reception, descrambling, encoding/transcoding, scrambling, multiplexing, PSI/SI generation,T2 gateway and modulation stages within a single chassis with integrated management.

Appear modules offer high channel and carrier density. The gateway module supports multiplexing and T2MI generation of up to 4 independent complete T2MI streams on IP or 2 T2MI streams on ASI and provides up to 140 regional PLPs per module. The combination of integration and performance offered by the module is unique, making it the most powerful, yet easiest to use, DVB-T2 Gateway solution on the market. The modules are usually provided in 1+1 redundancy configuration using the Appear seamless T2MI redundancy option.

The gateway's many features can be used to complement the requirements and distribution methods required by individual customers, and can support centralized (backhaul) and 'in region' (edge) content replacement models using any distribution mechanism including support for TS replacement or deterministic PLP replacement techniques as appropriate.
Architectures and Regionalization

Appear network delivery enhancements include support for the DVB-S/S2/S2x standard and are incorporated into the satellite modulator and demodulator modules. For IP distribution our 'seamless' packet re-construction technology provides superior protection against network packet loss and enables FEC levels to be reduced, re-claiming useful bandwidth. whilst ensuring exceptional QoS. Network reach can be extended via our fully integrated modular low-power

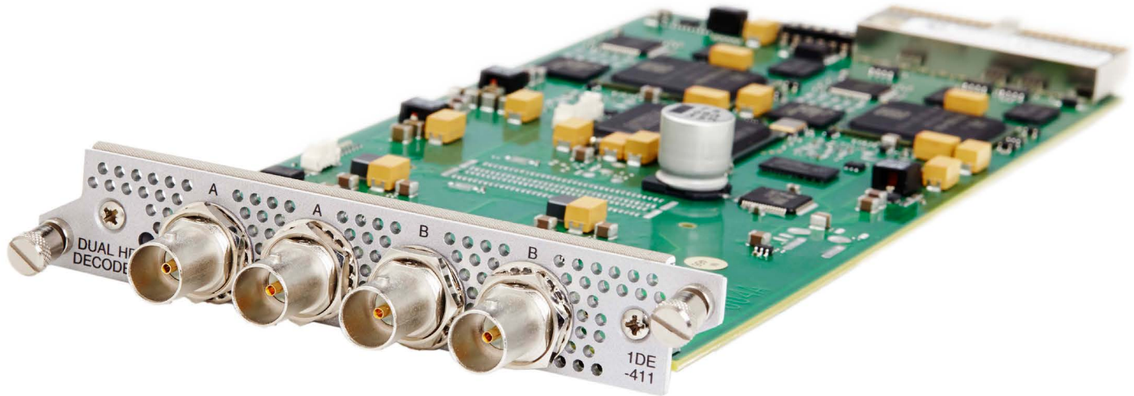
DECODER

A key feature of Appear platforms is the ability to use a common hardware platform to deliver high quality analog and digital TV services simultaneously. The SDI/HDSDI outputs and optional AES/EBU audio outputs are ideal for downlink and rebroadcast, or for monitoring purposes.

Simulcasting

The high performance decoders with RF modulation are ideal for operators wanting to eliminate the need to distribute analog channels over the core network. Appear's decoder modules with RF output support PAL, SECAM and NTSC together with A2, NICAM and MTS stereo audio modulation. Based on a full digital-modulation and up-conversion architecture, the decoder with RF modulation gives the best RF performance possible.

Appear FM radio decoders offer cable operators a compact solution for the delivery of radio services. Each radio module decodes 8 MPEG stereo audio tracks and FM modulates the audio with RDS. The FM radio module can be combined with decoders and digital QAM modulator, making them a complete remote head-end for cable operators.



FEATURES

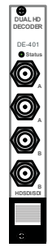
- Modular
- Scalable
- High density with up to 40 analogue RF modulated TV channels in 4RU
- Integrated analogue simulcast solution for video and FM radio
- MPEG-2/4 SD/HD decoding
- Digital RF modulation

DECODER MODULES

Dual MPEG-2/4 Decoder with SDI/HDSDI Output

DE-401 / DE-411*

- 2 decoders per module
- 2 × BNC with SDI/HDSDI outputs per decoder
- MPEG2 and MPEG4 (H264) SD and HD
- Frame Synchronization (Genlock) support (HW option)
- Dolby® Digital Plus (HW option)
  - Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF)
  - Conversion Dolby® Digital Plus to Dolby® Digital
- VBI re-insertion (WSS, WST/EBU Teletext, VPS, VITS)
- VANC re-insertion (WSS, Teletext, VPS, DPI, AFD, EBU Subtitles)
- DVB and EBU subtitling
- 1 slot wide

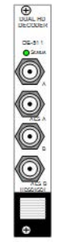


Dual MPEG-2/4 Decoder with SDI/HDSDI Output & AES Audio option

DE-501 / DE-511*

- 2 decoders per module
- 1 SD/HDSDI output per decoder
- 1 AES audio output per decoder
- MPEG2 and MPEG4 (H264) SD and HD video
- MPEG-1 Layer 1/2, MPEG-2 Layer 2, MPEG4 AAC-LC, MPEG4 AAC plus v.1/2 audio
- Dolby® Digital Plus (HW option)
  - Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF)
  - Conversion Dolby® Digital Plus to Dolby® Digital
- VBI re-insertion (WSS, WST/EBU Teletext, VPS, VITS)
- VANC re-insertion (WSS, Teletext, VPS, DPI, AFD, EBU Subtitles)
- DVB and EBU subtitling
- 1 slot wide

DE-411, DE-511 required for Genlock support



Dual MPEG 2/4 Decoder with Composite Output

DE-211

- 2 decoders per module
- Composite PAL and NTSC Video output - BNC connectors
- Balanced Stereo Audio output – D-sub connector
- MPEG2 and MPEG4 (H264) SD and HD
- Dolby® Digital Plus (HW option)
  - Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF)
- VBI re-insertion (WSS, WST/EBU Teletext, VPS, VITS)
- DVB and EBU subtitling
- 1 slot wide

FM Radio with RDS Output

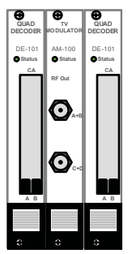
FM-100

- 8 independent radio channels per module
- Decoding of MPEG-1,2 audio
- FM modulation and up-conversion to FM band
- Fully agile independent frequency setting for each channel
- RDS insertion - UECP SPB490 or static
- One RF output connector, F-type, with all 8 channels
- MPX test output
- 1 slot wide

Quad Decoder with RF Output

2 x DE-101 + AM-100 / 1 x DE-101+1 AM-100

- 4 or 8 decoders and RF modulators
- MPEG-2/4 (H264) SD and HD decoding (half can be HD)
- PAL› B/G, D/K, I
- SECAM › B/G, D/K
- NTSC › M
- HD downconversion to SD
- Dolby® Digital Plus (HW option)
  - Dolby® Digital and Dolby® Digital Plus decoding, downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression modes (Line & RF)
- VBI re-insertion (WSS, WST/EBU Teletext, VPS, VITS)
- DVB and EBU subtitling
- RF modulation and up-conversion
- 47-862 MHz frequency range
- 2 F connector output ports, up to 4 channels per port
- 2 DVB Common Interfaces per decoder module
- 2 or 3 slots wide



REDUNDANCY

(AWARD WINNING)

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.

SWITCH MODULE SPECIFICATIONS

Switch Module
SW-200 (No IP IO)
SW-301, SW-401
SW-310, SW-410

Bitrate	: Gbit/s routing between modules in a chassis
Placement	: 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	: 10/100/1000 Base-T Ethernet
Built-in user interface	: Web
External interface	: SNMP for alarms, SOAP for configuration and status

* If SDI reference signal support is needed, contact your sales representative.

Licenced features	: 2xIP In, 1xIP In/1xIP Out, 2xIP Out, Seam. IP In, Cloned IP Out
	: 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 Input/Output**	
IP-200	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	Key reference specification	: EN 50083-9
AI-110	Connector	: BNC female, 75Ω
	Number of inputs per module	: 4
	Maximum bit-rate per port	: Up to 213.7Mbit/s (burst)
DVB-S/S2X input	Key reference specification	: EN 300 421, EN 302 307 part 1 and 2
SR-120	Connector	: F female, 75Ω
	Number of inputs per module	: 4
	Frequency range	: 950–2150 MHz
	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	: QPSK
	DVB-S2 Constellation	: QPSK, 8PSK, 16APSK, 32APSK
	DVB-S2X Constellation	: QPSK, 8PSK, 16APSK, 32APSK
	Symbol rate DVB-S/S2/S2X	: 1–45 MSym/s (1-39.9MSym/s for 32-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-S2 32APSK	: 2/3, 32/45, 11/15, 3/4, 7/9, 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
	Multiple streams	: 1 per input port
	T2MI De-encapsulation	: 1 PLP per port
	Licenced features	: DVB-S2 demodulation DVB-S2X demodulation T2MI de-encapsulation
DVB-T/T2 input	Number of DVB-T/T2 inputs per module	: 4
TR-210, TR-211	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 (64k), Short (16k)
	FEC code rate (PLP)	: 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 or 8 MHz
	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-110	Connector	: F female, 75Ω
	Number of inputs per module	: 4 independent tuner/demodulators
	Number of input ports	: 1 (internal splitter feeding the 4 tuners)
	Frequency range	: 47–862 MHz
	Channel bandwidth	: 6, 7 and 8 MHz
	QAM Mode	: 4, 16, 32, 64, 128, 256 QAM
	Symbol rate	: 1–7.2 Mbaud
	Spectrum inversion	: Automatic
	Input power level	: - 30 to -65 dBm (at 256 QAM, 6.9 Ms/s)
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)

8-VSB Input (ATSC)	Key reference specification	: ATSC A/53
TR-300	Connector	: F female, 75Ω
	Number of inputs per module	: 4
	Input level	: -34 to +40 dBmV
	Frequency range	: 50–860 MHz
	Modulation	: 8-VSB
	Band	: Broadcast
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

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. / Frame rates (SMPTE 292M)	: 1080i – 29.97 fps or 25 fps
		: 720p – 59.94 fps or 50 fps
	SD Res. / Frame rates (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 (HD) up to 60Mbps
		: 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, 5.1[1])
		: HE-AAC v1 (2.0, 5.1[1])
		: HE-AAC v2
		: Dolby® Digital[2]
		: Dolby® Digital Plus[3]
		: Dolby® Digital/Dolby® Digital Plus pass-through
	Audio Channel Modes	: Stereo, Mono and Dual Mono, 5.1[1] and 7.1 (Dolby® Digital/Dolby® Digital Plus only)
	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	: -18 LUFS to -31 LUFS (rec. -23 LUFS)
	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 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 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	: 192x128 (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.

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

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 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

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 Pairs[4)]
: Dolby® E Decode - Number of channels
: Subtitle transcoding from TTX to DVB
: OSDM
: Automatic Audio Levelling
: Subtitle PTS re-stamping

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 – 25Hz

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 (HD) up to 60Mbps : MP@ML (SD) up to 16Mbps
MPEG-4 AVC profiles	: MP@L4.2, HP@L4.2 (HD) up to 55Mbps : 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 : Convert Dolby® Digital Plus to Dolby® Digital Dolby® Digital / Dolby® Digital Plus Pass-thru
Audio Channel Modes	: Multichannel, Stereo, Mono, Dual Mono
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	: -18 LUFS to -31 LUFS (rec. -23 LUFS)
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 : 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	: 192x128 (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 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

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

5) For complete table please contact Appear TV.

Universal Encoder - MS/OTT
EC-400

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 Pairs[4)] : Dolby® E Decode - Number of channels : Subtitle transcoding from TTX to DVB : OSDM : Automatic Audio Levelling : Subtitle PTS re-stamping
Input Ports	: 2xHDSDI/4xSDI, 4 BNC 75 Ω
Input Format	: SMPTE 292M (HD SDI), SMPTE 259M (SD SDI)
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 270p @ 29.97, 25 fps : 416 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 @ 25/12.5 fps : 720 x 480i @ 29.97/14.985 fps : 640 x 480p @ 29.97, 25 fps : 640 x 360p @ 29.97, 25 fps : 544 x 416p @ 29.97, 25 fps : 480 x 360p @ 29.97, 25 fps : 480 x 270p @ 29.97, 25 fps : 416 x 240p @ 29.97 fps : 400 x 224p @ 29.97, 25 fps : 400 x 300p @ 29.97, 25 fps : 384 x 216p @ 29.97, 25 fps : 352 x 288p @ 25 fps : 320 x 240p @ 29.97 /14.985, 25/12.5 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	: Interlaced to progressive conversion
Scene change detection	: Yes, insertion of P frame
GOP structure	: Dynamic
Number of output profiles	: Ranging from 4x HD to 28 sub SD per module, depending on complexity of profiles
Audio Encode	
AAC-LC	: Modes: 2.0, Bit rates: 32 – 384kbps
HE-AAC v1	: Modes: 2.0, Bit rates: 32 - 192kbps
HE-AAC v2	: Modes: 2.0, Bit rates: 32 - 96kbps
Sample rates	: 32, 48kHz
Number of channels per video source	: 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)	: Extracted from VANC SMPTE 2016 and injected into video stream.

Encoder– CVBS input
AC-100

Number of channels	: 4 SD or 2 SD+PIP
Input Port	: 4 HD BNC 75 Ω, one per channel 25 Pin Compact D-sub for audio: - 4 balanced analogue audio inputs - 2 AES/EBU inputs
Video Input	: PAL B/G/I/D/K : SECAM D/K : PAL Nc : PAL M : NTSC M
Video Pre-processing	
Inverse Telecine Detection	: Yes
De-blocking Filter	: Adjustable
Motion Compensated Temporal Filter (MCTF)	: Adjustable
Horizontal Rescaling	: From 720 to 704, 640, 544, 528, 480 or 352
WSS Blanking	: Removal of line 23 WSS from active video
Logo Insertion	
File Format	: PNG (8-bit RGBA) file per encoded channel
Position	: User defined (pixel resolution)
Maximum Size	: 192 × 128 (SD)
Ancillary Data and VBI	
VBI Extraction and processing	: Closed Captioning (EIA 708) : Teletext, WSS, VPS
Video Encoder	
Number of channels per module	: 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)
MPEG-2 profiles	: up to HP@ML
MPEG-4 AVC profiles	: up to HP@L3.0
Rate Control Modes	: Constant Bit Rate (CBR) : Capped VBR (CVBR) with QP target
Rate Range	: 4SD: From 250kbps to 10Mbps : 2SD: From 250kbps to 19Mbps
GOP control	: Fixed or Dynamic with Scene Change Detection and adaptive GOP structure
Picture-In-Picture	: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96 or 96×96
Aspect Ratio Control	: Manual or WSS

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

6) Other TV standards can be supported upon request

Encoder - RF Input
AC-200

Audio Encoder

Audio CODECS	: MPEG-1 Layer 2 : AAC-LC : HE-AAC v1 : HE-AAC v2 : Dolby® Digital pass-through (from AES input)
AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
Channel Modes	: Stereo/Dual Mono/Mono
Encoded stereo pairs per video	: 2 pairs for 2SD+PIP configuration and 1 pair for 4 × SD configuration
Audio level adjustment	: +/-11dB
Injection of Private Data into service	: See Universal Encoder High VQ "Auxillary Data Injection"

Licensed Features : Number of encoded channels, PIP

Number of channels per module : 4 SD or 2 SD+PIP (2SD mode gives improved VQ)

RF Input

TV systems	: PAL B/G, PAL I and SECAM D/K®
RF inputs	: 4xF female, 75 Ω
Input frequency	: 47 – 862 MHz
Frequency tuner step size	: 1kHz
RF input level	
– Max	: 110 dBuV
– Min (for un-weighted video SNR=30dB)	: 44 dBuV

Video Encoder
Please refer to "Encoder -CVBS input"

Picture-in-Picture
Please refer to "Encoder -CVBS input"

Video Pre-processing
Please refer to "Encoder -CVBS input"

Logo Insertion
Please refer to "Encoder -CVBS input"

Audio Encoder

Audio CODECS	: MPEG-1 Layer 2 Stereo : AAC-LC Stereo : HE-AAC v1 Stereo : HE-AAC v2 Stereo
AC Data Encapsulation	: ADTS or LATM selectable per encoded channel
Channel Modes	: Stereo/Mono/Dual Mono
Encoded stereo pairs per video	: 1
Audio Level Adjustment	: ± 11 dB

VBI
Please refer to "Encoder -CVBS input"

Auxillary Data Injection
Injection of Private Data into service : See Universal Encoder High VQ "Auxillary Data Injection"

Licensed Features : Number of Encoded channels, PIP

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)

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/-10dB
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	: -18 LUFS to -31 LUFS (rec. -23 LUFS)
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

Dolby® Digital Plus Professional Decoder. 'Dolby' and the 'double-D' symbol are registered trademarks of Dolby® Laboratories.

: Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output.

Logo Insertion
Maximum Size
: 192x128 (SD)
: 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-200, 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 (HD)
: 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)
MPEG-4 AVC profiles : MP@L4.1, HP@L4.1 (HD)
: 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 : PCR on Video PID or as separate PID
End-to-end Encoder Delay : 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)
: Pass though of all audio types
Audio Channel Modes : Stereo, Mono
: 5.1 and 7.1 (TC-400)
AAC Data Encapsulation : ADTS or LATM selectable per encoded channel
Audio Lipsync Adjustment : +500ms /-200ms
Audio Level Adjustment : +6/-10dB
Audio Transcode Density : **TC-400 -** Max 6 stereo transcodes per video, limited to 24 stereo transcodes per module.
: **TC-200 -** Maximum 4 stereo transcodes per video, limited to 6 stereo transcodes per pair of video transcoder blocks.
: One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes
Number of audio per channel : Max 6

Automatic Audio Levelling
Key specification : EBU TECH 3344 (Service Loudness – EBU R128)
Number of stereo : 24
Target Level : -18 LUFS to -31 LUFS (rec. -23 LUFS)
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 59.94 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 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 : 192x128 (SD)
: 360x180 (HD 720P)
: 480x270 (HD 1080i)

7) For complete table please contact Appear TV.

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.)
are passed through Lipsync to video is maintained.

Video Processing

WSS (line 23) blanking	: Yes

Statistical Multiplexing (Not supported in initial release)

Statmux Controller	: Local within chassis.
Maximum # Groups	: Maximum 16, one per encoder/transcoder module.
Maximum # Services within group	: 32

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

MPEG-2 profiles	: Ranging from MP@ML (SD) to MP@HL (HD)
MPEG-4 AVC profiles	: up to HP@L4.2 : 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 fps[8)]	: 720p › 1280, 960, 854
Resolutions @ 29.97 fps or 25.00 fps[8)]	: 1080p › 1920, 1440, 1280, 960, 720, 640 : 720p › 1280, 960, 854 : 640p › 960 : 576p › 1024, 768, 720, 352[9)] : 540p › 960 : 480p › 854, 720, 640, 352
Resolutions @ 14.99 fps or 12.50 fps[8)]	: 432p › 768 : 360p › 640, 480 : 320p › 480 : 288p › 512 : 270p › 480, 360 : 256p › 144 : 240p › 320 : 216p › 384 : 180p › 320, 240 : 640p › 960 : 576p › 1024, 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, depending on complexity of profiles
Key Frame Alignment	: Frame accurate key frame alignment across all profiles. Fixed IDR to IDR distance.
GOP control	: Dynamic GOP structure with Scene Change Detection.

Audio Encode

Capacity	: Up to 8 per module
Output format	: AAC-LC. Modes: 2.0, Bit rates: 32–384kbps : 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

Audio leveling
AL-100

Number of audio tracks	: 250 stereo
Pass-Through	: All components signaled in service
Audio format	: MPEG-1 layer 2
Adjustable range	: ±30 dB

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

	Step	: 2 dB
	Adjustment mode	: Static
		: Integrated with 3rd party SW solutions for automatic adjustment
	Licensed Features	: Number of audio channels
Bulk Descrambling **BD-100**	Interface	: SW based smart card
	CA system support	: Please contact Appear TV*
	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

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

Audio Encoder Inputs

Number of SDI/HSDI inputs	: 4
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			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	: -18 LUFS to -31 LUFS (rec. -23 LUFS)
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	: Yes, on TS level. For SPTS output only
	PSI/SI handling	: Automatically regenerated
	Tables Supported:	
	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 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, CM-301** **CM-210, CM-310**	Key reference specifications	: EN 300 429, ITU J.83.ABC
	Interface	: 2 × F connector female, 75 Ω
	Number of carriers	: 3 and 4 per group (adjacent channels)
	Number of QAM frequencies per module	: up to 16 carriers in 4 groups, 8 per port
	Modulation	: 16 / 32 / 64 / 128 / 256 –QAM
	Symbol rate	: 4.48 to 7.00 Mbaud (Annex A and 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 (12 MHz available for 3 carrier groups)
	Frequency step size	: 1 Hz
	Frequency stability	: 2 ppm
	Output level	: -12 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	: typ > 16 dB
	Spurious	: typ < -60 dBc
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	: < -60 dBc/4kHz (typical)
In-band flatness	: 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	: < -60 dBc/4kHz
In-band flatness	: 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

DVB-T Cable Modulator
TM-101

Key reference specification	: ETSI EN 300744
Number of carriers	: 4 independent carriers
Number of output ports	: 2 (2 carriers per port)
Output connector	: F-type
Impedance	: 75 Ω
Output frequency	: 47–862 MHz
Frequency setting step size	: 1 Hz
Output level	: -12 to 2.2 dBm
Output level stability	: ± 0.5 dB
Frequency accuracy	: 2 ppm
Return loss	: >16 dB
MER	: > 42 dB
Test mode	: CW

DVB-T Coding and Modulation

FFT size	: 2k, 8k
Guard intervals	: 1/4, 1/8, 1/16, 1/32
Code rates	: 1/2, 2/3, 3/4, 5/6, 7/8
Constellation	: QPSK, 16-QAM, 64-QAM
Channel bandwidth	: 5, 6, 7, 8 MHz

DVB-T2 Cable Modulator
TM-200

Key reference specification	: ETSI EN 302755
Number of carriers	: 2 independent carriers
Number of output ports	: 2 (1 carrier per port)
Output connector	: F-type
Impedance	: 75 Ω
Output frequency	: 47-862 MHz
Frequency setting step size	: 1 Hz
Output level	: -10 to 2.2 dBm
Output level stability	: ± 0.5 dB
Frequency accuracy	: 2 ppm
Return loss	: >16 dB
MER	: > 42 dB
Test mode	: CW

DVB-T2 Coding and Modulation

FFT size	: 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended
Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
FEC frame	: Normal (64k), Short (16k)
FEC code rate	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
Constellation (PLP)	: QPSK, 16-QAM, 64-QAM, 256-QAM
Channel bandwidth	: 1.7, 5, 6, 7, 8, or 10 MHz
Pilot pattern	: P1–P8
Number of PLPs	: 1

DVB-T/T2 Modulator (Exciter)
TM-300

Key reference specification	: ETSI EN 302755 , ETSI EN 300744
Number of carriers	: 2 independent carriers
Number of output ports	: 2 (1 carrier per port)
Output connector	: BNC
Impedance	: 50 Ω
Output frequency	: 47-862 MHz
Frequency setting step size	: 1 Hz
Output level	: -15 to 0 dBm
Output level stability	: ± 0.5 dB
Frequency accuracy	: 2 ppm
Return loss	: >16 dB
MER	: > 42 dB
Test mode	: CW

DVB-T Coding and Modulation

Input	: TS with MIP (SFN) or remultiplexed TS
FFT size	: 2k, 8k
Guard intervals	: 1/4, 1/8, 1/16, 1/32
Code rates	: 1/2, 2/3, 3/4, 5/6, 7/8
Constellation	: QPSK, 16-QAM, 64-QAM
Channel bandwidth	: 5, 6, 7, 8 MHz

DVB-T2 Coding and Modulation

Input	: T2MI (SFN) or remultiplexed TS
SFN	: Relative timestamps within 1000 ms
T2 versions	: 1.1.1, 1.2.1 and 1.3.1 (T2MI source only)
FFT size	: 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended
Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
FEC frame	: Normal (64k), Short (16k)
FEC code rate	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3 (T2-Lite), 2/5 (T2-Lite)
Constellation (PLP)	: QPSK, 16-QAM, 64-QAM, 256-QAM
Channel bandwidth	: 1.7, 5, 6, 7, 8, or 10 MHz
Pilot pattern	: P1–P8
Number of PLPs	: up to 128

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*

10) DVB-T and DVB-T2 gateway run on different HW versions for ASI out.

Modulation	: QPSK, 16QAM, 64 QAM
Transmission mode	: 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-T/T2 Gateway ASI[10]
AO-110, AO-120

Connectors	: 4 x BNC 75Ω
Number of MPTS's with MIP	: 4
Number of T2MI streams	: 2
Maximum ASI bit-rate per port	: Spread Mode: 72Mbit/s Burst Mode: 213Mbit/s
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
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	
Number of PLPs	: 240 in total between all T2MI streams
PLP mode	: HEM, constant bit-rate
PLP types	: 1 and 2
TI types	: Within a T2 frame and across multiple T2 frames
Automatic calculation	: FEC blocks, TI blocks, TI frames and TI type
FEC frame	: Normal (64k), Short (16k)
FEC code rate	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
Constellations	: QPSK, 16-QAM, 64-QAM, 256-QAM
Rotated constellations	: Yes
ISSY supported	: Yes
Licensed Features	:DVB-T/T2 :MIP, T2MI :1 or 2 outputs :Multi PLP, Regional PLP

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	
Number of PLPs	: 240 in total between all T2MI streams
PLP mode	: HEM, constant bit-rate
PLP types	: 1 and 2
TI types	: Within a T2 frame and across multiple T2 frames
Automatic calculation	: FEC blocks, TI blocks, TI frames and TI type
FEC frame	: Normal (64k), Short (16k)
FEC code rate	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
Constellations	: QPSK, 16-QAM, 64-QAM, 256-QAM
Rotated constellations	: Yes
ISSY supported	: Yes
Licensed Features	: IP Out Redundancy, T2MI sync+IP Redundancy : T2MI : Multi PLP, Regional PLP : FEC out

DAB / DAB+ Cable Modulator
CM-400

Key reference specification	: ETSI EN 300 401, ETSI TS 102 693, ETS 300 799
Input format	: ETI over IP (EDI), no multiplexing support
RF Output Specification	
Number output ports	: 2
Number of carriers	: 8 (4 per port)
Connector	: F female, 75Ω

	Frequency range	: 174–300 MHz
	Channel spacing	: Carriers within a port must be within 40 MHz.
	Spurious	: < 60 dBc @ -4dBm (typ.)
	Frequency stability	: +/- 2 ppm
	Frequency step size	: 1 Hz
	Output power level per carrier	: Maximum: -4 dBm Minimum: -15 dBm
	Output level stability	: +/- 0.5 dB
	Output level adjustment	: 0.1 dB steps
	MER	: > 42 dB (typ.)
	Return loss	: >16 dB
	Licensed Features	: 4 or 8 carriers
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

DECODER SPECIFICATIONS

MPEG - 2/4 Decoder with SDI/HDSDI out **DE-401, DE-411**	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 5.1 to 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 Wide Screen Signaling (WSS)	: EN 300 743 v1.3.1
	Input	: EN 301 775 v1.2.1
	Output	: EN 300 294/ SMPTE 2031 (Composite decoder ITU-R BT .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 : Dolby® Digital/Dolby® Digital Plus Decode
MPEG-2/4 Decoder with SDI/HDSDI & AES out **DE-501, DE-511**	Number of decoded channels	: 2 per module
	Connector	: 1 SDI/HDSDI 75Ω BNC and 1 AES/EBU 75Ω BNC per Audio channel
	Video Decoding	Please refer to “MPEG-2/4 Decoder with SDI/HDSDI out”.
	Audio Decoding	Please refer to “MPEG-2/4 Decoder with SDI/HDSDI out”.
	VBI/VANC/DVB Sub Processing	Please refer to “MPEG-2/4 Decoder with SDI/HDSDI out”.
	Licensed Features	: HD : Genlock : OSDM : Dolby® Digital/Dolby® Digital Plus Decode
MPEG-2/4 Decoder with Composite Output **DE-211**	Number of decoded channels	: 2 per module
	Connector for video	: 1 Composite 75Ω BNC per channel, unbalanced
	Connector for audio	: 25 PIN min D-sub for audio (male) - 4 balanced audio, 2 per channel, balanced - 2 AES/EBU audio, 1 per channel (ch. 1)
	Video Decoding	Please refer to “MPEG-2/4 Decoder with SDI/HDSDI out”.
	Audio Decoding	Please refer to “MPEG-2/4 Decoder with SDI/HDSDI out”.
	VBI/VANC/DVB Sub Processing	Please refer to “MPEG-2/4 Decoder with SDI/HDSDI out”.
	Analogue Video	
	Video standards	: PAL and NTSC
	Conversion	: HD down conversion to SD
	Signal to noise ratio	: >70dB Measured Acc. Rec 569
	Luminance Non Linearity	: <1%
	Sin x/x Gain	: ±0.3dB
	Sin x/x Group Delay	: ±10ns
	Bar Amplitude	: 700 mV ±1% (PAL), 100 ±1 IRE (NTSC)
	Sync Amplitude	: 300 mV ±1% (PAL), 40 ±0.4 IRE (NTSC)
	Burst Amplitude	: 300 mV ±3% (PAL), 40 ±1 IRE (NTSC)
	Analogue Audio	

Linearity : ±0.5dB (20-20kHz)
'THD+N : typ 70dB (at 9dBu)

Licensed Features : HD
: Radio Mode
: Genlock
: OSDM
: Dolby® Digital/Dolby® Digital Plus Decode

Quad Decoder with RF
2 x DE-101 + AM-100 /
1 x DE-101+1 AM-100

Number of channels : 4 (max 2 HD) or 8 (max 4 HD) per module set.
Connector for RF mod video : 2 F connector 75Ω with 2 or 4 channels per connector.

Video Decoding
Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".

Audio Decoding
Number stereo pairs per video : 1
Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out" (except pass-through).

VBI/VANC/DVB Sub Processing
Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".

VHF/UHF Output
Analogue modulation : PAL› B/G, D/K, I (5 MHz video BW)
SECAM › B/G, D/K (5 MHz video BW)
NTSC › M
RF output frequency range : 47–862MHz
RF tuning step size : 500 Hz
Channel setting flexibility : 4 channel version fully agile.
8 channel version semi agile, two adjacent channels with 8, 16 or 24 MHz spacing
Output level (per carrier) : 105-112 dBuV /ch (115 dBuV/ch for 4 ch version)

Output level adjustment step size (GUI) : 0.2 dB
Return loss : >16dB
Video carrier frequency stability : ±3 ppm
Intermodulation distance, (4/8 : > 60 dB, Measured:
Channel TV Modulator only) @ 115 dBV per channel, 2 channels per port
@ 112 dBV per channel, 4 channels per port
Carrier to noise, in-band : > 66 dB @110 dBuV/ch
Carrier to noise, adjacent channel : > 66 dB @110 dBuV/ch
Carrier to noise (40 channels combined) : Typ. 61 dB @110 dBuV/ch
Carrier to spurious, full band (40 - 862 MHz) : > 60 dB

Video (demodulated video)[11)]
Differential gain : <2 %
Differential phase : <2°
Group delay variations : <50 ns
Luminance non-linearity : <1 %
2T K factor : <1 %
Signal to noise ratio : >60dB

Audio – Mono
Audio carrier output level (relative to video carrier) : -13dB (default)
Audio carrier output level range : -10 to - 20 dB, 0.5 dB steps
Audio inter carrier frequency stability : < 1ppm
Modulation : FM

Audio – NICAM Stereo
NICAM modulation : According to ETSI EN 300 163 v1.2.1, Fully synchronous operation, Digital J17 pre-emphasis
NICAM carrier level relative to vision carrier : 20dB
NICAM carrier output level range : +3/-6 dB, 0.5 dB step
Frequency accuracy (relative to video) : ± 1 Hz
Audio output modes : Stereo/Dual Mono/Mono
Output precision : 10 bits

Audio – A2 Stereo
Two sound-carrier FM system (A2) : According to ITU-R BS.707, Annex 1
Audio carrier levels relative to vision carrier : f1= -13dB, f2= 20 dB
Audio carrier output level range : f1: -10 to -20 dB, f2: -17 to -27 dB, 0.5 dB steps
Audio output modes : Stereo/Dual Mono/Mono
Modulation : FM
Audio-bandwidth : 40 to - 15 000 Hz

Audio – MTS Stereo
Two sound-carrier FM system (A2) : FCC-OET60 and CEA -TVSB-5
Audio carrier levels relative to vision carrier : f1= -13dB
Audio carrier output level range : -10 to - 20 dB, 0.5 dB steps
Audio output modes : Stereo

Licensed Features : HD
: NICAM/A2 Stereo
: OSDM
: Dolby® Digital/Dolby® Digital Plus Decode

FM Radio
FM-100

Number of channels per module : Up to 8
Output connector : F-type female, 75Ω
Decoding formats supported : MPEG-1 layers 1 and 2 (Musicam)

FM Output
Modulation : FM
RF output frequency range : 87.5 - 108 MHz
Output level 8 carriers combined : 105 - 120 dBV
Output level adjustment step size (GUI) : 0.1 dB
Return loss : 18 dB
Channel separation L/R : > 46dB
Carrier to spurious : > 60dB
RDS insertion : UECP SPB490 or static

MPX Output
MPX Output MPX Test output level : 0 dBu
MPX Test output load impedance : 600Ω
MPX Test output connector : 1 BNC, service selectable from GUI

* Quad decoder is a combination of the decoder and TV modulator.
11) All measurements are carried out in room temperature at 20°C Using R&S ETL as demodulator

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 PS
	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 PS
	Cooling	
	Fans	: 6 fans
	Hot swap of fans	: Yes, common fan module with all 6 fans
	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	: 5 to 95% (non-condensing)
Electrical safety	IEC 60950-1	
EMC	EN 55022, EN55013, EN50083-2, EN55024, 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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appear

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