



Datasheet

# XC 5000

# XC 5100

## 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.

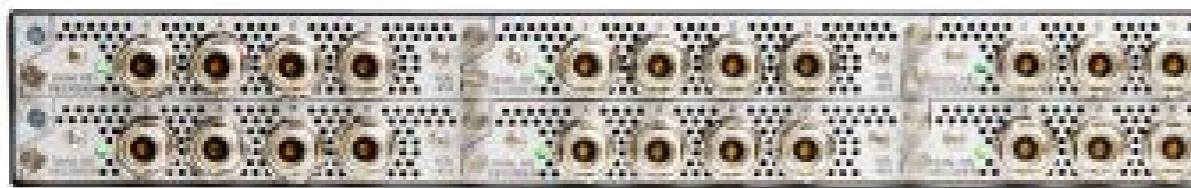
An advanced user friendly GUI offers an intuitive and comprehensive management of the many features of the system. The exhaustive multi-level alarm system, together with the easiness for integration to 3rd party management systems, enables full automatic control. The possibility of centralized monitoring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

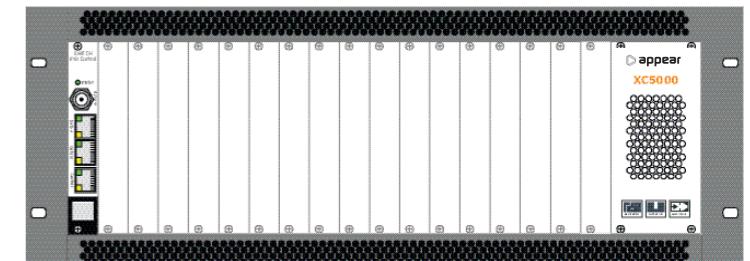
### 1RU - XC5100

- 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 x 177 x 400 (w x h x d mm)

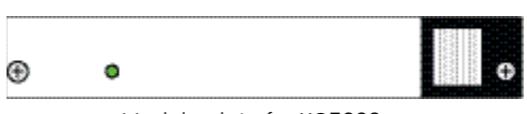


### 1RU (XC5100)

440 x 44 x 480 (w x h x d mm)

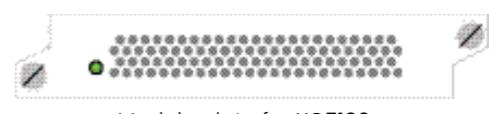


The XC5000 and XC5100 use the same set of modules and same SW, but the front plates are different.



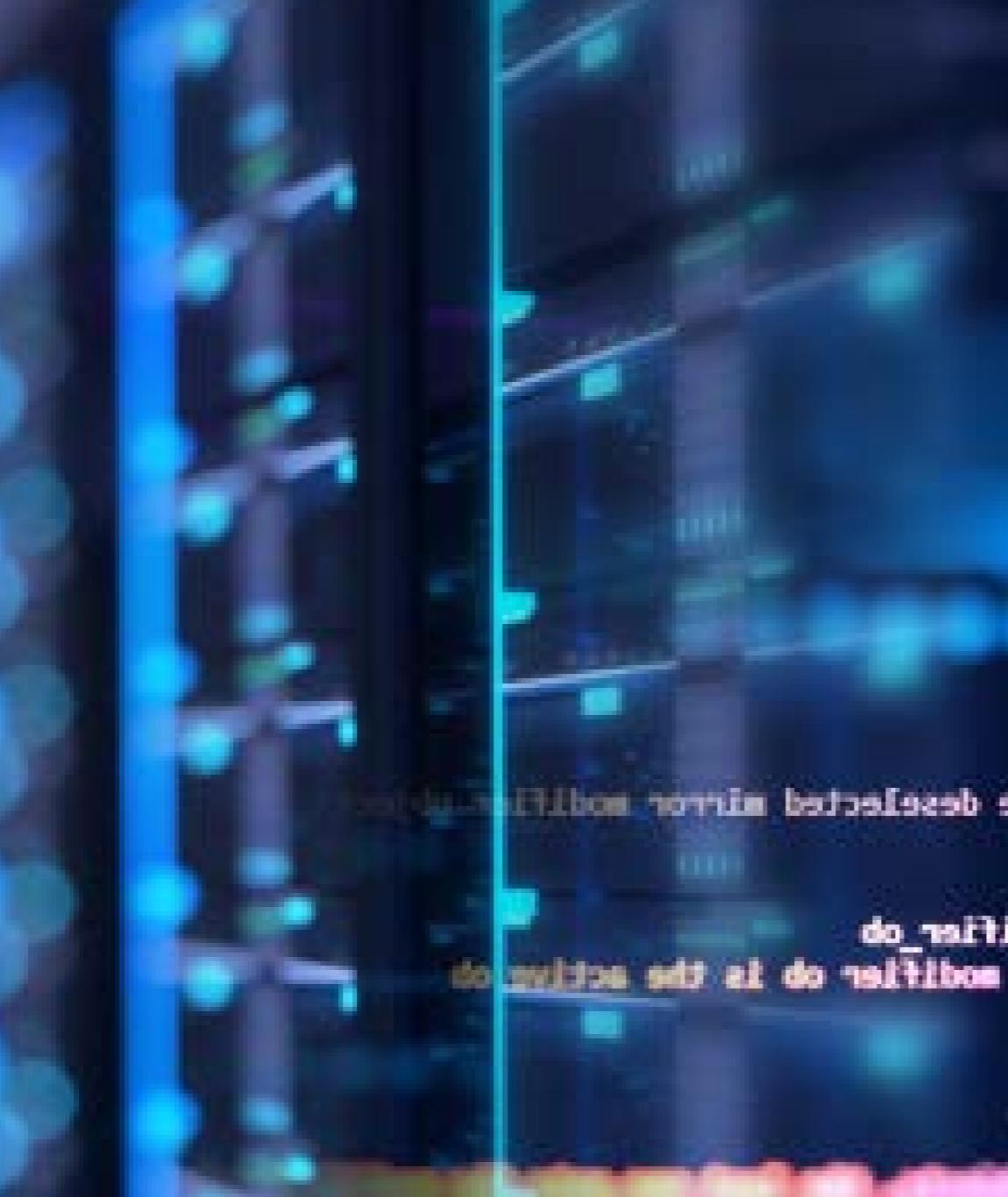
Module plate for XC5000

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



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
- 2 x Gbit RJ45 or SFP input or output port for data
- 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 x 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

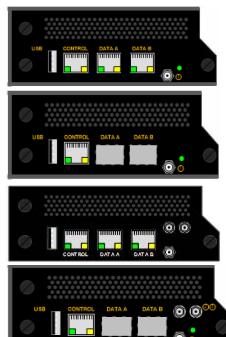
### Switch Module with Management

- 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 x 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

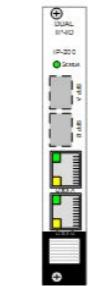


## INPUT MODULES

### Dual IP IO

IP-200

- 2 x Gbit RJ45 or SFP input port for data (or 1xin and 1xout)
- 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

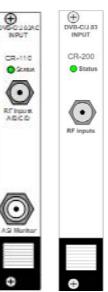
- 4 x ASI inputs
- 4 x BNC connectors
- 213 Mbit/s Burst mode or 72 Mbit/s Spread mode per input
- Supports reception of MPTS and SPTS
- Service filtering
- Input analysis
- 1 slot wide



### DVB-C Input

CR-110 / CR-200

- 4 x 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

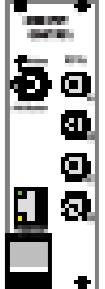
- 4 x DVB-S/S2/S2X inputs, 1 F connector per input
- Satellite standards:
  - DVB-S EN 300 421
  - DVB-S2 EN 302 307 – 1
  - DVB-S2X EN 302 307-2, Broadcast Services
- Frequency range 950 - 2150 MHz
- Constellation: QPSK, 8PSK, 16APSK, 32APSK
- Symbol rate:
  - DVB-S/S2/S2X: 1-45 MSym/s for QPSK, 8PSK, 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

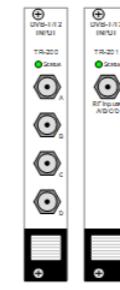
- 4 x 8VSB Inputs
- 4 x F connectors
- Frequency range 50 - 860 MHz
- ASI monitoring port
- Service filtering
- 2 slots wide



### DVB-T/T2 Input

TR-210, TR-211

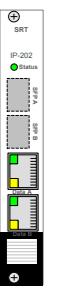
- 4 x DVB-T/T2 receivers per module.
- Input ports option:
  - 1 x F connector, signal is split and distributed internally
  - 4 x F connectors, one per demodulator
- Frequency range 47 - 862 MHz
- Carrier mode:
  - DVB-T: 2k, 8k
  - DVB-T2: 1k, 2k, 4k, 8k, 16k, 32k
- Modulation:
  - DVB-T: QPSK, 16QAM,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



### SRT

IP-202

- 2 x Gbit RJ45 or SFP ports for data (1xin and 1xout)
- Secure transmission over the Internet
  - Encryption algorithms: AES 128, AES 192, AES 256
- Reliable transmission over the Internet
  - 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 encodes to multiformat MPEG-4 TS output with IDR alignment. The encoder module accepts SDI/HDSI 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)



### 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



\*Other TV standards can be supported upon request

## 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 1920x1080p to 240x180p\*
- Resolution conversion
- Frame rate reduction
- GOP alignment
- Audio transcoding
- 1 slot wide

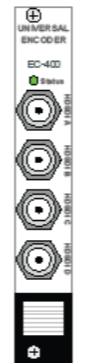
\*For complete list of available profiles, please contact Appear TV



## Universal Encoder - Multiscreen (OTT)

EC-400

- Encodes up to four services into multiple profiles
- 4xSDI or 2xHSDSI input with embedded audio
- Supports an extensive range of resolutions and frame-rates from full 720p60/50 HD down to 144p15/125
- 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/HSDSI 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

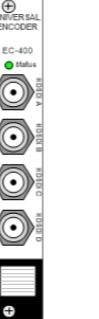
- Transcodes up to:
  - 4 HD with PIP
  - 12 SD with PIP
  - 16 SD no PIP
- Full decode and re-encode
- Audio transcoding
- Component pass-through
- Operates in 3 different Encoder Rate Control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
- Mediroom 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/HSDSI 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
- Provides integrated functionality normally requiring separate chassis or servers
- Customizable to specific operator demands
- High density
- Powerful MPEG processing with high throughput



## PROCESSING MODULES

### Bulk Descrambler

BD-100

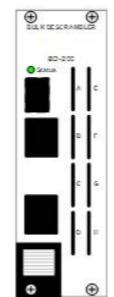
- Des scrambled up to 250 services (850 Mbit/s)
- Integrated with soft clients for ECM handling (no smart card required)
- Support for both DVB-CA and AES descrambling
- Integrated with Verimatrix and Latens
- BISS descrambling
- 1 slot wide



### SIM Bulk Descrambler

BD-200

- Des scrambled 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

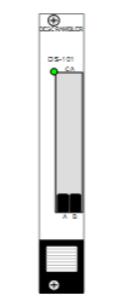
- DVB CA compliant scrambling (CSA) and AES compliant scrambling
- Scrambles up to 250 services, maximum 850 Mbit/s
- Supports scrambling of MPEG-2, MPEG-4 and HEVC
- DVB Simulcrypt compliant
- 10/100/1000BaseT IP interface towards CA system (RJ45)
- Handles up to 250 ECMS
- 1 slot wide



### Descrambler

DS-101

- 2 x 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 x 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

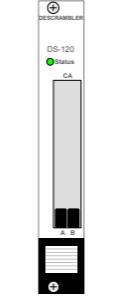


### Pro Descrambler

DS-120

- 2 x 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

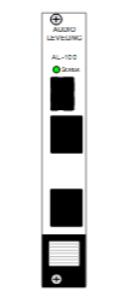


### Digital Audio Leveling

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: MPGEI2, 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 x Gbit output port for data (or 1xin and 1xout)
- 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 (SMPT 2022) (license)
- 1 slot wide



### ASI Output

AO-110

- 4 x ASI outputs
- 4 x 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 x 75Ω F connector + 1 x 50Ω SMA for monitoring per output
  - L-band: 1 x 50Ω SMA connector + 1 x 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

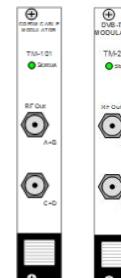
- 2 DVB-T2 or 2 DVB-T independent outputs
- 1 x BNC connector + 1 x BNC for monitoring per output
- Monitoring ports for each output
- VHF/UHF, 50 Ω BNC, 47–862 MHz
- Output levels: -15 to 0 dBm
- Supports multiplexing and transparent pass-through (mode A)
- Support for SFN (ETSI TS 102 733 T2-MI)
- 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 x 75 Ω F connector (2 x frequencies per output)
  - TM-200: 2 x 75 Ω F connector (1 x frequency 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

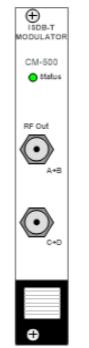
- 16 QAM modulators, 4 and 4 paired
- 2 x 75 Ω RF output (EN/IEC 60728-5) – F connector
- Full digital modulation and up-conversion
- DOCSIS 3.0 RF compliant
- 16 / 32 / 64 / 128 / 256 QAM modulation
- Frequency range of 47 – 1000 MHz
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP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



### ISDB-T Modulator

CM-500

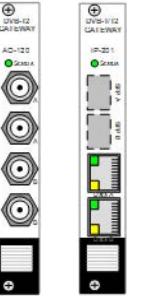
- 8 ISDB-T modulated carriers per module
- 2 x 75 Ω RF output – F connector
- Full digital modulation and up-conversion
- DOCSIS 3.0 RF compliant
- QPSK, 16QAM, 64 QAM modulation
- Frequency range of 47 – 862 MHz
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- Relevant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



### DVB-T/T2 GW

AO-120, IP-201

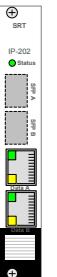
- IP or ASI out options:
  - 10/100/1000 BaseT (RJ45) or SFP output on IP
  - 2 x (1+1) ASI out
- Supports DVB-T MIPI insertion and DVB-T2 T2MI generation
- 4 independent gateways per module (2 for T2MI on ASI out)
- Supports up to 240 PLPs
- Regionalization options
- PAPR and MISO support
- Full (Re-)multiplexing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



### SRT

IP-202

- 2 x Gbit RJ45 or SFP ports for data (1xin and 1xout)
- Secure transmission over the Internet
  - Encryption algorithms: AES 128, AES 192, AES 256
- Reliable transmission over the Internet
  - 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 IRU 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 x 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

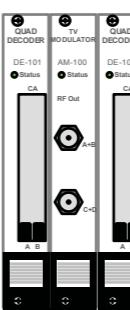
- 8 independent radio channels per module
- Decoding of MPEG-1,2 audio
- FM modulation and up-conversion to FM band
- Fully agile independent frequency setting for each channel
- RDS insertion - UECP SPB490 or static
- One RF output connector, F-type, with all 8 channels
- MPX test output
- 1 slot wide



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

## COMMON INPUT SPECIFICATIONS

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

## INPUT INTERFACE SPECIFICATIONS

IP Input/Output		DVB-T/T2 input		Licenced features	
IP-200	Interface Operational mode	: 2x10/100/1000 Base-T Ethernet and SFP : The module can be configured to; - 1 input and 1 output - Seamless (Hitless) IP in - Cloned IP out - Dual IP in - Dual IP out	: TR-210, TR-211	Number of DVB-T/T2 inputs per module Input connector Input connector configurations Input frequency range Input level range Minimum return loss	: 4 : F-female, 75 Ω : 1 F connector internally split or 4 F connectors : 47–862 MHz : -80 to -10 dBm (at T2, 8MHz, 256 QAM, 3/5, gaussian channel) : 10 dB
	Maximum data rate per port	: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1xIPIN + 1xIPOUT : Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode		DVB-T	: ETSI EN 300744, Nordig 2.0
	Maximum number of services per port	: 250		Key reference specification FFT Size Guard Intervals FEC code rate Constellation Channel bandwidth Hierarchy stream Hierarchy mode Spectral inversion	: 2k, 8k : 1/4, 1/8, 1/16, 1/32 : 1/2, 2/3, 3/4, 5/6, 7/8 : QPSK, 16-QAM, 64-QAM : 6, 7, or 8 MHz : High and Low priority : All : Automatic
	Data format	: UDP/RTP Multicast/Unicast			
	IP Input			DVB-T2	: ETSI EN 302755, Nordig 2.1
	IP de-jittering	: Yes, based on PCR or CBR		Key reference specification FFT Size	: 1k, 2k, 4k, 8k extended, 16k, 16k extended, 32k, 32k extended
	Forward Error Correction	: SMPTE 2022-1 250 input streams per data port		Guard Interval FEC frame FEC code rate (PLP) Constellation (PLP) Channel bandwidth Pilot pattern SISO and MISO transmission Single and Multiple-PLPs Spectral inversion Rotated constellation	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128 : Normal (64k), Short (16k) : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 : QPSK, 16-QAM, 64-QAM, 256-QAM : 5, 6, 7 or 8 MHz : P1-P8 : Yes : Yes : Automatic : Automatic
	IP Output				
	Multiplexing	: Yes		Licenced features	: DVB-T2 demodulation
	Forward Error Correction	: SMPTE 2022-1 250 output streams per data port			
	Lisenced features	: Seamless input, Cloned IP Out : FEC in, FEC out, FEC in/out : Multiplexing : IP output redundancy			
ASI Input					
AI-110	Key reference specification	: EN 50083-9			
	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					
SR-120	Key reference specification	: EN 300 421, EN 302 307 part 1 and 2			
	Connector	: F female, 75Ω			
	Number of inputs per module	: 4			
	Frequency range	: 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			
			CR-110		
			CR-200		

8-VSB Input (ATSC) <b>TR-300</b>	<b>Key reference specification</b> Connector Number of inputs per module Input level Frequency range Modulation Band	: ATSC A/53 : F female, 75Ω : 4 : -34 to +40 dBmV : 50–860 MHz : 8-VSB : Broadcast	<b>Clock Modes</b> Aspect Ratio Control PCR PID End-to-end Encoder Delay	: Locked to HDSDI/SDI input : Manual, WSS, Video Index or AFD Codes : PCR on Video PID or as separate PID : Typical 5000ms (4000ms reduced delay mode)
ISDB-T/SBTVD-T <b>TR-401</b>	<b>Key reference specification</b> <b>Channel bandwidth</b>  <b>RF Input specification</b> <b>Number of inputs per module</b> <b>Number of input ports</b> Connector Frequency range Input power level  <b>Return loss</b>  <b>Demodulation</b> FEC Spectrum inversion	: ARIB STD-B31 : 6, 7 and 8 MHz  : 4 independent tuner/demodulators : 1 (internal splitter feeding the 4 tuners) : F female, 75Ω : 50–860 MHz : -10 dBm to -76 dBm (QPSK, 2/3) : -10 dBm to -95dBm (64 QAM, 7/8)  : 10dB  : DQPSK, QPSK, 16QAM, 64QAM : 1/2, 2/3, 3/4, 5/6, 7/8, Automatic  : Automatic	<b>Audio Encoder</b> Number of encoded stereo pairs per main video : 8  Audio CODECS	: Locked to HDSDI/SDI input : Manual, WSS, Video Index or AFD Codes : PCR on Video PID or as separate PID : Typical 5000ms (4000ms reduced delay mode)
SRT <b>IP-202</b>	<b>SRT Input/Output</b> Interface Operational mode Maximum data rate in total Maximum number of services per port Transmission modes Encryption Data format  <b>SRT Input</b> IP de-jittering Receive latency  <b>SRT Output</b> MPEG-TS output  <b>Licensed features</b>	: 2x10/100/1000 Base-T Ethernet and SFP : 1 data port input and 1 data port output : Up to 35 Mbit/s : Limited by total throughput : Caller, Listener and Rendezvous : AES I28, AES I92, AES 256 : SRT  : Yes, based on PCR or CBR (after SRT de-encapsulation) : Configurable retransmission buffer size, 0 – 8000 ms  : Only SPTS  : SRT Input, SRT Output	<b>Audio Channel Modes</b>  AAC Data Encapsulation Audio Lipsync Adjustment Audio Level Adjustment  <b>Automatic Audio Levelling</b> Key specification Number of stereo Target Level Initial Adjustment Max. Adjustment step (per day)	: HE-AAC v2 : AAC-LC (2.0, 5.1 <sup>1)</sup> ) : HE-AAC v1 (2.0, 5.1 <sup>1)</sup> ) : HE-AAC V2 : Dolby® Digital <sup>2)</sup> : Dolby® Digital Plus <sup>3)</sup> : Dolby® Digital/Dolby® Digital Plus pass-through : Stereo, Mono and Dual Mono, 5.1 <sup>1)</sup> and 7.1 (Dolby® Digital/Dolby® Digital Plus only) : ADTS or LATM selectable per encoded channel : +500ms / -200ms : +6/-10dB
			<b>Picture-in-Picture</b> Density Codec Bitrate Resolutions GOP Size  <b>Video Pre-processing</b> Inverse Telecine Detection De-blocking Filter Motion Compensated Temporal Filter (MCTF) WSS Blanking  <b>Video Re-scaling</b> Horizontal Rescaling  <b>Logo Insertion</b> Maximum Size  <b>Ancillary Data and VBI</b> Teletext processing	: EBU TECH 3344 (Service Loudness – EBU R128) : 24 : -18 LUFS to -31 LUFS (rec. -23 LUFS) : -20 dB to 20 dB : 0.5 dB  : One PiP available for each main channel : MPEG-4 AVC BP or MP : Min 96kbps, Max 500kbps (CBR) : 320x240, 192x192, 176x144, 128x96 : Configurable independent of main channel  : Detect if input is 3:2 pull down and omit repeated fields. : Adjustable : Adjustable : Removal of line 23 WSS from active video  : From 1920 to 1440, 1280 or 960 : From 1280 to 960 or 640 : From 720 to 704, 640, 544, 528, 480 or 352 : Including aspect ratio conversion, letter-/pillar boxing : Including aspect ratio conversion, letter-/pillar boxing and de-interlacing. : 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.  : 192x128 (SD) : 360x180 (HD 720P) : 480x270 (HD 1080i) : User selectable (pixel accuracy) : PNG (8-bit RGB) file per encoded channel  : Extracted from VANC OP47, SMPTE-2031 or VBI and trans-coded to EN 301755.

## ENCODING/TRANSCODING SPECIFICATIONS

Universal Encoder – High VQ Broadcast <b>EC-400</b>	<b>Density</b> Number of channels per module	: Up to 1 HD or 2 SD	<b>Down Conversion HD to SD</b> <b>Up Conversion SD to HD</b>
	<b>Video Input</b> HD Res. / Frame rates (SMPTE 292M)	: 1080i – 29.97 fps or 25 fps : 720p – 59.94 fps or 50 fps	<b>Frame Rate Conversion</b>
	SD Res. / Frame rates (SMPTE 259M)	: 480i – 29.97 fps : 576i – 25 fps	: 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
	<b>Audio Inputs</b> Embedded Audio	: SMPTE 272M (SD), SMPTE 299M (HD) : Sample rate 48kHz, synchronous to video	<b>Logo Insertion</b> Maximum Size
	<b>Video Encoder</b> Architecture MPEG-2 profiles	: Dual Pass with look ahead : MP@HL (HD) up to 60Mbps : MP@ML (SD) up to 16Mbps	<b>Positioning</b> File format
	MPEG-4 AVC profiles	: MP@L4.2, HP@L4.2 (HD) up to 55Mbps : MP@L3.1, HP@L3.1 (SD) up to 16Mbps	<b>Ancillary Data and VBI</b>
	Rate Control Modes	: Constant Bit Rate (CBR) : Capped VBR (CVBR) with QP target	Teletext processing
	GOP structure	: Statistical Multiplexing : Dynamic with Scene Change Detection and Adaptive GOP structure.	: 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

Universal Encoder - Dense <b>EC-400</b>	<b>Closed Captioning (EIA 608/EIA 708)</b>	: Extracted from VANC and injected into video stream.	delay)
	<b>Digital Programme Insertion (DPI)</b>	: SCTE104 triggers extracted from VANC and transcoded to SCTE35 TS triggers.	
	<b>Active Format Description (AFD)</b>	: Extracted from VANC SMPTE 2016 and injected into video stream.	
	<b>Dolby® E metadata</b>	: External Dolby® E metadata extracted from VANC SMPTE 2020 used for Dolby® Digital/Dolby® Digital Plus encoding configuration.	
	<b>Wide Screen Signalling (WSS)</b>	: Extracted from VBI line 23 or VANC SMPTE 2031 and transcoded to EN 301755	
	<b>Video Programming System (VPS)</b>	: Extracted from VANC SMPTE 2031 and transcoded to EN 301755	
	<b>Video Inserted Time Code (VITC)</b>	: Extracted from VANC SMPTE-RP188 and injected into video stream.	
	<b>Auxillary Data Injection</b>	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.	
	<b>Subtitling conversion</b>	: Conversion from EBU Subtitling to DVB Subtitling	
	<b>Statistical Multiplexing</b>		
<b>Licensed Features</b>	<b>Statmux Controller</b>	: Local within chassis	
	<b>Max. Number of Groups per chassis</b>	: Maximum 16, one per encoder/transcoder module	
	<b>Max. Number of Services within group</b>	: 32	
	<b>Number of Encoder Channels HD</b>	: Number of Encoder Channels HD	
	<b>Number of Encoder Channels SD</b>	: Number of Encoder Channels SD	
	<b>Statistical Multiplexing - Number of Channels</b>	: Statistical Multiplexing - Number of Channels	
	<b>MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs</b>	: MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs	
	<b>Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs<sup>4)</sup></b>	: Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs <sup>4)</sup>	
	<b>Dolby® E Decode - Number of channels</b>	: Dolby® E Decode - Number of channels	
	<b>Subtitle transcoding from TTX to DVB</b>	: Subtitle transcoding from TTX to DVB	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>OSDM</b>	: OSDM	
	<b>Automatic Audio Levelling</b>	: Automatic Audio Levelling	
	<b>Subtitle PTS re-stamping</b>	: Subtitle PTS re-stamping	
	<b>Density</b>		
	<b>Number of channels per module</b>	: Up to 4 HD or 4 SD	
	<b>Video Input</b>		
	<b>HD Resolutions/Frame rates (SMPTE 292M)</b>	: 1080i – 29.97Hz or 25Hz	
		: 720p – 59.97Hz or 50Hz	
	<b>SD Resolutions/Frame rates (SMPTE 259M)</b>	: 480i – 29.97Hz	
		: 576i – 25Hz	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Audio Inputs</b>		
	<b>Embedded Audio</b>	: SMPTE 272M (SD), SMPTE 299M (HD)	
		Sample rate 48kHz, synchronous to video	
		PCM or Dolby® Digital/Dolby® Digital Plus	
	<b>Video Encoder</b>		
	<b>Architecture</b>	: Single Pass with look ahead	
	<b>MPEG-2 profiles</b>	: MP@HL (HD) up to 60Mbps	
		: MP@ML (SD) up to 16Mbps	
	<b>MPEG-4 AVC profiles</b>	: MP@L4.2, HP@L4.2 (HD) up to 55Mbps	
		: MP@L3.0, HP@L3.0 (SD) up to 16Mbps	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Rate Control Modes</b>	: Constant Bit Rate (CBR)	
		: Capped VBR (CVBR) with QP target	
		: Statistical Multiplexing	
	<b>GOP structure</b>	: Dynamic with Scene Change Detection and Adaptive GOP structure.	
	<b>Clock Modes</b>	: Locked to HDSDI/SDI input or to local clock	
	<b>Aspect Ratio Control</b>	: Manual, WSS, Video Index or AFD Codes	
	<b>PCR PID</b>	: PCR on Video PID or as separate PID	
	<b>End-to-end Encoder Delay</b>	: Video Quality optimized for 4500ms (3000ms reduced)	
	<b>Audio Encoder</b>		
	<b>Number of encoded stereo pairs per main video</b>	: 8 <sup>4)</sup>	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Audio CODECS</b>	: 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	
		: Multichannel, Stereo, Mono, Dual Mono	
		: ADTS or LATM selectable per encoded channel	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Audio Channel Modes</b>	: +500ms / -200ms	
	<b>AAC Data Encapsulation</b>	: +6/-10dB	
	<b>Audio Lipsync Adjustment</b>		
	<b>Audio Level Adjustment</b>		
	<b>Automatic Audio Levelling</b>		
	<b>Key specification</b>	: EBU TECH 3344 (Service Loudness – EBU R128)	
	<b>Number of stereo</b>	: 24	
	<b>Target Level</b>	: -18 LUFS to -31 LUFS (rec. -23 LUFS)	
	<b>Initial Adjustment</b>	: -20 dB to 20 dB	
	<b>Max. Adjustment step (per day)</b>	: 0.5 dB	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Video Pre-processing</b>		
	<b>WSS Blanking</b>	: Removal of line 23 WSS from active video	
	<b>Picture-in-Picture</b>		
	<b>Density</b>	: One PiP available for each channel	
	<b>Codec</b>	: MPEG-4 AVC BP or MP	
	<b>Bitrate</b>	: Min 96kbps, Max 500kbps (CBR)	
	<b>GOP Size</b>	: Configurable independent of main channel	
	<b>Resolutions</b>	: 320x240, 192x192, 176x144, 128x96, 96x96	
	<b>Video Re-scaling</b>		
	<b>Horizontal Rescaling</b>	: From 1920 to 1440, 1280 or 960	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Down Conversion HD to SD</b>	: From 1280 to 960 or 640	
	<b>Up Conversion SD to HD</b>	: From 720 to 704, 640, 544, 528	
	<b>Frame Rate Conversion</b>	: Including aspect ratio conversion, letter-/pillar boxing	
		: Including aspect ratio conversion, letter-/pillar boxing and de-interlacing.	
		: 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.	
	<b>Logo Insertion</b>		
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Maximum Size</b>	: 192x128 (SD)	
		: 360x180 (HD 720P)	
		: 480x270 (HD 1080i)	
	<b>Positioning</b>	: User selectable (pixel accuracy)	
	<b>File format</b>	: PNG (8-bit ARGB) file per encoded channel	
	<b>Ancillary Data and VBI</b>		
	<b>Teletext processing</b>	: Extracted from VANC OP47, SMPTE-2031 or VBI and transcoded to EN 301755.	
	<b>Closed Captioning (EIA 608/EIA 708)</b>	: Extracted from VANC and injected into video stream.	
	<b>Digital Programme Insertion (DPI)</b>	: SCTE104 triggers extracted from VANC and transcoded to SCTE35 TS triggers.	
	<b>Active Format Description (AFD)</b>	: Extracted from VANC SMPTE 2016 and injected into video stream.	
<b>Universal Encoder - Dense <b>EC-400</b></b>	<b>Dolby® Metatdata</b>	: SMPTE 2020 metadata extracted from VANC and injected into audio stream.	
	<b>Wide Screen Signalling (WSS)</b>	: Extracted from VBI line 23 or VANC SMPTE 2031 and transcoded to EN 301755	
	<b>Video Programming System (VPS)</b>	: 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.

Video Inserted Time Code (VITC)  <b>Auxiliary Data Injection</b> Subtitling insertion can be added to service through an Appear TV Input  Subtitling conversion  <b>Statistical Multiplexing</b> Statmux Controller Maximum Number of Groups per chassis Maximum Number of Services within group  <b>Licensed Features</b>	: Extracted from VANC SMPTE-RP188 and injected into video stream.	: From 30/29.97/50 reduced to ½
	: EBU Subtitling, DVB Subtitling, Teletext subtitling PIDs interface (e.g. ASI, IP). PTS can be re-	: Interlaced to progressive conversion : Yes, insertion of P frame
	: Conversion from EBU Subtitling to DVB Subtitling	: Dynamic : Ranging from 4x HD to 28 sub SD per module, depending on complexity of profiles
	: Local on a Universal Encoder or Transcoder module	
	: Maximum 16, one per encoder/transcoder module	
	: 32	
	: 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	
Universal Encoder - MS/OTT <b>EC-400</b>	: Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs <sup>4)</sup>	
	: Dolby® E Decode - Number of channels	
	: Subtitle transcoding from TTX to DVB	
	: OSDM	
	: Automatic Audio Levelling	
	: Subtitle PTS re-stamping	
	: 2xHDSDI/4xSDI, 4 BNC 75 Ω	
	: SMPTE 292M (HD SDI), SMPTE 259M (SD SDI)	
		Encoder- CVBS input <b>AC-100</b>
		Number of channels Input Port
<b>Video Pre-processing</b> WSS Blanking		
	: Removal of line 23 WSS from active video	
		Video Input
		: 4 SD or 2 SD+PIP
		: 4 HD BNC 75 Ω, one per channel
		: 25 Pin Compact D-sub for audio: - 4 balanced analogue audio inputs
		- 2 AES/EBU inputs
		: PAL B/G/I/D/K
		: SECAM D/K
		: PAL Nc
<b>Video Encode</b> MPEG-4 AVC Profiles		: PAL M
		: NTSC M
	: High profile up to HP@L4.0	
	: Main profile up to MP@L4.0	
	: Base profile up to BP@L4.0	
	: 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	
<b>HD and sub HD resolutions<sup>5)</sup></b>	: 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	
	: 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	
<b>SD and sub SD resolutions<sup>5)</sup></b>	: 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	
<b>De-interlacing</b> Scene change detection GOP structure Number of output profiles  <b>Audio Encode</b> AAC-LC HE-AAC v1 HE-AAC v2 Sample rates Number of channels per video source		
		: Dynamic
		: Ranging from 4x HD to 28 sub SD per module, depending on complexity of profiles
<b>Reformatting/ Rescaling</b> Format conversion		
		: From HD to sub SD
<b>Aspect Ratio Control</b> Aspect Ratio Modes		
		: Transparent Input to Output (Controlled by AFD), Manual 4:3 or 16:9
<b>Ancillary Data and VBI</b> Closed Captioning (EIA 608/EIA 708)		
		: Extracted from VANC and injected into video stream.
<b>Video Pre-processing</b> Inverse Telecine Detection De-blocking Filter Motion Compensated Temporal Filter (MCTF) Horizontal Rescaling WSS Blanking		
		: Yes
		: Adjustable
		: Adjustable
		: From 720 to 704, 640, 544, 528, 480 or 352
		: Removal of line 23 WSS from active video
<b>Logo Insertion</b> File Format Position Maximum Size		
		: PNG (8-bit RGBA) file per encoded channel
		: User defined (pixel resolution)
		: 192 x 128 (SD)
<b>Ancillary Data and VBI</b> VBI Extraction and processing		
		: Closed Captioning (EIA 708)
		: Teletext, WSS, VPS
<b>Video Encoder</b> Number of channels per module MPEG-2 profiles MPEG-4 AVC profiles Rate Control Modes		
		: 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)
		: up to HP@ML
		: up to HP@L3.0
		: Constant Bit Rate (CBR)
		: Capped VBR (CVBR) with QP target
		: 4SD: From 250kbps to 10Mbps
		: 2SD: From 250kbps to 19Mbps
		: Fixed or Dynamic with Scene Change Detection and
		: 416x240, 352x288, 352x240, 192x192, 128x128, 128x96
Frame rate conversion		: 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

<b>Encoder - RF Input</b> <b>AC-200</b>	<b>Audio Encoder</b>	: 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"	SD 50Hz resolutions SD 60Hz resolutions HD 1080i resolutions HD 720p resolutions	: HP@L3.2, 300kbps – 16Mbps : High 4:2:2@L4.2, 4.5Mbps – 80Mbps CABAC/100Mbps : 720/704/640/544/528/480/352 x 576i25 : 720/704/640/544/528/480/352 x 480i30/29.97 : 1920/1440/1280/960 x 1080i30/29.97/25 : 1280/960/640 x 720p60/59.94/50
	<b>Audio Decoder</b>	Audio CODECS	: MPEG-1 Layer 2 :AAC-LC : HE-AAC v1 : HE-AAC v2 : Dolby® Digital / Dolby® Digital Plus : Dolby® E : 5.1 to 2.0 for AAC and Dolby®	
	<b>Video Encoder</b>	Audio Downmix	: MP@HL, 1Mbps – 80Mbps : MP@ML, 600kbps – 15Mbps : MP@L4.2, 500kbps – 55Mbps : HP@L4.2, 1Mbps – 55Mbps : MP@L3.2, 300kbps – 16Mbps : HP@L3.2, 300kbps – 16Mbps : Constant Bit Rate (CBR) : Statistical Multiplexing : Dynamic with Scene Change Detection and Adaptive GOP structure. GOP structure	
	<b>Video Decoder</b>	MPEG-2 profiles	: Manual, Transparent input to output PCR PID End-to-end Encoder Delay	
	<b>Audio Encoder</b>	H.264 profiles	: Typically 5500ms (4500ms reduced delay mode)	
	<b>RF Input</b>	Rate Control Modes	: MPEG-1 Layer 2	
	TV systems	Aspect Ratio Control	: AAC-LC	
	RF inputs	PCR PID	: HE-AAC v1	
	Input frequency	End-to-end Encoder Delay	: HE-AAC v2	
	Frequency tuner step size		: Dolby® Digital	
<b>Encoder - CVBS Input</b> <b>AC-200</b>	<b>RF input level</b>		: Dolby® Digital Plus	
	– Max		: Pass though of all audio types	
	– Min (for un-weighted video SNR=30dB)		: Stereo, Mono, 5.1 and 7.1	
	<b>Video Encoder</b>	Audio Channel Modes	: ADTS or LATM selectable per encoded channel	
	Please refer to "Encoder -CVBS input"	AAC Data Encapsulation	: +500ms /-200ms	
	<b>Picture-in-Picture</b>	Audio Lipsync Adjustment	: +6/-10dB	
	Please refer to "Encoder -CVBS input"	Audio Level Adjustment	: Maximum 6 stereo transcodes per video, limited to 8	
	<b>Video Pre-processing</b>	Audio Transcode Density	transcode 5.1 per module. One 5.1 transcode consumes	
	Please refer to "Encoder -CVBS input"		resources equivalent to three stereo (2.0) transcodes.	
	<b>Logo Insertion</b>			
<b>Encoder - CVBS Input</b> <b>TC-400</b>	Please refer to "Encoder -CVBS input"			
	<b>Audio Encoder</b>	<b>Automatic Audio Levelling</b>	: EBU TECH 3344 (Service Loudness – EBU R128)	
	Audio CODECS	Key specification	: 24	
		Number of stereo	: -18 LUFS to -31 LUFS (rec. -23 LUFS)	
		Target Level	: -20 dB to 20 dB	
		Initial Adjustment	: 0.5 dB	
		Max. Adjustment step (per day)		
	<b>VBI</b>			
	Please refer to "Encoder -CVBS input"			
	<b>Auxillary Data Injection</b>			
<b>Universal Transcoder - High VQ Broadcast</b> <b>TC-400</b>	Injection of Private Data into service			
		<b>Picture-in-Picture</b>	: MPEG-4 AVC MP	
		Codec	: Min 96kbps, Max 400kbps (CBR)	
		Bitrate	: 192x192, 176x144, 128x96, 96x96	
		Resolutions	: Configurable independent of main channel	
		GOP Size		
	<b>Density</b>			
	Total Number of Video Transcodes	<b>Video Re-scaling</b>	: Including aspect ratio conversion, letter-/pillar boxing	
		Down Conversion HD to SD	: Including aspect ratio conversion, letter-/pillar-boxing	
		Up Conversion SD to HD	and de-interlacing.	
<b>Universal Transcoder - High VQ Broadcast</b> <b>TC-400</b>	<b>Video Decoder</b>	Frame Rate Conversion	: From 60 fps to 60/30 fps	
	MPEG-2 profiles		: 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	
	H.264 profiles			

		: Frame rate up conversion only for interlaced input	
(1080i/576i/480i) to 720p output.			
<b>Logo Insertion</b>			
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	
<b>Subtitling</b>			
Subtitling conversion		: Conversion from EBU Subtitling to DVB Subtitling	
DVB/EBU Subtitling burn in		: Yes, burned into Transcoded Video	
<b>Auxillary Data</b>			
Pass Through		: All auxillary data components (EBU Subtitling, DVB Subtitling, 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	
<b>Video Processing</b>			
WSS Blanking		: Line 23	
<b>Statistical Multiplexing</b>			
Statmux Controller		: Local within chassis. (Management module.)	
Maximum # Groups		: Max 16, one group per encoder/transcoder module.	
Maximum # Services within group		: 32	
<b>Licensed Features</b>			
		: 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			
<b>TC-200, TC-400</b>	<b>Density</b>		
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.			
<b>Video Decoder</b>			
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	
<b>Audio Decoder</b>			
Audio Codecs		: MPEG1 Layer 2 (2.0) : AAC-LC (2.0) : HE-AACv1 (2.0)	
<b>Logo Insertion</b>			
Maximum Size		: 192x128 (SD) : 360x180 (HD 720P) : 480x270 (HD 1080i)	
Audio Downmix			: HE-AACv2 (2.0) : Dolby® Digital (2.0/5.1)/Dolby® Digital Plus (2.0/5.1/7.1)
<b>Video Encoder</b>			: Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of transcode process.
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)
<b>Audio Encoder</b>			
Audio CODECS		: MPEG-1 Layer 2 : AAC-LC : HE-AAC v1 : HE-AAC v2 : Dolby® Digital (TC-400) : Dolby® Digital Plus (TC-400)	
Audio Channel Modes			: Pass though of all audio types : Stereo, Mono : 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			: <b>TC-400</b> – Max 6 stereo transcodes per video, limited to 24 stereo transcodes per module.
Number of audio per channel			: <b>TC-200</b> – 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 : Max 6
<b>Automatic Audio Levelling</b>			
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
<b>Picture-in-Picture</b>			
Codec			: MPEG-4 AVC MP
Bitrate			: Min 96kbps, Max 400kbps (CBR)
Resolutions			: 320x240, 192x192, 176x144, 128x96, 96x96
<b>Video Re-scaling</b>			
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
<b>Logo Insertion</b>			: Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output
Maximum Size			

<b>Positioning</b>	: User selectable (pixel accuracy)	: 432p, 768
<b>File format</b>	: PNG (8-bit ARGB) file per encoded channel	: 360p, 640, 480
<b>Subtitling</b>		: 320p, 480
Subtitling conversion	: Conversion from EBU Subtitling to DVB Subtitling	: 288p, 512
DVB/EBU Subtitling burn in	: Burned into Transcoded Video. Restricted to 4 channels per module	: 270p, 480, 360
<b>Auxillary Data</b>		: 256p, 144
Auxillary data components (EBU Subtitling, DVB Subtitling, Teletext etc.)		: 240p, 320
are passed through Lipsync to video is maintained.		: 216p, 384
<b>Video Processing</b>		: 180p, 320, 240
WSS (line 23) blanking	: Yes	: 640p, 960
<b>Statistical Multiplexing</b> (Not supported in initial release)		: 576p, 1024, 768, 720, 352
Statmux Controller	: Local within chassis.	: 480p, 854, 720, 640, 352
Maximum # Groups	: Maximum 16, one per encoder/transcoder module.	: 432p, 768
Maximum # Services within group	: 32	: 360p, 640, 480
<b>Licensed Features</b>		: 320p, 480
	: Video Transcode capacity in steps of blocks capable of 1xHD/4xSD	: 288p, 512
	: High Density Mode (dense-sd for 4xSD per block)	: 270p, 480, 360
	: Statistical Multiplexing - Number of Channels	: 256p, 144
	: MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs	: 240p, 320
	: Dolby® Digital/Dolby® Digital Plus Decode - Number of Stereo Pairs	: 216p, 384
	: Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs	: 180p, 320, 240
	: Subtitle transcoding from TTX to DVB	
	: OSDM	: From 60/59.94/50 reduced to 1/2, 1/4
	: Automatic Audio Levelling	: From 50 reduced to 1/2 or 1/4
Mediaroom:	: Approved	: From 30/29.97/50 reduced to 1/2
<b>Universal Transcoder - MS/OTT</b>		: Ranging from 4 × HD to 28 × sub SD per module, depending on complexity of profiles
<b>TC-400</b>		: Frame accurate key frame alignment across all profiles.
		: Fixed IDR to IDR distance.
		: Dynamic GOP structure with Scene Change Detection.
<b>Number of input channels</b>	: Up to 4 HD channels	
<b>Video Decoder</b>		
MPEG-2 profiles	: Ranging from MP@ML (SD) to MP@HL (HD)	
MPEG-4 AVC profiles	: up to HP@L4.2	: Interlaced to progressive conversion
	: up to MP@L4.2	: From HD to sub SD
	: up to BP@L4.1	
<b>Audio Decoder</b>		
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)	
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)	
	: MPEGI Layer II	
Pass-through	: AAC-LC	
	: HE-AACv1/2	
	: Dolby® Digital (AC-3)	
	: Dolby® Digital Plus (E-AC-3)	
<b>Video Encode</b>		
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 <sup>8)</sup>	: 720p, 1280, 960, 854	
Resolutions @ 29.97 fps or 25.00 fps <sup>9)</sup>	: 1080p, 1920, 1440, 1280, 960, 720, 640	
	: 720p, 1280, 960, 854	
	: 640p, 960	
	: 576p, 1024, 768, 720, 352 <sup>9)</sup>	
	: 540p, 960	
	: 480p, 854, 720, 640, 352	
<b>Resolutions @ 14.99 fps or 12.50 fps<sup>8)</sup></b>		
<b>Frame rate conversion</b>		
<b>Number of profiles</b>		
<b>Key Frame Alignment</b>		
<b>GOP control</b>		
<b>Audio Encode</b>		
<b>Capacity</b>	: Up to 8 per module	
<b>Output format</b>	: 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	
<b>Sample rates</b>	: 32, 48kHz	
<b>Reformatting/Rescaling</b>		
<b>De-interlacing</b>	: Interlaced to progressive conversion	
<b>Format conversion</b>	: From HD to sub SD	
<b>Aspect Ratio Control</b>		
<b>Aspect Ratio Modes</b>	: Transparent Input to Output, Manual 4:3 or 16:9	
<b>AFD Modes</b>	: Generated based on incoming AFD and format conversion.	
<b>VBI</b>		
<b>Digital Programme Insertion (DPI)</b>	: SCTE35 passthrough*	
	: I-frame insertion based on SCTE35 marker*	
<b>Pass-through</b>		
	: Components such as EBU Teletext and DVB Subtitling can be passed through. Synchronization to video will be maintained.	
<b>Closed Captioning</b>		
	: EIA-608n and EIA-708 passed through.	
<b>subtitling</b>		
<b>DVB Subtitling burn in</b>	: Yes, burned into Transcoded Video	
<b>Licensed Features</b>		
	: Dolby® Digital/Dolby® Digital Plus Decode	

## PROCESSING MODULES SPECIFICATIONS

Audio leveling	Number of audio tracks	: 250 stereo
<b>AL-100</b>	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	<b>Audio Encoder Inputs</b>	Number of SDI/HSDI inputs : 4
	Adjustment mode	: Static		Number of stereo audio per SDI Input : 8
		: Integrated with 3rd party SW solutions for automatic adjustment		Embedded Audio : SMPTE 272M (SD), SMPTE 299M (HD)
	<b>Licensed Features</b>	: Number of audio channels		Number of AES67 inputs : Sample rate 48kHz, synchronous
				: 1 - 32
Bulk Descrambling <b>BD-100</b>	Interface	: SW based smart card	<b>Audio Transcoder Inputs</b>	
	CA system support	: Please contact Appear TV*	Number of MPEG TS inputs	: 1 - 32
	BISS support	: Mode 1, Mode E		
	Maximum data rate	: Up to 850 MBit/s		
	Number of services per module	: 250	<b>Audio Decoding (Transcoding Mode)</b>	
	Scrambling algorithms	: DVB-CSA and AES	Audio Codecs	: MPEG-1 Layer 2 (2.0)
	<b>Licensed Features</b>	: Number of descrambled channels		: AAC-LC (2.0, 5.1)
		: Biss, Verimatrix, Latens		: HE-AACv1 (2.0, 5.1)
				: HE-AACv2 (2.0)
				: Dolby® Digital (2.0, 5.1)
SIM Bulk Descrambling <b>BD-200</b>	Interface	: SIM based smart card		: Dolby® Digital Plus (2.0, 5.1, 7.1)
	Number of SIM card readers	: 8 in front and 8 behind front plate (Only 8 in front can be replaced while in operation)	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.
	CA system support	: Conax, Cryptoguard		
	BISS support	: Mode 1, Mode E	<b>Audio Encoding (All Modes)</b>	
	Maximum data rate	: Up to 850 MBit/s	Audio Codecs	
	Number of services per module	: 250	Mono (kbps)	5.1
	Scrambling algorithms	: DVB-CSA and AES	Stereo (kbps)	7.1
	<b>Licensed Features</b>	: Number of descrambled channels	MPEG-1 Layer 2	32 / 192
		: Conax	MPEG-1 Layer 3 (MP3) 32 / 320	64 / 384
DVB Descrambling <b>DS-101</b>	Interface	: DVB Common Interface	AAC-LC	N/A
	CA system support*	: BetaCrypt, Conax, Cryptoworks, Irdeto, Mediaguard, Viaccess, NDS Viasat, Nagra	HE-AAC v1	N/A
	Number of services per CAM	: 10 (requires multi service CAM)	HE-AAC v2	192/640
			Dolby® Digital	N/A
DVB Descrambling gen. 2 <b>DS-110</b>	Interface	: DVB Common Interface	Dolby® Digital Plus	224/640
	CA system support*	: BetaCrypt, Conax, Cryptoworks, Irdeto, Mediaguard, Viaccess, NDS Viasat, Nagra, Panaccess		384/1024
	Maximum data rate per CAM	: 100 Mbps		
Pro Descrambler <b>DS-120</b>	Interface	: DVB Common Interface	<b>Bitrate minimum/maximum (at 48 kHz)</b>	
	CA system support**	: Sky UK - NDS ProCAM	Mono (kbps)	5.1
	Maximum data rate per CAM	: 100Mbps	Stereo (kbps)	7.1
Scrambling <b>CA-100</b>	Scrambling algorithm	: DVB-CSA and AES	MPEG-1 Layer 2	32 / 192
	Maximum data rate	: Up to 850 MBit/s	MPEG-1 Layer 3 (MP3) 32 / 320	64 / 384
	Fixed Key Scrambling	: BISS, BISS-E, BISS2, BISS2-E	AAC-LC	N/A
	Number of services per scrambler card	: 250 (depending on SW license)	HE-AAC v1	N/A
	Video format	: Transport stream; MPEG-2, MPEG-4, HEVC	HE-AAC v2	192/640
	Interface towards CA System	: Simulcrypt interface	Dolby® Digital	N/A
	Number of CA systems	: 4 CA systems simultaneously	Dolby® Digital Plus	224/640
	EMM	: Yes		384/1024
	Entropy reduction	: Yes for DVB No for AES		
	<b>Licensed Features</b>	: Number of descrambled channels		
		: PVR assist		
EPG <b>EP-200</b>	Ingest	: EIT table from any port, XMLTV	<b>Automatic Audio Levelling</b>	
	Output	: Re-generated EIT table	Key specification	: EBU TECH 3344 (Service Loudness – EBU R128)
Audio Processor <b>AP-100</b>	<b>Density</b>	: 32	Number of stereo	: 24
	Number of stereo channels	: 5.1 uses 3x stereo pairs and 7.1 uses 4x stereo pairs	Target Level	: -18 LUFS to -31 LUFS (rec. -23 LUFS)
		: Maximum of 20 MP3 audio encoded stereo channels	Initial Adjustment	: -20 dB to 20 dB
			Max. Adjustment step (per day)	: 0.5 dB
	<b>Licensed Features</b>		<b>Audio Encoder TS processing</b>	
			PSI/SI	: PMT generation signaled as radio service
				: SDT Generation
	<b>Licensed Features</b>		<b>Licensed Features</b>	
				: 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

\* 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

## COMMON OUTPUT SPECIFICATIONS

All Output Modules	Key reference specification	: ETSI TR 101 211 V1.9.1, ISO IEC 13818-1	QAM Output <b>CM-201, CM-301</b> <b>CM-210, CM-310</b>	Key reference specifications Interface Number of carriers Number of QAM frequencies per module Modulation Symbol rate Frequency range	: EN 300 429, ITU J.83.ABC : 2 × F connector female, 75 Ω : 3 and 4 per group (adjacent channels) : up to 16 carriers in 4 groups, 8 per port : 16 / 32 / 64 / 128 / 256 –QAM : 4.48 to 7.00 Mbaud (Annex A and C) : 47 – 862 MHz (CM-201, CM-301) : 47 – 1000 MHz (CM-210, CM-310)
	<b>Multiplexing</b>			Spectrum inversion Test mode Channel spacing	: user selectable : CW : 5, 6, 7, 8 MHz (12 MHz available for 3 carrier groups)
	Video format	: Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC		Frequency step size	: 1 Hz
	PCR regeneration	: Yes		Frequency stability	: 2 ppm
	<b>PSI/SI</b>			Output level	: -12 to +2.2dBm per carrier
	Function	: PSI/SI regeneration based on input and operations performed on the signal		Output level stability	: ± 0.5 dB
	Pass-through of scrambled services	: Yes, on TS level. For SPTS output only		Output level adjustment step size (GUI)	: 0.1 dB
	PSI/SI handling	: Automatically regenerated		MER	: > 42 dB
	Tables Supported:			Return loss	: typ > 16 dB
	PSI	: PAT, PMT, CAT		Spurious	: typ < -60 dBc
	SI	: SDT, NIT, EITpf, TOT, TDT, BAT, AIT			
	<b>PSIP</b>				
	Function	: PSIP input analysis			
	Tables Supported:				
	PSI	: PAT, PMT, CAT	<b>DVB-S/S2X Modulator</b> <b>SM-300</b>		
	PSIP	: MGT, TVCT,CVCT			

## OUTPUT MODULE SPECIFICATIONS

Dual IP IO	<b>IP Input/Output</b>				
	Interface	: 2×10/100/1000 Base-T Ethernet and SFP		Key reference specification	: EN 300 421, EN 302 307 part 1 and 2
	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		Number of DVB-S/S2X carriers per module	: 2
	Maximum data rate per port	: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1xIPIN+1xIPOUT : Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode		Spectrum inversion	: User selectable
	Maximum number of services per port	: 250		Pre-correction	: Static linear pre-correction
	Data format	: UDP/RTP Multicast/Unicast		Carrier ID	: DVB,NIT
	Transport stream	: SPTS and MPTS		DC output	: 24 Volt
	Service filtering	: Yes		Maximum DC output current	: 500 mA
	Video format	: Transport stream, MPEG-2/4 (H264) and HEVC		10MHz reference output	: 0 dBm ± 2dB
	<b>IP Input</b>				
	IP de-jittering	: Yes, based on PCR or CBR		<b>DVB-S Coding and Modulation</b>	
	Forward Error Correction	: SMPTE 2022-1 250 input streams per data port		Constellation	: QPSK
	<b>IP Output</b>			Modulation mode	: Constant
	Forward Error Correction	: SMPTE 2022-1 250 output streams per data port		FEC outer	: Reed-Solomon
	<b>Licensed Features</b>			FEC inner	: Viterbi
		: Seamless IP In, Cloned IP Out : Multiplexing : FEC in, FEC out, FEC in/out : IP Out Redundancy		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
	<b>ASI Output</b>				
	Key reference specification	: EN50083-9		<b>DVB-S2X Coding and Modulation</b>	
	Connectors	: 4 BNC female, 75Ω		Constellation	: QPSK, 8PSK, 16APSK, 32APSK
	Number of outputs per module	: 4 different Transport Streams		Modulation mode	: CCM
	Maximum bit-rate per port	: burst mode: 213.7Mbit/s spread mode: 72Mbit/s		FEC	: BCH/LDPC
	Transport stream output	: SPTS and MPTS		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
	Number of services per card	: 250 (sum of all 4 ports)		Code rates DVB-S2X 8PSK	: 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 5/6, 8/9, 9/10
	Output format	: Constant bit-rate		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
				<b>IF</b>	
				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

	<p>Frequency stability : 2 ppm</p> <p>Return loss : &gt;18 dB</p> <p>Spurious modulated signal : &lt; -65 dBc/4kHz (@ symbol rate ≥ 256 kbaud)</p> <p>Spurious carrier wave : &lt; -60 dBc/4kHz (typical)</p> <p>In-band flatness : typ &lt; ± 0.1 dB</p> <p>Monitoring ports level : -40 dBm</p> <p>Monitoring ports return loss : &gt;20dB</p>		<p><b>DVB-T2 Coding and Modulation</b></p> <p>FFT size : 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended</p> <p>Guard intervals : 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128</p> <p>FEC frame : Normal (64k), Short (16k)</p> <p>FEC code rate : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6</p> <p>Constellation (PLP) : QPSK, 16-QAM, 64-QAM, 256-QAM</p> <p>Channel bandwidth : 1.7, 5, 6, 7, 8, or 10 MHz</p> <p>Pilot pattern : P1-P8</p> <p>Number of PLPs : 1</p>
	<p><b>L-band</b></p> <p>Frequency range : 950-2150 MHz</p> <p>Main output connector : SMA female, 50 Ω</p> <p>Monitoring output connector : F-type female, 75 Ω</p> <p>Output level : -40 to 7 dBm</p> <p>Output level stability : ± 0.5 dB</p> <p>Frequency accuracy : 2 ppm</p> <p>Return loss : &gt;14 dB</p> <p>Spurious modulated signal : &lt; -65 dBc/4kHz (@ symbol rate ≥ 256 kbaud)</p> <p>Spurious carrier wave : &lt; -60 dBc/4kHz</p> <p>In-band flatness : typ &lt; ± 0.2 dB</p> <p>Monitoring ports level : -40 dBm</p> <p>Monitoring ports return loss : &gt;10dB</p>	<p><b>DVB-T/T2 Modulator (Exciter) TM-300</b></p>	<p>Key reference specification : ETSI EN 302755 , ETSI EN 300744</p> <p>Number of carriers : 2 independent carriers</p> <p>Number of output ports : 2 (1 carrier per port)</p> <p>Output connector : BNC</p> <p>Impedance : 50 Ω</p> <p>Output frequency : 47-862 MHz</p> <p>Frequency setting step size : 1 Hz</p> <p>Output level : -15 to 0 dBm</p> <p>Output level stability : ± 0.5 dB</p> <p>Frequency accuracy : 2 ppm</p> <p>Return loss : &gt;16 dB</p> <p>MER : &gt; 42 dB</p> <p>Test mode : CW</p>
	<p><b>Licensed Features</b></p> <p>: Number of carriers</p> <p>: DVB-S2 modulation</p> <p>: VB-S2X modulation Broadcast</p> <p>: DVB-S2X modulation professional</p> <p>: 10MHz and 24V DC output</p>		<p><b>DVB-T Coding and Modulation</b></p> <p>Input : TS with MIP (SFN) or remultiplexed TS</p> <p>FFT size : 2k, 8k</p> <p>Guard intervals : 1/4, 1/8, 1/16, 1/32</p> <p>Code rates : 1/2, 2/3, 3/4, 5/6, 7/8</p> <p>Constellation : QPSK, 16-QAM, 64-QAM</p> <p>Channel bandwidth : 5, 6, 7, 8 MHz</p>
DVB-T Cable Modulator <b>TM-101</b>	<p>Key reference specification : ETSI EN 300744</p> <p>Number of carriers : 4 independent carriers</p> <p>Number of output ports : 2 (2 carriers per port)</p> <p>Output connector : F-type</p> <p>Impedance : 75 Ω</p> <p>Output frequency : 47-862 MHz</p> <p>Frequency setting step size : 1 Hz</p> <p>Output level : -12 to 2.2 dBm</p> <p>Output level stability : ± 0.5 dB</p> <p>Frequency accuracy : 2 ppm</p> <p>Return loss : &gt;16 dB</p> <p>MER : &gt; 42 dB</p> <p>Test mode : CW</p>	<p><b>DVB-T2 Coding and Modulation</b></p> <p>Input : T2MI (SFN) or remultiplexed TS</p> <p>SFN : Relative timestamps within 1000 ms</p> <p>T2 versions : 1.1.1, 1.2.1 and 1.3.1 (T2MI source only)</p> <p>FFT size : 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended</p> <p>Guard intervals : 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128</p> <p>FEC frame : Normal (64k), Short (16k)</p> <p>FEC code rate : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3 (T2-Lite), 2/5 (T2-Lite)</p> <p>Constellation (PLP) : QPSK, 16-QAM, 64-QAM, 256-QAM</p> <p>Channel bandwidth : 1.7, 5, 6, 7, 8, or 10 MHz</p> <p>Pilot pattern : P1-P8</p> <p>Number of PLPs : up to 128</p>	
DVB-T2 Cable Modulator <b>TM-200</b>	<p><b>DVB-T Coding and Modulation</b></p> <p>FFT size : 2k, 8k</p> <p>Guard intervals : 1/4, 1/8, 1/16, 1/32</p> <p>Code rates : 1/2, 2/3, 3/4, 5/6, 7/8</p> <p>Constellation : QPSK, 16-QAM, 64-QAM</p> <p>Channel bandwidth : 5, 6, 7, 8 MHz</p>	<p><b>ISDBT – Modulator CM-500</b></p>	<p>Key reference specification : ARIB STD-B31, ARIB STD-B10</p> <p>Interface : 2 × F connector female, 75 Ω</p> <p>Number of ISDBT carriers per module : 8, 2 per group (adjacent channels)</p> <p>Carrier spacing : 6-31 MHz</p> <p>Frequency range : 47-862 MHz</p> <p>Spectrum inversion : User selectable</p> <p>Test mode : CW</p> <p>Frequency step size : 1 Hz</p> <p>Frequency stability : 2 ppm</p> <p>Output level : -10 to +2.2dBm per carrier</p> <p>Output level stability : ± 0.5 dB</p> <p>Output level adjustment step size (GUI) : 0.1 dB</p> <p>MER : &gt; 42 dB</p> <p>Return loss : &gt;16 dB</p> <p>Spurious : typ &lt; -60 dBc</p>

Modulation	: QPSK, 16QAM, 64 QAM	FEC code rate	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
Transmission mode	: Mode 3 (8K FFT)	Constellations	: QPSK, 16-QAM, 64-QAM, 256-QAM
Time interleaving	: 0	Rotated constellations	: Yes
Hierarchical transmission	: no	ISSY supported	: Yes
Guard interval	: 1/4, 1/8, 1/16, 1/32	<b>Licensed Features</b>	:DVB-T/T2
Code rate	: 1/2, 2/3, 3/4, 5/6, 7/8		:MIP, T2MI
Bandwidth	: 6, 7, 8 MHz		:1 or 2 outputs
<b>Multiplexing</b>			:Multi PLP, Regional PLP
Video format	: Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC	DVB-T2 Gateway IP	: 2 × 10/100/1000 Base-T Ethernet output or 2× Optical SFP (class 1 laser product)
PCR regeneration	: Yes	<b>IP-201</b>	: 4
<b>PSI/SI</b>		Connectors	: 4
Function	: PSI/SI regeneration based on input and operations performed on the signal. ARIB and ABNT compliant PSI/SI generation	Number of MPTS's with MIP	: Up to 850 MBit/s
PSI/SI handling	: Automatically regenerated	Number of T2MI streams	: CBR
Tables Supported		Maximum data rate	: UDP/RTP Multicast/Unicast
PSI	: PAT, PMT, CAT	Output mode	: Yes
SI	: SDT, NIT, EITpf, TOT, TDT, BAT, AIT	Data format	: SMPTE 2022-1 (Licensed)
Pass-through of scrambled services	: Yes, on TS level. For SPTS output only	Support for cloned output	: See common output module specifications
<b>PSIP</b>		Forward Error Correction	: ETSI EN 300 744, ETSI TS 101 191
Function	: PSIP input analysis	Re-multiplexing	: <1s
Tables Supported:		<b>DVB-T MIP inserter</b>	
PSI	: PAT, PMT, CAT	Key specification	
PSIP	: MGT, TVCT,CVCT	Relative timestamps	
<b>Licensed Features</b>	Number of carriers	<b>DVB-T2 T2MI</b>	
DVB-T/T2 Gateway ASI <sup>10)</sup>		Key reference specifications	: EN50083-9, ETSI EN 302 755, ETSI TS 102 773
<b>AO-110, AO-120</b>	Connectors	T2 version	: I.1.1, I.2.1 and I.3.1
	: 4 x BNC 75Ω	System redundancy	: I+I protection on unit with T2MI frame (licensed)
	: 4		Output redundancy based on OSPF (licensed)
	: 2		Network level redundancy (licensed)
	: Maximum ASI bit-rate per port	Regionalization	: Yes. Please contact Appear TV for more information
	: Spread Mode: 72Mbit/s	T2MI signaling	: T2MI is signaled in PSI/SI as a data service
	: Burst Mode: 213Mbit/s	Clock modes	: Relative Timestamps <1s (SFN) and Null timestamps (MFN)
	: See common output module specifications	PAPR	: TR and ACE (global on/off)
<b>DVB-T MIP inserter</b>		MISO/SISO	: Yes
Key specification	: ETSI EN 300 744, ETSI TS 101 191	Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
Relative timestamps	: <1s	FFT sizes	: 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended
<b>DVB-T2 T2MI</b>		Pilot Patterns	: P1 – P8
Key reference specifications	: EN50083-9, ETSI EN 302 755, ETSI TS 102 773	L1 Constellations	: QPSK, 16-QAM, 64-QAM, BPSK
T2 version	: I.1.1, I.2.1 and I.3.1	Bandwidth	: 1, 7, 5, 6, 7, 8, 10MHz
T2MI signaling	: T2MI is signaled in PSI/SI as a data service	<b>DVB-T2 PLP support</b>	: 240 in total between all T2MI streams
Clock modes	: Relative Timestamps <1s (SFN) and Null timestamps (MFN)	Number of PLPs	: HEM, constant bit-rate
PAPR	: TR and ACE (global on/off)	PLP mode	: 1 and 2
MISO/SISO	: Yes	PLP types	: Within a T2 frame and across multiple T2 frames
Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128	TI types	: FEC blocks, TI blocks, TI frames and TI type
FFT sizes	: 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended	Automatic calculation	: Normal (64k), Short (16k)
Pilot Patterns	: P1 – P8	FEC frame	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
L1 Constellations	: QPSK, 16-QAM, 64-QAM, BPSK	FEC code rate	: QPSK, 16-QAM, 64-QAM, 256-QAM
Bandwidth	: 1, 7, 5, 6, 7, 8, 10MHz	Constellations	: Yes
<b>DVB-T2 PLP support</b>		Rotated constellations	: Yes
Number of PLPs	: 240 in total between all T2MI streams	ISSY supported	: Yes
PLP mode	: HEM, constant bit-rate	<b>Licensed Features</b>	: IP Out Redundancy, T2MI sync+IP Redundancy
PLP types	: 1 and 2		: T2MI
TI types	: Within a T2 frame and across multiple T2 frames		: Multi PLP, Regional PLP
Automatic calculation	: FEC blocks, TI blocks, TI frames and TI type		: FEC out
FEC frame	: Normal (64k), Short (16k)	DAB / DAB+ Cable Modulator	
		<b>CM-400</b>	
		Key reference specification	: ETSI EN 300 401, ETSI TS 102 693, ETS 300 799
		Input format	: ETI over IP (EDI), no multiplexing support
		<b>RF Output Specification</b>	
		Number output ports	: 2
		Number of carriers	: 8 (4 per port)
		Connector	: F female, 75Ω

<b>SRT IP-202</b>	Frequency range	: 174–300 MHz	DVB subtitling according to Wide Screen Signaling (WSS)	: EN 300 743 v1.3.1
	Channel spacing	: Carriers within a port must be within 40 MHz.	Input	: EN 301 775 v1.2.1
	Spurious	: < 60 dBc @ -4dBm (typ.)	Output	: EN 300 294/ SMPTE 2031
	Frequency stability	: +/- 2 ppm	World standard teletext (WST/EBU)	(Composite decoder ITU-R BT .653-3 system B only)
	Frequency step size	: 1Hz	Input	: EN 301 775 v1.2.1
	Output power level per carrier	: Maximum: -4 dBm Minimum: -15 dBm	Output	: ITU-R BT .653-3 (System B only), SMPTE 2031
	Output level stability	: +/- 0.5 dB	Video Programming System (VPS)	: EN 301 775 v1.2.1
	Output level adjustment	: 0.1 dB steps	Input	: EN 300 231, SMPTE 2031
	MER	: > 42 dB (typ.)	Output	: Supported, OP-47
	Return loss	: >16 dB	Teletext Subtitling (OSD)	: ITU-T J.63
	<b>Licensed Features</b>	: 4 or 8 carriers	VITS (Vertical Interval Test Signal)	: sin(x)/x on line 281(525 lines) or 335 (625 lines)
	<b>SRT Input/Output</b>		Digital Program Insertion (DPI)	
<b>SRT Input</b>	Interface	: 2x10/100/1000 Base-T Ethernet and SFP	Input	: SCTE 35
	Operational mode	: 1 data port input and 1 data port output	Output	: SCTE 104
	Maximum data rate in total	: Up to 35 Mbit/s	Active Format Description (AFD)	
	Maximum number of services per port	: Limited by total throughput	Input	: ETSI TS 101 154
	Transmission modes	: Caller, Listener and Rendezvous	Output	: SMPTE 2016-3-2009
	Encryption	: AES 128, AES 192, AES 256		
	Data format	: SRT		
	<b>SRT Output</b>			
	MPEG-TS output	: Only SPTS		
	<b>Licensed features</b>	: SRT Input, SRT Output		

## DECODER SPECIFICATIONS

<b>DE-401, DE-411</b>	Number of decoded channels	: 2 per module	MPEG-2/4 Decoder with SDI/HDSDI & AES out	
	Connector	: 2 SDI/HDSDI 75Ω BNC per channel		
	Output format	: SMPTE 292 (HD-SDI), 259M (SD-SDI)		
	Embedded audio	: SMPTE 272M (SD), 299M (HD)		
<b>Video Decoding</b>	MPEG-2 profiles	: MP@HL (HD) MP@ML (SD)	MPEG-2/4 Decoder with Composite Output	
	MPEG-4 AVC profiles	: MP@L4, HP@L4 (HD) MP@L3, HP@L3 (SD)	<b>DE-211</b>	
	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.		
<b>Audio Decoding</b>	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

<b>Licensed Features</b>	: HD : Genlock : OSDM : Dolby® Digital/Dolby® Digital Plus Decode
Number of decoded channels	: 2 per module
Connector	: 1 SDI/HDSDI 75Ω BNC and 1 AES/EBU 75Ω BNC per Audio channel
<b>Video Decoding</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".
<b>Audio Decoding</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".
<b>VBI/VANC/DVB Sub Processing</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".
<b>Licensed Features</b>	: HD : Genlock : OSDM : Dolby® Digital/Dolby® Digital Plus Decode
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)
<b>Video Decoding</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".
<b>Audio Decoding</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".
<b>VBI/VANC/DVB Sub Processing</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".
<b>Analogue Video</b>	
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 'THD+N	: ±0.5dB (20-20kHz) : typ 70dB (at 9dBu)		
<b>Licensed Features</b>	: HD : Radio Mode : Genlock : OSDM : Dolby® Digital/Dolby® Digital Plus Decode	Two sound-carrier FM system (A2) Audio carrier levels relative to vision carrier Audio carrier output level range Audio output modes Modulation Audio-bandwidth	: According to ITU-R BS.707, Annex 1 : f1= -13dB, f2= 20 dB : f1: -10 to -20 dB, f2: -17 to -27 dB, 0.5 dB steps : Stereo/Dual Mono/Mono : FM : 40 to - 15 000 Hz
Quad Decoder with RF <b>2 x DE-101 + AM-100 / 1 x DE-101+1 AM-100</b>	Number of channels Connector for RF mod video	: 4 (max 2 HD) or 8 (max 4 HD) per module set. : 2 F connector 75Ω with 2 or 4 channels per connector.	<b>Audio – MTS Stereo</b> Two sound-carrier FM system (A2) Audio carrier levels relative to vision carrier Audio carrier output level range Audio output modes
<b>Video Decoding</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".		: FCC-OET60 and CEA -TVSB-5 : f1= -13dB : -10 to - 20 dB, 0.5 dB steps : Stereo
<b>Audio Decoding</b>	Number stereo pairs per video : 1 Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out" (except pass-through).		<b>Licensed Features</b> : HD : NICAM/A2 Stereo : OSDM : Dolby® Digital/Dolby® Digital Plus Decode
<b>VBI/VANC/DVB Sub Processing</b>	Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".		
<b>VHF/UHF Output</b>		<b>FM Radio</b> <b>FM-100</b>	
Analogue modulation	: PAL> B/G, D/K, I (5 MHz video BW) SECAM > B/G, D/K (5 MHz video BW) NTSC > M	Number of channels per module Output connector Decoding formats supported	: Up to 8 : F-type female, 75Ω : MPEG-1 layers 1 and 2 (Musicam)
RF output frequency range	: 47-862MHz	<b>FM Output</b>	
RF tuning step size	: 500 Hz	Modulation	: FM
Channel setting flexibility	: 4 channel version fully agile. 8 channel version semi agile, two adjacent channels with 8, 16 or 24 MHz spacing	RF output frequency range	: 87.5 - 108 MHz
Output level (per carrier)	: 105-112 dBuV /ch (115 dBuV/ch for 4 ch version)	Output level 8 carriers combined	: 105 - 120 dBV
Output level adjustment step size (GUI)	: 0.2 dB	Output level adjustment step size (GUI)	: 0.1 dB
Return loss	: >16dB	Return loss	: 18 dB
Video carrier frequency stability	: ±3 ppm	Channel separation L/R	: > 46dB
Intermodulation distance, (4/8	: > 60 dB, Measured:	Carrier to spurious	: > 60dB
Channel TV Modulator only)	@ 115 dBV per channel, 2 channels per port @ 112 dBV per channel, 4 channels per port	RDS insertion	: UECP SPB490 or static
Carrier to noise, in-band	: > 66 dB @110 dBuV/ch	<b>MPX Output</b>	
Carrier to noise, adjacent channel	: > 66 dB @110 dBuV/ch	MPX Output MPX Test output level	: 0 dBu
Carrier to noise (40 channels combined)	: Typ. 61 dB @110 dBuV/ch	MPX Test output load impedance	: 600Ω
Carrier to spurious, full band (40 - 862 MHz)	: > 60 dB	MPX Test output connector	: 1 BNC, service selectable from GUI
<b>Video (demodulated video)<sup>11)</sup></b>			
Differential gain	: <2 %		
Differential phase	: <2°		
Group delay variations	: <50 ns		
Luminance non-linearity	: <1 %		
2T K factor	: <1 %		
Signal to noise ratio	: >60dB		
<b>Audio – Mono</b>			
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		
<b>Audio – NICAM Stereo</b>			
NICAM modulation	: According to ETSI EN 300 163 v1.2.1, Fully synchronous operation, Digital JI7 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		
<b>Audio – A2 Stereo</b>			

\* 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" x 4RU x 400mm (440 x 177 x 400 mm)
<b>Power supply</b>		
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
<b>Cooling</b>		
Fans	:	4 fans
Hot swap of fans	:	Yes, fans are independently hot swappable
Airflow direction	:	Front to back
XC5100	Physical dimensions	: 19" x 1RU x 480mm (440 x 44 x 480 mm)
<b>Power supply</b>		
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
<b>Cooling</b>		
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

## APPEAR AS

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VERSION 4.5