Appear TV 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 TV'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 TV'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 TV 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.

All modules and functions are further described within the 'modules' section of this brochure.
CHASSIS

Appear TV 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 TV 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. The modules can therefore not be interchanged between XC5000 and XC5100.
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 1000 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 and IPIO**
- Gbit/s routing between modules in a chassis
- Enables WEB management
- 10/100/1000BaseT management port (RJ45)
- 1 slot wide

**Switch Module with Management and IP IO**
- Gbit/s routing between modules in a chassis
- 2 × Gbit RJ45 or SFP input/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
- 10/100/1000BaseT management port (RJ45)
- 1 slot wide

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

**Switch Module with Management and Dual IP IO**
- Gbit/s routing between modules in a chassis
- Enables WEB management
- 2 × Gbit RJ45 or SFP input/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
- 10/100/1000BaseT management port (RJ45)
- Optional GPS Receiver
- PTP Support

**Hardware-managed redundancy for unbeatable speed and long-term reliability**
MPEG INPUT MODULES

DVB-C Input
- 4 × QAM Annex A/C inputs
- 1 F-type, 75 ohm female input port (all 4 channels on one input cable)
- 0.87–6.9 Ms/s
- Supports reception of MPTS and SPTS
- Service filtering
- ASI monitoring port
- Input analysis
- 1 slot wide

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

ISDB-T Input module
- 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
- 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
- Supports reception of MPTS and SPTS
- Service filtering on input
- Input analysis
- 2 slots wide

8VSB/QAM Annex B Input
- 4 × 8VSB or QAM Annex B Inputs
- 4 × f connectors
- Frequency range 50-860 MHz
- Supports reception of MPTS and SPTS
- Service filtering
- Input analysis
- 2 slots wide

Dual IP IO
- 2 × GigE/I4S or SFP input port for data (or 1 × in and 1 × out)
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast
- Supports reception of MPTS and SPTS
- Supports seamless (hitless) input redundancy
- Service Filtering
- Input analysis
- 1 slot wide

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

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

Input Modules

Appear TV 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

MPEG INPUT MODULES

Dual IP IO
- 2 × GigE/I4S or SFP input port for data (or 1 × in and 1 × out)
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast
- Supports reception of MPTS and SPTS
- Supports seamless (hitless) input redundancy
- Service Filtering
- Input analysis
- 1 slot wide

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

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

8VSB/QAM Annex B Input
- 4 × 8VSB or QAM Annex B Inputs
- 4 × f connectors
- Frequency range 50-860 MHz
- Supports reception of MPTS and SPTS
- Service filtering
- Input analysis
- 2 slots wide

ISDB-T Input module
- 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
- 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
- Supports reception of MPTS and SPTS
- Service Filtering on input
- Input analysis
- 2 slots wide

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

DVB-C Input
- 4 × QAM Annex A/C inputs
- 1 F-type, 75 ohm female input port (all 4 channels on one input cable)
- 0.87–6.9 Ms/s
- Supports reception of MPTS and SPTS
- Service filtering
- ASI monitoring port
- Input analysis
- 1 slot wide

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

techex.
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 TV 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 XS5000 or XS5100 Series platforms and can work in combination with any other modules from Appear TV'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 TV enables broadcasters and IP network operators to provide high quality multiscreen services. The transcoder module supports MPEG-2/4 TS input and transcodes to multiformat MPEG-4 TS output with IDR alignment. The encoder module accepts SD/HDSDI inputs directly, and encodes these into multiple profiles as a single pass, avoiding the need to concatenate compression stages which always causes inefficiencies and reduces VQ. The unique architecture delivers significant VQ and efficiency benefits for all real-time applications.

Appear TV 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 TV 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/orignserver is another major feature of the Appear TV 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.

**ENCODING/TRANSCODING MODULES**

**ENCODER -RF input**

- Encodes up to 2 SD + PIP or 4 SD channels
- 4 F75I input connectors, one per service
- Input frequency range 47-862MHz
- PAL/B/C, PAL I and SECAM D/K input
- MPEG-2 and MPEG-4 SD and HD encoding
- Constant bit-rate (CBR)
- Capped variable bit-rate (VBR)
- Scalable

**Analogue Encoder**

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

*Other TV standards can be supported upon request.*

**UNIVERSAL ENCODER & TRANSCODER**

**Linear Broadcast**

- Moduar
- 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**

- 1 slot wide
- Logo insertion
- Capped variable bit-rate (VBR)
- Constant bit-rate (CBR)
- Capped variable bit-rate (VBR)
- 2 AES/EBU audio
- MPEG-2 and MPEG-4 SD encoding
- Constant bit-rate (CBR)
- Capped variable bit-rate (VBR)
- 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)**
BC-400
- Encodes up to four services into multiple profiles
- 4xSDI or 2xHDMI input with embedded audio
- Supports an extensive range of resolutions and frame-rates from full 720p/1080p HD down to 144p/15/12.5
- Resolution conversion
- Dynamic Encoder GOP Control Modes
- Keyframe alignment
- Audio encoding
- 1 slot wide

TC-200, TC-400
- Transcodes up to:
  - 1 HD with PIP
  - 2 SD with PIP
  - Full decode and re-encode
  - Statistical Multiplexing
  - Capped Variable Bit Rate (CVBR)
  - Constant Bit Rate (CBR)
  - Component pass-through
  - Operates in 3 different Encoder Rate Control modes:
    - Constant Bit Rate (CBR)
    - Capped Variable Bit Rate (CVBR)
    - Statistical Multiplexing
  - Resolution conversion
  - PowerPoint
  - Logo insertion
  - Advanced audio encoding with support for all common audio codecs
  - 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
- Component pass-through
- Operates in 3 different Encoder Rate Control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
- Resolution conversion
- 1 slot wide

**Universal Encoder - High VQ Broadcast**
BC-400
- Encodes 1 HD or 2 SD into MPEG-2 or MPEG-4
- SD/HDMI input with embedded audio
- Supports an extensive range of resolutions and frame-rates from full 720p/1080p HD down to 144p/15/12.5
- Operates in three encoder rate control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
- Resolution conversion
- Logo insertion
- Advanced audio encoding with support for all common audio codecs
- 1 slot wide

Universal Transcoder - Dense Broadcast
TC-200, TC-400
- Transcodes up to:
  - 2 HD with PIP
  - 9 SD with PIP
- Full decode and re-encode
- Component pass-through
- Operates in 3 different Encoder Rate Control modes:
  - Constant Bit Rate (CBR)
  - Capped Variable Bit Rate (CVBR)
  - Statistical Multiplexing
  - Median removed
- 1 slot wide

**Universal Encoder - Dense Broadcast**
BC-400
- Encodes 4 HD or 4 SD into MPEG-2 or MPEG-4
- SDI/HDMI 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
- 1 slot wide

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**PROCESSING MODULES**

**Descrambling and Scrambling**

Appear TV 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, SmaarTV, Aston etc., and supports descrambling of up to 10 services per CAM. The bulk descrambler is aimed at software-based CAM 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 TV’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.

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**FEATURES**

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

**Bulk Descrambler BD-100**
- Descrambles up to 250 services (850 Mbit/s)
- Integrated with soft clients for ECM handling
- Supports both DVB-CA and AES descrambling
- Integrated with Verimatrix and Latens
- BISS descrambling
- 1 slot wide

**SIM Bulk Descrambler BD-200**
- Descrambles up to 250 services (850 Mbit/s)
- Smart Card based descrambling (SIM)
- 10 SIM readers, 6 in front and 4 behind the front
- Support for both DVB-CA and AES descrambling
- Integrated with Comax
- BISS descrambling
- 2 slot wide

**Scrambler CA-100**
- DVB-CA compliant scrambling (CCA) and AES compliant scrambling
- Scrambling up to 250 services, maximum 850 Mbit/s
- Supports scrambling of MPEG-2, MPEG-4 and HEVC
- DVB Simulcrypt-compliant
- 10/100/1000Base-T IP interface towards CA system (XCA)
- Handles up to 250 ECMs
- 1 slot wide

**Audio Processor AP-100**
- Encodes up to 32 stereo channels
- 4x SD/HD/3G/6G input with embedded audio
- 4x SBC, 75 Ohm female input ports
- 8x stereo audio tracks per SD/HD/3G/6G feed
- Audio codec support
  - MPEG-1 – Layer 2
  - MPEG-1 – Layer 3 (MP3)
  - AAC-LC
  - HE-AAC v1
  - HE-AAC v2
- Audio channel modes
  - Stereo
  - Mono
- Audio Level Adjustment, +6/-10dB
- 1 slot wide

**Digital Audio Leveling AL-100**
- For equalization 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

**EPG EP-200**
- Bi-generation of EIT schedule on selected output ports
- Gather EIT information from all input ports
- EPG data is filtered and regenerated to reflect new channel plan
- Supports multiple of networks
- Configurable output rate with prioritization
- Configurable period to be played out
- EPG synchronization between multiple ATV units
- 1 slot wide

**MPEG OUTPUT MODULES**

Appear TV 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 andAppear TV’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 TV’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 TV’s advanced DVB-S/52/52x 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/52/52x modulator is available in two different output configurations: IF or L-band.

Appear TV’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 TV’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 TV 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 TV 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 ID**
- 2 x 8-bit output port for data (or 1 cm and Tsync)
- 10/100/1000BaseT (RJ45) or SFP output
- Up to 850 Mbit/s per output per TS
- Supports UDP/RTSP Multicast/Unicast
- Supports streaming of WPTS and SPTS
- Supports cloned output
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- Supports FEC ( SMPTE 2022 ) license
- 1 slot wide

**DVB-T/S2X modulator**
- 2 DVB-T/S2/Sx modulated carriers per module
- Output connectors:
  - IF: 1 x 75 Ohm F connector + 1 x 500 SMA connector for monitoring per output
  - L-band: 1 x 500 SMA connector + 1 x 75 Ohm F for monitoring per output
- Satellite standards:
  - DVB-S: EN 302 421
  - DVB-S2: EN 302 307 - 1
  - DVB-S2X: EN 302 307 - 2, Broadband Services
- Output options:
  - IF: 10 - 200 MHz
  - L-band: 900 - 2100 MHz
- Modulation:
  - DVB-S: QPSK
  - DVB-S2: QPSK, QPSK, 16 QAM, 32 QAM
- Symbol size: 8 - 16 MHz
- 24/1080i and 1080p reference output
- DVB Carrier ID, F Fracture ID
- Linear static precorrection
- Supports multiplexing and transparent pass-through

**DVB-T/T2 Terrestrial Modulator**
- 2 DVB-T2 or 2 DVB-T independent outputs
- 1 x BNC connector + 1 x BNC for monitoring per output
- Modulation options:
  - VHF/UHF, DVB, 47-2150 MHz
  - Output levels: 15 to 30 dBm
- Supports multiplexing and transparent pass-through (mode A)
- Supports for SPI (ETSI TS 152 712 T2-ME)
- Supports for multiple EPFL
- Supports multiplexing and transparent pass-through
- PSI/SI regeneration
- 1 slot wide

**ISDB-T Modulator**
- 8 ISDB-T modulated carriers per module
- 2 x 75 Ohm F output / connector
- Full digital modulation and up-conversion
- DOC5S 3.0 SF compatible
- QPSK, 16QAM, 64QAM modulation
- Frequency range of 47 - 300 MHz
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- Relevant Standards:
  - ARIB STD-B1
  - ARIB STD-B10
- 1 slot wide

**DVB-T/T2 GW**
- IP or ASI output options:
  - 10/100/1000BaseT (RJ45) or SFP output on IP
  - 2 x (1+1) ASI out
- Supports DVB-T2 MP 1.6 and DVB-T2 T2Mi generation
- 4 independent gateways per module (2 for T2Mi on ASI out)
- Supports up to 240 PLPs
- Regionalization options
- IP/MPLS and ASI output
- Full IP (multiplexing support per PLF)
- PSI/SI regeneration
- Supports SMPTE 2022 FEC (license)
- 1 slot wide

**QAM Modulator**
- 16 QAM modulation, 4 and 4 panel
- 2 x 75 Ohm F input (EN/IEC 60728-5): F connector
- Full digital modulation and up-conversion
- DOC5S 3.0 RF compatible
- 16: 32 / 64 / 128 / 256 QAM modulation
- Frequency range of 47 - 1000 MHz
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- 1 slot wide

**END TO END TERRESTRIAL SOLUTIONS**

Appear TV 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 TV can provide a complete low-power transmitter solution with all necessary components integrated into a compact 1RU chassis if required. All components are developed in house, giving customers 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

The advanced Appear TV DVB-T2 gateway module is representative of Appear TV’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 TV 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 TV seamless T2Mi redundancy option.

The gateway’s many features can be complemented by 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 TV network delivery enhancements include support for the DVB-S/5/2/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.
A key feature of Appear TV 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 TV’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 TV 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

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### DECODER MODULES

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

DE-401 / DE-411

- 2 decoders per module
- 2 × BNC with SDI/HDSDI outputs per decoder
- MPEG-2 and MPEG-4 (H264) SD and HD
- Frame Synchronization (Synclock) support (HW option)
- Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF)
- VANC re-insertion (WSS, Teletext, VPS, VITS)
- DVB and EBU subtitling
- 1 slot wide

#### 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
- MPEG-2 and MPEG-4 (H264) SD and HD
- Dolby® Digital (HW option)
- Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF)
- VANC re-insertion (WSS, Teletext, VPS, VITS)
- 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 SDI/HDSDI output per decoder
- AES audio output per decoder
- MPEG-2 and MPEG-4 (H264) SD and HD
- MPEG-1 Layer 1/2, MPEG-2 Layer 2, MPEG4-AAC-LC, MPEG4 AAC, plus 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)
- VANC re-insertion (WSS, Teletext, VPS, VITS)
- DVB and EBU subtitling
- 1 slot wide

*DE-411, DE-511 required for Genlock support

#### 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 - EREP, SPB490 or static
- One RF output connector, 7-taps, 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 x AM-100

- 4 or 8 decoders and RF modulators
- MPEG-2/4 SD/HD SD and HD decoding (full can be HD)
- SD/HD downconversion to SD
- SD/HD, HD, D/K, I
- 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)
- VANC re-insertion (WSS, Teletext, VPS, VITS)
- DVB and EBU subtitling
- RF modulation and up-conversion
- 47-862 MHz frequency range
- 2 or 3 slots wide

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Dolby® Digital Plus Professional Decoder “Dolby” and the double-D symbol are registered trademarks of Dolby® Laboratories.
### Redundancy

(AWARD WINNING)

Appear TV’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 TV’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 TV.

#### Input Redundancy

The Appear TV 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 channel. 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 TV 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 up 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 TV’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, and 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 TV 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 conventional NMS. Rather than relying on external PC hardware, Appear TV 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

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 TV 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

<table>
<thead>
<tr>
<th>Switch Module</th>
<th>Bitrate</th>
<th>Placement</th>
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</thead>
<tbody>
<tr>
<td>SW-200 (No IP IO)</td>
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<tr>
<td>SW-301, SW-401</td>
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<tr>
<td>SW-310, SW-410</td>
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</table>

#### IP Input/Output

- **Interface**: 10/100/1000 Base-T Ethernet or SFP
- **Optical SFP (class 1 laser product)**: Up to 850 MBit/s per port TS rate
- **G.7040/RTIP Multicast-Unicast**: SPTS and MPTS
- **STMIP**: Yes
- **Transport stream**: MPEG-2, MPEG-4, HEVC

#### IP Input

- **IP de-jittering**: PCR or CBR
- **Forward Error Correction**: Yes (licensed)
- **IP Output**: Fully transparent
- **IP Input/Output**: Transparent

#### Management

- **Interface**: 10/100/1000 Base-T Ethernet
- **Built-in user interface**: Web
- **SNMP**: Yes
- **Web interface**: for alarms, SOAP for configuration and status
- **Built-in user interface**: Yes
- **SNMP**: Yes
- **Web interface**: Yes
- **SNMP**: Yes
- **Web interface**: Yes

#### Reference Clock

- **Frame Synchronization Input (Genlock)**
- **Internal Clock Reference**
- **MOM Clock Synchronization**

#### GPS Reference Input

- **Antenna connector**: SMA female
- **Impedance**: 50 Ω
- **1pps timestamp accuracy**: ± 100 ns RMS
- **Active Antenna Voltage output**: ± 1V in 4 hrs @70˚C ± 0˚C
- **1pps reference input**: TEC, EEC out, EEC in/out
- **Input connector type**: BNC female
- **Impedance**: TTL or 50 Ω
- **Input level**: ± 1V in 4 hrs @70˚C ± 0˚C
- **Licenced features**: GPS receiver, OC50 oscillator, OC100 oscillator (stability 0.2ppb/day)

### License Features

- **Switch Module**: 1+1 redundancy in a chassis
- **N+M redundancy**: 1 redundant module in slot 17
- **Input redundancy**: One (switch and stop) Floating or Reverting
- **Output redundancy**: 2xIP In, 1xIP In/1xIP Out, 1xIP Out, Seam, IP In, Cloned IP Out
- **IP Input de-jittering**: PCR or CBR
- **Forward Error Correction**: Yes (licensed)
- **IP Output**: Transparent
- **IP Input/Output**: Transparent
- **Management**: Yes
- **Reference Clock**: Accepts black burst and Tri-Level reference signal
- **IP Input**: 10 MHz
- **IP Output**: Yes (SW-310, SW-410 only)
- **Management Interface**: Web
- **Clock Reference**: CK-100

### Technical Specifications

- **Impedance**: 50 Ω
- **Input connector type**: BNC female
- **Antenna connector**: SMA female
- **Impedance**: 50 Ω
- **1pps timestamp accuracy**: ± 100 ns RMS
- **Active Antenna Voltage output**: ± 1V in 4 hrs @70˚C ± 0˚C
- **1pps reference input**: TEC, EEC out, EEC in/out
- **Input connector type**: BNC female
- **Impedance**: TTL or 50 Ω
- **Input level**: ± 1V in 4 hrs @70˚C ± 0˚C
- **Licenced features**: GPS receiver, OC50 oscillator, OC100 oscillator (stability 0.2ppb/day)
### COMMON INPUT SPECIFICATIONS

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

### INPUT INTERFACE SPECIFICATIONS

#### Dual IP IO

**IP Input/Output Interface**
- Operational mode: The module can be configured to:
  - 1 input and 1 output
  - Seamless (Hitless) IP in
  - Cloned IP out
  - Dual IP in
  - Dual IP out

- Maximum data rate per port:
  - Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1×IPIN + 1×IPOUT
  - Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode

-:** Maximum number of services per port:** 250
- Data format: UDP/RTP Multicast/Unicast

**IP Input**
- IP de-jittering: Yes, based on PCR or CBR
- Forward Error Correction: SMPTE 2022-1

**IP Output**
- Multiplexing: Yes
- Forward Error Correction: SMPTE 2022-1

**Licensed features**
- Seamless input, Cloned IP Out
- FEC in, FEC out, FEC in/out
- Multiplexing
- IP output redundancy

**ASI Input**
- Key reference specification: EN 50083-9
- Connector: BNC female, 75Ω
- Maximum bit-rate per port: Up to 213.7 Mbit/s (burst)

**DVB-S/S2X input**
- Key reference specification: EN 300 421, EN 102 307 part 1 and 2
- Connector: F-female, 75Ω
- Frequency range: 950–2150 MHz
- Acquisition range: 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
- Symbol rate DVB-S/S2/S2X: 1–45 MSym/s (1-39.9 MSym/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, 25/36, 2/3, 2/5, 13/18, 3/4, 5/6, 8/9, 9/10
- FEC DVB-S2 8PSK: 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 7/9, 4/5, 5/6, 8/9, 9/10
- FEC DVB-S2 16APSK: 5/9, 26/45
- FEC DVB-S2 32APSK: 1-13 Mbits/s
- Spectrum inversion: Normal, Inverted
- Roll off DVB-S: 0.2, 0.25, 0.35
- Roll off DVB-S2: 0.2, 0.25, 0.35
- Spectrum inversion: Auto, Normal, Inverted

**DVB-T Input**
- Key reference specification: TR-210, TR-211
- Connector: Ffemale, 75Ω
- Frequency range: 47–862 MHz
- Input level range: - 80 to -10 dBm (at T2, 8MHz, 256 QAM, 3/5, gaussian channel)
- Minimum return loss: 10 dB
- DVB-T Key reference specification: ETSI EN 300744, Nordig 2.0
- FFT Size: 2k, 8k
- Guard Intervals: 1/4, 1/8, 1/16, 1/32
- FEC code rate: 1/2, 2/3, 3/4, 5/6, 7/8
- Constellation: QPSK, 16-QAM, 64-QAM
- Channel bandwidth: 5, 6, 7, 8 MHz
- Spectral inversion: Automatic
- DVB-T2 Key reference specification: ETSI EN 302755, Nordig 2.1
- FFT Size: 1k, 2k, 4k, 8k, 16k, 32k extended, 64k
- Guard Intervals: 1/4, 1/8, 1/16, 1/32
- FEC code rate (PLP): 1/2, 3/5, 3/4, 4/5, 5/6
- Constellation (PLP): QPSK, 16-QAM, 64-QAM, 256-QAM
- Channel bandwidth: 5, 6, 7, 8 MHz
- Pilot pattern: P1-P8
- Single and Multiple-PLPs: Yes
- Spectral inversion: Automatic
- Rotated constellation: Automatic

**Licensed features**
- DVB-T2 demodulation
- DVB-S2 demodulation
- DVB-S2X demodulation
- TRM de-encapsulation

**DVB-C Input**
- Key reference specification: CR-110
- Connector: Ffemale, 75Ω
- Number of inputs per module: 4
- Symbol rate: 1–7.2 Mbaud
- Spectrum inversion: Automatic
- Roll off DVB-C: 0.2, 0.25, 0.35
- Spectrum inversion: Auto, Normal, Inverted

**Licensed features**
- DVB-C demodulation
- DVB-T2 demodulation

**DVB-S2 FEC frames**
- Normal frames: 6/13/18 Vott
- 400 mA
- LNB voltage = 22Hz continuous tone
- 1 per input port
- 1 PLP per port

**Number of DVB-S/T2 inputs per module**
- 4
- F-female, 75Ω
- 1 F connector internally split or 4 F connectors
- 47–862 MHz
- 80 to 100 dBm (at T2, 8MHz, 256 QAM, 3/5, gaussian channel)
- 10 dB

**DVB-T Key reference specification**
- FD Size
- Guard Intervals
- FEC code rate
- constellation
- Channel bandwidth
- Spectral inversion
- DVB-T2 Key reference specification
- FD Size
- Guard Interval
- FEC frame
- FEC code rate (PLP)
- Constellation (PLP)
- Channel bandwidth
- Pilot pattern
- Single and Multiple-PLPs
- Spectral inversion
- Rotated constellation

**Licensed features**
- DVB-T2 demodulation
- DVB-S2 demodulation
- DVB-S2X demodulation
- TRM de-encapsulation
**ENCODING/TRANSCODING SPECIFICATIONS**

**Universal Encoder - High VQ Broadcast EC-400**

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

### Video Input
- HD Res. / Frame rates (SMpte 292M): 1080i – 29.97 fps or 25 fps
- SD Res. / Frame rates (SMpte 299M): 480i – 29.97 fps
- Number of inputs per module: 6
- Connected to: VIDEOS, RF Input
- Connectors: F, 75Ω, XLR, 75Ω
- Sampling frequency: 19.11 MHz
- Video Interlace: Interlaced or progressive

### Video Encoder
- Architecture: Dual Pass with look-ahead
- MPEG-2 profiles: MP, ML
- MPEG-4 AVC profiles: MP@L2, HP@L2, BP@L2, ML@L2
- Rate Control Modes:Constant Bit Rate
- GOP structure: Dynamic with Scene Change Detection and Adaptive GOP structure
- Clock Modes: Lock to HDSI/SDI input
- Aspect Ratio Control: Manual, WSS, Video Index or AFD Codes
- PCR PID: PCR on Video PID or as separate PID
- End-to-end Encoder Delay: Typical 5000ms (4000ms reduced delay mode)

### Audio Encoder
- Number of encoded stereo pairs per main video: 6 (4 for Dolby® Digital / Dolby® Digital Plus)
- Audio CODECS: MPEG-1 Layer 2, AAC-LC, HE-AAC v1, HE-AAC v2, Dolby® Digital, Dolby® Digital Plus
- Audio Level Adjustment: +6/-10 dB
- Audio Bitrate: 44.1 kHz
- Sample rates: 32 to 48 kHz
- Audio Interlace: Interlaced or progressive

### Statmux Controller
- Located within the chassis

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1. AAC-LC/HE-AAC v1.1 support in future release.
2. Dolby® Digital also known as AC-3
3. Dolby® Digital Plus also known as E AC-3
### Universal Encoder - Dense EC-400

<table>
<thead>
<tr>
<th><strong>Max. Number of Groups per chassis</strong></th>
<th><strong>Max. Number of Services within group</strong></th>
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<tr>
<td><strong>Licensed Features</strong></td>
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<td>Video Mode HPBC (required)</td>
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<tr>
<td>Number of Encoder Channels HD</td>
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<td>Number of Encoder Channels SD</td>
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<tr>
<td><strong>Audio Level Adjustment</strong></td>
<td>+6/-10 dB</td>
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<tr>
<td><strong>Input Ports</strong></td>
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<tr>
<td><strong>Input Format</strong></td>
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<tr>
<td><strong>Video Pre-processing</strong></td>
<td>Removal of line 23 WSS from active video</td>
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<td><strong>Picture-in-Picture</strong></td>
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<td></td>
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<tr>
<td><strong>Density</strong></td>
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<tr>
<td>Codec</td>
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<td>Bitrate</td>
<td></td>
</tr>
<tr>
<td><strong>Resolutions</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Universal Encoder - MS/OTT EC-400

| **Video Re-scaling**                |                                         |
| **Horizontal Rescaling**            |                                         |
| **Down Conversion HD to SD**        |                                         |
| Up Conversion SD to HD              |                                         |
| **Frame Rate Conversion**           |                                         |
| **Logo Insertion**                  |                                         |
| Maximum Size                        |                                         |
| Positioning                         |                                         |
| File format                         |                                         |
| **Ancillary Data and VBI**          |                                         |
| **Teletext processing**             |                                         |
| Closed Captioning (DA 608/DA 708)   |                                         |
| Digital Programmming Insertion (DPI)|                                         |
| Active Format Description (ATD)     |                                         |
| Dolby® Metadata                     |                                         |
| Wide Screen Signalling (WSS)        |                                         |
| Video Programming System (VPS)      |                                         |
| Video Inserted Time Code (VITC)     |                                         |
| **Auxiliary Data Injection**        |                                         |
| Subtitling insertion                |                                         |
| **Subtitling conversion**           |                                         |
| **Statistical Multiplexing**        |                                         |
| Statmux Controller                  |                                         |
| **Maximum Number of Groups per chassis** | Maximum number of services within group |
| **Input Ports**                     |                                         |
| **Input Format**                    |                                         |
| **Video Pre-processing**            | Removal of line 23 WSS from active video |
| **Picture-in-Picture**              |                                         |
| **Density**                         |                                         |
| Codec                               |                                         |
| Bitrate                             |                                         |
| **Resolutions**                     |                                         |

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.
### Encoder - CVBS input

**SD and sub SD resolutions**
- 1920 x 1080p @ 29.97 fps
- 1280 x 720p @ 29.97, 25 fps
- 960 x 540p @ 29.97, 25 fps
- 852 x 480p @ 29.97, 25 fps
- 640 x 360p @ 29.97, 25 fps
- 480 x 270p @ 29.97, 25 fps
- 416 x 240p @ 29.97 fps

**Frame rate conversion**
- From 60/59.94/50 reduced to ½, ¼
- From 50 reduced to ½ or ¼
- From 30/29.97/50 reduced to ½

**De-interlacing**
- Interlaced to progressive conversion

**Scene change detection**
- Yes, insertion of P frame

**GOP structure**
- Dynamic

**Number of output profiles**
- Ranging from 4x HD to 28 sub SD per module, depending on complexity of profiles

**Audio Encode**
- **MPEG1 Layer II**
  - Modes: 2.0 (stereo), Bit rates: 64 – 384kbps
- **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
- **Dolby® Digital pass-through (from AES input)**
- Sample rates: 32, 48kHz
- Number of channels per video source: 2 (Audio resources can be combined.)

**Reformatting/Rescaling**
- From HD to sub SD conversion

**Aspect Ratio Control**
- Transparent Input to Output (Controlled by AFD), Manual 4:3 or 16:9

**Auxiliary Data and VBI**
- **Closed Captioning (EIA 608/EIA 708)**
- **Teletext, WSS, VPS**
- **VBI Extraction and processing**
  - Closed Captioning (EIA 708)
  - Teletext, WSS, VPS

**Video Encoder**
- **Number of channels per module**
  - 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)
  - up to HP@ML
  - up to HP@L3.0
  - Constant Bit Rate (CBR)
  - Capped VBR (CBR) with OP target
  - 2SD: From 250kbps to 19Mbps

**Rate Range**
- 4SD: From 250kbps to 10Mbps
- 2SD: From 250kbps to 19Mbps

**GOP control**
- Fixed or Dynamic with Scene Change Detection and adaptive GOP structure

**Picture-in-Picture**
- 416×240, 352×288, 352×240, 192×192, 128×128, 128×96

**Aspect Ratio Control**
- Manual or WSS

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

**Licensed Features**
- Number of encoded channels, PIP

---

### Encoder - RF input

**Video Pre-processing**
- Inverse Telecine Detection
- De-blocking Filter
- Motion Compensated Temporal Filter (MCTF)
- Horizontal Rescaling
- WSS Blanking

**Logo Insertion**
- File format: Position
- Maximum Size: 192 x 128 (SD)

**Ancillary Data and VBI**
- **Closed Captioning (EIA 708)**
- **Teletext, WSS, VPS**

**Video Encoder**
- **Number of channels per module**
  - 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)
  - up to HP@ML
  - up to HP@L3.0
  - Constant Bit Rate (CBR)
  - Capped VBR (CBR) with OP target
  - 2SD: From 250kbps to 19Mbps

**Rate Range**
- 4SD: From 250kbps to 10Mbps
- 2SD: From 250kbps to 19Mbps

**GOP control**
- Fixed or Dynamic with Scene Change Detection and adaptive GOP structure

**Picture-in-Picture**
- 416×240, 352×288, 352×240, 192×192, 128×128, 128×96

**Aspect Ratio Control**
- Manual or WSS

**Audio Encoder**
- **Audio CODECS**
  - MPEG-1 Layer 2
  - AAC-LC
  - HE-AAC v1
  - HE-AAC v2
  - Dolby® Digital pass-through (from AES input)
  - ADTS or LATM selectable per encoded channel
  - Stereo/Dual Mono/Mono
  - 2 pairs for 2SD+PIP configuration and 1 pair for 4 x SD configuration
  - +/−11dB
  - Injection of Private Data into service
  - See Universal Encoder High VQ “Auxiliary Data Injection”

**Licensed Features**
- Number of encoded channels, PIP

---

### Encoder - RF Input

**AC-200**

**Number of channels per module**
- 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)

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

**Video Encoder**
- Please refer to “Encoder - CVBS input”

**Picture-in-Picture**
- Please refer to “Encoder - CVBS input”

**Video Pre-processing**
- Please refer to “Encoder - CVBS input”

---

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
4) Other TV standards can be supported upon request
Each block can be configured independently.

### Video Decoder
- **MPEG-2 profiles**: MP@HL (HD), MP@ML (SD)
- **MPEG-4 AVC profiles**: MP@L4.2, HP@L4.2 (HD), MP@L3.0, HP@L3.1 (SD)
- **SD resolutions**: 720/704/576i, 480i
- **HD 1080i resolutions**: 1920/1440/1080i
- **HD 720p resolutions**: 1280/960/720p

### Audio Decoder
- **Audio Codecs**: MPEG1 Layer 2 (2.0), AAC-LC (2.0), HE-AACv1 (2.0), HE-AACv2 (2.0), Dolby® Digital (AC-3), Dolby® Digital Plus (E-AC-3)
- **Audio Downmix**: Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of transcoding process.

### Video Encoder
- **MPEG-2 profiles**: MP@HL (HD), MP@ML (SD)
- **MPEG-4 AVC profiles**: MP@L4.1, HP@L4.1 (HD), MP@L3.1, HP@L3.1 (SD)
- **Rate Control Modes**: Constant Bit Rate (CBR), Capped VBR (CVBR) with QP target, Statistical Multiplexing (in future release)
- **GOP structure**: Dynamic with Scene Change Detection and Adaptive GOP structure
- **Aspect Ratio Control**: Manual, Transparent input to output
- **PCR PID**: PCR on Video PID or as separate PID
- **End-to-end Encoder Delay**: Typically 5000ms (3500ms reduced delay mode)

### Audio Encoder
- **Audio CODECS**: MPEG-1 Layer 2, AAC-LC, HE-AAC v1, HE-AAC v2, Dolby® Digital (AC-3), Dolby® Digital Plus (E-AC-3)
- **Audio Channel Modes**: Stereo, Mono, 5.1 and 7.1
- **Audio Data Encapsulation**: ADTS or LATM selectable per encoded channel
- **Audio Lipsync Adjustment**: +500ms /-200ms
- **Audio Level Adjustment**: +6/-10dB
- **Audio Transcode Density**: TC-400 - Max 6 stereo transcodes per video, limited to 24 stereo transcodes per module.
- **Number of audio per channel**: Max 6

### Logo Insertion
- **Logo Insertion**: MPEG-4 AVC MP
- **Bitrate**: Min 96kbps, Max 400kbps
- **Frame Rate Conversion**: From 29.97 fps to 29.97 fps

### Video Re-scaling
- **Down Conversion HD to SD**: Including aspect ratio conversion, letter/pillar boxing
- **Up Conversion SD to HD**: Including aspect ratio conversion, letter/pillar boxing and de-interlacing
- **Frame Rate Conversion**: From 60 fps to 60/30 fps

### Auxiliary Data
- **Logo Insertion**: MPEG-4 AVC MP
- **Bitrate**: Min 96kbps, Max 400kbps
- **Frame Rate Conversion**: From 29.97 fps to 29.97 fps

### Statistical Multiplexing
- **Statsmux Controller**: Local within chassis.
- **Maximum # Groups**: 16, one per encoder/transcoder module.
- **Maximum # Services within group**: 32

### Licensed Features
- **Video Transcode capacity**: In steps of blocks capable of 1HD/4xSD
- **Statistical Multiplexing**: Number of Channels
- **Dolby® Digital/Dolby® Digital Plus Decode**: High Density Mode (dense-sd for 4xSD per block)
- **MPEG2/H264**: Subtitle transcoding from TTX to DVB

### Mediaroom: Approved

### Universal Transcoder - MS/OTT TC-400
- **Number of input channels**: Up to 4 HD channels
- **Video Decoder**: MPEG-2 profiles, MPEG-4 AVC profiles
- **Audio Decoder**: Input format
- **Video Encode**: MPEG-4 AVC Profiles
- **Resolutions**: @ 59.94 fps or 50.00 fps

---

7) Full HD (1080p) input restricts input density to 2 channels.
8) For complete table please contact Appear TV.
### PROCESSING MODULES SPECIFICATIONS

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<th>Number of audio tracks</th>
<th>Pass-Through</th>
<th>Audio format</th>
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#### Licensed Features
- Number of audio channels

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<th>Bulk Descrambling</th>
<th>Interface</th>
<th>CA system support</th>
<th>BISS support</th>
<th>Maximum data rate</th>
<th>Number of services per module</th>
<th>Scrambling algorithms</th>
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#### Licensed Features
- Number of descrambled channels

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<th>SIM Bulk Descrambling</th>
<th>Interface</th>
<th>CA system support</th>
<th>BISS support</th>
<th>Maximum data rate</th>
<th>Number of services per module</th>
<th>Scrambling algorithms</th>
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#### Licensed Features
- Number of descrambled channels

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<th>CA system support*</th>
<th>Number of services per CAM</th>
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<th>Number of services per scrambler card</th>
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#### Licensed Features
- Number of descrambled channels

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<th>Scrambling algorithm</th>
<th>Maximum data rate</th>
<th>Number of services per scrambler card</th>
<th>Video format</th>
<th>Interface towards CA System</th>
<th>Number of CA systems</th>
<th>EMM</th>
<th>Entropy reduction</th>
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#### Licensed Features
- Number of descrambled channels

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<th>EP-200</th>
<th>Ingest</th>
<th>Output</th>
<th>EIT table from any port, XMLTV</th>
<th>Re-generated EIT table</th>
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#### Audio Processor
- Number of stereo channels

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<td></td>
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<td>4</td>
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</tbody>
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### Resolutions @ 14.99 fps or 12.50 fps

- 480p: 854, 720, 640, 352, 320, 312, 240, 234, 200, 192, 180, 160, 144, 128, 112, 96, 80, 64, 48, 32, 24, 16, 12, 8, 6, 4, 3, 2, 1
- 540p: 960
- 720p: 1280, 1024, 768, 720, 640, 352, 320, 288, 270, 256, 240, 224, 200, 176, 160, 144, 128, 112, 96, 80, 64, 48, 32, 24, 16, 12, 8, 6, 4, 3, 2, 1
- 960p: 1728, 1440, 1080, 960, 800, 720, 640, 352, 320, 288, 270, 240, 192, 160, 144, 128, 112, 96, 80, 64, 48, 32, 24, 16, 12, 8, 6, 4, 3, 2, 1
- 1080p: 1920, 1280, 1080, 960, 800, 720, 640, 352, 320, 288, 270, 240, 192, 160, 144, 128, 112, 96, 80, 64, 48, 32, 24, 16, 12, 8, 6, 4, 3, 2, 1
- 1440p: 2560, 2048, 1920, 1600, 1440, 1280, 1080, 960, 800, 720, 640, 352, 320, 288, 270, 240, 192, 160, 144, 128, 112, 96, 80, 64, 48, 32, 24, 16, 12, 8, 6, 4, 3, 2, 1
- 2160p: 3840, 2880, 2160, 1920, 1280, 1080, 960, 800, 720, 640, 352, 320, 288, 270, 240, 192, 160, 144, 128, 112, 96, 80, 64, 48, 32, 24, 16, 12, 8, 6, 4, 3, 2, 1

#### Frame rate conversion
- From 60/59.94/50 reduced to ½, ¼
- From 30/29.97/50 reduced to ½
- From 25 reduced to ½ or ¼
- From 15 reduced to ½ or ¼

#### Number of profiles
- Ranging from 4 × HD to 28 × sub SD per module, depending on complexity of profiles

#### Key Frame Alignment
- Frame accurate key frame alignment across all profiles. Fixed IDR to IDR distance.

#### GOP control
- Dynamic GOP structure with Scene Change Detection.

#### Audio Encode
- Number of audio tracks: 250 stereo
- All components signaled in service
- MPEG-1 layer 2
- 30 dB
- 2 dB
- Static
- Integrated with 3rd party SW solutions for automatic adjustment

#### Capacity
- Up to 8 per module

#### Output format
- AAC LC, Modes: 2.0, Bit rates: 32–384kbps
- HE-AAC v1, Modes: 2.0, Bit rates: 32–192kbps
- HE-AAC v2, Modes: 2.0, Bit rates: 32–96kbps
- Sample rates: 32, 48kHz

#### Sample rates
- 32, 48kHz

#### Reformatting/Rescaling
- Interlaced to progressive conversion
- From HD to sub SD

#### Aspect Ratio Control
- Transparent Input to Output, Manual 4:3 or 16:9
- Generated based on incoming AFD and format conversion

#### Aspect Ratio Modes
- AFD Modes
- Generated based on incoming AFD and format conversion

#### VBI
- Pass-through
- Components such as EBU Teletext and DVB Subtitling can be passed through. Synchronization to video will be maintained.
- EIA-608n and EIA-708 passed through.
- Closed Captioning
- DVB Subtitling

#### Graphics
- Subtitling Insertion (burn-in)
- DVB Subtitling

#### Licensed Features
- Dolby Digital/Dolby Digital Plus Decode

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* For complete table please contact Appear TV.
* SDI only available for 25 fps

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* Appear TV aims to integrate with all major CA providers. Please contact Appear TV for an updated list over integrated CA systems.
Number of stereo audio per SDI Input: 8
Embedded Audio:
- SMPTE 372M (SD)
- SMPTE 299M (HD)
  - Sample rate: 48kHz, synchronous
Number of AES67 inputs: 1 - 32
Audio Transcoder Inputs
Number of MPEG TS inputs: 1 - 32
Audio Decoding (Transcoding Mode)
Audio Codes:
- MPEG-1 Layer 2 (2.0)
- AAC-LC (2.0, 5.1)
- HE-AACv1 (2.0, 5.1)
- HE-AACv2 (2.0)
- Dolby® Digital (2.0, 5.1)
- Dolby® Digital Plus (2.0, 5.1, 7.1)
Audio Downmix:
- Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of the transcoding process if output is set to 2.0.
Audio Encoding (All Modes)
Audio Codes:
- MPEG-1 Layer 2
- MPEG-1 Layer 3 (MP3)
- AAC-LC
- HE-AACv1
- HE-AACv2
- Dolby® Digital
- Dolby® Digital Plus
Audio Channel Modes:
- Stereo and Mono
- 5.1 and 7.1
Sample Rates:
- 48 kHz input
- 48 kHz output, 16 kHz output (MP3 only)
Audio Level Adjustments:
- +6 / -10 dB
Audio Lipsync Adjustment:
- +500ms / -200ms
PCR:
- Common PCR (On separate PID)
- Embedded in audio PID
Audio Encoder TS processing
PIS/SI
- PMT generation signaled as radio service
- SID generation
Licensed Features:
- Number of MPEG-1 Layer 2 and AAC stereo decoders
- Number of MPEG-1 Layer 3 (MP3) stereo decoders
- Number of Dolby® Digital Plus Professional Decoder stereo pairs
- Number of Dolby® Digital Plus Professional Encoder stereo pairs
- AES67 input

<table>
<thead>
<tr>
<th>Birtate minimum/maximum (at 48 kHz)</th>
<th>Mono (kbps)</th>
<th>Stereo (kbps)</th>
<th>5.1</th>
<th>7.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPEG-1 Layer 2</td>
<td>32 / 192</td>
<td>64 / 384</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MPEG-1 Layer 3 (MP3) 32 / 320</td>
<td>32 / 320</td>
<td>192 / 640</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>AAC-LC</td>
<td>32 / 320</td>
<td>192 / 640</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>HE-AACv1</td>
<td>32 / 96</td>
<td>112 / 512</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>HE-AACv2</td>
<td>32 / 96</td>
<td>112 / 512</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Dolby® Digital</td>
<td>56/640</td>
<td>224/640</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Dolby® Digital Plus</td>
<td>32/1024</td>
<td>192/1024</td>
<td>384/1024</td>
<td></td>
</tr>
</tbody>
</table>

Audio Encoder TS processing
PIS/SI
- PMT generation signaled as radio service
- SID generation
Licensed Features:
- Number of MPEG-1 Layer 2 and AAC stereo encoders
- Number of MPEG-1 Layer 3 (MP3) stereo encoders
- Number of Dolby® Digital Plus Professional Decoder stereo pairs
- Number of Dolby® Digital Plus Professional Encoder stereo pairs
- AES67 input

Key reference specification
Connector:
- Number of outputs per module
- Maximum bit-rate per port
- Transport stream output
- Number of services per card
- Output format

Ouput format:
- Constant bit-rate
  - EN 50083-9
  - 4 × BNC female, 75Ω
  - 3 different transport streams:
    - burst mode: 213.7Mbit/s
    - spread mode: 228Mbit/s
    - SPTS and MPTS
    - 250 (sum of all 4 ports)
  - Constant bit-rate

Video format:
- Transport stream, MPEG-2/4 (H264) and HEVC

Dual IP IO
IP-200
<table>
<thead>
<tr>
<th>IP Input/Output</th>
<th>Interface</th>
<th>Operational mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

QAM Output
CM-201, CM-301, CM-210, CM-310
<table>
<thead>
<tr>
<th>QAM Output</th>
<th>CM-201, CM-301, CM-210, CM-310</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key reference specifications</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td></td>
</tr>
<tr>
<td>Number of carriers</td>
<td></td>
</tr>
<tr>
<td>Number of QAM frequencies per module</td>
<td></td>
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<tr>
<td>Modulation</td>
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<tr>
<td>Symbol rate</td>
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<tr>
<td>Frequency range</td>
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<tr>
<td>Spectrum inversion</td>
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<tr>
<td>Test mode</td>
<td></td>
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<tr>
<td>Channel spacing</td>
<td></td>
</tr>
<tr>
<td>Frequency step size</td>
<td></td>
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<tr>
<td>Frequency stability</td>
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<tr>
<td>Output level</td>
<td></td>
</tr>
<tr>
<td>Output level stability</td>
<td></td>
</tr>
<tr>
<td>Output level adjustment step size (GUI)</td>
<td></td>
</tr>
<tr>
<td>MER</td>
<td></td>
</tr>
</tbody>
</table>

| Key reference specifications |
| Interface |
| Number of carriers |
| Number of QAM frequencies per module |
| Modulation |
| Symbol rate |
| Frequency range |
| Spectrum inversion |
| Test mode |
| Channel spacing |
| Frequency step size |
| Frequency stability |
| Output level |
| Output level stability |
| Output level adjustment step size (GUI) |
| MER |

| Key reference specifications |
| Interface |
| Number of carriers |
| Number of QAM frequencies per module |
| Modulation |
| Symbol rate |
| Frequency range |
| Spectrum inversion |
| Test mode |
| Channel spacing |
| Frequency step size |
| Frequency stability |
| Output level |
| Output level stability |
| Output level adjustment step size (GUI) |
| MER |

Licensed Features:
- Seamless IP In, Cloned IP Out
- Multiplexing
- FEC in, FEC out, FEC in/out
- IP Out Redundancy

Common Output Specifications
All Output Modules
- Key reference specification
- Multiplexing
- Video format
- PCR regeneration
- PIS/SI
- Function
- Pass-through of scrambled services
- PIS/SI handling

Output Module Specifications
Common Output Specifications
All Output Modules
- Key reference specification
- Multiplexing
- Video format
- PCR regeneration
- PIS/SI
- Function
- Pass-through of scrambled services
- PIS/SI handling

Output Module Specifications
Dual IP IO
IP-200
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QAM Output
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</table>

| Key reference specifications |
| Interface |
| Number of carriers |
| Number of QAM frequencies per module |
| Modulation |
| Symbol rate |
| Frequency range |
| Spectrum inversion |
| Test mode |
| Channel spacing |
| Frequency step size |
| Frequency stability |
| Output level |
| Output level stability |
| Output level adjustment step size (GUI) |
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| Key reference specifications |
| Interface |
| Number of carriers |
| Number of QAM frequencies per module |
| Modulation |
| Symbol rate |
| Frequency range |
| Spectrum inversion |
| Test mode |
| Channel spacing |
| Frequency step size |
| Frequency stability |
| Output level |
| Output level stability |
| Output level adjustment step size (GUI) |
| MER |

Licensed Features:
- Seamless IP In, Cloned IP Out
- Multiplexing
- FEC in, FEC out, FEC in/out
- IP Out Redundancy
**DVB-S/S2X Modulator SM-300**

- **Return loss**: typ > 16 dB
- **Spurious**: typ < -60 dBc
- **Key reference specification**: EN 300 421, EN 302 307 part 1 and 2
- **Number of DVB-S/S2X carriers per module**: 2
- **Carrier ID**: DVB, NIT
- **DC output**: 24 Volt
- **Maximum DC output current**: 500 mA
- **10MHz reference output**: 0 dBm
- **Spectrum inversion**: User selectable
- **Precorrection**: Static linear pre-correction
- **In-band flatness**: typ ± 0.2 dB
- **Monitoring ports level**: -40 dBm
- **Monitoring ports return loss**: >10dB

**DVB-S Coding and Modulation**

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

**DVB-S2X Coding and Modulation**

- **Constellation**: QPSK, 8PSK, 16APSK, 32APSK
- **Modulation mode**: CCM
- **FEC**: BCH/LDPC
- **Code rates DVB-S2X QPSK**: 1/4, 1/3, 2/5, 1/2, 2/3, 3/4, 4/5, 5/6, 6/7, 7/8, 8/9, 9/10
- **Code rates DVB-S2X 8PSK**: 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 5/6, 8/9, 9/10
- **Code rates DVB-S2X 16APSK**: 5/9, 26/45
- **Code rates DVB-S2X 32APSK**: 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, 7/8, 9/10
- **Code rates DVB-S2X 64APSK**: 5/6, 4/5, 7/9, 11/18, 32/45
- **Frame length**: Normal, Short
- **Gold scrambling sequence**: 0–6
- **Symbol rate**: 0–6
- **Gold scrambling sequence**: 0–6

**DVB-T Cable Modulator TM-101**

- **Key reference specification**: ETSI EN 300744
- **Number of carriers**: 4 independent carriers
- **Number of output ports**: 2 (2 carriers per port)
- **Output connector**: F-type
- **Impedance**: 75 Ω
- **Output frequency**: 47.063 MHz
- **Frequency setting step size**: 1 Hz
- **Output level**: 0 dBm
- **Output level stability**: ± 0.5 dB
- **Frequency accuracy**: ± 0.5 dB
- **Return loss**: >16 dB
- **MER**: >42 dB
- **Test mode**: CW

**DVB-T2 Coding and Modulation**

- **FFT size**: 32, 64, 128, 256
- **Guard intervals**: 1/4, 1/8, 1/16, 1/32
- **Code rates**: 1/2, 3/4, 5/6, 7/8
- **Constellation**: QPSK, 16-QAM, 64-QAM
- **Channel bandwidth**: 6, 7, 8 MHz

**DVB-T2 Cable Modulator TM-200**

- **Key reference specification**: ETSI EN 302735
- **Number of carriers**: 2 independent carriers
- **Number of output ports**: 2 (1 carrier per port)
- **Output connector**: F-type
- **Impedance**: 75 Ω
- **Output frequency**: 47.862 MHz
- **Frequency setting step size**: 1 Hz
- **Output level**: 10 to 2.2 dBm
- **Output level stability**: ± 0.5 dB
- **Frequency accuracy**: ± 0.5 dB
- **Return loss**: >16 dB
- **MER**: >42 dB
- **Test mode**: CW

**DVB-T2 Coding and Modulation**

- **FFT size**: 1k, 2k, 4k, 8k extended, 16k
- **Guard intervals**: 1/4, 1/8, 1/16, 1/32
- **FEC frame**: Normal (64k), Short (16k)
- **FEC code rate**: 1/2, 3/4, 5/6, 7/8
- **Constellation (PLP)**: QPSK, 16-QAM, 64-QAM
- **Channel bandwidth**: 5.5, 6, 7, 8 MHz
- **Pilot pattern**: P1–P8
- **Number of PLPs**: 1

**DVB-T/T2 Modulator (Exciter) SM-300**

- **Key reference specification**: ETSI EN 302735, ETSI EN 300744
- **Number of carriers**: 2 independent carriers
- **Number of output ports**: 2 (1 carrier per port)
Output connector: BNC
Impedance: 50 Ω
Output frequency: 47-862 MHz
Frequency setting step size: 1 Hz
Output level: ± 0.5 dB
Frequency accuracy: ± 2 ppm
Return loss: > 42 dB
MER: > 42 dB
Test mode: CW

**DVB-T Coding and Modulation**

| Input | TS with MIP (SFN) or remultiplexed TS |
| Guard intervals | Relative timestamps within 1000 ms |
| FTT size | 1/1.1, 1/2.1 and 1.3.1 (T2MI source only) |
| Code rates | 1/4, 1/8, 1/16, 1/32 |
| Constellation | P8, 4K, 8K, 8K extended, 16K, 16K extended, 32K, 32K extended |
| Channel bandwidth | 1.4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128 |
| FFT size | 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3 (T2-Lite), 2/5 (T2-Lite) |
| FEC frame | 0.5, 0.7, 0.8, 0.9 |
| Pilot pattern | P1 – P8 |
| Number of PLPs | up to 128 |

**DVB-T2 Coding and Modulation**

| Input | T2MI (SFN) or remultiplexed T2 |
| Guard intervals | Relative timestamps within 1000 ms |
| FTT size | 1/1.1, 1/2.1 and 1.3.1 (T2MI source only) |
| Code rates | 1/4, 1/8, 1/16, 1/32 |
| Constellation | P8, 4K, 8K, 8K extended, 16K, 16K extended, 32K, 32K extended |
| Channel bandwidth | 1.4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128 |
| Pilot pattern | P1 – P8 |
| Number of PLPs | up to 128 |

**ISDB-T Coding and Modulation**

| Modulation mode | Mode 3 (64QAM) |
| Time interleaving | 0 |
| Guard interval | 1/4, 1/8, 1/16, 1/32 |
| Code rate | 1/2, 1/4, 3/4, 5/6, 7/8 |
| Bandwidth | 3, 4, 5, 6 MHz |

**Multiplexing**

| Video format | Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC |
| PCR regeneration | Yes |
| PSI/SI | Function |
| PSI/SI handling | Function |
| Tables Supported | Tables Supported: PSI, PSIP |
| PSIP | PSIP |
|Licensed Features | Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |

**DVB-T2 T2MI**

| Clock modes | Relative Timestamps <1s (SFN) and Null timestamps (MFN) |
| PAPR | Yes |
| MISO/SISO | Yes |
| Guard intervals | 1/4, 1/8, 1/16, 1/32 |
| FFT sizes | 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3 (T2-Lite), 2/5 (T2-Lite) |
| Pilot Patterns | P1 – P8 |
| Constellations | QPSK, 16-QAM, 64-QAM, 256-QAM |
| Rotated constellations | Yes |
| ISSY supported | Yes |

**Licensed Features**

| Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |
| DVB-T2 PLP support | Number of PLPs |
| PLP mode | PLP types |
| Automatic calculation | T1 types |
| FEC frame | Yes |
| FEC code rate | Yes |
| Constellations | Yes |
| Related constellations | Yes |

**Multiplexing**

| Video format | Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC |
| PCR regeneration | Yes |
| PSI/SI | Function |
| PSI/SI handling | Function |
| Tables Supported | Tables Supported: PSI, PSIP |
| PSIP | PSIP |
|Licensed Features | Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |

**DVB-T2 T2MI**

| Clock modes | Relative Timestamps <1s (SFN) and Null timestamps (MFN) |
| PAPR | Yes |
| MISO/SISO | Yes |
| Guard intervals | 1/4, 1/8, 1/16, 1/32 |
| FFT sizes | 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3 (T2-Lite), 2/5 (T2-Lite) |
| Pilot Patterns | P1 – P8 |
| Constellations | QPSK, 16-QAM, 64-QAM, 256-QAM |
| Rotated constellations | Yes |
| ISSY supported | Yes |

**Licensed Features**

| Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |
| DVB-T2 PLP support | Number of PLPs |
| PLP mode | PLP types |
| Automatic calculation | T1 types |
| FEC frame | Yes |
| FEC code rate | Yes |
| Constellations | Yes |
| Related constellations | Yes |

**Multiplexing**

| Video format | Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC |
| PCR regeneration | Yes |
| PSI/SI | Function |
| PSI/SI handling | Function |
| Tables Supported | Tables Supported: PSI, PSIP |
| PSIP | PSIP |
|Licensed Features | Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |

**DVB-T2 T2MI**

| Clock modes | Relative Timestamps <1s (SFN) and Null timestamps (MFN) |
| PAPR | Yes |
| MISO/SISO | Yes |
| Guard intervals | 1/4, 1/8, 1/16, 1/32 |
| FFT sizes | 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 1/3 (T2-Lite), 2/5 (T2-Lite) |
| Pilot Patterns | P1 – P8 |
| Constellations | QPSK, 16-QAM, 64-QAM, 256-QAM |
| Rotated constellations | Yes |
| ISSY supported | Yes |

**Licensed Features**

| Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |
| DVB-T2 PLP support | Number of PLPs |
| PLP mode | PLP types |
| Automatic calculation | T1 types |
| FEC frame | Yes |
| FEC code rate | Yes |
| Constellations | Yes |
| Related constellations | Yes |

**Multiplexing**

| Video format | Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC |
| PCR regeneration | Yes |
| PSI/SI | Function |
| PSI/SI handling | Function |
| Tables Supported | Tables Supported: PSI, PSIP |
| PSIP | PSIP |
|Licensed Features | Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |
| DVB-T2 PLP support | Number of PLPs |
| PLP mode | PLP types |
| Automatic calculation | T1 types |
| FEC frame | Yes |
| FEC code rate | Yes |
| Constellations | Yes |
| Related constellations | Yes |

**Multiplexing**

| Video format | Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC |
| PCR regeneration | Yes |
| PSI/SI | Function |
| PSI/SI handling | Function |
| Tables Supported | Tables Supported: PSI, PSIP |
| PSIP | PSIP |
|Licensed Features | Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |
| DVB-T2 PLP support | Number of PLPs |
| PLP mode | PLP types |
| Automatic calculation | T1 types |
| FEC frame | Yes |
| FEC code rate | Yes |
| Constellations | Yes |
| Related constellations | Yes |

**Multiplexing**

| Video format | Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC |
| PCR regeneration | Yes |
| PSI/SI | Function |
| PSI/SI handling | Function |
| Tables Supported | Tables Supported: PSI, PSIP |
| PSIP | PSIP |
|Licensed Features | Number of carriers |
| Connectors | Number of MPTS's with MIP |
| Number of T2MI streams | Maximum ASI bit rate per port |
| Re-multiplexing | DVB-T MIP inserter |
| Key specifications | Key specifications |
| Relative timestamps | Relative timestamps |
Maximum data rate: Up to 850 MBit/s
Output mode: CBR
Data format: UDP/RTP Multicast/Unicast
Support for cloned output: Yes
Forward Error Correction: SMPTE 2022-1 (Licensed)
Re-multiplexing: See common output module specifications

**DVB-T MIP inserter**
- Key specification: ETSI EN 300 744, ETSI TS 101 191
- Relative timestamps: ≤1s

**DVB-T2 T2MI**
- Key reference specifications: T2 version: 1.1.1, 1.2.1 and 1.3.1
- System redundancy
- Regionalization: Yes. Please contact Appear TV for more information
- Clock modes: Relative Timestamps ≤1s (SFN) and Null timestamps (MFN)
- PAPR: TR and ACE (global on/off)
- MISO/SISO: Yes
- Guard intervals: 1/4, 19/128, 1/8, 19/256, 1/16, 19/64, 1/32, 1/128
- FFT sizes: 1k, 2k, 4k, 8k, 16k, 32k, 64k, 128k
- Pilot Patterns: P1 – P8
- L1 Constellations: QPSK, 16-QAM, 64-QAM, BPSK
- Bandwidth: 1.7, 5, 6, 7, 8, 10MHz
- DVB-T2 PLP support
  - Number of PLPs: 240 in total between all T2MI streams
  - HEM, constant bit-rate: 1 and 2
  - Within a T2 frame and across multiple T2 frames: FEC blocks, T1 blocks, T1 frames and T1 type
  - Normal (64k), Short (16k)
  - 1/2, 3/7, 2/3, 3/4, 4/7, 5/6
  - QPSK, 16-QAM, 64-QAM, 256-QAM
  - Yes
  - IP Out Redundancy, T2MI sync=IP Redundancy
  - Yes
- Licensed Features
  - IP Out Redundancy, T2MI sync=IP Redundancy
  - Multi PLP, Regional PLP
  - FEC out
  - ETSI EN 300 401, ETSI EN 302 755, ETSI TS 102 773

**DAB / DAB+ Cable Modulator CM-400**

**Licensed Features**
- 4 or 8 carriers

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**DECODER SPECIFICATIONS**

**MPEG-2/4 Decoder with SDI/HDSDI out DE-401, DE-411**

- Number of decoded channels
- Connector
- Output format
- Embedded audio

**Video Decoding**
- MPEG-2 profiles
- MPEG-4 AVC profiles
- Aspect Ratio Conversion
- Frame Synchronization (Genlock)

**Audio Decoding**
- Number of stereo pairs per video Codecs
- Dolby® Digital/Dolby® Digital Plus Decode

**Licensed Features**
- HD
- Genlock
- OSDM
- Dolby® Digital/Dolby® Digital Plus Decode

**MPEG-2/4 Decoder with SDI/HDSDI & AES Audio out DE-501, DE-511**

- Number of decoded channels
- Connector
- Output format

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

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

**VBI/VANC/DVB Sub Processing**
- DE-401, DE-411
- DE-501, DE-511

**Licensed Features**
- 2 per module
- 1 SDI/HDSDI 75Ω BNC per channel
Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out".

**Licensed Features**  
- HD  
- Genlock  
- OSDM  
- Dolby® Digital/Dolby® Digital Plus Decode

**MPEG-2/4 Decoder with Composite Output DE-211**

- Number of decoded channels: 2 per module
- Connector for video: 1 Composite 75Ω BNC per channel, unbalanced
- Connector for audio: 2 AES/EBU audio, 1 per channel (ch. 1)

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

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

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

**Analogue Video**

- Video standards: PAL and NTSC
- Conversion: HD down conversion to SD
- Signal to noise ratio: >70dB Measured Acc. Rec 569
- Luminance Non Linearity: <1%
- Sin x/x Gain: ±0.3dB
- Sin x/x Group Delay: ±10ns
- Bar Amplitude: 700 mV ±1% (PAL), 100 ±1IRE (NTSC)
- Sync Amplitude: 300 mV ±1% (PAL), 40 ±0.4IRE (NTSC)
- Burst Amplitude: 300 mV ±3% (PAL), 40 ±1IRE (NTSC)
- Analogue Audio Linearity: ±0.5dB (20-20kHz)
- 'THD+N: typ 70dB (at 9dBu)

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

**Quad Decoder with RF**

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

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

**Audio Decoding**

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

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

**VHF/UHF Output**

- Analogue modulation: PAL / B/G / D/K / I (5 MHz video BW)
- SECAM: B/G, D/K (5 MHz video BW)
- NTSC: -M
- RF output frequency range: 47 - 862 MHz
- RF tuning step size: 500 Hz
- Channel setting flexibility: 4 channel version fully agile, 8 channel version semi agile, two adjacent channels with 8 channel version semi agile, two adjacent channels with 8, 16 or 24 MHz spacing
- Output level (per carrier): 105-112 dBuV /ch (115 dBuV/ch for 4 ch version)
- Output level adjustment step size (GUI): 0.2 dB
- Return loss: >16dB
- Video carrier frequency stability: ±3 ppm
- Intermodulation distance, (dB): >40 dB, Measured: @ 115 dBV per channel, 2 channels per port

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

**FM Radio FM-100**

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

**FM Output**

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

**MPX Output**

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

* Quads decoders are combination of the decoder and TV modulator

11) All measurements are carried out in room temperature at 20°C Using R&S ETL as demodulator
CHASSIS

XC5000

Physical dimensions: 19" × 4RU × 400mm (440 × 177 × 400 mm)

Power supply
- Power: 800 Watt
- Input voltage: 100-240 V AC, 50/60 Hz
- Optional: -48V DC
- Redundancy: Yes, dual hot swappable PS
- Monitoring: Via WEB GUI and LED indicators on PS

Cooling
- Fans: 4 fans
- Hot swap of fans: Yes, fans are independently hot swappable
- Airflow direction: Front to back

XC5100

Physical dimensions: 19" × 1RU × 400mm (440 × 44 × 480 mm)

Power supply
- Power: 400 Watt
- Input voltage: 100-240 V AC, 50/60 Hz
- Optional: -48V DC
- Redundancy: Yes, dual hot swappable PS
- Monitoring: Via WEB GUI and LED indicators on PS

Cooling
- Fans: 6 fans
- Hot swap of fans: Yes, common fan module with all 6 fans
- Airflow direction: Front to back

ENVIRONMENTAL CONDITIONS

Operational conditions
- Temperature: 0 to +40 °C
- Humidity: 5–95% (non-condensing)

Storage
- Temperature: 20 to +70 °C
- Humidity: 5 to 95% (non-condensing)

Electrical safety
- IEC 60950-1

EMC
- EN 55022, EN55013, EN50083-2, EN55024, EN61000-3-2, EN61000-3-3, FCC CFR 47 Part 15

RoHS
- Compliant

WEEE
- Compliant