Appear TV

XC 5000 XC 5100

appeartv.com

SYSTEM OF CHOICE FOR PROFESSIONAL OPERATORS

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 1RU and 4RU 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.



Advanced architecture designed to save space, energy and resources



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 power

DIMENSIONS

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



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

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



- 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



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



Module plate for XC5100



SWITCH MODULES

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

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

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

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

SWITCH MODULES FOR XC5000

Switch Module with Management sw-200 • Gbit/s routing between modules in a chassis

Enables WEB management
 10/100/1000BaseT management port (RJ45)
 1 slot wide



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Switch Module with Management $2 \times 10/100/1000$ Base-T sw-301

Gbit/s routing between modules in a chassis

- $\cdot 2 \times \text{Gbit RJ45}$ input or output port for data
- Frame Synchronization input (genlock)
 Up to 850 Mbit/s TS rate per data port
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast • Supports reception of MPTS and SPTS
- 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
 EEC oncoding and decod
- FEC encoding and decoding (license)
 Enables WEB management
- Enables WEB management
 10/100/1000 BaseT management port (RJ45)
- 10/100/1000 baser management port (K)4
 1 slot wide

SWITCH MODULES FOR XC5100

Switch Module with Management $2 \times 10/100/1000$ Base-T

Gbit/s routing between modules in a chassis
2 × Gbit RJ45 input or output port for data
Frame Synchronization input (genlock)
Up to 850 Mbit/s TS rate per data port
Supports UDP/RTP Multicast/Unicast

- Supports obj / Ith Multicast of least
 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)
- FEC encoding and decoding (license
 Enables WEB management
- 10/100/1000 BaseT management port (RJ45)



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

Clock Reference Module cK-100

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

Switch Module with Management Dual SFP

SW-401

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

Switch Module with Management Dual SFP

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





SWITCH

SV-401 SV-400 SV-401 SV-400

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MPEG 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-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-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 MPEGTS rate or 250 services. In re-multiplexing mode, all services are de-multiplexed by the input module before passed onto the backplane. Unused services are blocked by the input module to avoid propagating them further, which increases efficiency. The full content of an input port can be mapped transparently to an output port with the option to perform PID filtering or service filtering.



FEATURES

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



INPUT MODULES

Dual IP IO IP-200

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

DVB-C Input CR-110

• 4 × QAM Annex A/C inputs \cdot 1 \times F connector • 0.87-6.9 Ms/s Supports reception of MPTS and SPTS Service filtering ASI monitoring port Input analysis 1 slot wide

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CR-110 CR-110

DUAL IN10

Enhanced DVB-S/S2 Input SR-110

- 4 × DVB-S/S2 inputs, 1 F connector per input 4 × F connector • DVB-S, DVB-S2 QPSK, 8PSK modes, 16APSK and 32APSK modes
- 950 2150 MHz Frequency Range
- Symbol rate: - DVB-S: 1-45 MSym/s
- DVB-S2: 1-45 MSym/s
- FEC: DVB-S: 1/2, 2/3, 3/4, 5/6, 7/8
- DVB-S2 QPSK: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
- DVB-S2 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 10/9
- DVB-S2 16PSK: 2/3, 3/4, 4/5, 5/6, 8/9, 10/9 - DVB-S2 32PSK: 3/4, 4/5, 5/6, 8/9, 10/9
- Supports reception of MPTS and SPTS
- Supports multistream reception
- Service filtering ASI monitoring port
- Input analysis
- 2 slots wide

DVB-TInput TR-110

- 4 × COFDM inputs
- •1 × F connector • Frequency range 47-862MHz
- 1/2, 2/3, 3/4, 5/6, 7/8 FEC
- 2k and 8k carrier mode
 QPSK, 16QAM, 64QAM modulation
- Supports reception of MPTS and SPTS Service filtering
- ASI monitoring port
- Input analysis
- 1 slot wide



ASI Input

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

ISDB-T Input module

- Standard ARIB STD-B31
- 4 x ISDB-T receivers per module • 1 F-type, 75 ohm female input port
- (all 4 channels on one input cable)
- Frequency range 47-860MHz
- Supports reception of MPTS and SPTS
- Service filtering on input
- Input analysis
- 1 slot wide

8VSB/QAM Annex B Input TR-300

- ${\scriptstyle \bullet}$ 4 \times 8VSB or QAM Annex B Inputs
- 4 × F connectors 50 to 860 MHz Frequency Range
- Supports reception of MPTS and SPTS
- ASI monitoring port
- Service Filtering
- 2 slots wide

DVB-T/T2 Input TR-201, TR-211

- 4 × DVB-T/T2 receivers per module.
- Input ports option:
- 1 × F connector, signal is split and distributed internally - 4 × F connectors, one per demodulator
- Frequency range 47-862MHz
- 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





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UNIVERSAL ENCODER & TRANSCODER

Linear Broadcast

In order to optimize the performance of their networks, it is essential for professional broadcasters to deploy the latest advances in compression technology. Whether the aim is to add new channels to existing multiplexes or provide genuine video guality improvements, it is imperative operators 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 guality and channel density on a specifically designed module targeting a wide range of applications. This allows users to maintain the best possible quality of service in combination with low power consumption and integrated multi-level redundancy.

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

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

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

All new Universal Encoder/Transcoder modules can be used in new or existing XC5000 or XC5100 Series platforms and can work in combination with any other modules from Appear TVs 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 SDI/HDSDI inputs directly, and encodes these into multiple profiles as a single pass, avoiding the need to concatenate compression stages which always causes inefficiencies and reduces VQ. The unique architecture delivers significant VQ and efficiency benefits for all real-time applications

Appear 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/originserver 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.



FEATURES

- Modular
- Exceptional video quality Compact HW based
- encoding/transcoding
- Supports MPEG-2 and MPEG-4 SD and HD
- · Power and space efficient
- Scalable

- · Segmentation agnostic: Can be used with customers
- having existing segmentation infrastructure
- Complete: Use with other modules to build a complete solution within a chassis
- Can be used to create hybrid broadcast / OTT capable platforms

ENCODING/TRANSCODING MODULES

HD/SD SDI Encoder EC-100, EC-200

- Encodes up to 2 HD or 4 SD channels · 2 HD-SDI or up to 4 SD-SDI inputs, BNC connectors Available variants; - Dual HD Encoder with AES option - Quad SD upgradable to Dual HD Operates in three different Encoder Rate control modes - Constant Bit Rate (CBR) - Capped Variable Bit Rate (CVBR)
- Statistical Multiplexing
- MPEG-2/4 SD/HD encoding
- Picture in picture support
- Logo insertion
- 1 slot wide

DUAL HD ENCODER BC-100 • Zanak • Zanak Õ $\overline{\odot}$ •



SD/HD Transcoder TC-100

- Transcodes up to 2 HD or 4 SD channels
- Full decode and re-encode
- MPEG-2/4 SD/HD transcoding
- Operates in three different Encoder Rate control modes:
- Constant Bit Rate (CBR)
- Capped Variable Bit Rate (CVBR)
- Statistical Multiplexing (in future release)
- 1 slot wide



Encoder -RF input Analogue Encoder AC-100 AC-200 Descrambling and Scrambling • Encodes up to 2 SD + PIP or 4 SD channels • Encodes up to 2 SD + PIP or 4 SD channels Ð ENCODER CVESIN • 4 F 75 Ω input connectors, one per service • 4 HD BNC with composite video input Input frequency range 47-862MHz 25 pin mini D-sub for audio: • PAL B/G, PAL I and SECAM D/K input* - 4 balanced analogue audio \odot • MPEG-2 and MPEG 4 SD encoding - 2 AES/EBU audio Operates in two encoder rate control modes: • MPEG-2 and MPEG 4 SD encoding \odot - Constant bit-rate (CBR) - Capped variable bit-rate (CVBR) Constant bit-rate (CBR) \odot Capped variable bit-rate (CVBR) Logo insertion 0 1 slot wide EPG and audio leveling 0 *Other TV standards can be supported upon request Universal Transcoder - Multiscreen (OTT) Universal Encoder - Multiscreen (OTT) TC-200 EC-400 Transcodes up to four services into multiple profiles · Encodes up to four services into multiple profiles Ð • Transcodes single service into 4 HD or 28 sub SD profiles • 4xSDI or 2xHDSDI input with embedded audio Supports an extensive range of resolutions and frame-rates TC-200 Profile range from 1920×1080p to 240×180p* from full 720p60/50 HD down to 144p15/12.5 Resolution conversion Resolution conversion Frame rate reduction Dynamic Encoder GOP Control Modes GOP alignment Key frame alignment Audio encoding Audio transcoding 1 slot wide 1 slot wide ÷ ÷ CHI *For complete list of available profiles, please contact Appear TV Universal Transcoder - Dense Broadcast Universal Encoder - High VQ Broadcast TC-200 EC-400 Encodes 1 HD or 2 SD into MPEG-2 or MPEG-4 Transcodes up to: (UN IVERS - 4 HD with PIP SDI/HDSDI input with embedded audio - 12 SD with PIP TC-200 O Statu • 2 BNC, 75 ohm female input ports (plus 2 unused BNC) - 16 SD no PIP · Operates in three encoder rate control modes: • Full decode and re-encode - Constant Bit Rate (CBR) Audio transcoding - Capped Variable Bit Rate (CVBR) Component pass-through
 Operates in 3 different Encoder Rate Control modes: - Statistical Multiplexing Resolution conversion . - Constant Bit Rate (CBR) Picture in Picture - Capped Variable Bit Rate (CVBR) Logo insertion - Statistical Multiplexing (in future release) · Advanced audio encoding with support for all common Mediaroom approved

- 1 slot wide

audio codecs

1 slot wide

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PROCESSING MODULES

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

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.



FEATURES

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



PROCESSING MODULES

Bulk Descrambler BD-100

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



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SIM Bulk Descrambler

BD-200



Scrambler CA-100

 DVB CA compliant scrambling (CSA) and AES compliant scrambling Scrambles up to 250 services, maximum 850 Mbit/s • Supports scrambling of MPEG-2 and H264 in SD &HD DVB Simulcrypt compliant • 10/100/1000BaseT IP interface towards CA system (RJ45) Handles up to 250 ECMs 1 slot wide

Digital Audio Leveling

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

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



EPG FP-200

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



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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 and Appear 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/S2 modulator is a fully frequency agile modulator aimed at modulating SD/HD services on to satellite. This high density modulator is capable of producing up to 2 DVB-S or DVB-S2 modulated channels. The solution offers broadcasters a higher rack density and lower power consumption, compared to alternative solutions and comes with advanced functionality like pre-compensation. The DVB-S/S2 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 support 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 IO	ASI Output
IP-200	AO-110
 2 × Gbit output port for data (or 1×in and 1×out) 10/100/1000BaseT (RJ45) or SFP output Up to 850 Mbit/s per data port TS Supports UDP/RTP Multicast/Unicast Supports streaming of MPTS and SPTS Supports cloned output Supports cloned output Supports multiplexing and transparent pass-through PSI/SI/PSIP regeneration Supports FEC (SMPTE 2022) (license) 1 slot wide 	 • 213 Mbit/s Burst mode or 72 Mbit/s Spread mode per output • 4 different multiplexed outputs
QAM Modulator	DVB-S/S2 Modulator
CM-201	SM-100, SM-200
 16 QAM modulators, 4 and 4 paired 2 × 75 Ω RF output (EN/IEC 60728-5) - F connector Full digital modulation and up-conversion DOCSIS 3.0 RF compliant 3.2 / 64 / 128 / 256 QAM modulation Frequency range of 47 – 862 MHz Supports multiplexing and transparent pass-through PSI/SI/PSIP regeneration ITU-TI83. Annex A/B/C 1 slot wide 	Connectors: - IF > 1 × F connector + 1 × F for monitoring per output -L-band > 1 × SMA connector + 1 × F for monitoring per output -Based on ETSI EN 300 421 and ETSI EN 302 307 standards Output options: -IF > 50-200 MHz -L-band > 950-2150 MHz Output options: -L-band > 950-2150 MHz
DVB-T/T2 Terrestrial Modulator	DVB-T/T2 Cable Modulator
тм-зоо	TM-101, TM-200
 2 DVB-T2 or 2 DVB-T independent outputs 1 × BNC connector + 1 × BNC for monitoring per output Monitoring ports for each output VHF/UHF, 50 Ω BNC, 47-862 MHz Output levels: -15 to 0 dBm Based on ETSI EN 300 744 and ETSI EN 302 755 standards Supports multiplexing and transparent pass-through (mode A) Support for SFN (ETSI TS 102 733 T2-MI) Supports multiplexing and transparent PSI/SI regeneration 1 slot wide 	

DAB/DAB+ Modulator

8 x DAB/DAB+ modulated carriers

Frequency range 174-239 MHz

• Output level -4 dBm to -15 dBm

Standards DAB/DAB+

• Key specifications: ETSI EN 300 401, ETSI TS 102 693, ETS 300 799

CM-400

• EDI input

1 slot wide

UVB-12 CALEWAY

AC-120 • 22101A

DVB-T/T2 GW A0-120, A0-120, IP-201

• IP or ASI out options:

- -10/100/1000 BaseT (RJ45) or SFP output on IP
- $-2 \times (1+1)$ ASI out
- Supports DVB-T MIP insertion and DVB-T2 T2MI generation • 4 independent gateways per module (2 for T2MI on ASI out)

4 Independent gateways
 Supports up to 240 PLPs

- Regionalization options
- PAPR and MISO support
- Full (Re-)multiplexing support (per PLP) • PSI/SI regeneration
- Supports SMPTE 2022 FEC (license)
- 1 slot wide



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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 applicable. All components are developed in house, giving customer's access to our design level expertise with the added benefit of being able to customize the solution to meet specific customer requirements.

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

DVB-T2 Integrated Multiplexer and DVB-T2 Gateway Module

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

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

Architectures and Regionalization

Appear TV network delivery enhancements include support for the DVB-S/S2/S2x standard and are incorporated into the satellite modulator and demodulator modules. For IP distribution our 'seamless' packet re-construction technology provides superior protection against network packet loss and enables FEC levels to be reduced, re-claiming useful bandwidth





DECODER

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



DECODER MODULES

Dual MPEG-2/4 Decoder with SDI/HDSDI Output DE-401 / DE-411*

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

DE-401 O 00

B DUAL HD

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

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

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DUAL HD

Dual MPEG-2/4 Decoder with High Performance RF Modulation and Stereo Sound Output DM-111

• 2 outputs per decoder • MPEG-2/4 (H264) SD and HD

- PAL > B/G, SECAM > D/K
- HD downconversion to SD Dolby® Digital Plus (HW option)
- Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF)
 VBI re-insertion (WSS, WST/EBU Teletext, VPS, VITS)
- DVB and EBU subtitling High performance RF modulation and up-conversion
- 47 862 MHz frequency range • F connector output with both channels combined
- 2 DVB Common Interfaces. One per channel
- Dual stereo to dual mono conversion
- NICAM or A2 stereo audio (option)
- 2 slots wide

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

DE-501 / DE-511*

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

*DE-411 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 UECP SPB490 or static
- One RF output connector, F-type, with all 8 channels
- MPX test output
- 1 slot wide

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

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







REDUNDANCY

(AWARD WINNING)

Appear 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 TS regardless of input type. Input switching can also be performed on TS level using 'input port redundancy'.

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

Seamless IP input redundancy (License)

The Appear 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 network feeds.

The Seamless IP Switch can regenerate the traffic received via two networks, so that both networks are used 100% of the time to back each other up. Using the data provided by both networks simultaneously, redundant control modules can drive a (HD)SDI video router directly 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, management & control) as well as redundant power supplies. In case of input, switch or MMI failure, all output modules or decoder modules 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 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 a 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 to reconstruct a perfect outgoing stream even from two imperfect 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 of encoders and transcoders can be defined in the same chassis. For encoding, the

IP Output redundancy (License)

The IP output redundancy system presents a network with multiple sources from which it is possible to obtain the same service. Should the service from one source be corrupted, the network can receive the service from another source. The redundancy solution is service based redundant backplanes, redundant IP inputs, redundant MMI (i.e. (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 will switch backplane and log into the other MMI where it will receive 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.

Where full redundancy is not required, partial redundancy strategies can be implemented. Systems can be configured to provide full easily be hot-swapped, and the affected services will be up and 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

Placement

IP Input/Output

Maximum number of services per port Transport stream Service filtering IP Input IP de-jittering Forward Error Correction

IP Output Forward Error Correction

- PSIP

Frame Synchronization Input

Management

Licenced features

Clock Reference

GPS reference input

Antenna connector Active Antenna Voltage output Internal reference hold-over

1pps reference input mber of input ports out connector type Input level 1pps (1Hz) Internal reference hold-over

Licenced features

- : Gbit/s routing between modules in a chassis : 1 slot wide (4RU switch module must be placed in slot 0; redundant module in slot 17)
- $: 2 \times 10/100/1000$ Base-T Ethernet or SFP
- : Optical SFP (class 1 laser product)
- : Up to 850 MBit/s per port TS rate
- : UDP/RTP Multicast/Unicast
- : SPTS and MPTS
- : Transport stream: MPEG-2, MPEG-4, HEVC
- : PCR or CBR

- : SMPTE 2022-1

: Accepts black burst and Tri-Level reference signal.*

- : 10/100/1000 Base-T Ethernet
- : SNMP for alarms, SOAP for configuration and status

: 2xIP In, 1xIP In/1xIP Out, 2xIP Out, Seam. IP In, Cloned IP : FEC in, FEC out, FEC in/out : IP Out Redundancy

: 0V, 3.3V(default) or 5V $: \le 1$ us in 4 hrs @ $\Delta T = 0^{\circ}C$

: <u>BNC fe</u>male : TTL or 50 Ω : TTL

: GPS receiver, OCSO oscillator, OCXO oscillator (stability 0.2ppb/day)

COMMON INPUT SPECIFICATIONS

All Input Modules	Transport stream Service filtering Video format	: SPTS and MPTS : Yes : Transport stream, MPEG-2/4 (H264) SD/HD	DVB-T input	Key reference spo Connector Number of input Input level Frequency range
INPUT INTERFA	CE SPECIFICATIONS			Channel bandwid Guard interval
Dual IP IO	IP Input/Output Interface	: 2×10/100/1000 Base-T Ethernet and SFP		Carrier mode Hierarchy stream Hierarchy mode
	Operational mode	: The module can be configured to; - 1 input and 1 output - Seamless (Hitless) IP in - Cloned IP out - Dual IP in		Carrier modulatio FEC code rate Spectral inversio
	Maximum data rate per port	- Dual IP out : 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	DVB-T/T2 input	Number of DVB- Input connector Input connector
	Maximum number of services per port	IP out mode : 250		Input frequency Input level range Minimum return
	Data format	: UDP/RTP Multicast/Unicast		DVB-T
	IP Input IP de-jittering Forward Error Correction	: Yes, based on PCR or CBR : SMPTE 2022-1 250 input streams per data port		Key reference spo FFT Size Guard Intervals FEC code rate
	IP Output			Constellation
	Multiplexing Forward Error Correction	: Yes : SMPTE 2022-1 250 output streams per data port		Channel bandwi Hierarchy stream Hierarchy mode Spectral inversio
	Lisenced feature:	: Seamless input, Cloned IP Out : FEC in, FEC out, FEC in/out : Multiplexing : IP output redundancy		DVB-T2 Key reference spo FFT Size
				Guard Interval
ASI Input	Key reference specification	: EN 50083-9		FEC frame
	Connector Number of inputs per module	: BNC female, 75Ω : 4		FEC code rate (PL
	Maximum bit-rate per port	: Up to 213.7Mbit/s (burst)		Constellation (PL Channel bandwid Pilot pattern
Enhanced DVB-S/S2 Input	Key reference specifications	: EN 300 421, EN 302 307		SISO and MISO tr
	Connector Number of inputs per module	: F female, 75Ω : 4		Single and Multip
	DVB-S Constellation	. . : QPSK		Spectral inversio Rotated constella
	DVB-S2 Constellation	: QPSK, 8-PSK, 16-APSK		Notated constella
	Symbol rate DVB-S	: 1–45 MSym/s		Licenced featur
	Symbol rate DVB-S2	: 1–45 MSym/s : LDPC and BCH		
	Decoding DVB-S2 FEC DVB-S	: 1/2, 2/3, 3/4, 5/6, 7/8	DVB-C Input	Key reference spe
	FEC DVB-S2	: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10		Connector Number of input
	Roll off	: Auto, 0.15%, 0.20%, 0.25%, 0.35%		Number of input
	Acquisition range	: Auto, 0.15MHz, 1MHz, 2MHz, 2.5MHz, 5MHz		Frequency range
	Spectrum inversion DVB-S2 FEC frames	: Auto, Normal, Inverted : Short and Normal frames		Channel bandwi
	Input level	: -70 to -20 dBm (16 APSK, 9/10 code rate)		QAM Mode Symbol rate
	Frequency range	: 950–2150 MHz		Spectrum inversi
	LNB voltage	: 0/13/18 Volt		Input power leve
	Maximum LNB supply current LNB signaling	: 400 mA : LNB voltage + 22kHz continuous tone		
	Multiple streams	: Yes, 1 per input port	QAM Annex B input	Key reference spo Connector
	T2MI De-encapsulation	: Yes, one PLP per port		Number of input

: DVB-S2 demodulation

Licenced features:

Frequency range Channel bandwidth

configurations

PLP) PLP) vidth ransmission ple-PLPs

res:

ts per module

```
: ETSI EN 300744
 : 1/4, 1/8, 1/16, 1/32
: 2k, 8k
  : High and low priority
 : All
: QPSK, 16QAM, 64QAM
: 1/2, 2/3, 3/4, 5/6, 7/8
: Automatic
 : 4
: F-female, 75 Ω
: 1 F connector internally split or
4 F connectors
: 47–862 MHz
  : - 80 to -10 dBm (at T2, 8MHz, 256 QAM, 3/5, gaussian channel)
  : 10 dB
 : ETSI EN 300744, Nordig 2.0
  : 2k, 8k
  : 1/4, 1/8, 1/16, 1/32
  : 1/2, 2/3, 3/4, 5/6, 7/8
  : QPSK, 16-QAM, 64-QAM
 : High and Low priority
: ETSI EN 302755, Nordig 2.1

: 1k, 2k, 4k, 8k, 8k extended, 16k,

16k extended, 32k, 32k extended

: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128

: Normal (64k), Short (16k)

: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6

: QPSK, 16-QAM, 64-QAM, 256-QAM

: 5, 6, 7 or 8 MHz

: P1–P8

: Yes

: Yes

: Automatic

: Automatic
 : DVB-T2 demodulation
 : EN 300 429, ITU-T J83 annex A, and C
 : 1 (internal splitter feeding the 4 tuners)
 : 4, 16, 32, 64, 128, 256 QAM
: 1–7.2 Mbaud
  : - 30 to -65 dBm (at 256 QAM, 6.9 Ms/s)
 : ITU-T J83 annex B
: F female, 75Ω
```

	QAM Mode	: 64, 256 QAM	
	Symbol rate	: 5.057 Mbaud (64 QAM), 5.360 MBaud (256 QAM)	End-to-end Encoder Delay
8-VSB Input (ATSC)	Key reference specification	: ATSC A/53	Audio Encoder
	Connector	: F female, 75Ω	Number of encoded stereo pairs per
	Number of inputs per module Input level	:4 :-34 to +40 dBmV	Audio CODECS
	Frequency range	: 50–860 MHz	
	Modulation	: 8-VSB	
	Band	: Broadcast	
	Licenced features:	: 8-VSB, QAM Annex B	
ISDB-T/SBTVD-T	Key reference specification	: ARIB STD-B31	
	Channel bandwidth	: 6, 7 and 8 MHz	Audio Channel Modes
	RF Input specification		AAC Data Encapsulation
	Number of inputs per module	: 4 independent tuner/demodulators	
	Number of input ports	: 1 (internal splitter feeding the 4 tuners)	Audio Lipsync Adjustment
	Connector	: F female, 75Ω	Audio Level Adjustment
	Frequency range	: 50–860 MHz	
	Input power level		Picture-in-Picture
	Maximum	: -10 dBm	Density
	Minimum (QPSK, 2/3)	: -76 dBm	Codec
	Minimum (64 QAM, 7/8)	:-95dBm	Bitrate
	Return loss	:10dB	Resolutions
			Video Pre-processing
	Demodulation	: DQPSK, QPSK, 16QAM, 64QAM	Inverse Telecine Detection
	FEC	: 1/2, 2/3, 3/4, 5/6, 7/8, Automatic	De-blocking Filter
	Spectrum inversion	: Automatic	Motion Compensated Temporal Filt

ENCODING/TRANSCODING SPECIFICATIONS

Density				

Vid

SD I

Auc Emb

Vic Arc MP

isity	
mber of channels per module	: Up to 1 HD or 2 SD
eo Input	
Res. / Frame rates (SMPTE 292M)	: 1080i – 29.97 fps or 25 fps : 720p – 59.94 fps or 50 fps
Res. / Frame rates (SMPTE 259M)	: 480i – 29.97 fps : 576i – 25 fps
dio Inputs	
bedded Audio	: SMPTE 272M (SD), SMPTE 299M (HD) : Sample rate 48kHz, synchronous to video
3	: 75 Ohm BNC
	: PCM or Dolby® Digital/Dolby® Digital Plus
eo Encoder	
hitecture	: Dual Pass with look ahead
EG-2 profiles	: MP@HL (HD) up to 60Mbps
	: MP@ML (SD) up to 16Mbps
EG-4 AVC profiles	: MP@L4.2, HP@L4.2 (HD) up to 60Mbps
	: MP@L3.1, HP@L3.1 (SD) up to 16Mbps
e Control Modes	: Constant Bit Rate (CBR)
	: Capped VBR (CVBR) with QP target
	: Statistical Multiplexing
P structure	: Dynamic with Scene Change Detection and Adaptive GOP structure.
ck Modes	: Locked to HDSDI/SDI input
ect Ratio Control	: Manual, WSS or Video Index
R PID	: PCR on Video PID or as separate PID
histored trademarks of Dolby® Laboratories	

Logo Insertion Maximum Size

Video Re-scaling

File format

Ancillary Data and VBI

Digital Programme Insertion (DPI)

AAC-LC/HE-AAC v1 5.1 support in future release.
 Dolby® Digital also known as AC-3
 Dolby® Digital Plus also known as E-AC-3
 One 5.1 encode uses resources of 3x stereo pairs. One 7.1 encode uses resources of 4x stereo pairs.

PCF

```
er main video : 6 (4 for Dolby® Digital / Dolby® Digital Plus)
                    : AAC-LC (2.0, 5.1<sup>1)</sup>)
                    : Dolby<sup>®</sup> Digital<sup>2)</sup>
                     : Dolby<sup>®</sup> Digital Plus<sup>3)</sup>
                    : Dolby<sup>®</sup> Digital/Dolby<sup>®</sup> Digital Plus pass-through
                     Digital/Dolby<sup>®</sup> Digital Plus only)
                     : One PiP available for each main channel
                      : MPEG-4 AVC BP or MP
                      : Min 96kbps, Max 500kbps (CBR)
                      : 192x192, 176x144, 128x96, 96x96
ter (MCTF) : Adjustable

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

                      : 192x128 (SD)
                       : 360x180 (HD 720P)
                      : 480x270 (HD 1080i)
                      : User selectable (pixel accuracy)
                      : Extracted from VANC OP47, SMPTE-2031 or VBI and trans-
                      coded to EN 301755.
```

- 2020 used for Dolby[®] Digital/Dolby[®] Digital Plus encoding configuration.

	Wide Screen Signalling (WSS)	: Extracted from VBI line 23 or VANC SMPTE 2031 and transcoded to EN 301755		
	Video Programming System (VPS)	: Extracted from VANC SMPTE 2031 and transcoded to EN		De-interlacing Scene change detection
	Video Inserted Time Code (VITC)	301755 : Extracted from VANC SMPTE-RP188 and injected into video stream.		GOP structure Number of output profiles
		ed to service through an Appear TV Input Interface (e.g. ASI,		Audio Encode MPEG1 Layer II
	IP). PTS can be restamped for DVB subtitling.			AAC-LC
	Statistical Multiplexing Statmux Controller	: Local within chassis		HE-AAC v1
	Max. Number of Groups per chassis Max. Number of Services within group	:4 :32		HE-AAC v2 Sample rates
	Licensed Features Video Mode HPBC (required)			Number of channels per video sourc
	Number of Encoder Channels HD Number of Encoder Channels SD			Reformatting/ Rescaling
	Statistical Multiplexing - Number of Channels Dolby® Digital/Dolby® Digital Plus Encode - Num	show of Change Datur4)		Format conversion
	MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 E			Aspect Ratio Control Aspect Ratio Modes
ersal Encoder - MS/OTT	Input Ports Input Format	: 2xHDSDI/4xSDI, 4 BNC 75 Ω : SMPTE 292M (HD SDI), SMPTE 259M (SD SDI)		Ancillary Data and VBI
	Video Pre-processing WSS Blanking	: Removal of line 23 WSS from active video		Closed Captioning (EIA 608/EIA 708) Active Format Desctription (AFD)
	Video Encode			
	MPEG-4 AVC Profiles	: High profile up to HP@L4.0 : Main profile up to MP@L4.0	Encoder – SDI/HDSDI input	HW options
	HD and sub HD resolutions $5)$: Base profile up to BP@L4.0 : 1920 x 1080i @ 29.97, 25 fps		Input Port options
		: 1920 x 1080f @ 29.97, 25 fps : 1920 x 1080p @ 29.97, 25 fps : 1280 x 720p @ 59.94, 50 fps		Input Format
		: 1280 x 720p @ 29.97, 25 fps : 960 x 540p @ 29.97, 25 fps		Video Input HD Resolutions
		: 852 x 480p @ 29.97, 25 fps : 640 x 360p @ 29.97, 25 fps		SD Resolutions
		: 480 x 270p @ 29.97, 25 fps : 416 x 240p @ 29.97 fps		Video Pre-processing
	SD and sub SD resolutions ⁵⁾	: 320 x 180p @ 29.97/14.985, 25/12.5 fps : 720 x 576i @ 25/12.5 fps : 720 x 480i @ 29.97/14.985 fps : 640 x 480p @ 29.97, 25 fps		De-blocking Filter Motion Compensated Temporal Filte Horizontal Rescaling
		: 640 x 360p @ 29.97, 25 fps : 544 x 416p @ 29.97, 25 fps : 480 x 360p @ 29.97, 25 fps		Inverse Telecine Detection WSS Blanking
		: 480 x 270p @ 29.97, 25 fps : 416 x 240p @ 29.97 fps : 400 x 224p @ 29.97, 25 fps		Logo Insertion File Format Position
		: 400 x 300p @ 29.97, 25 fps : 384 x 216p @ 29.97, 25 fps : 352 x 288p @ 25 fps		Maximum Size
		: 320 x 240p @ 29.97 /14.985, 25/12.5 fps : 320 x 180p @ 29.97, 25 fps		Video Encoder
		: 240 x 180p @ 29.97/14.985, 25/12.5 fps		Number of channels per module MPEG-2 profiles
	Frame rate conversion	: From 60/59.94/50 reduced to ½, ¼		H.264/AVC profiles

From 50) redu	lced	to ½	or 1⁄4	

- : From 30/29.97/50 reduced to 1/2

: Interlaced to progressive conversion : Yes, insertion of P frame : Dynamic : Ranging from 4x HD to 28 sub SD per module, depend-ing oncomplexity of profiles

- : Modes: 2.0 (stereo), Bit rates: 64 384kbps
- : Modes: 2.0, Bit rates: 32 384kbps
- : Modes: 2.0, Bit rates: 32 192kbps
- : Modes: 2.0, Bit rates: 32 96kbps
- : 32, 44.1, 48kHz

: Extracted from VANC SMPTE 2016 and injected into

: Two HW options.

- Quad SD upgradable to Dual HD
- 4 BNC 75 Ω configured as:
 2 SDI /HDSDI and 2 AES/EBU inputs, one per channel
- : SMPTE 292M (HD SDI), SMPTE 259M (SD SDI)

: 1080i - 30 fps, 29.97 fps or 25 fps

- : 576i 25 fps

Iter (MCTF) : Adjustable

: From 1920 to 1440, 1280 or 960

- : From 720 to 704, 640, 544, 528, 480 or 352

: PNG (8-bit RGBA) file per encoded channel

- : User defined (pixel resolution)
- : 192 × 128 (SD)

- : up to HP@HL (HD) : up to HP@ML (SD)

	Rate Control Modes	: Constant Bit Rate (CBR)		
		: Capped VBR (CVBR) with QP target		Video Encoder
	Rate Range	: Statistical Multiplexing : From 250kbps to limit by profile/level (max 38Mbps)		Number of channels per module
	GOP control	: Fixed or Dynamic with Scene Change Detection and		MPEG-2 profiles
		adaptive GOP structure		MPEG-4 AVC profiles
	Encoder Clock	: Locked to SDI/HDSDI input		Rate Control Modes
	Picture-In-Picture	: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96		
		or 96×96		Data Danga
	Aspect Ratio Control	: Manual, WSS or Video Index		Rate Range
	Ancillary Data and VBI			GOP control
	VANC processing	: Closed Captioning (EIA 708)		
		: AFD (SMPTE 2016)		Picture-In-Picture
		: Teletext (Extracted from VBI, OP47 or SMPTE-2031)		
		: VPS (Extracted from SMPTE-2031)		Aspect Ratio Control
		: WSS (Extracted from VBI, OP47 or SMPTE-2031)		
		: DPI (SCTE 104 VANC extraction and SCTE 35 Private Data generation)		Audio Encoder
		generation		Audio CODECs
	Audio Input			
	Embedded Audio	: According to SMPTE 272M (SD), SMPTE 299M (HD)		
	AES 3	: 75 Ω BNC (Dual HD version only)		
	Audio Encoder			
	CODECs	: MPEG-1 Layer 2		AAC Data Encapsulation Channel Modes
		: AAC-LC		Encoded stereo pairs per video
		: HE-AAC v1		
		: HE-AAC v2 : Dolby® Digital pass-through		Audio level adjustment
	AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel		Injection of Private Data into service
	Channel Modes	: Stereo/Dual Mono/Mono		
	Stereo pairs per video	: 2 pairs for Dual HD/SD version from any codec above		Licensed Features
		: 1 pair for Quad SD version		
		: Additional 4 AAC-LC or 8 MPEG1 Layer 2 per module	Encoder - RF Input	Number of channels per module
		shared between video ch (capacity reduced to half in		DE la sost
		statmux mode)		RF Input TV systems
	Injection of Private Data into service	: See Universal Encoder High VQ "Auxillary Data Injection"		RF inputs
	injection of Frivate Data into service	. See Oniversal Encoder Flight VQ Auxiliary Data Hijection		Input frequency
	Licensed Features	: Number of encoded channels		Frequency tuner step size
		: Statmux (per module)		RF input level
		: DVB subtitle restamping		– Max
				– Min (for un-weighted video SNR=3)
adar CV/DC innut	Number of choose de			Video Encoder
coder– CVBS input	Number of channels Input Port	: 4 SD or 2 SD+PIP : 4 HD BNC 75 Ω, one per channel		Please refer to "Encoder -CVBS input"
	inputroit	25 Pin Compact D-sub for audio:		
		- 4 balanced analogue audio inputs		Picture-in-Picture
		- 2 AES/EBU inputs		Please refer to "Encoder -CVBS input"
	Video Input	: PAL B/G/I/D/K		
		: SECAM D/K		Video Pre-processing
		: PAL NC		Please refer to "Encoder -CVBS input"
		: PAL M : NTSC M		Logo Insertion
				Please refer to "Encoder -CVBS input"
	Video Pre-processing			
	Inverse Telecine Detection	: Yes		Audio Encoder
	De-blocking Filter Motion Compensated Temporal Filter (MCTF)	: Adjustable : Adjustable		Audio CODECS
	Horizontal Rescaling	: From 720 to 704, 640, 544, 528, 480 or 352		
	WSS Blanking	: Removal of line 23 WSS from active video		
				AC Data Encapsulation
	Logo Insertion File Format	DNIC (9 hit DCPA) file percented d chapped		Channel Modes
	Position	: PNG (8-bit RGBA) file per encoded channel : User defined (pixel resolution)		Encoded stereo pairs per video
	Maximum Size	: 192 × 128 (SD)		Audio Level Adjustment
	Ancillary Data and VBI			
	VBI Extraction and processing	: Closed Captioning (EIA 708)	6) Other TV standards can be su	upported upon request

```
: 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)
: up to HP@ML
: up to HP@L3.0
: Constant Bit Rate (CBR)
: Capped VBR (CVBR) with QP target
  : 2SD: From 250kbps to 19Mbps
: Fixed or Dynamic with Scene Change Detection and adaptive GOP structure
  .
: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96
: MPEG-1 Layer 2

: AAC-LC

: HE-AAC v1

: HE-AAC v2

: Dolby<sup>®</sup> 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 × SD
```

- configuration : +/-11dB

: 44 dBuV

: 4xF female, 75 Ω : 47 – 862 MHz

: MPEG-1 Layer 2 Stereo : AAC-LC Stereo : HE-AAC v1 Stereo : HE-AAC v2 Stereo : ADTS or LATM selectable per encoded channel : Stereo/Mono/Dual Mono

	VBI Please refer to "Encoder -CVBS input" Auxillary Data Injection Injection of Private Data into service	: See Universal Encoder High VQ "Auxillary Data Injection"		Picture-in-Picture Codec Bitrate Resolutions Video Re-scaling
	Licensed Features	: Number of Encoded channels, PIP		Down Conversion HD to SD Up Conversion SD to HD
sal Transcoder - Dense Bro				Frame Rate Conversion
	Density Total Number of Video Transcodes	: Up to 4x HD or 16x SD channels per module		
	Video transcoder consists of four blocks each ca	ipable of		
		: 1x HD transcode with PiP OR : 4x SD transcode without PiP OR : 3x SD transcode with PiP OR : 1x HD/SD transcode with PiP and up/downconv.		
	Each block can be configured independently.			Logo Insertion Maximum Size
	Video Decoder			Maximum Size
	MPEG-2 profiles	: MP@HL (HD)		
	MPEG-4 AVC profiles	: MP@ML (SD) : MP@L4.2, HP@L4.2 (HD)		Positioning File format
	SD resolutions	: MP@L3.0, HP@L3.1 (SD) : 720/704/544/528/480/352 x 576i25 fps : 720/704/640/544/528/480/352 x 480i29.97 fps		Subtitling Burn In DVB/EBU Subtitling
	HD 1080i resolutions HD 720p resolutions	: 1920/1440/1280/960 x 1080i30/29.97/25 fps : 1280/960/640 x 720p60/59.94/50 fps		Auxillary Data
	Audio Decoder			Auxillary data components (EBU Subt
	Audio Decoder Audio Codecs	: MPEG1 Layer 2 (2.0)		Lipsync to video is maintained.
		: AAC-LC (2.0)		Video Processing
		: HE-AACv1 (2.0) : HE-AACv2 (2.0)		WSS (line 23) blanking
		: Dolby® Digital (2.0/5.1)/Dolby® Digital Plus (2.0/5.1/7.1)		Statistical Multiplexing (Not suppor
	Audio Downmix	: Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of transcode process.		Statmux Controller Maximum # Groups
	Video Encoder			Maximum # Services within group
	MPEG-2 profiles	: MP@HL (HD)		
	MPEG-4 AVC profiles	: MP@ML (SD) : MP@L4.1, HP@L4.1 (HD) : MP@L3.1, HP@L3.1 (SD)		Licensed Features
	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		Mediaroom:
	Aspect Ratio Control	: Manual, Transparent input to output	Universal Transcoder - MS/OTT	Number of input channels
	PCR PID	: PCR on Video PID or as separate PID		
	End-to-end Encoder Delay Audio Encoder	: Typically 5500ms		Video Decoder MPEG-2 profiles MPEG-4 AVC profiles
	Audio CODECS	: MPEG1 Layer 2 (2.0)		
		: AAC-LC (2.0)		
		: HE-AACv1 (2.0)		Audio Decoder
		: HE-AACv2 (2.0)		Input format
		: Dolby® Digital pass-through : Dolby® Digital Plus pass-through		
	Audio Channel Modes	: Stereo, Mono		
	AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel		
	Audio Lipsync Adjustment	: +/- 300ms		Pass-through
	Audio Level Adjustment	: +/-6dB		
	Audio Transcode Density	: 12 transcodes per 2 blocks, max 4 per channel		

: MPEG-4 AVC MP

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

: 360x180 (HD 720P)

: 480x270 (HD 1080i)

: User selectable (pixel accuracy)

: PNG (8-bit ARGB) file per encoded channel

oorted in initial release) : Local within chassis. : One per Universal Transcoder board in chassis

1xHD/4xSD

: Dolby[®] Digital/Dolby[®] Digital Plus Decode : High Density Mode (dense-sd for 4xSD per block) : MPEG2/H264

: Up to 4 HD channels⁷⁾

: Ranging from MP@ML (SD) to MP@HL (HD) : up to HP@L4.2 : up to MP@L4.2

: up to BP@L4.1

: HE-AAC v1/2. Modes: 2.0, 5.1 (downmixed to 2.0) : Dolby[®] Digital (AC-3) : Modes: 2.0, 5.1 (downmixed to 2.0)

mixed to 2.0)

: MPEG1 Layer II

			PROCESSING M	ODULES SPECIFICATIONS
	Video Encode MPEG-4 AVC Profiles	: up to HP@4.0		
		: up to MP@4.0 : up to BP@4.0	Audio leveling	Number of audio tracks Pass-Through
	Resolutions @ 59.94 fps or 50.00 fps ⁸⁾	: 720p > 1280, 960, 854		Audio format
	Resolutions @ 29.97 fps or 25.00 fps ⁸⁾	: 1080p > 1920, 1440, 1280, 960, 720, 640		Adjustable range
		: 720p > 1280, 960, 854 : 640p > 960		Step
		: 576p > 1024, 768, 720, 352 ⁹		Adjustment mode
		: 540p > 960		
		: 480p > 854, 720, 640, 352 : 432p > 768		
		: 360p > 640, 480		Licensed Features
		: 320p > 480		
		: 288p > 512 : 270p > 480, 360	Bulk Descrambling	Interface
		: 256p > 144		CA system support
		: 240p > 320		BISS support Maximum data rate
		: 216p > 384 : 180p > 320, 240		Number of services per module
	Resolutions @ 14.99 fps or 12.50 fps ⁸⁾	: 640p > 520, 240 : 640p > 960		Scrambling algorithms
		: 576p > 1024, 768, 720, 352		
		: 480p > 854, 720, 640, 352		Licensed Features
		: 432p > 768 : 360p > 640, 480		
		: 320p > 480	SIM Bulk Descrambling	Interface
		: 288p>512		Number of SIM card readers
		: 270p > 480, 360 : 256p > 144		
		: 240p > 320		CA system support
		: 216p > 384		BISS support Maximum data rate
		: 180p > 320, 240		Number of services per module
	Frame rate conversion	: From 60/59.94/50 reduced to ½, ¼		Scrambling algorithms
		: From 50 reduced to $\frac{1}{2}$ or $\frac{1}{4}$		
	Number of profiles	: From 30/29.97/50 reduced to $\frac{1}{2}$: Ranging from 4 $ imes$ HD to 28 $ imes$ sub SD per module, de-		Licensed Features
		pending on complexity of profiles		
	Key Frame Alignment	: Frame accurate key frame alignment across all profiles. Fixed IDR to IDR distance.	DVB Descrambling	Interface
	GOP control	: Dynamic GOP structure with Scene Change Detection.		CA system support*
	Audio Encode			Number of services per CAM
	Capacity	: Up to 8 per module		
	Output format		Scrambling	Scrambling algorithm
		: AAC-LC. Modes: 2.0, Bit rates: 32–384kbps : HE-AAC v1. Modes: 2.0, Bit rates: 32–192kbps		Maximum data rate
		: HE-AAC v2. Modes: 2.0, Bit rates: 32–96kbps		Number of services per scrambler card Video format
	Sample rates	: 32, 44.1, 48kHz		Interface towards CA System
	Reformatting/Rescaling			Number of CA systems
	De-interlacing Format conversion	: Interlaced to progressive conversion : From HD to sub SD		EMM
				Entropy reduction
	Aspect Ratio Control Aspect Ratio Modes	: Transparent Input to Output, Manual 4:3 or 16:9		
	AFD Modes	: Generated based on incoming AFD and format conver-		Licensed Features
		sion.		
	VBI		EPG	Ingest
	Pass-through	: Components such as EBU Teletext and DVB Subtitling	(ETSI EN 300 458 V1.9.1)	Output
		can be passed through. Synchronization to video will be maintained.		
	Closed Captioning	: EIA-608n and EIA-708 passed through.		
	Graphics			
	Subtitling Insertion (burn-in)	: DVB Subtitling		
	Licensed Features	: Dolby® Digital/Dolby® Digital Plus Decode	* A	
ut rostricts in	nut density to 2 channels		* Appear 1V aims to integrate with all n	najor CA providers. Please contact Appear TV for an updated list ove

7) Full HD (1080p) input restricts input density to 2 channels. 8) For complete table please contact Appear TV. 9) 352 only available for 25 fps

 All components signaled in service MPEG-1 layer 2 ±30 dB 2 dB Static Integrated with 3rd party SW solutions for automatial
: Number of audio channels
: SW based smart card : Please contact Appear TV* : Mode 1, Mode E : Up to 850 MBit/s : 250 : DVB-CSA and AES
: Number of descrambled channels : Biss, Verimatrix, Latens
: SIM based smart card : 8 in front and 8 behind front plate (Only 8 in front can be replaced while in operation) : Conax : Mode 1, Mode E : Up to 850 MBit/s : 250 : DVB-CSA and AES
: Number of descrambled channels : Conax
: DVB Common Interface : BetaCrypt, Conax, Cryptoworks, Irdeto, Mediaguard Viaccess, NDS Viasat, Nagra : 10 (requires multi service CAM)
: DVB-CSA and AES : Up to 850 MBit/s : 250 (depending on SW license) : Transport stream, MPEG-2 SD/HD and MPEG-4 SD/H : Simulcrypt interface : 4 CA systems simultaneously : Yes
: Yes for DVB No for AES
: Number of descrambled channels

- : EIT table from any port : Re-generated EIT table

COMMON OUTPUT SPECIFICATIONS

	IF OT SELCHICATIONS		QAM Output	Interface
All Output Modules	Key reference specification	: ETSI TR 101 211 V1.9.1, ISO IEC 13818-1		Number of carriers Number of QAM frequencies per mo
	Multiplexing			Modulation
	Video format	: Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD,		Symbol rate
		and HEVC		Frequency range
	PCR regeneration	: Yes		Spectrum inversion
	PSI/SI			Test mode
				Channel spacing
	Function	: PSI/SI regeneration based on input and		Frequency step size
		operations performed on the signal		Frequency stability Output level
	Pass-through of scrambled services	: Yes, on TS level. For SPTS output only		Output level stability
	PSI/SI handling	: Automatically regenerated		Output level adjustment step size (G
	Tables Supported:			MER
	PSI	: PAT, PMT, CAT		Return loss
	SI	: SDT, NIT, EITpf ,TOT, TDT, BAT, AIT		Spurious
	PSIP			Spunous
	Function	: PSIP input analysis	DVB-S/S2 Modulator, IF	Key reference specification
	Tables Supported:			Number of DVB-S/S2 outputs per mo
	PSI	: PAT, PMT, CAT		
	PSIP	: MGT, TVCT,CVCT		Monitoring ports
				Output connector
				Output frequency (center)
				Output level
OUTPUT MODULE SPECIFICATIONS				Output level stability
				Frequency stability

OUTPUT MODULE SPECIFICATIONS

				Frequency stability
Dual IP IO	IP Input/Output Interface Operational mode	: 2×10/100/1000 Base-T Ethernet and SFP : The module can be configured to;		Return loss Spurious In-band flatness Sportrum inversion
		- 1 input and 1 output - Seamless (Hitless) IP in		Spectrum inversion Precorrection
		- Cloned IP out - Dual IP in - Dual IP out		DVB-S Coding and Modulatio Constellation
	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		Modulation mode FEC outer FEC inner Code rates Symbol rate
	Maximum number of services per port	: 250		
	Data format	: UDP/RTP Multicast/Unicast		DVB-S2 Coding and Modulati Constellation
	Transport stream	: SPTS and MPTS		Modulation mode
	Service filtering	:Yes		FEC
	Video format	: Transport stream, MPEG-2/4 (H264) SD/HD		Code rates
	IP Input			Frame length
	IP de-jittering	: Yes, based on PCR or CBR		Symbol rate
	Forward Error Correction	: SMPTE 2022-1		Roll off
		250 input streams per data port		
	IP Output			Licensed Features
	Forward Error Correction	: SMPTE 2022-1		
		250 output streams per data port		
			DVB-S/S2 Modulator, L Band	Key reference specification
	Licensed Features	: Seamless IP In, Cloned IP Out		Number of DVB-S/S2 outputs p
		: Multiplexing		Monitoring ports
		: FEC in, FEC out, FEC in/out		Output connector
		: IP Out Redundancy		
				Output frequency
ASI Output	Key reference specification Connectors	: EN50083-9 : 4 BNC female, 75Ω		Output level
	Number of outputs per module	: 4 different Transport Streams		Output level stability
	Maximum bit-rate per port	: burst mode: 213.7Mbit/s		Frequency accuracy
		spread mode: 72Mbit/s		Return loss
	Transport stream output	: SPTS and MPTS		Spectrum inversion
	Number of services per card	: 250 (sum of all 4 ports)		Spurious
	Output format	: Constant bit-rate		In-band flatness

	: EN 300 429, ITU J.83.ABC : 2 × F connector female, 75 Ω : 3 and 4 per group (adjacent channels)
ule	: up to 16 carriers in 4 groups, 8 per port
	: 32 / 64 / 128 / 256 - QAM : 4.48 to 7.00 Mbaud (Annex A and C)
	: 47–862 MHz : user selectable
	: CW : 5, 6, 7, 8 MHz (12 MHz available for 3 carrier groups)
	: 1 Hz : 2 ppm
	: -12 to +2.2dBm per carrier : ± 0.5 dB
II)	: 0.1 dB
	:> 42 dB :>16 dB
	: typ < -60 dBc
	: EN 300 421 , EN 302 307
dule	: 2 : 1 per output (30 dB attenuated)
	: F-type female, 75 Ω (RF Out and Test out)
	: 70–200 MHz : -15 to 0 dBm
	: ± 0.5 dB
	: 2 ppm : >16 dB
	: typ < -60 dBc
	$:$ typ < \pm 0.1 dB
	: user selectable : Static linear pre-correction
	: QPSK : Constant
	: RS (188, 204)
	: Viterbi : 1/2, 2/3, 3/4, 5/6, 7/8
	: 0.5–45 Mbaud
	: QPSK, 8-PSK, 16-APSK, 32-APSK
	: CCM
	: BCH/LDPC : 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
	: 16200 bits (short), 64800 bits (long) : 0.5–45 Mbaud
	: 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35
	: DVB-S/S2
	:1 or 2 outputs
dule	: EN 300 421 , EN 302 307 : 2
	: 1 per output (30 dB attenuated)
	: SMA female, 50Ω (RF out) : F-type female, 75Ω (Test out)
	: 950–2150 MHz
	: -20 to 5 dBm
	: ± 0.5 dB : 2 ppm
	:>14 dB
	: user selectable $(a \in 55 dBc/(kHz) (a symbol rate > 256 kb/c)$
	: < -65 dBc/4kHz (@ symbol rate \ge 256 kb/s) : typ < \pm 0.1 dB

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Portection sources of the second seco					
PUS Colorg and Musicine Construction Cons		Precorrection	: Static linear pre-correction		
VET Cable Modulator Vet Cable		DVP & Coding and Modulation			Number of PLPs
Mathematics Control Control Net definition			• UD2K		
Namber of carines				DVB-T/T2 Modulator (Exciter)	Key reference specificat
PET Cable Modulator PET Cable Modulator Provide and Modulator Number of captor points Output frequency of captor points VE-T Cable Modulator ICPR (PS) (V, APS), 22, APS), (V, APS), 2					
NB T Cable Modulator					
Mart Cable Manufation made Symbol rate 00-96, 898, 16, 458, 22, 4PSK Model frequency setting view Constraints made 0096, 898, 16, 458, 22, 4PSK Model frequency setting view Model fuence 0096, 898, 16, 458, 22, 4PSK Model frequency setting view Model fuence 0096, 898, 16, 458, 22, 4PSK Model frequency setting view Model fuence 0096, 16, 10, 10, 20, 10, 20, 20, 20, 20, 20, 30, 30, 44, 55, 56, 86, 90, 10 Model frequency setting view Model fuence 0096, 109, 200, 02, 20, 20					
NB - 52. Colorg and Modulation Network Noticitation Nome					
VB-21 Colling and modulation OPEX of PSX 16 APSX 22 APSX PSX 00 OPEX 05 APSX 16 APSX 12 APXX 12 APX			. 0.5 15 115444		
VB T Cable Modulator VB T T T T T T T T T T T T T T T T T T T					
NR-T Cable Modulator 0000 Output Event and the part of the part					
VB-T Cable Modulator VB-T T Cable MC VB-T VB-T VB-T VB-T VB-T VB-T VB-T VB-T					
Francingth 1000 bis bis for (1, 4400 bits (bing) Nettin los Symbol race 0.05-30 Ma.ud Nettin los Kell of 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35 Nettin los Jess of the second					
Symbol rate Out-of Maxwell MRR Note of Construction 100 000,010,020,020,020,000,000 Text mode VB T Cable Modulator Expression features 100 2000000 Text mode VB T Cable Modulator Expression features 100 2000000 Text mode Text mode VB T Cable Modulator Expression features 100 2000000 Text mode Text mode VB T Cable Modulator Expression features 100 2000000 Text mode Text mode VB T Cable Modulator Expression features 100 20000000000000000000000000000000000					
Koll off 005.010.015.020.025, and 035 Test mode Lienced Features 10.72 outputs FT 5 soc 10.72 outputs FT 5 soc Gast distance Number of arraines > 10.02 outputs Gast distance Number of arraines > 10.02 outputs Gast distance Output connector > 750 Gast distance Output frequency > 24.02 arries rep port Gast distance Output frequency > 25.0 Gast distance Nome bandwidth > 25.0 Gast distance Frequency accuracy > 25.0 Gast distance Nome bandwidth > 24.0 Gast distance Frequency accuracy > 20.0					
Liensed Features DVPS-522 : 1 or 2 outputs DVPS-1 Coling and Model Input V8-T Coling and Model Input Key reference specification ETER N 300744 - 4 independent carriers Guided intervisis Carsielation Number of arriers - 2 id arriers per port) Guided intervisis Carsielation Guided intervisis Carsielation Output connector - 2 Foppe - 2 Foppe - 2 Foppe Output frequency - 47-362 MHz - 2 Foppe Output frequency - 47-362 MHz - 2 Foppe Output level stability - 2 Output frequency - 5 Fop Output level stability - 2 Output frequency - 5 Fop Return loss - 3 Fop - 7 Versions Frequency secturacy - 2 pom - 7 Versions Return loss - 3 Fop - 7 Versions Return loss - 3 Fop - 7 Versions Guard Intervids - 1 Versions - 7 Versions Constellation - 2 Pop - 7 Versions Return loss - 3 Fop - 7 Versions Guard Intervids - 1 Versions - 7 Versions Constellation - 2 Pop - 7 Versions Return loss - 3 Pop - 7 Versions Guard Intervids - 1 Versions - 7 Versions Constellation					
VB T Cable Modulator Key reference specification Number of arrings Key reference specification Number of arrings Key reference specification Number of arrings Constellation Constellati		Roll off	: 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35		Test mode
V8 T Cable Modulator V8 T Cable Modulator FF 3 ac Guad intervals Guad intervals V8 T Cable Modulator Key reference specification EST 18 900744 Guad intervals Number of carriers 41 degenerate tarriers Guad intervals Guad intervals Output connector E type E type Constellation Constellation Output connector E type E type P0 87 2 Collog and Modulation Frequency setting staps are 11 Hz Frequency acturacy 2 DBM E type Frequency acturacy 2 DBM Output level shability 2 DS 48 E type Frequency acturacy 3 FN Output level shability 2 DS 48 E type FF size FF size Return loss 2 Ad 48 E type FF size Guad intervals Test mode 1/2 Z Ad 3, 56 7/8 Constellation (FLP) Constellation (FLP) Guard intervals 1/2 Z Ad 3, 45 6 7/8 Constellation (FLP) Constellation (FLP) Cantellation 1/2 Z Si, 84, 56 7/8 Constellation (FLP) Constellation (FLP) Cantellation 1/2 Z Si, 84, 56 7/8 Constellation (FLP) Constellation (FLP) Cantellation 1/2 Z Si, 84, 56 7/8 Constellation (FLP) Constellation (FLP) Cantellation		Licensed Features	: DVB-S/S2		DVB-T Coding and M
WB-T Cable Modulator Key reference specification FTSI [N 300744 Guard intervals Guard intervals Number of arries -11 dependent carries Code rites Code rites Number of arries -21 dependent carries Code rites Code rites Output connector -Ftope Code rites Code rites Output fequency -47.802 MHz DBP 372 Code and M Input Prequency string step size -11 HZ PUP 372 Code and M Input Output level -12 h2 2 dBn SPN SPN SPN Prequency string step size -14 K Output level SPN SPN Output level -14 k1 02 dBn Gaard intervals SPN SPN Ret moles -20 dBn -20 dBn Gaard intervals SPN Ret moles -20 dBn -20 dBn Gaard intervals <			: 1 or 2 outputs		Input
Number of curptions : 21 data for each of the second secon					FFT size
Number of output points 2 (2 carriers per port) Canale bandwidth Impedance 75 G Channel bandwidth I	WB-I Cable Modulator				Guard intervals
VB T2 Cable Madulator VB T2 VB					Code rates
Impedance :750 Channel Sundancian Impedance :750 Channel Sundancian Input frequency setting step size :14z Input Output flevel :-12 to 2.2 dBm SR Output flevel :-12 to 2.2 dBm T2 versions Frequency setting step size :14z SR Output flevel :-12 to 2.2 dBm T2 versions Frequency accuracy :2 ppm Frequency accuracy :2 dB Return loss :16 dB Frequency accuracy :2 dB MER :2 4 2 dB Code acconce FEE Code acconce Test mode :2 MP FEE Code acconce FEE Code acconce Otype Coding and Modulation :5 6 7.8 ME FEE Code acconce FEE Code acconce FFF size :2 M, 9K, 16 0, 1/2 Constellation PMebro PL/S Code rates :17, 27, 3, 47, 56, 7.8 Number of Author PL/S Constellation Code rates :17, 27, 3, 47, 56, 7.8 Number of Author PL/S Constellation VB-T2 Coble Modulator :ETSI EN 302755 Number of Author PL/S Re multiplexing Number of carriers :2 independent carriers Number of Author PL/S Result transtamps Output flevel istability :2 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5					Constellation
NBT2 Colling and Modulation Propertion 147-802.MHz Mpat2 Propertion 11 Hz Mpat2 Output level 12 to 2.2 dBin Teversions Output level 2 pm Teversions Return loss 2 pm Teversions Return loss 2 bd 3 Teversions Test mode 2 W Test mode Guard intervals DVBT Coding and Modulation TEST best 2005.05 (7.8 MHz Meson Test mode Code rates 17.4 1/8, 1/16, 1/32 DVB-7.72 Gateway ASI ¹⁰ Constellation (PLP) Channel bandwidth 2.5 6, 7.8 MHz DVB-7.72 Gateway ASI ¹⁰ Constellation (PLP) Vituates of output ports 2.10 dependent carriers Mumber of arriers Maintervals Number of output ports 2.10 dependent carriers Maintervals PS-7.12 Gateway ASI ¹⁰ Number of output ports 2.10 dependent carriers Maintervals PS-17.20 fill inserter Output level 12 to 2.2 dBin (TBD) Test encode are specification PS-17.20 fill inserter Output level 12 to 2.2 dBin (TBD) Test encode are specification Resultion Number of output ports 2.10 Carrier per port1 PS-17.20 fill inserter Output level 12 to 2.2 dBin (TBD) PS-17 Mill inserter <					Channel bandwidth
Prequency setting step size I Hz Input Output level 1-12 to 2.2 dBm Output level 5.6 dB Prequency setting step size 2 pm Return loss 5.16 dB MER 5.42 dB Test mode CW PFT face FEC frame FT size FEC frame FT size FEC frame FT face 2.8, 8k Guard Intervals 1.14, 1/8, 1/6, 1/32 Constellation 1.09K / 1.6, 1/32 Constellation 1.5, 6, 7/8 Number of output ports 1.2 independent carriers Number of output ports					
Output level ::12 to 2.2 dBm SFN Output level stability ::::0.5 dB T2 versions Frequency accuracy ::::0.5 dB T2 versions Return loss ::::0.5 dB Garad intervals Test mode :::::0.5 dB Garad intervals Test mode ::::::0.5 dB Garad intervals FEF face ::::::0.5 dB Garad intervals Test mode ::::::0.5 dB Garad intervals Garad intervals :::::0.5 dB Constellation (PLP) Channel bandwidth ::::0.5 dB Constellation (PLP) Channel bandwidth :::0.5 dB Constellation (PLP) Channel bandwidth :::0.5 dB Constellation (PLP) Channel bandwidth :::0.5 dB Constellation (PLP) VB-T2 Cable Modulator :::0.5 dB, 7.8 MHz DVB-T/T2 Gateway ASI** Connectors Number of output ports :::0.1 dB appendinct carriers SU appendinct carriers Number of APTS's with Number of APTS's with Number of arriers Number of output ports :::0.1 dB appendinct carriers :::0.1 dB appendinct carriers Re-multiplexing <t< td=""><td></td><td></td><td></td><td></td><td></td></t<>					
V8-T2 Cable Modulator V9-T2 Cable Modulator			: 1 Hz		
Prequency accuracy 2 ppm FT size Return loss > 42 dB Test mode CW DVB-T Coding and Modulation FEC frame FT size 2k, 8k Guard intervals FEC frame Guard intervals FEC frame FT size 2k, 8k Guard intervals FEC frame Guard intervals 1/4, 1/8, 1/16, 1/32 Constellation CPSK, 16-0AM, 64-0AM Constellation CPSK, 16-0AM, 64-0AM Channel bandwidth 5, 6, 7, 8 MHz DVB-T/2 Gateway ASI** Connectors Number of carriers 2 lt carrier per port) Number of carriers 2 lt carrier per port) Output connector 1-7 S0 Number of carriers 2 lt carrier per port) Output level -12 to 22 dBm (TBD) Output level 1-12 to 22 dBm (TBD) Output level -12 to 22 dBm (TBD) Output level -16 dB MER >42 dB MER >42 dB PET size 24 dB Maximum ASI bit rate per port) PUB-TIMP inserter Key specification -12 to 22 dBm (TBD) Maximum ASI bit rate per port) PUB-TIMP inserter Maximum ASI bit rate per port)		Output level	: -12 to 2.2 dBm		
Return loss i a la da MER i a la da da Test mode i cV Guard intervals FEC fame FEC code rate Constellation (PLP) FFT size i 2k, 8k Guard intervals Guard intervals FFT size i 2k, 8k Guard intervals Guard intervals FFT size i 2k, 8k Guard intervals Constellation (PLP) Constellation (PLP)		Output level stability	:±0.5 dB		
MER :: 24 2 dB Guard intervals Test mode :: 24 2 dB FEC fame :: 24 2 2 dB FEC fame :: 24 2 dB FEC fame ::		Frequency accuracy	: 2 ppm		FFT size
Test mode :CW FEC frame DVB-T Coding and Modulation FEC code rate Constellation (PLP) FFT size :2x, 8k Constellation Constellation (PLP) Code rates :1/2, 2/3, 3/4, 5/6, 7/8 Number of PLPs Constellation :OPSK, 16-OAM, 64-OAM DVB-T/T2 Gateway ASI*** Connector Channel bandwidth :S, 6, 7, 8 MH2 DVB-T/T2 Gateway ASI*** Connector VB-T2 Cable Modulator Key reference specification :ETSI EN 302755 Number of PLPs Number of output ports :2 in dependent carriers Maximum ASI bit-rate pr Number of output ports :2 (1 carrier per port) Maximum ASI bit-rate pr Output frequency :47.862 MHz Re-multiplexing Trequency setting step size :1 Hz DVB-T AISI Output level :-12 to 2.2 dBm (TBD) Return loss Output level :-12 to 2.2 dBm (TBD) Return loss MER :-24 dB :-24 dB Test mode :-20 pum Key reference specification Cott for the code set in the c		Return loss	:>16 dB		
DVB-T Coding and Modulation FEC code rate Constellation (PLP) FFT size : 2k, 8k Guard intervals : 1/4, 1/8, 1/16, 1/32 Code rates : Constellation Constellation : CPSK, 16-QAM, 64-QAM Channel bandwidth : S, 6, 7, 8 MHz Constellation : CPSK, 16-QAM, 64-QAM Channel bandwidth : S, 6, 7, 8 MHz VB-T2 Cable Modulator Key reference specification Number of carriers : 2/1 dependent carriers Number of carriers : 2/1 dependent carriers Number of output ports : 2/1 carrier pr port) Output connector : F1ype Impedance : 75 0 Output frequency y : 47-862 MHz Frequency setting step size : 1/1 Hz Output tevel : 1/2 to 2.2 dBm (TBD) Output tevel stability : ± 0.5 dB MER :> 42 d8 Eres mode : CW		MER	: > 42 dB		Guard intervals
PVF-T Coding and Modulation FEC code rate Constellation (PLP) Constellation (PLP) Guard intervals 1/4, 1/8, 1/16, 1/32 PMB-T Coding and Modulation Constellation (PLP) Code rates 1/2, 2/3, 3/4, 5/6, 7/8 PMB-T Coding and Modulation Piotopattern VB-T2 Cable Modulator constellation cpSK, 16-QAM, 64-QAM PMB-T/T2 Gateway ASI ^(M) Connectors VB-T2 Cable Modulator Key reference specification :ETSI EN 302755 Number of Carriers Number of T2MI stream Number of carriers :2 (1 carrier per port) PMB-T Coding and Modulation Re-multiplexing Output connector :Ftype Fequency setting step size Ftype Prequency setting step size :1 H Z DVB-T 20 dBMI Pionester Restructions and Step setting step size Output level stability :1 2to 2.2 dBm (TBD) Relative timestamps DVB-T 21 2MI NER :2 in 6.6 B :2 in 6.8 C :2 Version MER :2 in 6.8 C :2 in 6.8 C :2 Version NER :2 in 6.8 C :2 Version :2 Version Statistic code set :2 Version :2 Version :2 Version Number of set set mode :2		Test mode	: CW		FEC frame
FT size :2k, 8k Constentiation (PLP) Guard intervals :1/4, 1/8, 1/16, 1/32 Channel bandwidth Code rates :1/2, 2/3, 3/4, 5/6, 7/8 Number of PLPs Constellation :OP5K, 16-QAM, 64-QAM Number of PLPs Channel bandwidth :5, 6, 7, 8 MHz DVB-T/T2 Gateway ASI® VB-T2 Cable Modulator Key reference specification :ETSI EN 302755 Number of carriers :2 independent carriers Number of TAPIS's with Number of TAPIS's with Number of TAPIS's with Number of TAPIS's with Number of Carriers Number of carriers :2 independent carriers Re-multiplexing Output connector :Fiype Re-multiplexing Output frequency :47-862 MHz VB-T2 to 2.2 dBm (TBD) Output level :12 to 2.2 dBm (TBD) Relative timestamps Output level stability :± 0.5 dB DVB-T2 T2MI Rey reference specification :± 0.5 dB Z version Return loss :> 16 dB Z version MER :> 42 dB :> 42 dB Z version T2W Standadd :< 16 dB					FEC code rate
Guard intervals 1/4, 1/8, 1/16, 1/32 Pilot pattern Code rates 1/2, 2/3, 3/4, 5/6, 7/8 Number of PLPs Constellation : QPSK, 16-QAM, 64-QAM DV8-T/T2 Gateway ASI [™] Connectors VB-T2 Cable Modulator Key reference specification : ETSI EN 302755 Number of arriers 2 independent carriers Number of T2MI stream Number of output ports : 2 (1 carrier per port) Maximum ASI bit-rate pr Maximum ASI bit-rate pr Output connector : F-type Re-multiplexing PV8-T7 MP inserter Frequency setting step size : Hz PV8-T 862 MHz PV8-T 122 Cable Modulator Output frequency : 47-862 MHz PV8-T 202 dBm (TBD) Relative timestamps Output level : 1/2 0.2 dBm (TBD) Relative timestamps Output level stability : 0.5 dB : 2.9 pm Key referince specification Return loss : > 1/6 dB : > 42 dB T2 version T2 version T2MI signaling : Ock modes : > 2.9 dB T2 version T2 version T2M isgnaling : > 42 dB : > 42 dB T2 version T2 version T2MI signaling : > 2.9 dB : > 4					Constellation (PLP)
Guard intervals :1/4,1/8,1/3,2/ Pilot pattern Code rates :1/2,2/3,3/4,5/6,7/8 Number of PLPs Constellation :0PSK, 16-QAM, 64-QAM DVB-T/T2 Gateway ASI® Connectors VB-T2 Cable Modulator Key reference specification :ETSI EN 302755 Number of Carriers 2 independent carriers Number of T2MI stream Number of carriers :2 independent carriers Number of T2MI stream Maximum ASI bit-rate pr Output connector :F-type Re-multiplexing PVB-T2 Coll public ports PVB-T2 Gateway ASI® PVB-T2 MI stream Output connector :F-type Re-multiplexing PVB-T2 MI stream Maximum ASI bit-rate pr Output frequency :47-862 MHz Frequency setting step size 1 Hz PVB-T2 MI stream Output level :41-20 CB Min (TBD) :41-20 CB Min (TBD) Relative timestamps PVB-T2 T2MI stream MER :> 2.42 dB :> 16 dB :> 42 dB T2 version T2 version T2MI signaling :> 2.42 dB :> 42 dB T2 version T2 version T2MI signaling :> 42 dB :> 42 dB T2 version T2 version T2MI signaling <t< td=""><td></td><td></td><td></td><td></td><td>Channel bandwidth</td></t<>					Channel bandwidth
Code rates 1/2,2/3,3/4,5/6,7/8 Number of PLPs Constellation QPSK,16-QAM, 64-QAM DVB-T/T2 Gateway ASI® Connectors VB-T2 Cable Modulator 5.6,7,8 MHz DVB-T/T2 Gateway ASI® Connectors Number of carriers 2 independent carriers Number of MPTS's with Number of T2MI stream Number of output ports 2 (1 carrier per port) Maximum ASI bit-rate prot Maximum ASI bit-rate prot Output connector i F-type Re-multiplexing PVB-T MIP inserter Key specification Impedance 1.7 2.0 dBm (TBD) Output level stability ± 0.5 dB Relative timestamps Output level stability ± 0.5 dB 2.9 pm Key reference specification Relative timestamps MER > 2.4 dB > 2.4 dB T2 version T2 version T2 version 2.4 dB T2 version T2 version T2 version T2 version 1.4 dB 2.4 dB T2 version T2 version MER > 2.4 dB T2 version T2 version T2 version Number of MDdulation > 1.6 dB T2 version T2 version T2 version NER >					
Constellation : OPSK, 16-QAM, 64-QAM Channel bandwidth : 5, 6, 7, 8 MHz DVB-T/T2 Gateway ASI® Connectors Number of Carriers : 21 independent carriers Number of carriers : 21 independent carriers Number of carriers : 21 (1 carrier per port) Output connector : F-type Impedance : 75 Ω Output frequency : 47-862 MHz Frequency setting step size : 11 tz 2.2 dBm (TBD) Output level stability : ± 0.5 dB Frequency accuracy : 2 ppm Return loss : 16 dB dB MER : > 42 dB Tz wersion T2MI signaling Connectors : 24 dB T2 wersion T2MI signaling CDW-T2 Gateway ASI® : 200 DVB-T T2 Gateway ASI® : 200 DVB-T T2 Gateway ASI® : 200 Number of T2MI stream Maximum ASI bit-rate pr Maximum ASI b		Code rates			
VB-T2 Cable Modulator VB-T2 Cable MD-T2 VB-T2 MD-T2		Constellation	: QPSK, 16-QAM, 64-QAM		
VB-T2 Cable Modulator Key reference specification :ETSI EN 302755 Number of MPTS's with Number of T2MI stream Mumber of T2MI stream Mumber of T2MI stream Maximum ASI bit-rate p Number of output ports :2 (1 carrier per port) Maximum ASI bit-rate p Output connector :F-type Re-multiplexing Impedance :75 Ω DVB-T MIP inserter Frequency setting step size :1 Hz Key specification Output level :-12 to 2.2 dBm (TBD) Relative timestamps Output level stability :±0.5 dB DVB-T 22000 Frequency accuracy :2 ppm Key reference specification Return loss :>16 dB T2 version MER :>42 dB T2 version Test mode :24 2 dB T2 version Test mode :EV Lt be note to		Channel bandwidth	: 5, 6, 7, 8 MHz	DVR-T/T2 Gateway ASI10	Connectors
VB-12 Cable Modulator Key reference specification : E1ST EN 302/55 Number of carriers Maximum ASI bit-rate pr Number of output ports : 2 (1 carrier per port) Maximum ASI bit-rate pr Maximum ASI bit-rate pr Output connector : F-type Re-multiplexing Output frequency : 47-862 MHz DVB-T MIP inserter Frequency setting step size : 1 Hz Key specification Output level : -12 to 2.2 dBm (TBD) Relative timestamps Output level stability : ± 0.5 dB DVB-T 2 CMI Frequency accuracy : 2 ppm Key reference specification MER : > 42 dB T2 version Test mode : CW Clock modes				DVD 1/12 Guteway //Si	
Number of dramers 2 independent carriers Maximum ASI bit-rate p Number of output ports 2 f carrier per port) Maximum ASI bit-rate p Output connector F-type Re-multiplexing Impedance 75 Ω DVB-T MIP inserter Frequency setting step size 1 Hz Key specification Output level -12 to 2.2 dBm (TBD) Relative timestamps Output level stability ± 0.5 dB DVB-T 22MI Frequency accuracy 2 ppm Key reference specification Return loss >16 dB T2 version Test mode CW T2MI signaling Clock modes T2MI signaling PAPR TATE Coding and Modulation	VB-T2 Cable Modulator				
Number of output ports 12 (Camer per port) Output connector :F-type Impedance :75 Ω Output frequency :47-862 MHz Output frequency setting step size :1 Hz Output level :-12 to 2.2 dBm (TBD) Output level stability :± 0.5 dB Output level stability :± 0.5 dB Return loss :> 16 dB MER :> 42 dB Test mode :CW		Number of carriers	: 2 independent carriers		
Impedance 75 Ω Re-multiplexing Output frequency 47-862 MHz DVB-T MIP inserter Frequency setting step size 1 Hz Key specification Output level -12 to 2.2 dBm (TBD) Relative timestamps Output level stability ± 0.5 dB DVB-T2 TMI Frequency accuracy 2 ppm Key reference specification Return loss >16 dB T2 version MER >42 dB T2 version Test mode CW T2MI signaling Clock modes		Number of output ports	: 2 (1 carrier per port)		Maximum ASI bit-rate p
Impedance .7312 Output frequency :47-862 MHz Frequency setting step size :1 Hz Output level :-12 to 2.2 dBm (TBD) Output level stability :± 0.5 dB Frequency accuracy :2 ppm Return loss :>16 dB MER :>42 dB Test mode :CW		Output connector	: F-type		
Frequency setting step size 1 Hz Key specification Output level -12 to 2.2 dBm (TBD) Relative timestamps Output level stability ± 0.5 dB DVB-T2 T2MI Frequency accuracy 2 ppm Key reference specification Return loss > 16 dB Key reference specification MER > 42 dB T2 version Test mode CW T2MI signaling VDB-T2 Coding and Modulation Et per to the total stability to the total stability PAPR		Impedance	: 75 Ω		Re-multiplexing
Frequency setting step size 1 Hz Key specification Output level -12 to 2.2 dBm (TBD) Relative timestamps Output level stability ± 0.5 dB DVB-T2 T2MI Frequency accuracy 2 ppm Key reference specification Return loss > 16 dB Key reference specification MER > 42 dB T2 version Test mode CW T2MI signaling VDB-T2 Coding and Modulation Et per to the total stability to the total stability PAPR		Output frequency	: 47-862 MHz		DVB-T MIP inserter
Output level :-12 to 2.2 dBm (TBD) Relative timestamps Output level stability :± 0.5 dB DVB-T2 T2MI Frequency accuracy :2 ppm Key reference specificat Return loss :> 16 dB T2 version MER :> 42 dB T2 version Test mode :CW T2MI signaling Clock modes PAPR		Frequency setting step size	: 1 Hz		
Output level stability ± 0.5 dB DVB-T2 T2MI Frequency accuracy : 2 ppm Key reference specificat Return loss :>16 dB T2 version MER :>42 dB T2 version Test mode :CW Clock modes			: -12 to 2.2 dBm (TBD)		
Frequency accuracy : 2 ppm DVB-T2 T2MI Return loss :>16 dB Key reference specificat MER :>42 dB T2 version Test mode :CW Clock modes					
Return loss :>16 dB Key reference specificat MER :>42 dB T2 version Test mode :CW Clock modes DVB-T2 Coding and Modulation PAPR					DVB-T2 T2MI
MER :> 42 dB Test mode :CW DVB-T2 Coding and Modulation T2 version T2MI signaling Clock modes PAPR					Key reference specificat
Test mode : CW Clock modes DVB-T2 Coding and Modulation PAPR					T2 version
DVB-T2 Coding and Modulation PAPR					T2MI signaling
		DVB-T2 Coding and Modulation			PAPR
			: 1k, 2k, 4k, 8k, 8k extended, 16k,		

Guard intervals FEC frame FEC code rate Constellation (PLP) Chann<u>el bandwidth</u> : 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended : 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/12 : Normal (64k), Short (16k) : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 : QPSK, 16-QAM, 64-QAM, 256-QAM

Pilot Patterns

lodulation

Modulation

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

```
: 2 independent carriers
: 2 (1 carrier per port)
: -15 to 0 dBm
: ± 0.5 dB
: 2 ppm
: >16 dB
 : > 42 dB
: 1/2, 2/3, 3/4, 5/6, 7/8
: QPSK, 16-QAM, 64-QAM
 : Normal (64k), Short (16k)
: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
: 4 x BNC 75Ω
: ETSI EN 300 744, ETSI TS 101 191
 : 1.1.1, 1.2.1 and 1.3.1
: T2MI is signaled in PSI/SI as a data service
: Relative Timestamps <1s (SFN) and Null timestamps
(MFN)
 : TR and ACE (global on/off)
 : 1k, 2k, 4k, 8k, 8k extended, 16k,
 16k extended, 32k, 32k extended
 : P1 – P8
```

L1 Constellations

DVB-T2 PLP support

Number of PLPs PLP mode TI types FEC frame FEC code rate

Licensed Features

DVB-T2 Gateway IP

Number of MPTS's with MIP Number of T2MI streams Output mode Data format Forward Error Correction

Re-multiplexing **DVB-T MIP inserter**

Key specification Relative timestamps

DVB-T2 T2MI

T2 version

T2MI signaling Clock modes

Pilot Patterns L1 Constellations

DVB-T2 PLP support

Number of PLPs PLP mode FEC frame FEC code rate Rotated constellations

: QPSK, 16-QAM, 64-QAM, BPSK : 1.7, 5, 6, 7, 8, 10MHz

: 240 in total between all T2MI streams : Within a T2 frame and across multiple T2 frames : FEC blocks, TI blocks, TI frames and TI type : Normal (64k). Short (16k) : 1/2. 3/5. 2/3. 3/4. 4/5. 5/6 QPSK, 16-QAM, 64-QAM, 256-QAM

:MIP, T2MI :Multi PLP, Regional PLP

: 2 × 10/100/1000 Base-T Ethernet output or 2× Optical SFP (class 1 laser product) : Up to 850 MBit/s : UDP/RTP Multicast/Unicast : SMPTE 2022-1 (Licensed) : See common output module specifications

: ETSI EN 300 744, ETSI TS 101 191

: 1.1.1, 1.2.1 and 1.3.1 : 1+1 protection on unit with T2MI frame (licensed) Output redundancy based on OSPF (licensed) Network level redundancy (licensed) Yes. Please contact Appear TV for more information :T2MI is signaled in PSI/SI as a data serv : Relative Timestamps <1s (SFN) and Null timestamps : QPSK, 16-QAM, 64-QAM, BPSK : 1.7, 5, 6, 7, 8, 10MHz

: HEM, constant bit-rate 1 and 2 : FEC blocks, TI blocks, TI frames and TI type : Normal (64k), Short (16k) : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 : QPSK, 16-QAM, 64-QAM, 256-QAM

Licensed Features

DAB/DAB+ Cable Modulator

Key reference specification Input format

RF Output Specification

Number of carriers Channel spacing Frequency step size Output power level per carrier

Licensed Features

DECODER SPECIFICATIONS

MPEG-2/4 Decoder with SDI/HDSDI out Number of decoded channels 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

VBI/VANC/DVB sub Processing

World standard teletext (WST/EBU)

```
: T2MI
: Multi PLP, Regional PLP
: FEC out
: ETSI EN 300 401, ETSI TS 102 693, ETS 300 799
: ETI over IP (EDI),
: 174–239 MHz
: Carriers within a port must be within 40 MHz.
: < 60 dBc @ -4dBm (typ.)
: Maximum: -4 dBm
<u>: > 42 dB (typ.)</u>
:>16 dB
```

```
: 4 or 8 carriers
```

- : 2 per module
- : 2 SDI/HDSDI 75Ω BNC per channel
- : SMPTE 292 (HD-SDI), 259M (SD-SDI)
- : SMPTE 272M (SD), 299M (HD)
- : MP@HL (HD)
- MP@ML (SD)
- : MP@L4, HP@L4 (HD)
- MP@L3, HP@L3 (SD)
- : Accepts PAL and NTSC black burst, 720p50/59.94/60 and 1080i50/59.94/60 tri-level reference signals. (HW option). If SDI reference signal support is needed, contact your sales
- : MPEG-1 Layer 1 and 2 (Musicam) MPEG-2 Layer 2, MPEG4 AAC-LC Dolby[®] Digital and Dolby[®] Digital Plus decoding, Downmix RF) (HW option) Conversion from Dolby[®] Digital Plus to Dolby[®] Digital at a fixed bitrate of 640 Kbit/s (HW option)

	Output Video Programming System (VPS)	: ITU-R BT .653-3 (System B only), SMPTE 2031	Quad Decoder with RF ¹¹⁾	Number of channels Connector for RF mod video
	Input	: EN 301 775 v1.2.1		
	Output	: EN 300 231, SMPTE 2031		Video Decoding Please refer to "MPEG-2/4 Deco
	Teletext Subtitling (OSD)	: Supported, OP-47		
	VITS (Vertical Interval Test Signal)	: ITU-T J.63		Audio Decoding
	Digital Program Insertion (DPI)	Sin(x)/x on line 281(525 lines) or 335 (625 lines)		Number stereo pairs per video Please refer to "MPEG-2/4 Decc
	Input Output	: SCTE 35 : SCTE 104		VBI/VANC/DVB Sub Processing
	Active Format Description (AFD)	. SCIL 104		Please refer to "MPEG-2/4 Deco
	Input	: ETSI TS 101 154		VHF/UHF Output
	Output	: SMPTE 2016-3-2009		Analogue modulation
	Licensed Features	:HD		
		: Genlock		RF output frequency range
		: OSDM		RF tuning step size
		: Dolby [®] Digital/Dolby [®] Digital Plus Decode		Channel setting flexibility
MPEG-2/4 Decoder	Number of decoded channels	: 2 per module		
with SDI/HDSDI & AES	Connector	: 1 SDI/HDSDI 75Ω BNC and 1 AES/EBU 75Ω BNC per		Output level (per carrier)
Audio out		channel		Output level adjustment step s
	Video Decoding			Return loss
	Please refer to "MPEG-2/4 Decoder with	SDI/HDSDI out".		Video carrier frequency stabilit
	Audio Decoding			Intermodulation distance, (4/8
	Please refer to "MPEG-2/4 Decoder with	SDI/HDSDI out".		Channel TV Modulator only)
	VBI/VANC/DVB Sub Processing			Carrier to noise, in-band
	Please refer to "MPEG-2/4 Decoder with	SDI/HDSDI out".		Carrier to noise, adjacent chan
				Carrier to noise (40 channels of
	Licensed Features	: HD : Genlock		Carrier to spurious, full band (4
		: OSDM		Video (demodulated video) ¹²⁾
		: Dolby® Digital/Dolby® Digital Plus Decode		Differential gain
				Differential phase
MPEG-2/4 Decoder	Number of decoded channels	: 2 per module		Group delay variations Luminance non-linearity
with Composite Output	Connector for video	: 1 Composite 75 Ω BNC per channel, unbalanced		2T K factor
	Connector for audio	: 25 PIN min D-sub for audio (male)		Signal to noise ratio
		- 4 balanced audio, 2 per channel, balanced - 2 AES/EBU audio, 1 per channel (ch. 1)		Audio – Mono
		- 2 AES/EBO audio, 1 per channel (ch. 1)		Audio carrier output level (relati
	Video Decoding			Audio carrier output level rand
	Please refer to "MPEG-2/4 Decoder with	SDI/HDSDI out".		Audio inter carrier frequency s
	Audio Decoding			Modulation
	Please refer to "MPEG-2/4 Decoder with	SDI/HDSDI out".		Audio – NICAM Stereo
	VBI/VANC/DVB Sub Processing			NICAM modulation
	Please refer to "MPEG-2/4 Decoder with	SDI/HDSDI out".		NICAM carrier level relative to
	Analogue Video			NICAM carrier output level ran
	Video standards	: PAL and NTSC		Frequency accuracy (relative to
	Conversion	: HD down conversion to SD		Audio output modes
	Signal to noise ratio Luminance Non Linearity	: >70dB Measured Acc. Rec 569 : <1%		Output precision
	Sin x/x Gain	: ±0.3dB		Audio – A2 Stereo
	Sin x/x Group Delay	: ±10ns		Two sound-carrier FM system (
	Bar Amplitude	: 700 mV ±1% (PAL), 100 ±1 IRE (NTSC)		Audio carrier levels relative to
	Sync Amplitude	: 300 mV ±1% (PAL), 40 ±0.4 IRE (NTSC)		Audio carrier output level rang
	Burst Amplitude	: 300 mV ±3% (PAL), 40 ±1 IRE (NTSC)		Audio output modes Modulation
	Analogue Audio	· TU 246 (JU JUFA)		Audio-bandwidth
	Linearity 'THD+N	: ±0.5dB (20-20kHz) : typ 70dB (at 9dBu)		
				Audio – MTS Stereo Two sound-carrier FM system (
	Licensed Features	: HD		Audio carrier levels relative to
		: Radio Mode		Audio carrier output level rang
		: Genlock		Audio output modes
		: OSDM : Dolby® Digital/Dolby® Digital Plus Decode		
			11) All measurements are carri	ed out in room temperature at 20°C

All measurements are carried out in room temperature at 20
 Using R&S ETL as demodulator

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SECAM > B/G, D/K (5 MHz video BW)
                               8 channel version semi agile, two adjacent channels with
8, 16 or 24 MHz spacing

i > 16dB
bility : ±3 ppm
4/8 : > 60 dB, Measured:

@ 115 dBV per channel, 2 channels per port
@ 112 dBV per channel, 4 channels per port
: > 66 dB @110 dBuV/ch

is combined) : Typ. 61 dB @110 dBuV/ch
d (40 - 862 MHz) : > 60 dB

                             : <2 %
: <2°
: <50 ns
: <1 %
: <1 %
: >60dB
 lative to video carrier) :-13dB (default)
nge :-10 to - 20 dB, 0.5
v stability :< 1ppm
 : According to ETSI EN 300 163 v1.2.1, Fully synchronous
operation, Digital J17 pre-emphasis
o vision carrier : 20dB
  to video)
                               : Stereo/Dual Mono/Mono
                               : Stereo/Dual Mono/Mono
                               : -10 to - 20 dB, 0.5 dB steps
```

	Licensed Features	:HD		
		: NICAM/A2 Stereo		
		: OSDM : Dolby® Digital/Dolby® Digital Plus Decode		
ual MPEG-2/4 Decoder	Number of channels	: 2 per module		
vith High Performance	Connector for RF mod video	: 1 F connector 75 Ω with both channels and 1 F connector		
F Modulation and		test output with both channels.		
tereo Sound*	Video Decoding			
	Please refer to "MPEG-2/4 Decoder with SI	DI/HDSDI out".		
	Audio Decoding			
	Please refer to "MPEG-2/4 Decoder with SI	DI/HDSDI out" (except pass-through).		
	VBI/VANC/DVB Sub Processing			
	Please refer to "MPEG-2/4 Decoder with SI	DI/HDSDI out".	* Quad decoder is a combination of	the decoder and TV modulator.
	VHF/UHF Output		CHASSIS	
	Analogue modulation RF output frequency range	: PAL B/G, SECAM D/K : 47– 862MHz	CIRSSIS	
	RF tuning step size	: 12.5 kHz	XC5000	Physical dimensions
	Channel setting flexibility	: Fully agile	AC5000	Physical dimensions
	Output level (per carrier)	: 105-115 dBuV /ch		Power supply
	Output level adjustment step size (GUI)	: 0.2 dB		Power
	Return loss	:>16dB		Input voltage
	Video carrier frequency stability Carrier to noise, in-band	: ±3 ppm : > 66 dB @112 dBuV/ch		Redundancy
	Carrier to noise, adjacent channel	: > 68 dB @112 dBuV/ch		Monitoring
	Carrier to noise (40 channels combined)	: Typ. 65 dB @112dBuV/ch		Cooling
	Carrier to spurious, full band (40 - 862 MH	z) : > 62 dB		Fans
	Video (demodulated video)			Hot swap of fans
	For "Video (demodulated video)", please re	efer to "Quad Decoder with RF"		Airflow direction
	Audio – Mono		XC5100	Physical dimensions
	For "Audio – Mono", please refer to "Quad	Decoder with RF"	xe5100	
	Audio – NICAM Stereo			Power supply
	For "Audio – NICAM Stereo", please refer to	o "Ouad Decoder with RF"		Power
				Input voltage
	Audio – A2 Stereo For "Audio – A2 Stereo", please refer to "Qu	iad Decoder with RF"		Redundancy
				Monitoring
	Audio – MTS Stereo			Cooling
	Not supported			Fans
	Licensed Features	: HD Downconversion		Hot swap of fans
		: NICAM/A2 Stereo		Airflow direction
		: OSDM		
		: Dolby [®] Digital/Dolby [®] Digital Plus Decode		AL CONDITIONS
				AL CONDITIONS
M Radio	Number of channels per module	: Up to 8	Operational conditions	Temperature
	Output connector	: F-type female, 75Ω	Operational conditions	Humidity
	Decoding formats supported	: MPEG-1 layers 1 and 2 (Musicam)		
	FM Output		Storage	Temperature
	Modulation	: FM		Humidity
	RF output frequency range	: 87.5 - 108 MHz	Electrical safety	IEC 60950-1
	Output level 8 carriers combined	: 105 - 120 dBV	EMC	EN 55022, EN55013, EN50083-2, I
	Output level adjustment step size (GUI) Return loss	: 0.1 dB : 18 dB		
	Channel separation L/R	: > 46dB	RoHS	Compliant
	Carrier to spurious	: > 60dB	WEEE	Compliant
	RDS insertion	: UECP SPB490 or static		
	MPX Output			e disposed of with other household waste. Accor
	MPX Output MPX Test output level	: 0 dBu		are disposed of in an environmentally sound man d environmentally sound processing of scrapped
	MPX Test output load impedance	: 600Ω	product to Appear TV A	S, Lilleakerveien 2b, 0283 Oslo, Norway, and we v point for the recycling of waste electrical and elec
	MPX Test output connector	: 1 BNC, service selectable from GUI	contact your local resel	er to enquire about local collection points for rec

: 100-240 V AC, 50/60 Hz

: Yes, dual hot swappable PS : Via WEB GUI and LED indicators on PS

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







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