

XC 5000 XC 5100

# Complete solutions for every major broadcast segment

# SYSTEM OF CHOICE FOR PROFESSIONAL OPERATORS

Appear TV is dedicated to providing world class platforms 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.

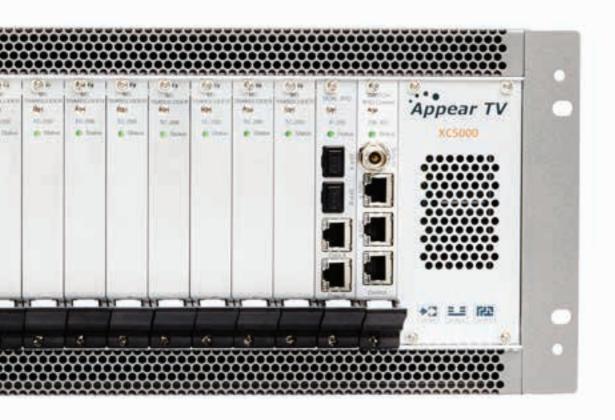
Appear TV's XC5000 and XC5100 are our latest generation carrier grade platforms with 1RU and 4RU chassis options of unmatched power and versatility. There are no restrictions even for the most intensive processing requirement. Both units feature uprated dual-redundant and hot swappable power supplies,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

### 1RU - XC5100

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

# **DIMENSIONS**

### 4RU (XC5000)

 $440 \times 177 \times 400 (w \times h \times d mm)$ 



### 1RU (XC5100)

 $440 \times 44 \times 480$  (w × h × d mm)

but the front plates are different.

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

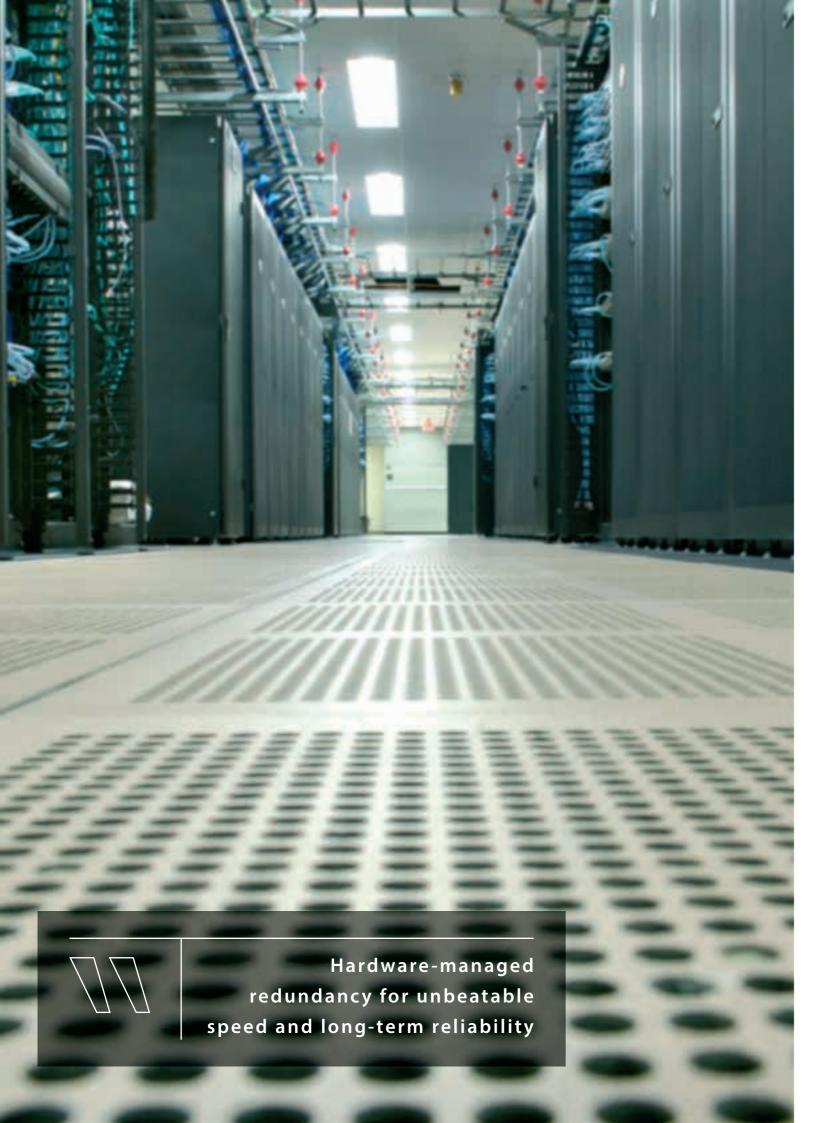


Module plate for XC5000

The XC5000 and XC5100 use the same set of modules and same SW,



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 hotswappable 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**

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



### Clock Reference Module

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



### **Switch Module with Management** 2 × 10/100/1000 Base-T

- Gbit/s routing between modules in a chassis
- $\cdot$  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 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)



 $\bullet$  2 × Gbit SFP input or output port for data

**Switch Module with Management** 

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



# **SWITCH MODULES FOR XC5100**

### **Switch Module with Management** 2 × 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 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 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)



# MPEG INPUT MODULES

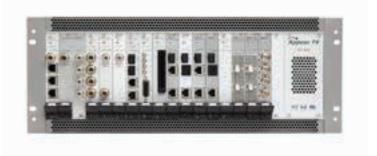
Appear TV has a wide range of input modules making it the most effective content aggregation solution on the market. An input module analyzes incoming transport streams and extracts selected MPEG services from the desired physical input interface (eg. ASI, IP, DVB-S/S2, DVB-C, DVB-T/T2, ISDB-T and 8VSB). 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

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**

### **IP Input**

- 10/100/1000BaseT (RJ45) or SFP input
- Supports UDP/RTP Multicast/Unicast reception
- Supports reception of MPTS and SPTS
- Service filtering
- Supports FEC (SMPTE 2022) (Ext HW + license)
- Input analysis
- 1 slot wide



### **Dual IP IO**

- 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



### **DVB-C Input**

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



### **ASI Input**

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



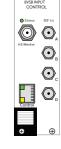
### **DVB-S/S2 Input Enhanced DVB-S/S2 Input**

- 4 × DVB-S/S2 inputs, 1 F connector per input
- 4 × F connectors
- 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\* or 5-30 MSym/s FFC.
- 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<sup>3</sup>
- Service filtering
- ASI monitoring port
- Input analysis
- \*Only supported by Enhanced DVB/S&S2 Input version



### **8VSB/QAM Annex B Input**

- 4 × 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 Input**

- 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



# **DVB-T/T2 Input**

- 4 × DVB-T/T2 receivers per module.
- Input ports option:
- $1 \times F$  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
- 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



# **ENCODING/TRANSCODING MODULES**

### Broadcast s/transcoders

Appear TV's encoding and transcoding module utilizes the latest-generation compression technology to process large numbers of services efficiently and with exceptional quality. Appear TV's MPEG-2 and MPEG-4 AVC (also known as Part 10 or H.264) encoder solutions are able to encode digital video data in all common distribution profiles from SD to HD. Input is SDI/HDSDI with embedded audio (AES available as option) or composite video with balanced analog stereo. The transcoder solution is able to transcode digital video data in all common distribution profiles from SD to HD. The transcoder module is able to transcode AVC to MPEG-2, MPEG-2 to MPEG-2 to AVC and AVC to AVC. Both the encoders and transcoders support statistical multiplexing to further optimize bandwidth utilization.

### Multiscreen transcoders

Appear TV's multiscreen transcoding module (for OTT) is a fully integrated, hardware-based system capable of simultaneously preparing multiple profiles from any input source in any format for distribution to a mobile or fixed platform utilizing an unmanaged network (such as a wi-fi network or the internet) for content delivery. The target device could be a high definition television in the home, a high-resolution computer screen, a tablet or simple low-cost devices using lower-resolution web and mobile-based profiles. The system accommodates specific device formats at different bit rates optimized for each destination device while maintaining a high QoS and exceptional reliability. The latest evolution of the multiscreen transcoding module allows users to simultaneously transcode a higher number of HD and SD inputs with exceptional channel density. The hardware platform makes the transcoder ideally suited for today's shift towards increasing channel counts and more HD resolutions. The result is a vastly improved real-time compression performance and efficiency that only solutions architected in hardware can deliver.



# **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**

- 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



### SD/HD Transcoder

- 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



### MS Transcoder (OTT)

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





# **Analogue Encoder**

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





# **PROCESSING MODULES**

### **Descrambling and Scrambling**

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

### **EPG** and audio leveling

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

Appear 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**

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



### SIM Bulk Descrambler

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



### Scrambler

- · 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



### Descrambler

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



### **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**

- 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 channel plan
- 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



# 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.

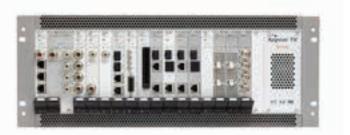
Appear TV's compact QAM solution generates 16 QAM frequencies for cable networks. The module support both full re-multiplexing and transparent mapping with optional NIT replacement and PID/Service blocking making it one of the most versatile QAM modulation solutions for linear broadcasting on the market. 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**

### **IP Output**

- 1 × Gbit output port for data
- 10/100/1000BaseT (RJ45) or SFP output
- Supports UDP/RTP Multicast/Unicast transmission
- Streaming of up to 850 Mbit/s
- Maximum 250 services
- Supports streaming of SPTS and MPTS
- Supports multiplexing and transparent pass-through
- Supports FEC (SMPTE 2022) (Ext HW + license)



### **Dual IP IO**

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



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# **ASI Output**

- 4 × ASI outputs
- 4 x BNC connectors • 213 Mbit/s per output
- · 4 different multiplexed outputs
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- 1 slot wide



### **OAM Modulator**

- · 16 QAM modulators, 4 and 4 paired
- 2 x 75 O RF output (FN/IFC 60728-5) F connector
- Full digital modulation and up-conversion • DOCSIS 3.0 RF compliant
- 32 / 64 / 128 / 256 QAM modulation
- Frequency range of 47 862 MHz
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- ITU-TJ83. Annex A/B/C
- 1 slot wide



### **DVB-S/S2 Modulator**

- 2 DVB-S/S2 modulated carriers per module
- Connectors:
- IF >  $1 \times F$  connector  $+ 1 \times F$  for monitoring per output L-band  $> 1 \times SMA$  connector  $+ 1 \times F$  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
- Modulation:
- DVB-S > OPSK
- DVB-S2 > QPSK, 8-PSK, 16-APSK, 32-APSK
- Symbol rate: 0.5-45 Mbaud
- Static precorrection (linear/non-linear)
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- · 1 slot wide



### DVB-T/T2 Terrestrial Modulator (Exciter)

- 2 DVB-T2 or 2 DVB-T independent outputs
- $1 \times BNC$  connector  $+ 1 \times BNC$  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 (ETSITS 102 733 T2-MI)
- Support for multiple PLPs
- Supports multiplexing and transparent
- · PSI/SI regeneration
- · 1 slot wide



### DVB-T/T2 Cable Modulator

- 4 DVB-T modulators (FTSLFN 300744)
- 2 DVB-T2 modulators (ETSI EN 302 755)
- Connectors: COFDM  $> 1 \times F$  connector  $+ 1 \times F$  for monitoring per module DVB-T2  $\rightarrow$  1  $\times$  BNC connector + 1  $\times$  BNC for monitoring per output
- Full digital modulation and up-conversion
- 5, 6, 7, 8 MHz bandwidth
- Frequency range 47-862 MHz, fully agile Output levels: -12 to 2.2 dBm
- PSI/SI regeneration
- 1 slot wide



型。

### DVB-T/T2 GW

- 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)
- 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)







# **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

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



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

- 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



### **Dual MPEG 2/4 Decoder with Composite Output**

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



### FM Radio with RDS Output

- 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



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

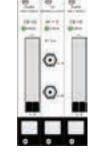
- · 2 outputs per decoder
- MPEG-2/4 (H264) SD and HD
- PAL > B/G, SECAM > D/K HD downconversion to SD
- Dolby® Digital Plus (HW option) Dolby\* Digital and Dolby\* Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF)

  • 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



# **Quad Decoder with RF Output**

- 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 &
- 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 modul
- 2 or 3 slots wide



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

# REDUNDANCY

(AWARD WINNING)

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

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

### Input redundancy

The Appear TV system is equipped with an advanced input redundancy switching mechanism. Any output service can be configured to have a backup service from a different input 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 to reconstruct a perfect outgoing stream even from two imperfect backplane and the power supplies. Each 4RU chassis will be equipped network feeds.

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

### Internal Redundancy (4RU chassis feature)

By using Appear 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 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 redundant control modules can drive a (HD)SDI video router directly

### IP Output redundancy (License)

The IP output redundancy system presents a network with multiple sources from which it is possible to obtain the same service. Should the service from one source be corrupted, the network can receive the service from another source. The redundancy solution is service based 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

IP Input/Output

Maximum data rate per port

Data format Service filtering Video format

IP de-jittering Forward Error Correction

IP Output

Forward Error Correction

Frame Synchronization Input

: 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

: Up to 850 MBit/s per port TS rate

: UDP/RTP Multicast/Unicast

: SPTS and MPTS

: Transport stream, MPEG-2 SD/HD and MPEG-4 SD/HD

: Yes (licensed)

: SMPTE 2022-1

250 output streams per data port (licensed)

: PAT, PMT, CAT

: MGT, TVCT, CVCT

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

: 10/100/1000 Base-T Ethernet

: Web : SNMP for alarms, SOAP for configuration and status

Clock Reference

# **GPS** reference input

Internal reference hold-over

1pps reference input

: 50 Ω < 100 ns RMS

: 0V, 3.3V(default) or 5V

: ≤1us in 4 hrs @ΔT= 0°C

:TTL or 50 Ω

: ≤1us in 4 hrs @ΔT= 0°C

# INPUT INTERFACE SPECIFICATIONS

Dual IP IO

Transport stream
Network de-jittering using PCR
FEC (SMPTE 2022-1)

**IP Input/Output** 

Operational mode

: 10/100/1000 Base-T Ethernet and SFP interface : Optical SFP (class 1 laser product) : Up to 850 MBit/s

: UDP Multicast/Unicast, RTP : SPTS and MPTS

: 125 services

: 2×10/100/1000 Base-T Ethernet and SFP

- 1 input and 1 output - Seamless (Hitless) IP in

- Cloned IP out - Dual IP in

<sup>\*</sup> If SDI reference signal support is needed, contact your sales representative.

		- Dudi ir Out			
	Maximum data rate per port	: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1×IPIN + 1×IPOUT	DVB-T/T2 input	Number of DVB-T/T2 inputs per module Input connector	: 4 : F-female, 75 Ω
		: Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode		Input connector configurations	: 1 F connector internally split or 4 F connectors
	Maximum number of services per port	: 250		Input frequency range	: 47–862 MHz
	Data format	: UDP/RTP Multicast/Unicast		Input level range	: - 80 to -10 dBm (at T2, 8MHz, 256 QAM, 3/5, gaussian c
	Transport stream	: SPTS and MPTS		Minimum return loss	: 10 dB
	Service filtering	: Yes			
	Video format	: Transport stream, MPEG-2/4 (H264) SD/HD		DVB-T	
	IP Input			Key reference specification FFT Size	: ETSI EN 300744, Nordig 2.0 : 2k, 8k
	IP de-jittering	: Yes, based on PCR or CBR		Guard Intervals	: 1/4, 1/8, 1/16, 1/32
	Forward Error Correction	: SMPTE 2022-1		FEC code rate	: 1/2, 2/3, 3/4, 5/6, 7/8
		250 input streams per data port (licensed)		Constellation	: QPSK, 16-QAM, 64-QAM
	IP Output			Channel bandwidth	: 6, 7, or 8 MHz
	Multiplexing	: Yes (licensed)		Hierarchy stream	: High and Low priority
	Forward Error Correction	: SMPTE 2022-1		Hierarchy mode	: All
				Spectral inversion	: Automatic
		250 output streams per data port (licensed)		DVB-T2	
ACI Innut	Kov reference energification	· EN E0002 0		Key reference specification	: ETSI EN 302755, Nordig 2.1
ASI Input	Key reference specification	: EN 50083-9		FFT Size	: 1k, 2k, 4k, 8k, 8k extended, 16k,
	Connector Number of inputs per module	: BNC female, $75\Omega$		11 1 Size	16k extended, 32k, 32k extended
		:4		Guard Interval	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
	Maximum bit-rate per port	: Up to 213.7Mbit/s (burst)		FEC frame	: Normal (64k), Short (16k)
DVD C/C2 I	V	FN 200 421 FN 202 207		FEC code rate (PLP)	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
DVB-S/S2 Input	Key reference specifications	: EN 300 421, EN 302 307		Constellation (PLP)	: 1/2, 3/3, 2/3, 3/4, 4/3, 3/6 : QPSK, 16-QAM, 64-QAM, 256-QAM
	Connector	: F female, 75 $\Omega$		Channel bandwidth	: 5, 6, 7 or 8 MHz
	Number of inputs per module	:4		Pilot pattern	: P1–P8
	Decoding  DVB & Constallation	: LDPC and BCH		SISO and MISO transmission	: Yes
	DVB-S Constellation	: QPSK		Single and Multiple-PLPs	: Yes
	DVB-S2 Constellation	: QPSK, 8-PSK		Spectral inversion	: Automatic
	DVB-S2 Constellation (Enhanced version)	: QPSK, 8-PSK, 16-APSK		Rotated constellation	: Automatic
	Symbol rate DVB-S	: 1–45 MSym/s		notated constellation	. Automatic
	Symbol rate DVB-S2	: 5–30 MSym/s	DVB-C Input	Key reference specification	: EN 300 429, ITU-T J83 annex A, and C
	Symbol rate DVB-S2 (Enhanced version)	: 1–45 MSym/s	DVB-C IIIput	Connector	: F female, 75 $\Omega$
	FEC DVB-S	: 1/2, 2/3, 3/4, 5/6, 7/8		Number of inputs per module	: 4 independent tuner/demodulators
	FEC DVB-S2 QPSK	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10		Number of input ports	: 1 (internal splitter feeding the 4 tuners)
	FEC DVB-S2 8PSK FEC DVB-S2 (Enhanced version)	: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10		Frequency range	: 47–862 MHz
		: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10		Channel bandwidth	: 6, 7 and 8 MHz
	Roll off (Enhanced version)	: Auto, 0.15%, 0.20%, 0.25%, 0.35% : Auto, 0.15MHz, 1MHz, 2MHz, 2.5MHz, 5MHz		QAM Mode	: 4, 16, 32, 64, 128, 256 QAM
	Acquisition range (Enhanced version) Spectrum inversion (Enhanced version)			Symbol rate	: 1–7.2 Mbaud
	DVB-S2 FEC frames	: Auto, Normal, Inverted : Normal frames		Spectrum inversion	: Automatic
	DVB-52 FEC frames (Enhanced version)	: Short and Normal frames		Input power level	: - 30 to -65 dBm (at 256 QAM, 6.9 Ms/s)
	Input level	:-70 to -25 dBm		input power level	. 30 to 03 dbiii (dt 230 Qi iiii, 0.5 iiis) sj
	Input level (Enhanced version)	:-70 to -20 dBm (16 APSK, 9/10 code rate)	QAM Annex B input	Key reference specification	: ITU-T J83 annex B
	Frequency range	: 950–2150 MHz	Qruit ruit ex 5 in pac	Connector	: F female, $75\Omega$
	LNB voltage	: 0/13/18 Volt		Number of inputs per module	:4
	Maximum LNB supply current	: 400 mA		Frequency range	: 54–860 MHz
	LNB signaling	: LNB voltage + 22kHz continuous tone		Channel bandwidth	:6
	Multiple streams (Enhanced version)	: Yes, 1 per input port		QAM Mode	: 64, 256 QAM
	T2MI De-encapsulation (Enhanced version)	: Yes, one PLP per port		Symbol rate	: 5.057 Mbaud (64 QAM), 5.360 MBaud (256 QA
	12Mil Desencapsulation (Elinanced Version)	. res, one i Li pei port		5,25252	. 5.057
DVB-T input	Key reference specification	: ETSI EN 300744	8-VSB Input (ATSC)	Key reference specification	: ATSC A/53
	Connector	: F female, $75\Omega$		Connector	: F female, $75\Omega$
	Number of inputs per module	: 4 demodulators (one connector)		Number of inputs per module	:4
	Input level	: -30 to -75 dBm (at 8MHz, 3/4, 64-QAM, gaussian channel)		Input level	: -34 to +40 dBmV
	Frequency range	: 47 – 862 MHz		Frequency range	: 50–860 MHz
	Channel bandwidth	: 7 and 8 MHz		Modulation	: 8-VSB
	Guard interval	: 1/4, 1/8, 1/16, 1/32		Band	: Broadcast
	Carrier mode	: 2k, 8k			
	Hierarchy stream	: High and low priority			
	Hierarchy mode	: All			
	Carrier modulation	: QPSK, 16QAM, 64QAM			
	FEC code rate	: 1/2, 2/3, 3/4, 5/6, 7/8			
	- I Le code late				

# ENCODING/TRANSCODING SPECIFICATIONS

**HW** options - Dual HD/SD Encoder with separate AES/EBU input
- Quad SD upgradable to Dual HD
: 4 BNC 75 Ω configured as:
- 2 SDI /HDSDI and 2 AES/EBU inputs, one per channel
- 4 SDI or 2 HDSDI, one per channel
: SMPTE 292M (HD SDI), SMPTE 259M (SD SDI) **Video Input** : 720p – 60Hz, 59.94Hz or 50Hz : 480i – 30Hz, 29.97Hz : 576i – 25Hz SD Resolutions Video Pre-processing
De-blocking Filter
Motion Compensated Temporal Filter (MCTF)
Horizontal Rescaling From 1920 to 1440, 1280 or 960 From 1280 to 960 or 640 WSS Blanking : Removal of line 23 WSS from active video **Logo Insertion** : PNG (8-bit RGBA) file per encoded channel : User defined (pixel resolution) Maximum Size : 192 × 128 (SD) : 360 × 180 (720p) Video Encoder : Up to 2 HD or 4 SD channels MPEG-2 profiles : up to HP@HL (HD) : up to HP@ML (SD) H.264/AVC profiles : up to HP@L4.1 (HD) : up to HP@L3.0 (SD) Rate Control Modes : Constant Bit Rate (CBR) : Capped VBR (CVBR) with QP target : Statistical Multiplexing : From 250kbps to limit by profile/level (max 38Mbps) CBR Rate Range GOP control **Encoder Clock** : 416×240, 352×288, 352×240, 192×192, 128×128, 128×96 : Manual, WSS or Video Index Aspect Ratio Control **Ancillary Data and VBI** : Closed Captioning (EIA 708) : DPI (SCTE 104 VANC extraction and SCTE 35 Private Data **Audio Input** : According to SMPTE 272M (SD), SMPTE 299M (HD) Audio Encoder

> : AAC-LC
> : HE-AAC v1
> : HE-AAC v2
> : Dolby® Digital pass-through
> : ADTS or LATM selectable per encoded channel
> : Stereo/Dual Mono/Mono AAC Data Encapsulation

Injection of Private Data into service

ENCODER – CVCBS input Number of channels : 4 SD or 2 SD+PIP

: 4 HD BNC 75  $\Omega$ , one per channel

25 Pin Compact D-sub for audio:
- 4 balanced analogue audio inputs
- 2 AES/EBU inputs

: PAL B/G/I/D/K Video Input

: SECAM D/K : PAL Nc : PAL M : NTSC M

Video Encoder

MPEG-2 profiles MPEG-4 AVC profiles : up to HP@L3.0 Rate Control Modes : Constant Bit Rate (CBR)

: Capped VBR (CVBR) with QP target

Rate Range : From 250kbps to limit by profile/level (max 38Mbps) GOP control

: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96 Picture-In-Picture

**Video Pre-processing** 

Inverse Telecine Detection

Motion Compensated Temporal Filter (MCTF)

**Logo Insertion** 

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

Position

: 192 × 128 (SD)

**Ancillary Data and VBI** 

: Closed Captioning (EIA 708)

**Audio Encoder** 

Audio CODECs : MPEG-1 Layer 2

: HE-AAC v2

: Dolby® Digital pass-through (from AES input)
: ADTS or LATM selectable per encoded channel
: Stereo/Dual Mono/Mono
: 2 pairs for 2SD+PIP configuration and 1 pair for 4 × SD AAC Data Encapsulation

Number of channels : Up to 2 HD or 4 SD channels

Video Decoder

MPEG-2 profiles H.264/AVC profiles

: Ranging from MP@ML (SD) to MP@HL (HD) : Ranging from MP@L3.0, HP@L3.0 (SD) to MP@L4.0, HP@ L4.0 (HD)

**Audio Decoder** 

: MPEG-1 Layer 2

**Video Pre-processing** 

Inverse Telecine Detection
De-blocking Filter Motion Compensated Temporal Filter (MCTF) Horizontal Rescaling

: From 1280 to 960 or 640 : From 720 to 704, 640, 544, 528, 480 or 35 : Downconversion HD to SD (requires SD license)

Video Encoder

MPEG-2 profiles

: MP@HL (HD)
: MP@ML (SD)
: MP@L4.1, HP@L4.1 (HD)
: MP@L3.0, HP@L3.0 (SD)
: Constant Bit Rate (CBR)
: Capped VBR (CVBR) with QP target
: Statistical Multiplexing
: From 250kbps to limit by profile/level (max 19Mbps)
: Automatic or Manual
: Locked to input **Rate Control Modes** 

GOP structure
Clock Modes

: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96 Picture-In-Picture

or 96×96

Audio Encoder

: Up to 8 stereo pairs per module (4 in statmux mode) : Up to 4 stereo pairs per module (2 in statmux mode) : ADTS or LATM selectable per encoded channel AAC Data Encapsulation

: Stereo/Dual Mono/Mono Channel Modes

Pass-through : MPEG1 Layer II

: HE-AACv1/2

: Dolby® Digital (AC-3) : Dolby® Digital Plus (E-AC-3)

Private Data : Synchronization (Teletext, DVB Subtitling etc) is main-

tained through transcoder.

MS Transcoder

Number of input channels : Up to 4 HD channels\*

Video Decoder

: Ranging from MP@ML (SD) to MP@HL (HD)

up to MP@L4.2 (1080p60) up to BP@L4.1 (1080i60)

**Audio Decoder** 

: MPEG-1 Layer 2. Modes: 1.0 (mono), 2.0 (stereo) Input format

: AAC-LC. Modes: 2.0, 5.1 (downmixed to 2.0) : HE-AAC v1/2. Modes: 2.0, 5.1 (downmixed to 2.0) : Dolby® Digital (AC-3) : Modes: 2.0, 5.1 (downmixed to 2.0)\*\*
: Dolby® Digital Plus (E-AC-3): Modes: 2.0, 5.1, 7.1 (downmixed to 2.0)\*\*

: Dolby® Digital (AC-3) : Dolby® Digital Plus (E-AC-3)

Video Encode

MPEG-4 AVC Profiles

: up to HP@4.0 : up to MP@4.0

: up to BP@4.0 Resolutions @ 59.94 fps or 50.00 fps : 720p > 1280, 960, 854 Resolutions @ 29.97 fps or 25.00 fps : 1080p > 1920, 1440, 1280, 960, 720, 640 720p > 1280, 960, 854 640p > 960 360p > 640, 480 270p > 480, 360 256p > 144 240p > 320 216p > 384 180p > 320, 240 : 640p > 960 576p > 1024, 768, 720, 352 480p > 854, 720, 640, 352 432p > 768 360p > 640, 480 320p > 480 Resolutions @ 14.99 fps or 12.50 fps 270p > 480, 360 180p > 320, 240 Frame rate conversion : From 60/59.94/50 reduced to ½ or ¼ fps Number of profiles : Ranging from  $4 \times HD$  to  $28 \times sub SD$  per module, de-: Frame accurate key frame alignment across all profiles. GOP control **Audio Encoder** : HE-AAC v1. Modes: 2.0, Bit rates: 32–192kbps : HE-AAC v2. Modes: 2.0, Bit rates: 32–96kbps : 32, 44.1, 48kHz

Reformatting/Rescaling

: Interlaced to progressive conversion : From HD to sub SD

**Aspect Ratio Control** 

: Transparent Input to Output, Manual 4:3 or 16:9

VBI

Graphics

: DVB Subtitling

<sup>\*</sup> Full HD (1080p) input restricts input density to 2 channels.

\*\* Dolby® Digital and Dolby® Digital Plus decoding support pending approval.

\*\*\* 352 only available for 25 fps

# PROCESSING MODULES SPECIFICATIONS

Number of audio tracks

Pass-Through

: MPEG-1 layer 2

Integrated with 3rd party SW solutions for automatic

: SW based smart card **Bulk Descrambling** 

> CA system support : Please contact Appear TV

BISS support : Mode 1

: Up to 850 MBit/s

: DVB-CA and AES

: SIM based smart card

: 8 in front and 8 behind front plate

(Only 8 in front can be replaced while in operation)

: Mode 1 : Up to 850 MBit/s

Scrambling algorithms

**DVB** Descrambling

Viaccess, NDS Viasat, Nagra

: 250 (depending on SW license)

: DVB-CA and AES

: DVB-CA and AES

Scrambling algorithm

: Up to 850 MBit/s

Number of services per scrambler card

Video format

: Transport stream, MPEG-2 SD/HD and MPEG-4 SD/HD : Simulcrypt interface

: EIT table from any port

: Re-generated EIT table

(ETSI EN 300 458 V1.9.1)

# COMMON OUTPUT SPECIFICATIONS

All Output Modules : ETSI TR 101 211 V1.9.1, ISO IEC 13818-1

Multiplexing

Video format : Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD,

: PAT, PMT, CAT

PCR regeneration

PSI/SI

: PSI/SI regeneration based on input and operations performed on the signal: Yes, on TS level. For SPTS output only

: SDT, NIT, EITpf ,TOT, TDT, BAT, AIT

PSIP

: PAT, PMT, CAT PSIP : MGT, TVCT,CVCT

# **OUTPUT MODULE SPECIFICATIONS**

: 10/100/1000 Base-T Ethernet output and SFP interface IP Output

: Up to 850 MBit/s \*

Maximum number of services Data format

: CBR and VBR on SPTS : SMPTE 2022-1 Forward Error Correction

Dual IP IO IP Input/Output

: 2×10/100/1000 Base-1 Ethernet and SFP
: The module can be configured to;
- 1 input and 1 output
- Seamless (Hitless) IP in
- Cloned IP out
- Dual IP in
- Dual IP out
: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1×IPIN+1×IPOUT

Maximum data rate per port

: Up to 850 Mbit/s sum of both ports in Dual IP in or Dual

IP out mode

Maximum number of services per port

: UDP/RTP Multicast/Unicast Data format

Transport stream : SPTS and MPTS

Service filtering

Video format : Transport stream, MPEG-2/4 (H264) SD/HD

**IP Input** 

: Yes, based on PCR or CBR

: SMPTE 2022-1

IP Output

Multiplexing Forward Error Correction

250 output streams per data port (licensed)

**ASI Output** 

Key reference specification Connectors Number of outputs per module Maximum bit-rate per port

: 4 BNC female, 75Ω : 4 different Transport Streams : burst mode: 213.7Mbit/s

	Number of services per card Output format	: 250 (sum of all 4 ports) : Constant bit-rate		
QAM Output	Key reference specifications Interface	: EN 300 429, ITU J.83.ABC : 2 $\times$ F connector female, 75 $\Omega$		
	Number of carriers Number of QAM frequencies per module Modulation	: 3 and 4 per group (adjacent channels) : up to 16 carriers in 4 groups, 8 per port : 32 / 64 / 128 / 256 - QAM		
	Symbol rate Frequency range	: 4.48 to 7.00 Mbaud (Annex A and C) : 47–862 MHz		
	Spectrum inversion	: user selectable		
	Test mode	: CW		
	Channel spacing Frequency step size	: 5, 6, 7, 8 MHz (12 MHz available for 3 carrier groups) : 1 Hz		
	Frequency stability Output level Output level stability	: 2 ppm :-12 to +2.2dBm per carrier : ± 0.5 dB		
	Output level adjustment step size (GUI)  MER	: 0.1 dB :> 42 dB		
	Return loss	:>16 dB		
	Spurious	: typ < -60 dBc		
OVB-S/S2 Modulator, IF	Key reference specification	: EN 300 421 , EN 302 307 : 2		
	Number of DVB-S/S2 outputs per module  Monitoring ports	: 2 : 1 per output (30 dB attenuated)		
	Output connector	: F-type female, 75 Ω (RF Out and Test out)		
	Output frequency (center)	: 70–200 MHz		
	Output level	: -15 to 0 dBm		
	Output level stability	: ± 0.5 dB		
	Frequency stability	: 2 ppm		
	Return loss	:>16 dB		
	Spurious In-band flatness	: typ < -60 dBc		
	Spectrum inversion	: typ $< \pm 0.1$ dB : user selectable		
	Precorrection	: Static. Linear and non-linear		
	<b>DVB-S Coding and Modulation</b> Constellation	: QPSK		
	Modulation mode	: Constant		
	FEC outer	: RS (188, 204)		
	FEC inner	: Viterbi		
	Code rates	: 1/2, 2/3, 3/4, 5/6, 7/8		
	Symbol rate	: 0.5–45 Mbaud		
	DVB-S2 Coding and Modulation Constellation	: QPSK, 8-PSK, 16-APSK, 32-APSK		
	Modulation mode	: CCM		
	FEC	: BCH/LDPC		
	Code rates	: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10		
	Frame length Symbol rate	: 16200 bits (short), 64800 bits (long) : 0.5–45 Mbaud		
	Roll off	: 0.20, 0.25, and 0.35		
OVB-S/S2 Modulator, L Band	Key reference specification	: EN 300 421 , EN 302 307		
	Number of DVB-S/S2 outputs per module  Monitoring ports	: 2 : 1 per output (30 dB attenuated)		
	Output connector	: SMA female, $50\Omega$ (RF out)		
	Output frequency	: F-type female, 75Ω (Test out) : 950–2150 MHz		
	Output frequency  Output level	: -20 to 5 dBm		
	Output level stability	: ± 0.5 dB		
	Frequency accuracy	: 2 ppm		
	Return loss	:>14 dB		
	Spectrum inversion	: user selectable		
	Spurious	: < -65 dBc/4kHz (@ symbol rate ≥ 256 kb/s)		
	In-hand flatnoss	typ < + 0.1 dB		

In-band flatness

**DVB-S Coding and Modulation** Constellation Modulation mode : QPSK : Viterbi : 1/2, 2/3, 3/4, 5/6, 7/8 : 0.5–45 Mbaud DVB-S2 Coding and Modulation Constellation
Modulation mode
FEC
Code rates
Frame length
Symbol rate
Roll off : 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 : ETSI EN 300744 Number of carriers Number of output ports Impedance
Output frequency Frequency accuracy :>16 dB : > 42 dB DVB-T Coding and Modulation : 2k, 8k Code rates : 1/2, 2/3, 3/4, 5/6, 7/8 : QPSK, 16-QAM, 64-QAM Channel bandwidth Key reference specification Number of carriers : ETSI EN 302755 : 2 independent carriers : -12 to 2.2 dBm (TBD) Output level Output level stability : ± 0.5 dB Frequency accuracy
Return loss
MER : 2 ppm : >16 dB : > 42 dB **DVB-T2 Coding and Modulation**FFT size : 1k, 2k, 4k, 8k, 8k extended, 16k, : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 : QPSK, 16-QAM, 64-QAM, 256-QAM Constellation (PLP)

DVB-T Cable Modulator

DVB-T2 Cable Modulator

Channel bandwidth

Pilot pattern Number of PLPs

DVB-T/T2 Modulator (Exciter)	Key reference specification	: ETSI EN 302755 , ETSI EN 300744		
	Number of carriers	: 2 independent carriers		
	Number of output ports	: 2 (1 carrier per port)		
	Output connector	: BNC		
	Impedance	: 50 Ω		
	Output frequency	: 47-862 MHz		
	Frequency setting step size	: 1 Hz		
	Output level	: -15 to 0 dBm		
	Output level stability	: ± 0.5 dB		
	Frequency accuracy	: 2 ppm		
		:>16 dB		
	Return loss			
	MER	: > 42 dB		
	Test mode	: CW		
	DVB-T Coding and Modulation			
	Input	:TS with MIP (SFN) or remultiplexed TS		
	FFT size	: 2k, 8k		
	Guard intervals	: 1/4, 1/8, 1/16, 1/32		
	Code rates	: 1/2, 2/3, 3/4, 5/6, 7/8		
	Constellation	: QPSK, 16-QAM, 64-QAM		
	Channel bandwidth	: 5, 6, 7, 8 MHz		
		. 3, 6, 7, 6 14112		
	DVB-T2 Coding and Modulation	TOMI (CENI) III I I I I		
	Input	: T2MI (SFN) or remultiplexed TS		
	SFN	: Relative timestamps within 1000 ms		
	T2 versions	: 1.1.1 and 1.2.1		
	FFT size	: 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended		
	Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128		
	FEC frame	: Normal (64k), Short (16k)		
	FEC code rate	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6		
	Constellation (PLP)	: QPSK, 16-QAM, 64-QAM, 256-QAM		
	Channel bandwidth	: 1.7, 5, 6, 7, 8, or 10 MHz		
	Pilot pattern	: P1-P8		
	Number of PLPs			
	Number of PLPS	: up to 128		
DVB-T/T2 Gateway ASI*	Connectors	: 4 x BNC 75Ω		
	Number of MPTS's with MIP			
	Number of T2MI streams	:2		
	Maximum ASI bit-rate per port	: Spread Mode: 72Mbit/s		
		Burst Mode: 213Mbit/s		
	Re-multiplexing	: See common output module specifications		
	DVB-T MIP inserter			
	Key specification	: ETSI EN 300 744, ETSI TS 101 191		
	Relative timestamps	: <1s		
	DVB-T2 T2MI			
	Key reference specifications	: EN50083-9, ETSI EN 302 755, ETSI TS 102 773		
	T2 version	: 1.1.1 and 1.2.1		
	T2MI signaling	:T2MI is signaled in PSI/SI as a data service		
	Clock modes	: Relative Timestamps <1s (SFN) and Null timestamps		
		(MFN)		
	PAPR	: TR and ACE (global on/off)		
	MISO/SISO	: Yes		
	Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128		
	FFT sizes	: 1k, 2k, 4k, 8k, 8k extended, 16k,		
	11731263	16k extended, 32k, 32k extended		
		Tok exteriaed, 32k, 32k exteriaed		

: QPSK, 16-QAM, 64-QAM, BPSK

Pilot Patterns L1 Constellations

**DVB-T2 PLP support** 

TI types FEC frame : Normal (64k), Short (16k) FEC code rate : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 : QPSK, 16-QAM, 64-QAM, 256-QAM :  $2 \times 10/100/1000$  Base-T Ethernet output or  $2 \times$  Optical SFP (class 1 laser product) Number of T2MI streams Maximum data rate : Up to 850 MBit/s : CBR : SMPTE 2022-1 (Licensed) : See common output module specifications **DVB-T MIP inserter** : ETSI EN 300 744, ETSI TS 101 191 Key specification Relative timestamps DVB-T2 T2MI Output redundancy based on OSPF (licensed) Network level redundancy (licensed) : Yes. Please contact Appear TV for more information T2MI signaling :T2MI is signaled in PSI/SI as a data service Clock modes (MFN) : Yes : Yes : 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128 : 1k, 2k, 4k, 8k, 8k extended, 16k,16k extended, 32k, 32k extended MISO/SISO Guard intervals FFT sizes : QPSK, 16-QAM, 64-QAM, BPSK **DVB-T2 PLP support** Number of PLPs : 240 in total between all T2MI streams PLP mode

: Normal (64k), Short (16k) FEC frame : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 FEC code rate : QPSK, 16-QAM, 64-QAM, 256-QAM

Rotated constellations

DVB-T2 Gateway IP

# **DECODER SPECIFICATIONS**

MPEG-2/4 Decoder

Number of decoded channels : 2 per module

Embedded audio

**Video Decoding** 

: MP@HL (HD) MP@ML (SD)

MPEG-4 AVC profiles MP@L3, HP@L3 (SD) : Off, Letterbox, Panscan

: Accepts PAL and NTSC black burst, 720p50/59.94/60 and 1080i50/59.94/60 tri-level reference signals. (HW option). If SDI reference signal support is needed, contact your sales representative.

**Audio Decoding** 

: 2
: MPEG-1 Layer 1 and 2 (Musicam)
MPEG-2 Layer 2, MPEG4 AAC-LC
MPEG4 AACplus (HE-AAC, AAC+SBR) v1 and v2
Dolby® Digital and Dolby® Digital Plus decoding, Downmix from 5.1 to 2.0 (Lo/Ro & Lt/Rt), Compression Modes (Line & RF) (HW option)
Conversion from Dolby® Digital Plus to Dolby® Digital at a fixed bitrate of 640 Kbit/s (HW option)

: ITU-R BT .653-3 (System B only), SMPTE 2031

Sin(x)/x on line 281(525 lines) or 335 (625 lines)

: EN 300 743 v1.3.1

: FN 301 775 v1.2.1 : EN 300 294/ SMPTE 2031

: EN 301 775 v1.2.1

: EN 301 775 v1.2.1

: EN 300 231, SMPTE 2031

**VBI/VANC/DVB** sub Processing

DVB subtitling according to Wide Screen Signaling (WSS) Input

World standard teletext (WST/EBU)

Video Programming System (VPS)

Teletext Subtitling (OSD)

SCTE 35 : SCTE 104

: ETSITS 101 154 : SMPTE 2016-3-2009

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

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

**Audio Decoding** 

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

**VBI/VANC/DVB Sub Processing** 

MPEG-2/4 Decoder

Connector for audio

: 25 PIN min D-sub for audio (male) - 4 balanced audio, 2 per channel, balanced - 2 AES/EBU audio, 1 per channel (ch. 1)

### Video Decoding

### Audio Decoding

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

### VBI/VANC/DVB Sub Processing

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

### Analogue Video

Video standards : PAL and NTSC

: HD down conversion to SD : >70dB Measured Acc. Rec 569 Signal to noise ratio

Sin x/x Gain : ±0.3dB

: ±0.5dB (20-20kHz)

Quad Decoder with RF\*

: 4 (max 2 HD) or 8 (max 4 HD) per module set. Connector for RF mod video

### **Video Decoding**

### Audio Decoding

Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out" (except pass-through). Dolby® Digital and Dolby® Digital Plus decoding support pending approval.

### VBI/VANC/DVB Sub Processing

### VHF/UHF Output

RF tuning step size Channel setting flexibility

: 500 Hz : 4 channel version fully agile.

8 channel version semi agile, two adjacent channels with 8, 16 or 24 MHz spacing: 105-112 dBuV/ch (115 dBuV/ch for 4 ch version)

Output level (per carrier)
Output level adjustment step size (GUI)
Return loss
Video carrier frequency stability
Intermodulation distance, (4/8
Channel TV Modulator only) : ±3 ppm : > 60 dB, Measured:

@ 115 dBV per channel, 2 channels per port
@ 112 dBV per channel, 4 channels per port

Carrier to noise, in-band Carrier to noise, adjacent channel Carrier to noise (40 channels combined) : Typ. 61 dB @110 dBuV/ch

Carrier to spurious, full band (40 - 862 MHz) : > 60 dB

### Video (demodulated video)\*\*

Differential gain : <2 % Differential phase Group delay variations : <50 ns 2T K factor Signal to noise ratio

Audio carrier output level (relative to video carrier) :-13dB (default)

Audio carrier output level range : -10 to - 20 dB, 0.5 dB steps

<sup>\*</sup> All measurements are carried out in room temperature at 20°C \*\* Using R&S ETL as demodulator

Audio – NICAM Stereo

NICAM modulation : According to ETSI EN 300 163 v1.2.1, Fully synchronous

operation, Digital J17 pre-emphasis

NICAM carrier level relative to vision carrier: 20dB

Audio – A2 Stereo

Audio carrier levels relative to vision carrier : f1= -13dB, f2= 20 dB

Audio carrier output level range : f1: -10 to -20 dB, f2: -17 to -27 dB, 0.5 dB steps

: Stereo/Dual Mono/Mono : FM Audio output modes Modulation Audio-bandwidth

Audio – MTS Stereo

: FCC-OET60 and CEA -TVSB-5

Two sound-carrier FM system (A2) : FCC-OET6(
Audio carrier levels relative to vision carrier : f1= -13dB
Audio carrier output level range : -10 to - 20
Audio output modes : Stereo

Number of channels

: 1 F connector 75Ω with both channels and 1 F connector Connector for RF mod video

**Stereo Sound\*** 

Dual MPEG-2/4 Decoder

with High Performance RF Modulation and

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

**Audio Decoding**Please refer to "MPEG-2/4 Decoder with SDI/HDSDI out" (except pass-through).

Dolby® Digital and Dolby® Digital Plus decoding support pending approval.

### VBI/VANC/DVB Sub Processing

## VHF/UHF Output

: 47– 862MHz : 12.5 kHz RF tuning step size
Channel setting flexibility
Output level (per carrier)
Output level adjustment step size (GUI)

: Fully agile : 105-115 dBuV /ch

Return loss : >16dB

Video carrier frequency stability : ±3 ppm

Carrier to noise, in-band :> 66 dB @112 dBuV/ch

Carrier to noise, adjacent channel :> 68 dB @112 dBuV/ch

Carrier to noise (40 channels combined) : Typ. 65 dB @112dBuV/ch

Carrier to spurious, full band (40 - 862 MHz) :> 62 dB

# Audio – NICAM Stereo

# <u> Audio – MTS Stereo</u>

FM Radio

Output connector

**FM Output** 

: 18 dB : > 46dB : > 60dB : UECP SPB490 or static Return loss
Channel separation L/R
Carrier to spurious
RDS insertion

**MPX Output** 

MPX Output MPX Test output level MPX Test output load impedance MPX Test output connector

: 600Ω : 1 BNC, service selectable from GUI

# CHASSIS

Power supply

: 800 Watt Power

: 100-240 V AC, 50/60 Hz : Yes, dual hot swappable PS

: Via WEB GUI and LED indicators on PS

Cooling

Hot swap of fans

: Front to back Airflow direction

XC5100 Physical dimensions

**Power supply** 

: 400 Watt

: 100-240 V AC, 50/60 Hz

: Via WEB GUI and LED indicators on PS

Cooling

Hot swap of fans

: Front to back

# **ENVIRONMENTAL CONDITIONS**

Operational conditions

Humidity

: -20 to +70 °C

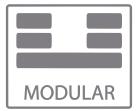
: 5 to 95% (non-condensing)

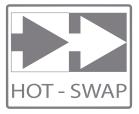
Electrical safety IEC 60950-1

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









MULTIPLEXING VERSION 010

# APPEAR TV AS

Po Box 8 Lilleaker No-0216 Oslo

Norway

Tel: +47 24 11 90 20 Fax: +47 24 11 90 21

Email: info@appeartv.com Web: www.appeartv.com