TOTA

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SYSTEM OF CHOICE FOR PROFESSIONAL OPERATORS

Sencore is dedicated to providing world class equipment that enable operators to deliver professional broadcast services at the highest possible quality. The DMG 3200 is built around a modular platform 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 DMG 3200 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. Sencore'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.

Sencore's DMG 3200 is 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.

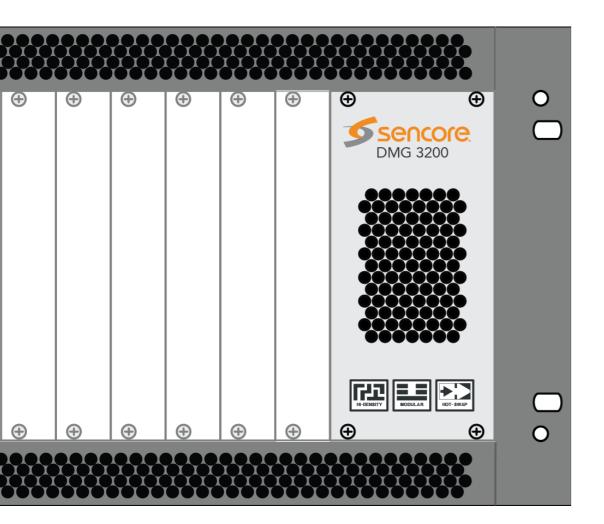
An advanced user friendly GUI offers an intuitive and comprehensive management of the many features of the system. The exhaustive multi-level alarm system, together with the easiness for integration to 3rd party management systems, enables full automatic control. The possibility of centralized monitoring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

Sencore classifies its modules into different categories depending on the functionality. These include switching, input for content aggregation, compression, processing, and output 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

Sencore offers two different chassis: the 4RU chassis which can hold 16 modules and the 1RU 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, and Output 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 Sencore 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

- 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

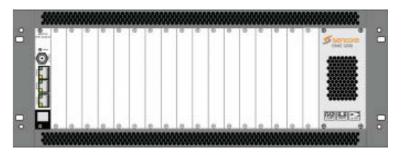
1RU

- 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

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



RU

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

The 4RU and 1RU use the same set of modules and same SW, but the front plates are different.



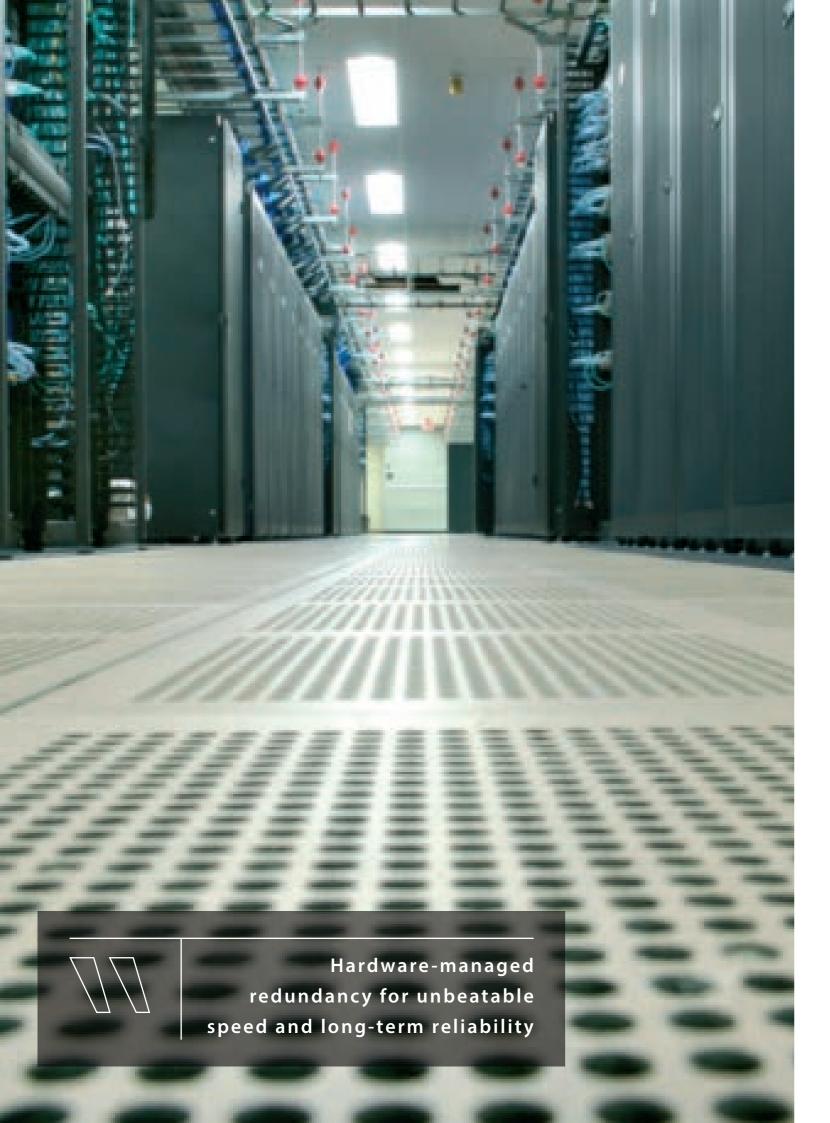
Module plate for 4RU



The modules can therefore not be interchanged between 4RU and 1RU.



Module plate for 1RU



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 4RU 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 1RU chassis provides an integrated switch module in the front with IP IO as standard. The switch module for 1RU is functionally identical to the switch module used in the larger 4RU 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 4RU, this is a separate module that must be placed in slot 1, while for 1RU, 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 DMG 3200 4RU

Switch Module with Management

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



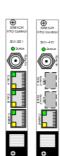
Clock Reference Module

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



Switch Module with Management and IPIO

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



SWITCH MODULES FOR DMG 3200 1RU

Switch Module with Management

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



Switch Module with Management and Dual IPIO

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





MPEG INPUT MODULES

Sencore 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/S2X, DVB-C, DVB-T/T2, ISDB-T and 8VSB). Each input module type is based on embedded hardware design offering high density and reliability. The ability to mix input types freely within a chassis enables multiple MPEG transport streams originating from a variety of sources to be received and processed in parallel. Received signals can be demodulated, de-multiplexed and distributed to other modules inside the chassis via the

A wide range of input modules are available including IP, ASI, DVB-S/S2/S2X, DVB-C, DVB-T/T2, ISDB-T and 8VSB. The chassis supports any combination of input modules limited only by available slot space. Each input module is designed to receive up to 850Mbit/s of 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

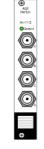
- 2 × Gbit RJ45 or SFP input port for data (or 1×in and 1×out)
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast
- Supports reception of MPTS and SPTS Supports seamless (hitless) input redundancy
- Service filtering
 Supports FEC (SMPTE 2022) (license)
- 1 slot wide



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
- 1 slot wide





DVB-C Input

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



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DVB-8/82X INPUT

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ISDB-T Input module

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





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DVB-S/S2X Input

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

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



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
- Frequency range 950 2150 MHz
- Symbol rate:
- DVB-S: 1-45 MSym/s
- DVB-S2: 1-45 MSym/s
- 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 Itering
- ASI monitoring port
- Input analysis
- 2 slots wide

• 2 slots wide



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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 47-862 MHz
 - Carrier mode:
 - DVB-T: 2k, 8k
 - DVB-T2: 1k, 2k, 4k, 8k, 16k, 32k
 - Modulation:
 - DVB-T: QPSK, 16QAM, 64QAM - DVB-T2: QPSK, 16QAM, 64QAM, 128QAM, 256QAM
 - Supports reception of MPTS and SPTS
 - Service filtering on input
 - Input analysis
 - 1 slot wide



UNIVERSAL ENCODER & TRANSCODER

Linear Broadcast

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

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

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

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

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

All new Universal Encoder/Transcoder modules can be used in new or existing 4RU or 1RU Series platforms and can work in combination with any other modules from Sencores 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 Sencore 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.

Sencore 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 Sencore 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 Sencore 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.

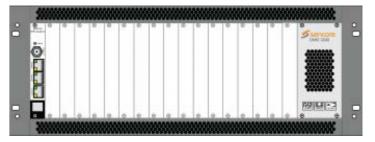


FEATURES

- 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

- 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
- 1 slot wide



Encoder -RF input

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

*Other TV standards can be supported upon request



- 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 analog audio
- 2 AES/EBU audio
- MPEG-2 and MPEG 4 SD encoding
- Constant bit-rate (CBR)
- Capped variable bit-rate (CVBR)
- Logo insertion
- 1 slot wide

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Universal Transcoder - Multiscreen (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



Universal Encoder - Multiscreen (OTT)

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



Universal Transcoder - High VQ Broadcast

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

Universal Encoder - High VQ Broadcast

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

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Universal Transcoder - Dense Broadcast

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



Universal Encoder - Dense Broadcast

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



PROCESSING MODULES

Descrambling and Scrambling

Sencore 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.

Sencore'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



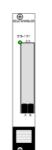
Scrambler

- 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
- 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 Sencore.





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 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



Audio Processor

- Encodes up to 32 stereo channels
- 4x SDI/HDSDI input with embedded audio
- 4x BNC, 75 Ohm female input ports
- 8 stereo audio tracks per SD/HDSDI feed Audio codec support
- MPEG-1 Laver 2
- MPEG-1 Layer 3 (MP3)
- AAC-LC - HE-AAC v1
- HE-AAC v2 Audio channel modes:
- Stereo - Mono
- Audio Level Adjustment , +6/-10dB



MPEG OUTPUT MODULES

Sencore 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 Sencore'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 Sencore'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. Sencore'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.

Sencore'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/S2X modulator is available in two different output configurations: IF or L-band.

Sencore'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. Sencore'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 Sencore 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 Sencore 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.

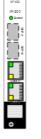
FEATURES

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

OUTPUT MODULES

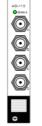
Dual IP IO

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



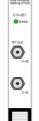
ASI Output

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



QAM Modulator

- 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
- 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
- IF > 1 × F connector + 1 × F for monitoring per output -L-band > 1 × SMA connector + 1 × F for monitoring per output
- Output options:
- IF > 50-200 MHz
- L-band > 950-2150 MHz
- Modulation:
- DVR-S > OPSK
- DVB-S2 > QPSK, 8-PSK, 16-APSK, 32-APSK
- Symbol rate: 0.5-45 Mbaud
- Linear static precorrection
- Supports multiplexing and transparent pass-through
- PSI/SI/PSIP regeneration
- 1 slot wide

DVD-G/SE MODULATOR 2232 511-220 • 2312 • 0 0 0 0 0 0

DVB-T/T2 Terrestrial Modulator

- 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
- Supports multiplexing and transparent pass-through (mode A)
- Support for SFN (ETSLTS 102 733 T2-MI)
- Support for multiple PLPs
- Supports multiplexing and transparent
- PSI/SI regeneration



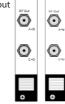
- Connectors:
- COFDM > 1 × F connector + 1 × F for monitoring per module - DVB-T2 > 1 × BNC connector + 1 × BNC for monitoring per output

- 1 slot wide



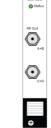
DVB-T/T2 Cable Modulator

- 4 DVB-T modulators (TM-101)
- 2 DVB-T/T2 modulators (TM-200)
- 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



ISDB-T Modulator

- 8 ISDB-T modulated carriers per module
- 2 × 75 RF output F connector • Full digital modulation and up-conversion
- DOCSIS 3.0 RF compliant
- QPSK, 16QAM, 64 QAM modulation
- Frequency range of 47 862 MHz
- Supports multiplexing and transparent pass-through • PSI/SI/PSIP regeneration
- Relevant Standards:
- ARIR STD-R31
- ARIB STD-B10
- 1 slot wide



⊕ ISDB-T

DVB-S/S2/S2X Modulator

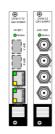
- 2 DVB-S/S2/S2x modulated carriers per module
- -IF $> 1 \times 75$ F connector $+ 1 \times 50$ SMA for monitoring per output
- -L-band $> 1 \times 50$ SMA connector $+ 1 \times 75$ F for
- monitoring per output
- Satellite standards
- -DVB-S EN 300 421
- -DVB-S2 EN 302 307 1
- -DVB-S2X EN 302 307 -2,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





DVB-T/T2 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)
- 1 slot wide



DAB/DAB+ Modulator

- Standards: DAR/DAR+
- EDI input 8 x DAB/DAB+ modulated carriers
- Frequency range 174-239 MHz • Output level -4 dBm to -15 dBm
- 1 slot wide



END TO END TERRESTRIAL SOLUTIONS

Sencore 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 Sencore 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, Sencore 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

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

The advanced Sencore DVB-T2 gateway module is representative of Sencore'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.

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

Sencore network delivery enhancements include support for the DVB-S/S2 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

REDUNDANCY

Sencore'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.

Sencore'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 Sencore.

Input redundancy

switching mechanism. Any output service can be configured to have a backup service from a different input TS regardless of input type. 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 Sencore 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 network feeds.

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 Sencore's Internal Redundancy feature, all critical single points of failure in the 4RU chassis are eliminated. This clever mechanism facilitates configurations with redundant switch modules, redundant control) as well as redundant power supplies. In case of input, switch or MMI failure, all output modules will switch backplane and log into and switch.

By having 1+1 redundancy on inputs and switch modules, all components of the chassis are backed up, except for the output modules which normally handle a subset of the available channels. In case of failure of output modules, they can easily be hot-swapped, and the affected services will be up and running in seconds.

N+M redundancy (4RU chassis feature) (License)

The Sencore self-managed N+M redundancy for encoding and The Sencore system is equipped with an advanced input redundancy 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. Input switching can also be performed on TS level using 'input port Rather than relying on external PC hardware, Sencore have integrated the redundancy control into the built in management system thus simplifying system configuration eliminating integration and operational issues between HW and management PC. It is the perfect method for creating the intelligent 'device islands' that are increasingly being favored by broadcasters when architecting new solutions.

The encoders and transcoders will be the only items within the chassis in N+M configuration. Everything else will be 1+1. This includes any input and output ports, all control and management functions, the backplane and the power supplies. Each 4RU chassis will be equipped with backup encoder or transcoder module(s) capable of reconstruct a perfect outgoing stream even from two imperfect providing module level replacement for any of the active encoders or transcoders within the chassis. Multiple redundancy groups can be combined in the chassis by automatically creating groups of encoders The Seamless IP Switch can regenerate the traffic received via two and transcoders. For encoding, the redundant control modules can drive a (HD)SDI video router directly

IP Output redundancy (License)

The IP output redundancy system presents a network with multiple sources from which it is possible to obtain the same service. Should the service from one source be corrupted, the network can receive the service from another source. The redundancy solution is service based (multicast based) where the same service will be available for backplanes, redundant IP inputs, redundant MMI (i.e. management & two or more sources. As long as all sources with the same channel have the same IP source address, the network will route just a single copy of the multicast stream forward to the receiver based on routing the other MMI where it will receive the services from the backup inputs cost. In the event of a service issue within, or prior to, the Sencore chassis, the IP output module exploits standard IP protocols to trigger external routers to switch to secondary sources. The "Monitor-in-out" functionality may be used for those networks not utilizing routing

> Where full redundancy is not required, partial redundancy strategies can be implemented. Systems can be configured to provide full redundancy of only selected premium or 'must-carry' services. Operators can then choose not to replicate the input and descrambling functions of lower priority services, but still equip the chassis with

SWITCH MODULE SPECIFICATIONS

IP Input/Output

Transport stream
Service filtering
Video format

IP Output

Forward Error Correction

Reference Clock

Frame Synchronization Input (Genlock)
Internal Clock Reference MMI Clock Synchronization

Management

External interface

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

Licenced features

: 2xIP In, 1xIP In/1xIP Out, 2xIP Out, Seam. IP In, Cloned IP

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

: Gbit/s routing between modules in a chassis

 $: 2 \times 10/100/1000$ Base-T Ethernet or SFP

: Transport stream; MPEG-2, MPEG-4, HEVC

: Optical SFP (class 1 laser product) : Up to 850 MBit/s per port TS rate

250 output streams per data port

: UDP/RTP Multicast/Unicast

: SPTS and MPTS

: Yes (licensed)

: SMPTE 2022-1

: PAT, PMT, CAT

: 10/100/1000 Base-T Ethernet

: Multiplexing : IP Out Redundancy

Clock Reference

GPS reference input

1pps timing accuracy
Active Antenna Voltage output Internal reference hold-over

1pps reference input

Licensed features

: SMA female

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

: ≤1us in 4 hrs @ΔT= 0°C

: GPS receiver, OCSO oscillator, OCXO oscillator

(stability 0.2ppb/day)

COMMON INPUT SPECIFICATIONS

Transport stream Service filtering Video format : SPTS and MPTS

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

INPUT INTERFACE SPECIFICATIONS

Dual IP IO

IP Input/Output

: 2×10/100/1000 Base-T Ethernet and SFP : The module can be configured to; - 1 input and 1 output - Seamless (Hitless) IP in - Cloned IP out

- Dual IP in

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

Data format

: UDP/RTP Multicast/Unicast

: Yes, based on PCR or CBR

IP Input

IP de-jittering

Forward Error Correction

SMPTE 2022-1

250 input streams per data port

Multiplexing
Forward Error Correction

SMPTE 2022-1

Licensed feature:

: Seamless input, Cloned IP Out : FEC in, FEC out, FEC in/out

: EN 50083-9

: BNC female, 75Ω

: Multiplexing : IP output redundancy

: Up to 213.7Mbit/s (burst)

: EN 300 421, EN 302 307 p1&2

: QPSK : QPSK, 8-PSK, 16-APSK, 32-APSK : 1–45 MSym/s : 1–45 MSym/s : LDPC and BCH : 1/2, 2/3, 3/4, 5/6, 7/8 : 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 : Auto, 0.15, 0.20, 0.25, 0.35 : Auto, 0.15MHz, 1MHz, 2MHz, 2.5MHz, 5MHz : Auto, Normal, Inverted : Short and Normal frames : -70 to -20 dBm (16 APSK, 9/10 code rate) : 950–2150 MHz

: LNB voltage + 22kHz continuous tone

ASI Input

Key reference specification

Maximum bit-rate per port

Enhanced DVB-S/S2 Input

Symbol rate DVB-S2 Symbol rate DVB-S2 Decoding DVB-S2 FEC DVB-S FEC DVB-S2

Acquisition range Spectrum inversion DVB-S2 FEC frames

Input level
Frequency range
LNB voltage

Maximum LNB supply current

LNB signaling Multiple streams T2MI De-encapsulation

Licenced features:

: DVB-S2 Demodulation

: Yes, 1 per input port

: Yes, one PLP per port

: 0/13/18 Volt

DVB-S/S2X input

Key reference specification

SR-120 Connector

Acquisition range

DVB-S2 Constellation DVB-S2X Constellation

Symbol rate DVB-S/S2/S2X Decoding DVB-S2/S2X FEC DVB-S FEC DVB-S2 QPSK

FEC DVB-S2 8PSK

FEC DVB-S2 8APSK

FEC DVB-S2 16APSK

FEC DVB-S2 32APSK Roll off DVB-S Roll off DVB-S2 Roll off DVB-S2X

DVB-S2 FEC frames LNB voltage

Maximum LNB supply current

Multiple streams

Licenced features

DVB-T/T2 input

Number of DVB-T/T2 inputs per module

Input connector
Input connector configurations

Input frequency range Input level range Minimum return loss

Key reference specification FFT Size

Hierarchy stream Hierarchy mode

Key reference specification

FFT Size

DVB-T2

Guard Interval

Constellation (PLP) Channel bandwidth

Pilot pattern
SISO and MISO transmission
Single and Multiple-PLPs
Spectral inversion
Rotated constellation

Licenced features:

: EN 300 421, EN 302 307 part 1 and 2

: 950-2150 MHz

: QPSK, 8PSK, 16APSK, 32APSK : 1–45 MSym/s (1-39.9MSym/s for 32-APSK) : LDPC and BCH

: 1/2, 2/3, 3/4, 5/6, 7/8 : 1/4, 13/45, 1/3, 2/5, 9/20, 1/2, 11/20, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 : 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 5/6, 8/9, 9/10

: 5/9, 8/15, 1/2, 26/45, 3/5, 28/45, 23/36, 2/3, 25/36, 13/18, 3/4, 7/9, 4/5, 5/6, 77/90, 8/9, 9/10 : 2/3, 32/45, 11/15, 3/4, 7/9, 4/5, 5/6, 8/9, 9/10

: Auto, 0.35

: Auto, 0.20, 0.25, 0.35

: Auto, 0.05, 0.10, 0.15, 0.20, 0.25, 0.35

: Auto, Normal, Inverted

: Normal frames : 0/13/18 Volt

: LNB voltage + 22kHz continuous tone

: 1 per input port : 1 PLP per port : DVB-S2 demodulation

DVB-S2X demodulation T2MI de-encapsulation

: 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)

: ETSI EN 300744, Nordig 2.0

: 1/2, 2/3, 3/4, 5/6, 7/8 : OPSK, 16-OAM, 64-OAM

: 6, 7, or 8 MHz : High and Low priority

: ETSI EN 302755, Nordig 2.1

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

: DVB-T2 demodulation

: EN 300 429, ITU-T J83 annex A, and C **DVB-C Input**

: 47–862 MHz : 6, 7 and 8 MHz Frequency range Channel bandwidth

OAM Mode : 4, 16, 32, 64, 128, 256 QAM

: 1–7.2 Mbaud

: - 30 to -65 dBm (at 256 QAM, 6.9 Ms/s)

QAM Annex B input : ITU-T J83 annex B : F female, 75Ω

: 54–860 MHz

Frequency range Channel bandwidth QAM Mode

64, 256 QAM

: 5.057 Mbaud (64 QAM), 5.360 MBaud (256 QAM)

: ATSC A/53 8-VSB Input (ATSC)

Connector
Number of inputs per module
Input level
Frequency range
Modulation :-34 to +40 dBmV : 50–860 MHz

8-VSB

: 8-VSB. OAM Annex B Licenced features:

ISDB-T/SBTVD-T Key reference specification : ARIB STD-B31 Channel bandwidth : 6, 7 and 8 MHz

RF Input specification

: 4 independent tuner/demodulators : 1 (internal splitter feeding the 4 tuners)

:-10 dBm :-76 dBm

: DQPSK, QPSK, 16QAM, 64QAM

ENCODING/TRANSCODING SPECIFICATIONS

Universal Encoder - High VQ Broadcast

DensityNumber of channels per module : Up to 1 HD or 2 SD

HD Res. / Frame rates (SMPTE 292M) : 720p – 59.94 fps or 50 fps : 480i – 29.97 fps

SD Res. / Frame rates (SMPTE 259M) : 576i – 25 fps

Audio Inputs

: SMPTE 272M (SD), SMPTE 299M (HD) : Sample rate 48kHz, synchronous to video

Video Encoder

: Dual Pass with look ahead MPEG-2 profiles : MP@HL (HD) up to 60Mbps : MP@ML (SD) up to 16Mbps

'Dolby' and the 'double-D' symbol are registered trademarks of Dolby® Laboratories.

: MP@L4.2, HP@L4.2 (HD) up to 55Mbps MPEG-4 AVC profiles : MP@L3.1, HP@L3.1 (SD) up to 16Mbps

Rate Control Modes

: Capped VBR (CVBR) with QP target

GOP structure

: Locked to HDSDI/SDI input : Manual, WSS, Video Index or AFD codes : PCR on Video PID or as separate PID : Typical 5000ms (4000ms reduced delay mode) Aspect Ratio Control PCR PID

End-to-end Encoder Delay

Audio Encoder

Number of encoded stereo pairs per main video : 6 (4 for Dolby® Digital / Dolby® Digital Plus)

Audio CODECS MPEG-1 Layer 2

> : AAC-LC (2.0, 5.11) : HE-AAC v1 (2.0, 5.1¹⁾) : Dolby® Digital²⁾ : Dolby® Digital Plus³)

: Dolby® Digital/Dolby® Digital Plus pass-through

Digital/Dolby® Digital Plus only)

AAC Data Encapsulation : ADTS or LATM selectable per encoded channel

Audio Level Adjustment : +6/-10dB

Picture-in-Picture

: Configurable independent of main channel

Video Pre-processing

: Detect if input is 3:2 pull down and omit repeated fields. : Adjustable : Adjustable

Inverse Telecine Detection
De-blocking Filter
Motion Compensated Temporal Filter (MCTF)
WSS Blanking

: Removal of line 23 WSS from active video

Video Re-scaling

Horizontal Rescaling : From 1920 to 1440, 1280 or 960

: From 1280 to 960 or 640

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

: Including aspect ratio conversion, letter-/pillar boxing : Including aspect ratio conversion, letter-/pillar boxing Down Conversion HD to SD

Up Conversion SD to HD

Frame Rate Conversion : From 59.94 fps to 59.94/29.97 fps

: From 50 fps to 50/25 fps : From 29.97 fps to 59.94/29.97 fps

: From 25 fps to 50/25 fps

(1080i/576i/480i) to 720p output.

Logo Insertion

: 192x128 (SD)

: 480x270 (HD 1080i)

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

File format

Ancillary Data and VBI

: Extracted from VANC OP47, SMPTE-2031 or VBI and trans-

Digital Programme Insertion (DPI)

: SCTE104 triggers extracted from VANC and transcoded to SCTE35 TS triggers.

¹⁾ AAC-LC/HE-AAC v1 5.1 support in future release.

²⁾ Dolby® Digital also known as AC-3 3) Dolby® Digital Plus also known as E-AC-3

Active Format Description (AFD) : Extracted from VANC SMPTE 2016 and injected into

Dolby® E metadata : External Dolby® E metadata extracted from VANC SMPTE

2020 used for Dolby® Digital/Dolby® Digital Plus encod-

Wide Screen Signalling (WSS)

ing configuration.
: Extracted from VBI line 23 or VANC SMPTE 2031 and transcoded to EN 301755
: Extracted from VBI line 23 or VANC SMPTE 2031 and transcoded to EN 301755 Video Programming System (VPS)

: Extracted from VANC SMPTE-RP188 and injected into

Auxillary Data Injection

Subtitling conversion : Conversion from EBU Subtitling to DVB Subtitling

Statistical Multiplexing

Statmux Controller : Local within chassis

Max. Number of Groups per chassis : Maximum 16, one per encoder/transcoder module

Licensed Features : Video Mode HPBC (required)

: Number of Encoder Channels HD

: Number of Encoder Channels SD

: Dolby® Digital/Dolby® Digital Plus Encode - Number of

: MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode -

Number of Stereo Pairs

<u>Universal Encoder - Dense</u>

: Up to 2 HD or 4 SD

HD Resolutions/Frame rates (SMPTE 292M)

SD Resolutions/Frame rates (SMPTE 259M)

PCM or Dolby® Digital/Dolby® Digital Plus

: Single Pass with look ahead Architecture MPEG-2 profiles : Single Pass with look ahead : MP@HL (HD) up to 60Mbps : MP@ML (SD) up to 16Mbps : MP@L4.2, HP@L4.2 (HD) up to 55Mbps : MP@L3.0, HP@L3.0 (SD) up to 16Mbps : Constant Bit Rate (CBR) : Capped VBR (CVBR) with QP target : Statistical Multiplexing

MPEG-4 AVC profiles

Rate Control Modes

: Statistical Multiplexing : Dynamic with Scene Change Detection GOP structure

and Adaptive GOP structure

: Locked to HDSDI/SDI input or to local clock Clock Modes Aspect Ratio Control : Manual, WSS, Video Index or AFD Codes

PCR PID : PCR on Video PID or as separate PID

End-to-end Encoder Delay : Video Quality optimized for 4500ms (3000ms reduced

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

Audio CODECS

: MPEG-1 Layer 2 : AAC-LC : HE-AAC v1 : HE-AAC v2

: Delby® Digital2) 2.0 and 5.1 : Dolby® Digital Plus3) 2.0, 5.1 and 7.1 : Convert Dolby® Digital Plus to Dolby® Digital Dolby® Digital / Dolby® Digital Plus Pass-thru : Multichannel, Stereo, Mono, Dual Mono

Audio Channel Modes : ADTS or LATM selectable per encoded channel AAC Data Encapsulation

Audio Lipsync Adjustment : +6/-10dB

Video Pre-processing

WSS Blanking : Removal of line 23 WSS from active video

: MPEG-4 AVC BP or MP

: Configurable independent of main channel : 320x240, 192x192, 176x144, 128x96, 96x96

: From 1920 to 1440, 1280 or 960
: From 1280 to 960 or 640
: From 720 to 704, 640, 544, 528
: 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 29.97 fps to 59.94/29.97 Down Conversion HD to SD Up Conversion SD to HD

Frame Rate Conversion

: From 25 fps to 50/25 fps

(1080i/576i/480i) to 720p output.

Maximum Size

: 360x180 (HD 720P) : 480x270 (HD 1080i)

: User selectable (pixel accuracy)

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

Ancillary Data and VBI Teletext processing

Closed Captioning (EIA 608/EIA 708)

Digital Programme Insertion (DPI)

Active Format Desctription (AFD)

Dolby® Metatdata

Video Programming System (VPS)

Video Inserted Time Code (VITC)

Auxillary Data Injection

Subtitling conversion Statmux Controller

: Extracted from VANC OP47, SMPTE-2031 or VBI and

: Extracted from VANC and injected into video stream. : SCTE104 triggers extracted from VANC and transcoded

to SCTE35 TS triggers.
: Extracted from VANC SMPTE 2016 and injected into video stream.
: SMPTE 2020 metadata extracted from VANC and injected into audio stream.

into audio stream.
: Extracted from VBI line 23 or VANC SMPTE 2031 and

transcoded to EN 301755 : Extracted from VANC SMPTE 2031 and transcoded to

: EBU Subtitling, DVB Subtitling. Teletext subtitling PIDs

can be added to service through an Sencore Input interface (e.g. ASI, IP). PTS can be re-stamped. : Conversion from EBU Subtitling to DVB Subtitling

: Local on a Universal Encoder or Transcoder module

⁵⁾ For complete table please contact Sencore.

	Maximum Number of Services within group	:32
	Licensed Features	: Number of Encoder Channels HD : Number of Encoder Channels SD
		: Subtitle transcoding from TTX to DVB : Statistical Multiplexing - Number of Channels
		: Dolby® Digital Encode
		: Dolby® Digital Plus Encode
		. Dolby Digital Flas Effective
Jniversal Encoder - MS/OTT	Input Ports	: 2xHDSDI/4xSDI, 4 BNC 75 Ω
	Input Format	: SMPTE 292M (HD SDI), SMPTE 259M (SD SDI)
	Video Pre-processing	
	WSS Blanking	: Removal of line 23 WSS from active video
	Video Encode	
	MPEG-4 AVC Profiles	: High profile up to HP@L4.0
		: Main profile up to MP@L4.0
		: Base profile up to BP@L4.0
	HD and sub HD resolutions ⁵⁾	: 1920 x 1080i @ 29.97, 25 fps
		: 1920 x 1080p @ 29.97, 25 fps
		: 1280 x 720p @ 59.94, 50 fps
		: 1280 x 720p @ 29.97, 25 fps
		: 960 x 540p @ 29.97, 25 fps
		: 852 x 480p @ 29.97, 25 fps
		: 640 x 360p @ 29.97, 25 fps
		: 480 x 270p @ 29.97, 25 fps
		: 416 x 240p @ 29.97 fps
		220 400 0 2007/44005 25/42 5 (
	SD and sub SD resolutions ⁵⁾	: 320 x 180p @ 29.97/14.985, 25/12.5 fps : 720 x 576i @ 25/12.5 fps
		: 720 x 480i @ 29.97/14.985 fps
		: 640 x 480p @ 29.97, 25 fps
		: 640 x 360p @ 29.97, 25 fps
		: 544 x 416p @ 29.97, 25 fps
		: 480 x 360p @ 29.97, 25 fps
		: 480 x 270p @ 29.97, 25 fps
		: 416 x 240p @ 29.97 fps
		: 400 x 224p @ 29.97, 25 fps
		: 400 x 300p @ 29.97, 25 fps
		: 384 x 216p @ 29.97, 25 fps
		: 352 x 288p @ 25 fps
		: 320 x 240p @ 29.97 /14.985, 25/12.5 fps : 320 x 180p @ 29.97, 25 fps
		: 240 x 180p @ 29.97/14.985, 25/12.5 fps
		. 240 x 100p @ 25.57/ 14.505, 25/ 12.5 1ps
	Frame rate conversion	: From 60/59.94/50 reduced to ½, ¼
		: From 50 reduced to ½ or ¼
		: From 30/29.97/50 reduced to $\frac{1}{2}$
	De-interlacing	: Interlaced to progressive conversion
	Scene change detection	: Yes, insertion of P frame
	GOP structure	: Dynamic
	Number of output profiles	: Ranging from 4x HD to 28 sub SD per module, depending an appearance in a property of profiles
	Audio Encode	ing oncomplexity of profiles
	MPEG1 Layer II	: Modes: 2.0 (stereo), Bit rates: 64 – 384kbps
	AAC-LC	: Modes: 2.0, Bit rates: 32 – 384kbps
	HE-AAC v1	: Modes: 2.0, Bit rates: 32 - 192kbps
	HE-AAC v2	: Modes: 2.0, Bit rates: 32 - 96kbps
	Sample rates	: 32, 44.1, 48kHz
	Number of channels per video source	: 2 (Audio resources can be combined.)
	Reformatting/ Rescaling	· From HD to sub SD
	Format conversion	From HILLYO SUID SU

: From HD to sub SD

Aspect Ratio Control

4:3 or 16:9

Ancillary Data and VBI

Closed Captioning (EIA 608/EIA 708)

: Extracted from VANC SMPTE 2016 and injected into Active Format Desctription (AFD)

: 4 SD or 2 SD+PIP Encoder– CVBS input Number of channels

> : 4 HD BNC 75 Ω , one per channel Input Port

: PAL B/G/I/D/K : SECAM D/K : PAL Nc : PAL M : NTSC M

Video Pre-processing

Inverse Telecine Detection
De-blocking Filter
Motion Compensated Temporal Filter (MCTF)
Horizontal Rescaling
WSS Blanking : Adjustable : Adjustable : From 720 to 704, 640, 544, 528, 480 or 352

Logo Insertion

: PNG (8-bit RGBA) file per encoded channel : User defined (pixel resolution) : 192 × 128 (SD)

Ancillary Data and VBI

: Closed Captioning (EIA 708)

Video Encoder

: 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)

Number of channels per module MPEG-2 profiles MPEG-4 AVC profiles Rate Control Modes : 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 GOP control

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

Aspect Ratio Control : Manual or WSS

Audio Encoder

Audio CODECs

: MPEG-1 Layer 2
: AAC-LC
: HE-AAC v1
: HE-AAC v2
: Dolby® Digital pass-through (from AES input)
: ADTS or LATM selectable per encoded channel
: Stereo/Dual Mono/Mono
: 2 pairs for 2SD+PIP configuration and 1 pair for 4 × SD configuration
: +/-11dB AAC Data Encapsulation

Channel Modes
Encoded stereo pairs per video

Audio level adjustment

: See Universal Encoder High VQ "Auxillary Data Injection"

Licensed Features

³⁾ Dolby® Digital Plus also known as E-AC-3

: 4 SD or 2 SD+PIP (2SD mode gives improved VQ)

RF Input

: PAL B/G, PAL I and SECAM D/K⁶⁾

: 4xF female, 75 Ω : 47 – 862 MHz : 1kHz

Frequency tuner step size

RF input level

– Max

: 110 dBuV – Min (for un-weighted video SNR=30dB) : 44 dBuV

Video Encoder

Picture-in-Picture

Video Pre-processing

Please refer to "Encoder -CVBS input"

Audio Encoder

Audio CODECS

: HE-AAC v2 Stereo : ADTS or LATM selectable per encoded channel

Encoded stereo pairs per video Audio Level Adjustment

Please refer to "Encoder -CVBS input"

Auxillary Data Injection
Injection of Private Data into service

Licensed Features

Universal Transcoder - High VQ Broadcast

Total Number of Video Transcodes : Up to 1x HD or 2x SD channels

Video Decoder

: MP@HL, 1Mbps – 80Mbps MPEG-2 profiles : MP@ML, 600kbps – 15Mbps

: MP@L4.2, 500kbps – 5<u>5Mbps</u> H.264 profiles : HP@L4.2, 1Mbps – 55Mbps

: MP@L3.2, 300kbps – 16Mbps : HP@L3.2, 300kbps – 16Mbps

SD 50Hz resolutions HD 1080i resolutions HD 720p resolutions : 1920/1440/1280/960 x 1080i30/29.97/25 : 1280/960/640 x 720p60/59.94/50

Audio Decoder

: MPEG-1 Layer 2 :AAC-LC

: HE-AAC v1 : HE-AAC v2 : Dolby® Digital / Dolby® Digital Plus : 5.1 to 2.0 for AAC and Dolby®

Video Encoder

Audio Downmix

MPEG-2 profiles : MP@HL, 1Mbps – 80Mbps

: MP@ML, 600kbps – 15Mbps

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

H.264 profiles : MP@L4.2, 500kbps – 55Mbps

: HP@L4.2, 1Mbps – 55Mbps : MP@L3.2, 300kbps – 16Mbps

: HP@L3.2, 300kbps – 16Mbps

GOP structure

Aspect Ratio Control PCR PID

Audio Encoder

Rate Control Modes

Audio CODECS

: MPEG-1 Layer 2
: AAC-LC
: HE-AAC v1
: HE-AAC v2
: Dolby® Digital
: Dolby® Digital Plus
: Pass though of all audio types
: Stereo, Mono

Audio Channel Modes

AAC Data Encapsulation

Audio Lipsync Adjustment Audio Level Adjustment : +6/-10dB

Picture-in-Picture

: MPEG-4 AVC MP

: 192x192, 176x144, 128x96, 96x96

Video Re-scaling

: Including aspect ratio conversion, letter-/pillar boxing

Up Conversion SD to HD

: From 30 fps to 60/30 fps : From 29.97 fps to 59.94/29.97

: From 25 fps to 50/25 fps : Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output.

Audio Transcode Density

Logo Insertion

Maximum Size

: 360x180 (HD 720P) : 480x270 (HD 1080i)

Positioning : User selectable (pixel accuracy)

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

Subtitling Burn In

DVB/EBU Subtitling : Burned into Transcoded Video

Auxillary Data

Pass Through

titling, Teletext etc.). Lipsync to video is maintained. : EBU Subtitling, DVB Subtitling, Teletext subtitling PIDs from a generator can be added in the mux output

Video Processing

: Line 23 WSS Blanking

Statistical Multiplexing
Statmux Controller
Maximum # Groups
Maximum # Services within group : Local within chassis. (Management module.) : Max 16, one group per encoder/transcoder module.

Licensed Features

- : Number of HD encoders : Number of SD encoders
- Statistical Multiplexing Number of Channels
- : Statistical Multiplexing Number of Channels
 : MPEG/AAC Audio Transcode Number of audio channels
 : Dolby ® Decode Number of channels
 : Dolby ® E Decode Number of channels
 : Dolby ® Encode Number of channels
 : 4:2:2 10bit decoding Density
 : Subtitle transcoding from TTX to DVB

Universal Transcoder - Dense Broadcast Mode

Density Total Number of Video Transcodes : Up to 4x HD or 16x SD channels per module

Video transcoder consists of four blocks each capable of

1x HD transcode with PiP OR : 4x SD transcode without PiP OR : 3x SD transcode with PiP OR

: 1x HD/SD transcode with PiP and up/downconv.

Each block can be configured independently.

Video Decoder

: MP@HL (HD) MPEG-2 profiles : MP@ML (SD)

MPEG-4 AVC profiles

: 720/704/640/544/528/480/352 x 576i25 fps : 720/704/640/544/528/480/352 x 480i29.97 fps SD resolutions HD 1080i resolutions

: 1280/960/640 x 720p60/59.94/50 fps

Audio Decoder

: MPEG1 Layer 2 (2.0) : AAC-LC (2.0) : HE-AACv1 (2.0) : HE-AACv2 (2.0)

: Dolby® Digital (2.0/5.1)/Dolby® Digital Plus (2.0/5.1/7.1) : Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of transcode process. Audio Downmix

Video Encoder

: MP@HL (HD)

: MP@ML (SD) : MP@L4.1, HP@L4.1 (HD) : MP@L3.1, HP@L3.1 (SD) MPEG-4 AVC profiles

: Constant Bit Rate (CBR) Rate Control Modes Capped VBR (CVBR) with QP target

: Statistical Multiplexing (in future release) : Dynamic with Scene Change Detection and

GOP structure Adaptive GOP structure

Aspect Ratio Control : Manual, Transparent input to output

: PCR on Video PID or as separate PID PCR PID

End-to-end Encoder Delay : Typically 5500ms (3500ms reduced delay mode)

Audio Encoder

Audio CODECS

: AAC-LC (2.0)

: Dolby® Digital pass-through
: Dolby® Digital Plus pass-through
: Stereo, Mono
: 5.1 and 7.1 (TC-400)
: ADTS or LATM selectable per encoded channel
: +500ms / -200ms
: +6dB / -10dB

Audio Channel Modes

AAC Data Encapsulation

to 24 stereo transcodes per module.

: TC-200 - Maximum 4 stereo transcodes per video, limited to 6 stereo transcodes per pair of video transcoder blocks.

: One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes

Number of audio per channel

Picture-in-Picture

: MPEG-4 AVC MP

: Min 96kbps, Max 400kbps (CBR)

: 320x240,192x192, 176x144, 128x96, 96x96

Video Re-scaling

: Including aspect ratio conversion, letter-/pillar boxing Up Conversion SD to HD : Including aspect ratio conversion, letter-/pillar-boxing

Frame Rate Conversion

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

Logo Insertion

: 360x180 (HD 720P) : 480x270 (HD 1080i)

Positioning File format

: 480x270 (HD 10801) : User selectable (pixel accuracy) : PNG (8-bit ARGB) file per encoded channel

Subtitling

Subtitling Conversion
DVB/EBU Subtitling : Conversion from EBU Subtitling to DVB Subtitling : Burned into Transcoded Video. Restricted to 4 channels

Auxillary Data

Auxillary data components (EBU Subtitling, DVB Subtitling, Teletext etc.) are passed through

Lipsync to video is maintained.

Video Processing

Statistical Multiplexing (Not supported in initial release)

Maximum # Services within group

Licensed Features

1xHD/4xSD : Statistical Multiplexing - Number of Channels : Dolby® Digital/Dolby® Digital Plus Decode : High Density Mode (dense-sd for 4xSD per block) : MPEG2/H264 : Subtitle transcoding from TTX to DVB

Universal Transcoder - MS/OTT Number of input channels : Up to 4 HD channels⁷⁾

Video Decoder

: Ranging from MP@ML (SD) to MP@HL (HD) : up to HP@L4.2 : up to MP@L4.2 MPEG-2 profiles
MPEG-4 AVC profiles

Audio Decoder

: MPEG-1 Layer 2. Modes: 1.0 (mono), 2.0 (stereo) : AAC-LC. Modes: 2.0, 5.1 (downmixed to 2.0)

: Dolby® Digital (AC-3) : Modes: 2.0, 5.1 (downmixed to can be passed through. Synchronization to video will be maintained.

: EIA-608n and EIA-708 passed through. mixed to 2.0) MPEG1 Layer II Graphics : HE-AACv1/2 : Dolby® Digital (AC-3) : Dolby® Digital Plus (E-AC-3) **Licensed Features** : Dolby® Digital/Dolby® Digital Plus Decode Video Encode : up to HP@4.0 : up to MP@4.0 : up to BP@4.0 : 720p > 1280, 960, 854 : 1080p > 1920, 1440, 1280, 960, 720, 640 : 720p > 1280, 960, 854 PROCESSING MODULES SPECIFICATIONS MPEG-4 AVC Profiles Number of audio tracks Pass-Through Audio format : All components signaled in service : MPEG-1 layer 2 : ±30 dB Resolutions @ 59.94 fps or 50.00 fps8) Audio format Adjustable range Step Adjustment mode : 576p > 1024, 768, 720, 352⁹⁾ Integrated with 3rd party SW solutions for automatic adjustment : 540p > 960 : 480p > 854, 720, 640, 352 **Licensed Features** : Number of audio channels : 360p > 640, 480 : SW based smart card : 270p > 480, 360 Resolutions @ 14.99 fps or 12.50 fps⁸⁾ : DVB-CSA and AES Scrambling algorithms : Number of descrambled channels **Licensed Features** : 432p > 768 : 360p > 640, 480 : 320p > 480 : 288p > 512 : 270p > 480, 360 : 256p > 144 : 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) : 240p > 320 : 216p > 384 : 180p > 320, 240 BISS support : Up to 850 MBit/s Number of services per module Scrambling algorithms : DVB-CSA and AES : From 60/59.94/50 reduced to ½, ¼ : From 50 reduced to ½ or ¼ **Licensed Features** : From 30/29.97/50 reduced to ½ Number of profiles : Ranging from $4 \times HD$ to $28 \times sub SD$ per module, depending on complexity of profiles : DVB Common Interface **DVB** Descrambling : Frame accurate key frame alignment across all pro-: BetaCrypt, Conax, Cryptoworks, Irdeto, Mediaguard, CA system support* files. Fixed IDR to IDR distance. Viaccess, NDS Viasat, Nagra GOP control : Dynamic GOP structure with Scene Change Detec-**Audio Encode** : DVB-CSA and AES Scrambling algorithm : Up to 8 per module Capacity : Up to 850 MBit/s Number of services per scrambler card : 250 (depending on SW license) : AAC-LC. Modes: 2.0, Bit rates: 32–384kbps Video format : Transport stream; MPEG-2, MPEG-4, HEVC : HE-AAC v1. Modes: 2.0, Bit rates: 32–192kbps Interface towards CA System : HE-AAC v2. Modes: 2.0, Bit rates: 32–96kbps Number of CA systems : 32, 48kHz Reformatting/Rescaling : Yes for DVB : Interlaced to progressive conversion No for AES : From HD to sub SD **Aspect Ratio Control Licensed Features** : Number of descrambled channels Aspect Ratio Modes : Transparent Input to Output, Manual 4:3 or 16:9 : PVR assist AFD Modes : Generated based on incoming AFD and format con-EPG

Number of stereo channels

Number of SDI/HSDI inputs Number if stereo audio per SDI Input

: SMPTE 272M (SD), SMPTE 299M (HD)

Audio Encoder Audio Codecs : MPEG-1 Layer 2 64 / 384

: MPEG-1 Laver 3 (MP3) 32 / 320 32 / 320 64 / 384 : AAC-I C : HE-AAC v1 32 / 96 32/96

Audio Channel Modes : +6 / -10 dB PCR

Common PCR

Licensed Features : Number of MPEG-1 Layer 2 and AAC stereo encoders : Number of MPEG-1 Layer 3 (MP3) stereo encoders

COMMON OUTPUT SPECIFICATIONS

All Output Modules

Multiplexing

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

PCR regeneration

PSI/SI

operations performed on the signal: Yes, on TS level. For SPTS output only

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

PSI/SI handling Tables Supported:

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

PSIP

Pass-through of scrambled services

MGT, TVCT,CVCT

OUTPUT MODULE SPECIFICATIONS

Dual IP IO IP Input/Output

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

:The module can be configured to:

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

- Cloned IP out - Dual IP in

: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned Maximum data rate per port

out or 1×IPIN+1×IPOUT

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

SPTS and MPTS

: Transport stream, MPEG-2/4 (H264) and HEVC grated CA systems.

IP de-jittering Forward Error Correction

Forward Error Correction : SMPTE 2022-1

250 output streams per data port

Licensed Features

: EN50083-9

: EN 300 429, ITU J.83.ABC

: EN 300 421 , EN 302 307

ASI Output

Number of outputs per module

: 4 BNC female, 75Ω : 4 different Transport Streams : burst mode: 213.7Mbit/s spread mode: 72Mbit/s : SPTS and MPTS Transport stream output Number of services per card Output format

Key reference specifications QAM Output

Number of carriers

: 2 × F connector female, 75 Ω : 3 and 4 per group (adjacent channels) : up to 16 carriers in 4 groups, 8 per port : 16 / 32 / 64 / 128 / 256 - QAM : 4.48 to 7.00 Mbaud (Annex A and C)

: 47–862 MHz (CM-201, CM-301) : 47-1000 MHz (CM210, CM-310)

: user selectable

: CW

: 5, 6, 7, 8 MHz (12 MHz available for 3 carrier groups) Channel spacing

Frequency step size Frequency stability

: ± 0.5 dB

: 0.1 dB :>16 dB : typ < -60 dBc

DVB-S/S2 Modulator, IF Key reference specification

Number of DVB-S/S2 outputs per module

: 1 per output (30 dB attenuated)

: -15 to 0 dBm Output level stability : 2 ppm

: Static linear pre-correction

DVB-S Coding and ModulationConstellation
Modulation mode : Constant : RS (188, 204)

: 1/2, 2/3, 3/4, 5/6, 7/8 : 0.5–45 Mbaud

DVB-S2 Coding and Modulation

Constellation Modulation mode : QPSK, 8-PSK, 16-APSK, 32-APSK

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

Transport stream
Service filtering
Video format
* Sencore aims to integrate with all major CA providers. Please contact Sencore for an updated list over

: 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35 : DVB-S/S2 **Licensed Features** :1 or 2 outputs DVB-S/S2 Modulator, L Band Key reference specification : EN 300 421 , EN 302 307 Number of DVB-S/S2 outputs per module : 1 per output (30 dB attenuated) : 950-2150 MHz Output level : -20 to 5 dBm Output level stability : ± 0.5 dB **DVB-S Coding and Modulation** : Viterbi : 1/2, 2/3, 3/4, 5/6, 7/8 : 0.5–45 Mbaud **DVB-S2 Coding and Modulation** Constellation
Modulation mode Frame length Symbol rate Roll off : 16200 bits (short), 64800 bits (long) : 0.5–45 Mbaud : 0.5–45 Mbaud : 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35 **Licensed Features** : DVB-S/S2 DVB-S/S2X Modulator : EN 300 421, EN 302 307 part 1 and 2 : User selectable : Static linear pre-correction Carrier ID : 24 Volt DVB-S Coding and Modulation : OPSK FEC outer : 1/2, 2/3, 3/4, 5/6, 7/8 Roll off DVB-S DVB-S2X Coding and Modulation : QPSK, 8PSK, 16APSK, 32APSK : CCM : 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 5/6, 8/9, 9/10 Code rates DVB-S2X 8PSK

: 16200 bits (short), 64800 bits (long)

: 0.5–45 Mbaud

Frame length

Code rates DVB-S2X 8APSK : 5/9, 26/45 : 5/9, 8/15, 1/2, 26/45, 3/5, 28/45, 23/36, 2/3, 25/36, Code rates DVB-S2X 16APSK 13/18, 3/4, 7/9, 4/5, 5/6, 77/90, 8/9, 9/10 Code rates DVB-S2X 32APSK : 2/3, 32/45, 11/15, 3/4, 7/9, 4/5, 5/6, 8/9, 9/10 Code rates DVB-S2X 64APSK : Normal, Short Gold scrambling sequence : 0-6 : 0.1–68 MSvm/s : 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35 Frequency range : 70-200 MHz : F-type female, 75 Ω Monitoring output connector : SMA female, 50Ω Output level : -15 to 0 dBm : ± 0.5 dB Return loss :>18 dB Spurious modulated signal : < -65 dBc/4kHz (@ symbol rate \ge 256 kbaud) : < -60 dBc/4kHz (typical) In-band flatness : -40 dBm L-band Frequency range : 950-2150 MHz Main output connector : SMA female, 50 Ω :>14 dB Spurious modulated signal : < -65 dBc/4kHz (@ symbol rate \ge 256 kbaud) Spurious carrier wave : < -60 dBc/4kHz In-band flatness : -40 dBm Licensed Features : DVB-S2X modulation professional : 10MHz and 24V DC output Key reference specification Number of carriers : ETSI EN 300744 : 4 independent carriers : 2 (2 carriers per port) : 75 Ω : 47-862 MHz Frequency setting step size Output level : -12 to 2.2 dBm : ± 0.5 dB Return loss **DVB-T Coding and Modulation** FFT size : 2k, 8k Guard intervals : 1/4, 1/8, 1/16, 1/32

: 1/2, 2/3, 3/4, 5/6, 7/8

DVB-T Cable Modulator

	Channel bandwidth	: 5, 6, 7, 8 MHz
DVB-T2 Cable Modulator	Key reference specification	: ETSI EN 302755
	Number of carriers	: 2 independent carriers
	Number of output ports	: 2 (1 carrier per port)
	Output connector	: F-type
	Impedance	: 75 Ω
	Output frequency	: 47-862 MHz
	Frequency setting step size	: 1 Hz
	Output level	: -10 to 2.2 dBm (TBD)
	Output level stability	: ± 0.5 dB
	Frequency accuracy	: 2 ppm
	Return loss	:>16 dB
	MER	: > 42 dB
	Test mode	: CW
	DVB-T2 Coding and Modulation	
	FFT size	: 1k, 2k, 4k, 8k, 8k extended, 16k,
		16k extended, 32k, 32k extended
	Guard intervals	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
	FEC frame	: Normal (64k), Short (16k)
	FEC code rate	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
	Constellation (PLP)	: QPSK, 16-QAM, 64-QAM, 256-QAM
	Channel bandwidth	: 1.7, 5, 6, 7, 8, or 10 MHz
	Pilot pattern	:P1-P8
	Number of PLPs	
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
	Return loss	:>16 dB
	MER	: > 42 dB
	Test mode	: CW
	DVB-T Coding and Modulation	
	Input	: TS with MIP (SFN) or remultiplexed TS
	FFT size	: 2k, 8k
	Guard intervals	: 1/4, 1/8, 1/16, 1/32
	Code rates	: 1/2, 2/3, 3/4, 5/6, 7/8
	Constellation	: QPSK, 16-QAM, 64-QAM
	Channel bandwidth	: 5, 6, 7, 8 MHz
	DVB-T2 Coding and Modulation	TOME (CEAL)
	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	: up to 128

: ARIB STD-B31, ARIB STD-B10 : 8, 2 per group (adjacent channels) : 6-31 MHz : 47–862 MHz Frequency stability Output level Output level stability : ± 0.5 dB ISDB-T Coding and Modulation* : QPSK, 16QAM, 64 QAM Multiplexina : Transport stream, MPEG-2 SD/HD, PSI/SI operations performed on the signal. : PAT, PMT, CAT : SDT, NIT, EITpf ,TOT, TDT, BAT, AIT PSIP PSIP : MGT, TVCT,CVCT Licensed Features : Number of carriers **DVB-T MIP inserter** Key specification Relative timestamps : ETSI EN 300 744, ETSI TS 101 191 DVB-T2 T2MI : 1.1.1, 1.2.1 and 1.3.1 T2 version : T2MI is signaled in PSI/SI as a data service

: Relative Timestamps < 1s (SFN) and Null timestamps

(MFN)

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

Pilot Patterns : QPSK, 16-QAM, 64-QAM, BPSK L1 Constellations : 1.7, 5, 6, 7, 8, 10MHz **DVB-T2 PLP support** Number of PLPs : 240 in total between all T2MI streams PLP mode PLP types : FEC blocks, TI blocks, TI frames and TI type FEC frame : Normal (64k), Short (16k) FEC code rate : 1/2, 3/5, 2/3, 3/4, 4/5, 5/6 : QPSK, 16-QAM, 64-QAM, 256-QAM ISSY supported **Licensed Features** :Multi PLP, Regional PLP $: 2 \times 10/100/1000$ Base-T Ethernet output or 2×0 ptical SFP (class 1 laser product) Number of MPTS's with MIP Number of T2MI streams : 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 : 1.1.1, 1.2.1 and 1.3.1 Output redundancy based on OSPF (licensed) Network level redundancy (licensed) : Yes. Please contact Sencore for more information T2MI signaling Clock modes :T2MI is signaled in PSI/SI as a data service : Relative Timestamps <1s (SFN) and Null timestamps (MFN) MISO/SISO : 1k, 2k, 4k, 8k, 8k extended, 16k,16k extended, 32k, 32k extended : QPSK, 16-QAM, 64-QAM, BPSK **DVB-T2 PLP support** : 240 in total between all T2MI streams Number of PLPs PLP mode

:TR and ACE (global on/off)

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

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

PAPR

DVB-T2 Gateway IP

Guard intervals

Automatic calculation : FEC blocks, TI blocks, TI frames and TI type

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

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

Rotated constellations : Yes
ISSY supported : Yes

Licensed Features : IP Out Redundancy, T2MI sync+IP Redundancy

: T2MI

: Multi PLP, Regional PLP

: FEC out

CHASSIS

Physical dimensions $:19" \times 4RU \times 400mm (440 \times 177 \times 400mm)$

Power supply

ower : 800 Watt

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

onitoring : Via WEB GUI and LED indicators on PS

Cooling

ins : 4 fans

Hot swap of fans : Yes, fans are independently hot swappable

Airflow direction : Front to back

J Physical dimensions : $19^{\circ} \times 180 \times 400$ mm ($440 \times 44 \times 480$ mm)

Power supply

wer : 400 Watt

nput voltage : 100-240 V AC, 50/60 Hz : optional: -48V DC

undancy : Yes, dual hot swappable PS

nitoring : Via WEB GUI and LED indicators on PS

Cooling

: 6 to

t swap of fans : Yes, common fan module with all 6 fans

Airflow direction : Front to back

ENVIRONMENTAL CONDITIONS

Operational conditions Temperature : 0 to +40 °C

Humidity : 5–95% (non-condensing)

Storage Temperature :-20 to +70 °C

Humidity : 5 to 95% (non-condens

Electrical safety IEC 60950-1

EMC EN 55022, EN55013, EN55083-2, EN55024, EN61000-3-2, EN61000-3-3, FCC CFR 47 Part 15

oHS Compliant
/EEE Compliant