PHASE | SENCORE:
Moduladores Satcom

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PHASE®

Professional Satellite Modulator

SMD 989

The SENCORE SMD 989 professional satellite modulator is ideal for MPEG Transport Stream transmission using DVB-S/S2/S2X or Broadcom TurboPSK modulation. Leveraging the latest modulation technology, the SMD provides high-value solution with unmatched signal quality.

Support for DVB-S2X and Multistream with Variable Coding and Modulation (VCM) ensures the SMD will be ready for the future of S2 modulation. Integrated processing features such as TR 101 290 error checking and BISS scrambling make the SMD an ideal solution for video delivery.

The optional, built-in L-Band upconverter enables the SMD 989 to provide an IF or L-band output. This eliminates the need for multiple pieces of equipment and provides a compact solution for facilities housing multiple modulators or for insertion into L-band inter-facility links.

The chassis has two bays allowing for a variety of configurations, including two independent modulators for density, redundant power supplies for reliability, or DC BUC power for truck installs.

APPLICATIONS

- **News Gathering**
  Quick to boot, easy-to-use, robust platform
  Support for stored presets
  Carrier ID (DVB-CID) standard
  Built-in BISS scrambling
  Support for all advanced modulation features (multistream, VCM, 16APSK/32APSK/64APSK)

- **Uplink Facility Deployment**
  State-of-the-art S2 and S2X modulation technology
  TR 101 290 failover for redundant encoder support
  Available dual power supply option for high reliability
  High modulation efficiency with 8/16/32/64APSK modes
  Full control and monitoring via SNMP

- **Advanced Modulation/Retransmission Use Cases**
  Support for up to six streams of multistream transmission
  VCM mode for variable-level protection
  Higher-order modulation for high-throughput signals

KEY FEATURES

- Super-efficient S2X modulation schemes and roll off factors
- Broadcom TurboPSK modulation modes
- Ability to modulate 1 to 6 multistream transport streams on a single carrier (single-box multistream solution)
- L-band and IF outputs
- Optional diplexed 10MHz and DC power on L-band
- Front panel and web GUI for easy configuration
- ASI and IP inputs
- Available with dual, redundant power supply

SPECIFICATIONS
Professional Satellite Modulator SMD 989

INPUTS

SWITCHING
Automatic failover and failback between any two inputs

Triggered on:	TS Sync Loss (Standard) TR 101 290 P1 Errors (with License)

ASI

Connector:	2x BNC
Impedance:	75Ω
Packet format:	Auto detect 188/204 byte
TS Bitrate:	0.5 Mbps - 213 Mbps

IP

Ports:	2x RJ45 GbE port
Connector Type:	RJ45 10/100/1000 - Auto Negotiating
Input Format:	UDP or RTP
FEC Support:	SMPTE 2022/COP3
IP Encapsulation:	1 to 7 TS packets per IP packet
Addressing:	Unicast and Multicast
IGMP Compatibility:	Version 1, 2, and 3
Per TS Bitrate:	0.5 Mbps - 213 Mbps

MODULATION

DVB-CID

Modulation Format:	ETSI TS 103 129

DVB-S/DSNG

Modulation Format & FEC rate:	QPSK: 1/2, 2/3, 3/4, 5/6, 7/8 8PSK: 2/3, 5/6, 8/9 16QAM: 3/4, 7/8
Symbol rate range:	0.5 - 45 MSps
Roll-off Factor:	0.20, 0.25, 0.35
Spectral Inversion:	On / Off

DVB-S2

Modulation Format & FEC rate:	QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10* 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10* 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10* 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10* **Normal FECFRAME only* ***Short FECFRAME only*
Symbol rate range:	0.5 - 45 MSps
Roll-off Factor:	0.05, 0.10, 0.15, 0.20, 0.25, 0.35
Spectral Inversion:	On / Off
FEC Frames:	Normal (64,800) / Short (16,200)

DVB-S2X

Modulation Format & FEC rate:	QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10*, 13/45*, 9/20*, 11/20*, 11/45**, 4/15**, 14/45**, 7/15**, 8/15**, 32/45** 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10*, 23/36*, 25/36*, 13/18*, 7/15**, 8/15**, 26/45**, 32/45** 8PSK-L: 5/9*, 26/45* 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 26/45, 3/5, 9/10*, 28/45*, 23/36*, 25/36*, 13/18*, 7/9*, 77/90*, 7/15**, 8/15**, 32/45** 16APSK-L: 1/2*, 8/15*, 5/9*, 3/5*, 2/3* 32APSK: 3/4, 4/5, 5/6, 8/9, 32/45, 9/10*, 11/15*, 7/9*, 2/3** 32APSK-L: 2/3* 64APSK: 11/15*, 7/9*, 4/5*, 5/6* 64APSK-L: 32/45* **Normal FECFRAME only* ***Short FECFRAME only*
Symbol rate range:	0.5 - 45 MSps
Roll-off Factor:	0.05, 0.10, 0.15, 0.20, 0.25, 0.35
Spectral Inversion:	On / Off
FEC Frames:	Normal (64,800) / Short (16,200)

TURBOPSK

Modulation Format & FEC rate:	Turbo QPSK: 1/2, 2/3, 3/4, 5/6, 7/8 Turbo 8PSK: 2/3, 3/4**, 5/6, 8/9 Turbo 16QAM: 3/4 ***2.05, 2.10, and 2.20 bits/symbol modes*
Symbol rate range:	0.5 - 30 MSps
Roll-off Factor:	0.10, 0.15, 0.20, 0.25, 0.35

REFERENCE

External Reference Input:	10 Mhz/50Ω BNC
Reference Input Level:	-3dBm to 7dBm
Internal Reference:	Ovenized 10MHz Oscillator
Reference Output Source:	Internal or Reconditioned External
Reference Output Level:	+5dBm
Reference Output Return Loss:	>25 dB

PROCESSING

TS ANALYSIS

Analysis Engines:	2x (Primary and Backup Inputs)
Error Checking:	Full TR 101 290 P1 Analysis with User-Settable Thresholds

SPECIFICATIONS
Professional Satellite Modulator SMD 989

BISS SCRAMBLING

Supported Modes:	BISS 1 or BISS E with Injected ID
Scrambling Capability:	Single Key, Single TS Scrambling
Supported Bitrates:	0.5 - 145 Mbps

OUTPUTS

IF OUTPUT MODULE

Frequency:	60-180 MHz (5 MHz steps)
Level:	
910 Modulator Option	-30 dBm to -5 dBm (1 dB steps)
912A Modulator Option	-20 dBm to +5 dBm (1 dB steps)
Connector:	75Ω BNC
Return Loss:	>20 dB
Monitoring Output:	-20 dBc (IF) / -50 dBmV (1100MHz)
Spurious Signal Level (typical):	-60dBc @ -10dBm

L-BAND UPCONVERTER OUTPUT

Frequency:	950-2150 MHz (1 KHz steps)
Level:	-30 dBm to 5 dBm (0.1 dB steps)
Connector:	50Ω SMA
Return Loss:	>15 dB
Monitoring Output:	-20 dBc @ main L-band frequency
Spurious Signal Level:	-60 dBc @ -10dBm

DIPLEXED L-BAND OUTPUT

Connector:	50Ω SMA
Reference on L-Band:	10 MHz
Reference Source:	Internal or external (auto detect)
Reference Level:	+5 dBm
DC Power on L-Band:	24VDC @ 3.1A (optional) 48VDC @ 1.6A (optional)
DC Power Source:	Integrated or external supply
DC Power Control:	On/Off switching (internal supply)

MANAGEMENT

Connector:	RJ-45 10/100 - Auto Negotiating
Protocols:	HTTP and SNMP
User Interfaces:	Full control via web GUI Full control via front panel
Automation Interfaces:	Full status and control via SNMP Configurable SNMP traps Web services access to main GUI
Contact Closure Alarms:	2 form C relays (9 pin D-sub)

DIMENSIONS/POWER

Height:	1RU, 1.75" (5cm)
Width:	17.4" (44.2 cm)
Depth:	23" (58 cm)
Power:	100-240 AC 50/60 Hz @ 3 Amps -48 VDC available
Supply Type:	Integrated supply (standard) Dual, hot-swappable, redundant load sharing supplies (optional)

ENVIRONMENTAL CONDITIONS

Operating Temp:	0° to 45°C
Storage Temp:	-40°C to 65°C
Relative Operating Humidity:	<95% (non-condensing)

DMG 3200

sencore.com

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.

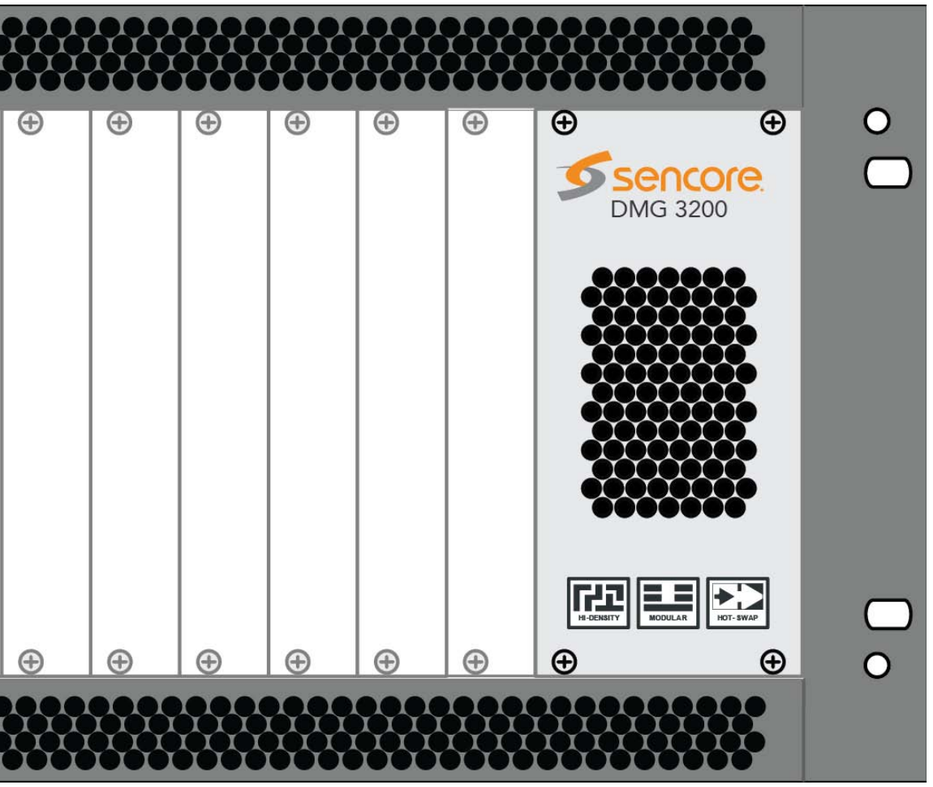
An advanced user friendly GUI offers an intuitive and comprehensive management of the many features of the system. The exhaustive multi-level alarm system, together with the easiness for integration to 3rd party management systems, enables full automatic control. The possibility of centralized monitoring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

Complete solutions for every major broadcast segment

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

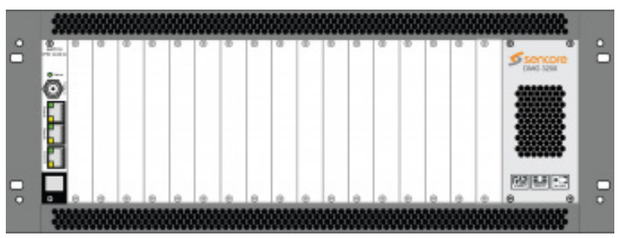
1RU

- 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 ×177 ×400 (w × h × d mm)



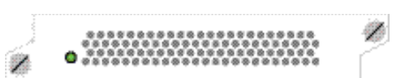
1RU

440 ×44 ×480 (w × h × d mm)

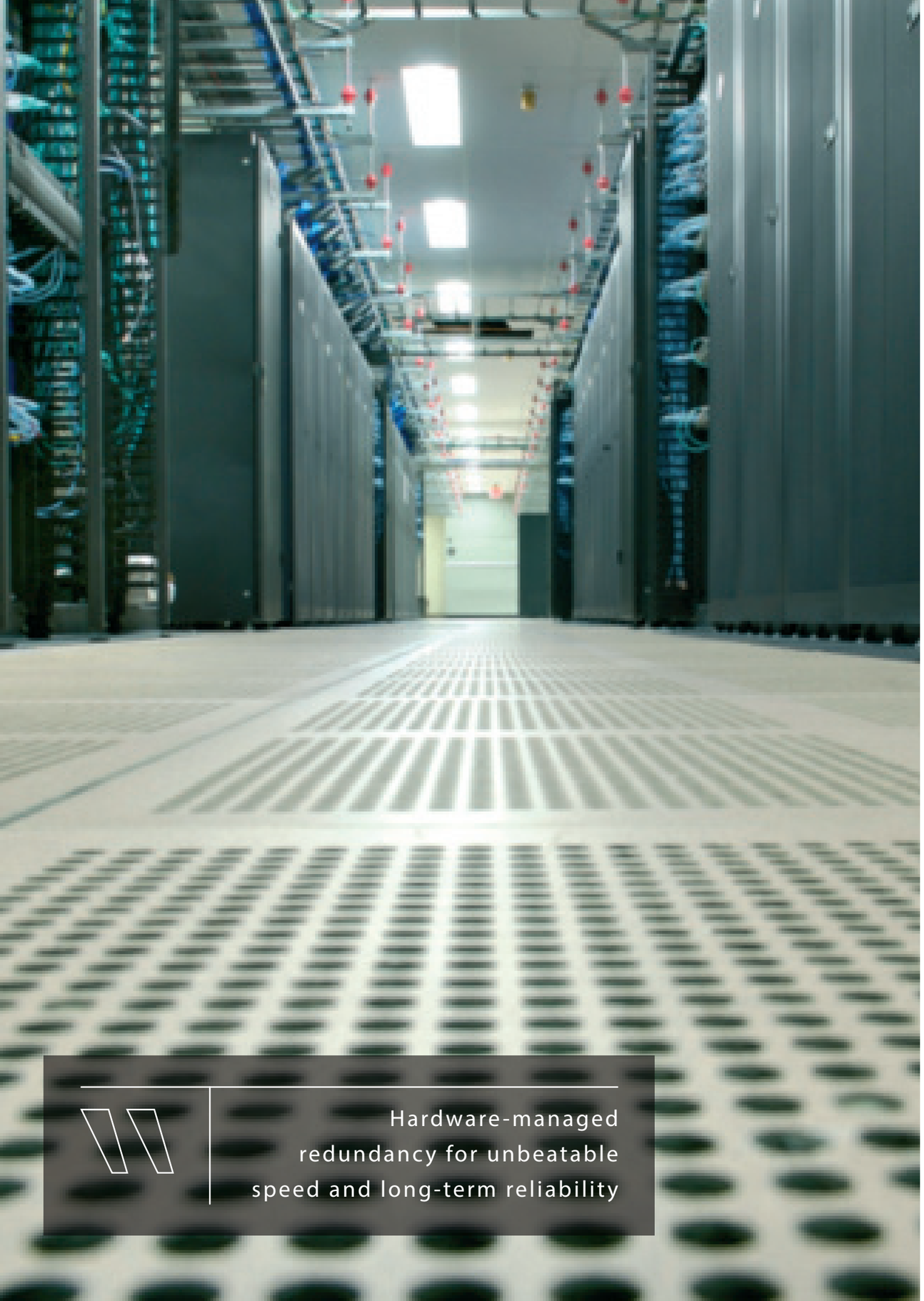
The 4RU and 1RU use the same set of modules and same SW, but the front plates are different.

Module plate for 4RU

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



Module plate for 1RU



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

SWITCH MODULES

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

The 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 hot-swappable for easy maintenance.

The Switch IP IO MMI module can also be ordered to include a GPS receiver for terrestrial SFN applications. For the 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.

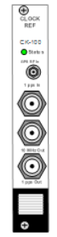
SWITCH MODULES FOR DMG 3200 4RU

Switch Module with Management
SW-200

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

Clock Reference Module
CK-100

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



Switch Module with Management
2 × 10/100/1000 Base-T
SW-301

- 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)
- 1 slot wide

Switch Module with Management
Dual SFP
SW-401

- Gbit/s routing between modules in a chassis
- 2 × Gbit SFP input or output port for data
- Frame Synchronization input (genlock)
- Up to 850 Mbit/s TS rate per data port
- Supports UDP/RTP Multicast/Unicast
- Supports 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 DMG 3200 1RU

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

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

A wide range of input modules are available including IP, ASI, DVB-S/S2, DVB-C, DVB-T/T2, ISDB-T and 8VSB. The chassis supports any combination of input modules limited only by available slot space. Each input module is designed to receive up to 850Mbit/s of MPEG TS rate or 250 services. In re-multiplexing mode, all services are de-multiplexed by the input module before passed onto the backplane. Unused services are blocked by the input module to avoid propagating them further, which increases efficiency. The full content of an input port can be mapped transparently to an output port with the option to perform PID filtering or service filtering.

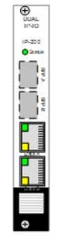
FEATURES

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

INPUT MODULES

Dual IP IO
IP-200

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



ASI Input
AI-110

- 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-C Input
CR-110

- 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
- 1 slot wide

ISDB-T Input module
TR-401

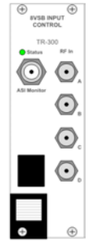
- 4 x ISDB-T receivers per module
- 1 F-type, 75 ohm female input port (all 4 channels on one input cable)
- Frequency range 47-860MHz
- Supports reception of MPTS and SPTS
- Service filtering on input
- Input analysis
- 1 slot wide

DVB-S/S2X Input
SR-200

- 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
- Symbol rate:
  - 1-45 MSym/s: QPSK, 8PSK, 16APSK
  - 1-39.9 MSym/s: 32APSK
- FEC:
  According to EN300421 & EN302307 p1 & p2 for Broadcast Services
- Supports MPTS and SPTS
- Service filtering
- Input analysis
- 1 slot wide

8VSB/QAM Annex B Input
TR-300

- 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

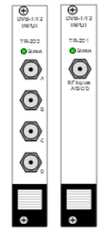


DVB-T Input
TR-110

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

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

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



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, it is imperative operators 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.

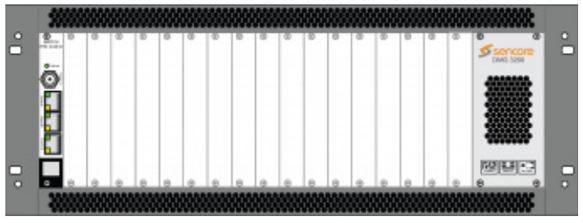
Sencore now offers a truly optimized OTT solution capable of accepting any input signal format. These benefits are magnified further by a modular architecture that lets you fit encoding or transcoding options freely according to actual need. The Sencore Multiscreen encoder/ transcoder simultaneously 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

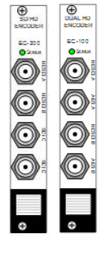


ENCODING/TRANSCODING MODULES

HD/SD SDI Encoder

EC-100, EC-200

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



SD/HD Transcoder

TC-100

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

Encoder -RF input
AC-200

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

*Other TV standards can be supported upon request

Analogue Encoder
AC-100

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

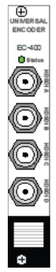
Universal Transcoder - Multiscreen (OTT)
TC-200

- 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

*For complete list of available profiles, please contact Sencore

Universal Encoder - Multiscreen (OTT)
EC-400

- 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
TC-400

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

Universal Encoder - High VQ Broadcast
EC-400

- 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 audio codecs
- 1 slot wide

Universal Transcoder - Dense Broadcast
TC-200, TC-400

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

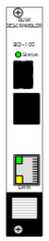
FEATURES

- 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

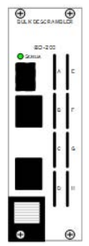
Bulk Descrambler
BD-100

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



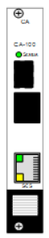
SIM Bulk Descrambler
BD-200

- 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
CA-100

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



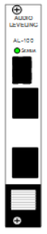
Descrambler
DS-101

- 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
AL-100

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

Note: For Dynamic audio leveling (Interface options), please contact Sencore.



EPG
EP-200

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

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 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
- Seamless redundancy options
- Intelligent, automatic redundancy solutions
- Powerful multiplexing with high throughput
- Integrated multiplexing & PSI/SI re-generation

OUTPUT MODULES

Dual IP IO
IP-200

• 2 × 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

ASI Output
AO-110

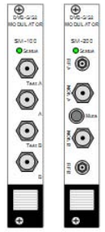
• 4 × ASI outputs
• 4 × BNC connectors
• 213 Mbit/s Burst mode or 72 Mbit/s Spread mode per output
• 4 different multiplexed outputs
• Supports multiplexing and transparent pass-through
• PSI/SI/PSIP regeneration
• 1 slot wide

QAM Modulator
CM-201

• 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
SM-100, SM-200

• 2 DVB-S/S2 modulated carriers per module
• Connectors:
  - 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:
  - DVB-S › QPSK
  - 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



DVB-T/T2 Terrestrial Modulator
TM-300

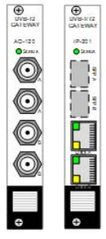
• 2 DVB-T2 or 2 DVB-T independent outputs
• 1 × BNC connector + 1 × BNC for monitoring per output
• Monitoring ports for each output
• VHF/UHF, 50 Ω BNC, 47-862 MHz
• Output levels: -15 to 0 dBm
• Supports multiplexing and transparent pass-through (mode A)
• Support for SFN (ETSI TS 102 733 T2-MI)
• Support for multiple PLPs
• Supports multiplexing and transparent
• PSI/SI regeneration
• 1 slot wide

DVB-T/T2 Cable Modulator
TM-101, TM-200

• 4 DVB-T modulators (TM-101)
• 2 DVB-T/T2 modulators (TM-200)
• Connectors:
  - COFDM › 1 × F connector + 1 × F for monitoring per module
  - DVB-T2 › 1 × BNC connector + 1 × 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

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

• IP or ASI out options:
  -10/100/1000 BaseT (RJ45) or SFP output on IP
  - 2 × (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



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

The Sencore 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 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 reconstruct a perfect outgoing stream even from two imperfect network feeds.

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

Internal Redundancy (4RU chassis feature)

By using 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 backplanes, redundant IP inputs, redundant MMI (i.e. management & control) as well as redundant power supplies. In case of input, switch or MMI failure, all output modules will switch backplane and log into the other MMI where it will receive the services from the backup inputs and switch.

By having 1+1 redundancy on inputs and switch modules, all components of the chassis are backed up, except for the 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 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, 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 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 (multicast based) where the same service will be available for two or more sources. As long as all sources with the same channel have the same IP source address, the network will route just a single copy of the multicast stream forward to the receiver based on routing cost. In the event of a service issue within, or prior to, the Sencore 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 redundancy of only selected premium or 'must-carry' services. Operators can then choose not to replicate the input and descrambling functions of lower priority services, but still equip the chassis with multiple IP output modules to provide limited fault tolerance.

SWITCH MODULE SPECIFICATIONS

Switch Module	Bitrate	: Gbit/s routing between modules in a chassis
	Placement	: 1 slot wide (4RU switch module must be placed in slot 0; redundant module in slot 17)
	IP Input/Output	
	Interface	: 2 × 10/100/1000 Base-T Ethernet or SFP
		: Optical SFP (class 1 laser product)
	Maximum data rate per port	: Up to 850 MBit/s per port TS rate
	Maximum number of services per port	: 250
	Data format	: UDP/RTP Multicast/Unicast
	Transport stream	: SPTS and MPTS
	Service filtering	: Yes
	Video format	: Transport stream; MPEG-2, MPEG-4, HEVC
	IP Input	
	IP de-jittering	: PCR or CBR
	Forward Error Correction	: SMPTE 2022-1
		250 input streams per data port
	IP Output	
	Multiplexing	: Yes (licensed)
	Forward Error Correction	: SMPTE 2022-1
		250 output streams per data port
	Tables Supported	
	- PSI	: PAT, PMT, CAT
	- SI	: SDT, NIT, EIT pf , TOT, TDT, BAT, AIT
	- PSIP	: MGT, TVCT, CVCT
	Frame Synchronization Input	
	Interface	: Accepts black burst and Tri-Level reference signal.*
	Management	
	Interface	: 10/100/1000 Base-T Ethernet
	Built-in user interface	: Web
	External interface	: SNMP for alarms, SOAP for configuration and status
	* 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 Out
		: FEC in, FEC out, FEC in/out
		: Multiplexing
		: IP Out Redundancy
Clock Reference	**GPS reference input**	
	Antenna connector	: SMA female
	Impedance	: 50 Ω
	1pps timing accuracy	: < 100 ns RMS
	Active Antenna Voltage output	: 0V, 3.3V(default) or 5V
	Internal reference hold-over	: ≤1us in 4 hrs @ΔT= 0˚C
	1pps reference input	
	Number of input ports	: 1
	Input connector type	: BNC female
	Impedance	: TTL or 50 Ω
	Input level 1pps (1Hz)	: TTL
	Internal reference hold-over	: ≤1us in 4 hrs @ΔT= 0˚C
	Licenced features	: GPS receiver, OCSO oscillator, OCXO oscillator (stability 0.2ppb/day)

COMMON INPUT SPECIFICATIONS

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

INPUT INTERFACE SPECIFICATIONS

Dual IP IO	**IP Input/Output**	
	Interface	: 2×10/100/1000 Base-T Ethernet and SFP
	Operational mode	: The module can be configured to; - 1 input and 1 output - Seamless (Hitless) IP in - Cloned IP out - Dual IP in - Dual IP out
	Maximum data rate per port	: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1×IPIN + 1×IPOUT : Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode
	Maximum number of services per port	: 250
	Data format	: UDP/RTP Multicast/Unicast
	IP Input	
	IP de-jittering	: Yes, based on PCR or CBR
	Forward Error Correction	: SMPTE 2022-1 250 input streams per data port
	IP Output	
	Multiplexing	: Yes
	Forward Error Correction	: SMPTE 2022-1 250 output streams per data port
	Lisenced feature:	: Seamless input, Cloned IP Out : FEC in, FEC out, FEC in/out : Multiplexing : IP output redundancy
ASI Input	Key reference specification	: EN 50083-9
	Connector	: BNC female, 75Ω
	Number of inputs per module	: 4
	Maximum bit-rate per port	: Up to 213.7Mbit/s (burst)
DVB-S/S2X Input	Key reference specifications	: EN 300 421, EN 302 307 p1&2
	Connector	: F female, 75Ω
	Number of inputs per module	: 4
	DVB-S Constellation	: QPSK
	DVB-S2/S2x Constellation	: QPSK, 8-PSK, 16-APSK, 32-APSK
	Symbol rate DVB-S	: 1–45 MSym/s
	Symbol rate DVB-S2	: 1–45 MSym/s
	Decoding DVB-S2	: LDPC and BCH
	FEC DVB-S	: 1/2, 2/3, 3/4, 5/6, 7/8
	FEC DVB-S2 QPSK	: 1/4, 13/45, 1/3, 2/5, 9/20, 1/2, 11/20, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
	FEC DVB-S2 8PSK	: 3/5, 23/36, 2/3, 25/36, 13/18, 3/4, 5/6, 8/9, 9/10
	FEC DVB-S2 8APSK	: 5/9, 26/45
	FEC DVB-S2 16APSK	: 5/9, 8/15, 1/2, 26/45, 3/5, 28/45, 23/36, 2/3, 25/36, 13/18, 3/4, 7/9, 4/5, 5/6, 77/90, 8/9, 9/10
	FEC DVB-S2 32APSK	: 2/3, 32/45, 11/15, 3/4, 7/9, 4/5, 5/6, 8/9, 9/10
	Roll off DVB-S	: Auto, 0.35
	Roll off DVB-S2	: Auto, 0.20, 0.25, 0.35
	Roll off DVB-S2X	: Auto, 0.05, 0.10, 0.15, 0.20, 0.25, 0.35
	Acquisition range	: Auto, 0.15MHz, 1MHz, 2MHz, 2.5MHz, 5MHz
	Spectrum inversion	: Auto, Normal, Inverted
	DVB-S2 FEC frames	: Normal frames
	Input level	: -79 to -20 dBm (16 APSK, 9/10 code rate)
	Frequency range	: 950–2150 MHz
	LNB voltage	: 0/13/18 Volt
	Maximum LNB supply current	: 400 mA
	LNB signaling	: LNB voltage + 22kHz continuous tone
	Multiple streams	: Yes, 1 per input port
	T2MI De-encapsulation	: Yes, one PLP per port
	Licenced features:	: DVB-S2 Demodulation, DVB-S2X Demodulation, T2-MI De-encapsulation
DVB-T input	Key reference specification	: ETSI EN 300744
	Connector	: F female, 75Ω
	Number of inputs per module	: 4 demodulators (one connector)
	Input level	: -30 to -75 dBm (at 8MHz, 3/4, 64-QAM, gaussian channel)
	Frequency range	: 47 – 862 MHz
	Channel bandwidth	: 7 and 8 MHz
	Guard interval	: 1/4, 1/8, 1/16, 1/32
	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
	Spectral inversion	: Automatic
DVB-T/T2 input	Number of DVB-T/T2 inputs per module	: 4
	Input connector	: F-female, 75 Ω
	Input connector configurations	: 1 F connector internally split or 4 F connectors
	Input frequency range	: 47–862 MHz
	Input level range	: - 80 to -10 dBm (at T2, 8MHz, 256 QAM, 3/5, gaussian channel)
	Minimum return loss	: 10 dB
	DVB-T	
	Key reference specification	: ETSI EN 300744, Nordig 2.0
	FFT Size	: 2k, 8k
	Guard Intervals	: 1/4, 1/8, 1/16, 1/32
	FEC code rate	: 1/2, 2/3, 3/4, 5/6, 7/8
	Constellation	: QPSK, 16-QAM, 64-QAM
	Channel bandwidth	: 6, 7, or 8 MHz
	Hierarchy stream	: High and Low priority
	Hierarchy mode	: All
	Spectral inversion	: Automatic
	DVB-T2	
	Key reference specification	: ETSI EN 302755, Nordig 2.1
	FFT Size	: 1k, 2k, 4k, 8k, 8k extended, 16k, 16k extended, 32k, 32k extended
	Guard Interval	: 1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
	FEC frame	: Normal (64k), Short (16k)
	FEC code rate (PLP)	: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
	Constellation (PLP)	: QPSK, 16-QAM, 64-QAM, 256-QAM
	Channel bandwidth	: 5, 6, 7 or 8 MHz
	Pilot pattern	: P1–P8
	SISO and MISO transmission	: Yes
	Single and Multiple-PLPs	: Yes
	Spectral inversion	: Automatic
	Rotated constellation	: Automatic
	Licenced features:	: DVB-T2 demodulation
DVB-C Input	Key reference specification	: EN 300 429, ITU-T J83 annex A, and C
	Connector	: F female, 75Ω
	Number of inputs per module	: 4 independent tuner/demodulators
	Number of input ports	: 1 (internal splitter feeding the 4 tuners)
	Frequency range	: 47–862 MHz
	Channel bandwidth	: 6, 7 and 8 MHz
	QAM Mode	: 4, 16, 32, 64, 128, 256 QAM

	Symbol rate	: 1–7.2 Mbaud
	Spectrum inversion	: Automatic
	Input power level	: - 30 to -65 dBm (at 256 QAM, 6.9 Ms/s)
QAM Annex B input	Key reference specification	: ITU-T J83 annex B
	Connector	: F female, 75Ω
	Number of inputs per module	: 4
	Frequency range	: 54–860 MHz
	Channel bandwidth	: 6
	QAM Mode	: 64, 256 QAM
	Symbol rate	: 5.057 Mbaud (64 QAM), 5.360 MBaud (256 QAM)
8-VSB Input (ATSC)	Key reference specification	: ATSC A/53
	Connector	: F female, 75Ω
	Number of inputs per module	: 4
	Input level	: -34 to +40 dBmV
	Frequency range	: 50–860 MHz
	Modulation	: 8-VSB
	Band	: Broadcast
	Licenced features:	: 8-VSB, QAM Annex B
ISDB-T/SBTVD-T	Key reference specification	: ARIB STD-B31
	Channel bandwidth	: 6, 7 and 8 MHz
	RF Input specification	
	Number of inputs per module	: 4 independent tuner/demodulators
	Number of input ports	: 1 (internal splitter feeding the 4 tuners)
	Connector	: F female, 75Ω
	Frequency range	: 50–860 MHz
	Input power level	
	Maximum	: -10 dBm
	Minimum (QPSK, 2/3)	: -76 dBm

ENCODING/TRANSCODING SPECIFICATIONS

Universal Encoder - High VQ Broadcast

Density	
Number of channels per module	: Up to 1 HD or 2 SD
Video Input	
HD Res. / Frame rates (SMPTE 292M)	: 1080i – 29.97 fps or 25 fps
	: 720p – 59.94 fps or 50 fps
SD Res. / Frame rates (SMPTE 259M)	: 480i – 29.97 fps
	: 576i – 25 fps
Audio Inputs	
Embedded Audio	: SMPTE 272M (SD), SMPTE 299M (HD)
	: Sample rate 48kHz, synchronous to video
Video Encoder	
Architecture	: Dual Pass with look ahead
MPEG-2 profiles	: MP@HL (HD) up to 60Mbps
	: MP@ML (SD) up to 16Mbps
MPEG-4 AVC profiles	: MP@L4.2, HP@L4.2 (HD) up to 60Mbps
	: MP@L3.1, HP@L3.1 (SD) up to 16Mbps
Rate Control Modes	: Constant Bit Rate (CBR)
	: Capped VBR (CVBR) with QP target
	: Statistical Multiplexing
GOP structure	: Dynamic with Scene Change Detection and Adaptive GOP structure.
Clock Modes	: Locked to HDSDI/SDI input
Aspect Ratio Control	: Manual, WSS or Video Index
PCR PID	: PCR on Video PID or as separate PID
End-to-end Encoder Delay	: Typical 5500ms

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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, 5.1[1])
	: HE-AAC v1 (2.0, 5.1[1])
	: HE-AAC v2
	: Dolby® Digital[2]
	: Dolby® Digital Plus[3]
	: Dolby® Digital/Dolby® Digital Plus pass-through
Audio Channel Modes	: Stereo, Mono and Dual Mono, 5.1[1] and 7.1 (Dolby® Digital/Dolby® Digital Plus only)
AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
Audio Lipsync Adjustment	: +/- 500ms
Audio Level Adjustment	: +6/-10dB
Picture-in-Picture	
Density	: One PiP available for each main channel
Codec	: MPEG-4 AVC BP or MP
Bitrate	: Min 96kbps, Max 500kbps (CBR)
Resolutions	: 192x192, 176x144, 128x96, 96x96
Video Pre-processing	
Inverse Telecine Detection	: Detect if input is 3:2 pull down and omit repeated fields.
De-blocking Filter	: Adjustable
Motion Compensated Temporal Filter (MCTF)	: Adjustable
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
Down Conversion HD to SD	: Including aspect ratio conversion, letter-/pillar boxing and de-interlacing.
Up Conversion SD to HD	: From 59.94 fps to 59.94/29.97 fps
Frame Rate Conversion	: From 50 fps to 50/25 fps
	: From 29.97 fps to 59.94/29.97 fps
	: From 25 fps to 50/25 fps
	: Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output.
Logo Insertion	
Maximum Size	: 192x128 (SD)
	: 360x180 (HD 720P)
	: 480x270 (HD 1080i)
Positioning	: User selectable (pixel accuracy)
File format	: PNG (8-bit ARGB) file per encoded channel
Ancillary Data and VBI	
Teletext processing	: Extracted from VANC OP47, SMPTE-2031 or VBI and trans-coded to EN 301755.
Closed Captioning (EIA 608/EIA 708)	: Extracted from VANC and injected into video stream.
Digital Programme Insertion (DPI)	: SCTE104 triggers extracted from VANC and transcoded to SCTE35 TS triggers.
Active Format Description (AFD)	: Extracted from VANC SMPTE 2016 and injected into video stream.
Dolby® E metadata	: External Dolby® E metadata extracted from VANC SMPTE 2020 used for Dolby® Digital/Dolby® Digital Plus encoding configuration.

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

	Wide Screen Signalling (WSS)	: Extracted from VBI line 23 or VANC SMPTE 2031 and transcoded to EN 301755
	Video Programming System (VPS)	: Extracted from VANC SMPTE 2031 and transcoded to EN 301755
	Video Inserted Time Code (VITC)	: Extracted from VANC SMPTE-RP188 and injected into video stream.

Auxillary Data Injection
EBU Subtitling, DVB Subtitling, PIDs can be added to service through an Sencore Input Interface (e.g. ASI, IP). PTS can be restamped for DVB subtitling.

Statistical Multiplexing

Statmux Controller	: Local within chassis
Max. Number of Groups per chassis	: 4
Max. Number of Services within group	: 32

Licensed Features
Video Mode HPBC (required)
Number of Encoder Channels HD
Number of Encoder Channels SD
Statistical Multiplexing - Number of Channels
Dolby® Digital/Dolby® Digital Plus Encode - Number of Stereo Pairs[4)]
MPEG-1 Layer 2/AAC-LC/HE-AAC v1/HE-AAC v2 Encode - Number of Stereo Pairs

Universal 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
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
Frame rate conversion	: From 60/59.94/50 reduced to ½, ¼ : From 50 reduced to ½ or ¼

4) One 5.1 encode uses resources of 3x stereo pairs. One 7.1 encode uses resources of 4x stereo pairs.
5) For complete table please contact Sencore.

	: From 30/29.97/50 reduced to ½
De-interlacing	: Interlaced to progressive conversion
Scene change detection	: Yes, insertion of P frame
GOP structure	: Dynamic
Number of output profiles	: Ranging from 4x HD to 28 sub SD per module, depending oncomplexity of profiles

Audio Encode

MPEG1 Layer II	: Modes: 2.0 (stereo), Bit rates: 64 – 384kbps
AAC-LC	: Modes: 2.0, Bit rates: 32 – 384kbps
HE-AAC v1	: Modes: 2.0, Bit rates: 32 - 192kbps
HE-AAC v2	: Modes: 2.0, Bit rates: 32 - 96kbps
Sample rates	: 32, 44.1, 48kHz
Number of channels per video source	: 2 (Audio resources can be combined.)

Reformatting/ Rescaling

Format conversion	: From HD to sub SD

Aspect Ratio Control

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

Ancillary Data and VBI

Closed Captioning (EIA 608/EIA 708)	: Extracted from VANC and injected into video stream.
Active Format Desctription (AFD)	: Extracted from VANC SMPTE 2016 and injected into video stream.

Encoder – SDI/HDSDI input

HW options	: Two HW options. - Dual HD/SD Encoder with separate AES/EBU input - Quad SD upgradable to Dual HD
Input Port options	: 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
Input Format	: SMPTE 292M (HD SDI), SMPTE 259M (SD SDI)

Video Input

HD Resolutions	: 1080i - 30 fps, 29.97 fps or 25 fps : 720p – 60 fps, 59.94 fps or 50 fps
SD Resolutions	: 480i – 30 fps, 29.97 fps : 576i – 25 fps

Video Pre-processing

De-blocking Filter	: Adjustable
Motion Compensated Temporal Filter (MCTF)	: Adjustable
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
Inverse Telecine Detection	: Enable/Disable
WSS Blanking	: Removal of line 23 WSS from active video

Logo Insertion

File Format	: PNG (8-bit RGBA) file per encoded channel
Position	: User defined (pixel resolution)
Maximum Size	: 192 × 128 (SD) : 360 × 180 (720p) : 480 × 270 (1080i)

Video Encoder

Number of channels per module	: 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@L3.2 (SD)
Rate Control Modes	: Constant Bit Rate (CBR)

		: Capped VBR (CVBR) with QP target
		: Statistical Multiplexing
	Rate Range	: From 250kbps to limit by profile/level (max 38Mbps)
	GOP control	: Fixed or Dynamic with Scene Change Detection and adaptive GOP structure
	Encoder Clock	: Locked to SDI/HDSDI input
	Picture-In-Picture	: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96 or 96×96
	Aspect Ratio Control	: Manual, WSS or Video Index
	Ancillary Data and VBI	
	VANC processing	: Closed Captioning (EIA 708)
		: AFD (SMPTE 2016)
		: Teletext (Extracted from VBI, OP47 or SMPTE-2031)
		: VPS (Extracted from SMPTE-2031)
		: WSS (Extracted from VBI, OP47 or SMPTE-2031)
		: DPI (SCTE 104 VANC extraction and SCTE 35 Private Data generation)
	Audio Input	
	Embedded Audio	: According to SMPTE 272M (SD), SMPTE 299M (HD)
	AES 3	: 75 Ω BNC (Dual HD version only)
	Audio Encoder	
	CODECs	: MPEG-1 Layer 2
		: AAC-LC
		: HE-AAC v1
		: HE-AAC v2
		: Dolby® Digital pass-through
	AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
	Channel Modes	: Stereo/Dual Mono/Mono
	Stereo pairs per video	: 2 pairs for Dual HD/SD version from any codec above
		: 1 pair for Quad SD version
		: Additional 4 AAC-LC or 8 MPEG1 Layer 2 per module shared between video ch (capacity reduced to half in statmux mode)
	Injection of Private Data into service	: See Universal Encoder High VQ “Auxillary Data Injection”
	Licensed Features	: Number of encoded channels
		: Statmux (per module)
		: DVB subtitle restamping
Encoder– CVBS input	Number of channels	: 4 SD or 2 SD+PIP
	Input Port	: 4 HD BNC 75 Ω, one per channel
		25 Pin Compact D-sub for audio:
		- 4 balanced analogue audio inputs
		- 2 AES/EBU inputs
	Video Input	: PAL B/G/I/D/K
		: SECAM D/K
		: PAL Nc
		: PAL M
		: NTSC M
	Video Pre-processing	
	Inverse Telecine Detection	: Yes
	De-blocking Filter	: Adjustable
	Motion Compensated Temporal Filter (MCTF)	: Adjustable
	Horizontal Rescaling	: From 720 to 704, 640, 544, 528, 480 or 352
	WSS Blanking	: Removal of line 23 WSS from active video
	Logo Insertion	
	File Format	: PNG (8-bit RGBA) file per encoded channel
	Position	: User defined (pixel resolution)
	Maximum Size	: 192 × 128 (SD)
	Ancillary Data and VBI	
	VBI Extraction and processing	: Closed Captioning (EIA 708)
		: Teletext, WSS, VPS
	Video Encoder	
	Number of channels per module	: 4 SD or 2 SD w/PiP (2SD mode gives improved VQ)
	MPEG-2 profiles	: up to HP@ML
	MPEG-4 AVC profiles	: up to HP@L3.0
	Rate Control Modes	: Constant Bit Rate (CBR)
		: Capped VBR (CVBR) with QP target
	Rate Range	: 4SD: From 250kbps to 10Mbps
		: 2SD: From 250kbps to 19Mbps
	GOP control	: Fixed or Dynamic with Scene Change Detection and adaptive GOP structure
	Picture-In-Picture	: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96 or 96×96
	Aspect Ratio Control	: Manual or WSS
	Audio Encoder	
	Audio CODECs	: MPEG-1 Layer 2
		: AAC-LC
		: HE-AAC v1
		: HE-AAC v2
		: Dolby® Digital pass-through (from AES input)
	AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
	Channel Modes	: Stereo/Dual Mono/Mono
	Encoded stereo pairs per video	: 2 pairs for 2SD+PIP configuration and 1 pair for 4 × SD configuration
	Audio level adjustment	: +/-11dB
	Injection of Private Data into service	: See Universal Encoder High VQ “Auxillary Data Injection”
	Licensed Features	: Number of encoded channels, PIP
Encoder - RF Input	Number of channels per module	: 4 SD or 2 SD+PIP (2SD mode gives improved VQ)
	RF Input	
	TV systems	: PAL B/G, PAL I and SECAM D/K[6]
	RF inputs	: 4xF female, 75 Ω
	Input frequency	: 47 – 862 MHz
	Frequency tuner step size	: 1kHz
	RF input level	
	– Max	: 110 dBuV
	– Min (for un-weighted video SNR=30dB)	: 44 dBuV
	Video Encoder	
	Please refer to “Encoder -CVBS input”	
	Picture-in-Picture	
	Please refer to “Encoder -CVBS input”	
	Video Pre-processing	
	Please refer to “Encoder -CVBS input”	
	Logo Insertion	
	Please refer to “Encoder -CVBS input”	
	Audio Encoder	
	Audio CODECS	: MPEG-1 Layer 2 Stereo
		: AAC-LC Stereo
		: HE-AAC v1 Stereo
		: HE-AAC v2 Stereo
	AC Data Encapsulation	: ADTS or LATM selectable per encoded channel
	Channel Modes	: Stereo/Mono/Dual Mono
	Encoded stereo pairs per video	: 1
	Audio Level Adjustment	: ± 11 dB

6) Other TV standards can be supported upon request

VBI
Please refer to "Encoder -CVBS input"
Auxillary Data Injection
Injection of Private Data into service : See Universal Encoder High VQ "Auxillary Data Injection"

Licensed Features : Number of Encoded channels, PIP

Universal Transcoder - High VQ Broadcast

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

Video Decoder
MPEG-2 profiles : MP@HL, 1Mbps – 80Mbps
: MP@ML, 600kbps – 15Mbps
H.264 profiles : MP@L4.2, 500kbps – 55Mbps
: HP@L4.2, 1Mbps – 55Mbps
: MP@L3.2, 300kbps – 16Mbps
: HP@L3.2, 300kbps – 16Mbps
: High 4:2:2@L4.2, 4.5Mbps - 80Mbps CABAC/100Mbps
SD 50Hz resolutions : 720/704/544/528/480/352 x 576i25
SD 60Hz resolutions : 720/704/640/544/528/480/352 x 480i30/29.97
HD 1080i resolutions : 1920/1440/1280/960 x 1080i30/29.97/25
HD 720p resolutions : 1280/960/640 x 720p60/59.94/50

Audio Decoder
Audio CODECS : MPEG-1 Layer 2 :AAC-LC
: HE-AAC v1
: HE-AAC v2
: Dolby® Digital / Dolby® Digital Plus
Audio Downmix : 5.1 to 2.0 for AAC and Dolby®

Video Encoder
MPEG-2 profiles : MP@HL, 1Mbps – 80Mbps
: MP@ML, 600kbps – 15Mbps
H.264 profiles : MP@L4.2, 500kbps – 55Mbps
: HP@L4.2, 1Mbps – 55Mbps
: MP@L3.2, 300kbps – 16Mbps
: HP@L3.2, 300kbps – 16Mbps
Rate Control Modes : Constant Bit Rate (CBR)
: Statistical Multiplexing
GOP structure : Dynamic with Scene Change Detection and Adaptive GOP structure.
Aspect Ratio Control : Manual, Transparent input to output
PCR PID : PCR on Video PID or as separate PID
End-to-end Encoder Delay : Typically 5500ms

Audio Encoder
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
Audio Channel Modes : Stereo, Mono
AAC Data Encapsulation : ADTS or LATM selectable per encoded channel
Audio Lipsync Adjustment : +/- 300ms
Audio Level Adjustment : +6/-10dB

Picture-in-Picture
Codec : MPEG-4 AVC MP
Bitrate : Min 96kbps, Max 400kbps (CBR)
Resolutions : 192x192, 176x144, 128x96, 96x96

Video Re-scaling
Down Conversion HD to SD : Including aspect ratio conversion, letter-/pillar boxing
Up Conversion SD to HD : Including aspect ratio conversion, letter-/pillar-boxing and de-interlacing.

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

Frame Rate Conversion : From 60 fps to 60/30 fps
: From 59.94 fps to 59.94/29.97 fps
: From 50 fps to 50/25 fps
: From 30 fps to 60/30 fps
: From 29.97 fps to 59.94/29.97
: From 25 fps to 50/25 fps
: Frame rate up conversion only for interlaced input (1080i/576i/480i) to 720p output.

Audio Transcode Density
The table below describes maximum audio transcode density as a function of codec type.
One 5.1 audio use the same resources as 3x 2.0 audio. A combination of audio types are supported.

Logo Insertion
Maximum Size : 192x128 (SD)
: 360x180 (HD 720P)
: 480x270 (HD 1080i)
Positioning : User selectable (pixel accuracy)
File format : PNG (8-bit ARGB) file per encoded channel

Subtitling Burn In
DVB/EBU Subtitling : Burned into Transcoded Video

Auxillary Data
Pass Through : All auxillary data components (EBU Subtitling, DVB Sub titling, Teletext etc.). Lipsync to video is maintained.
Generation : EBU Subtitling, DVB Subtitling, Teletext subtitling PIDs from a generator can be added in the mux output

Video Processing
WSS Blanking : Line 23

Statistical Multiplexing
Statmux Controller : Local within chassis. (Management module.)
Maximum # Groups : 4
Maximum # Services within group : 32

Licensed Features
Number of HD encoders
Number of SD encoders
Logo Insertion
Statistical Multiplexing - Number of Channels
MPEG/AAC Audio Transcode – Number of audio channels
Dolby ® Decode – Number of channels
Dolby ® Encode– Number of channels
4:2:2 10bit decoding Density

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
MPEG-2 profiles : MP@HL (HD)
: MP@ML (SD)
MPEG-4 AVC profiles : MP@L4.2, HP@L4.2 (HD)
: MP@L3.0, HP@L3.1 (SD)
SD resolutions : 720/704/544/528/480/352 x 576i25 fps

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

	: 720/704/640/544/528/480/352 x 480i29.97 fps
HD 1080i resolutions	: 1920/1440/1280/960 x 1080i30/29.97/25 fps
HD 720p resolutions	: 1280/960/640 x 720p60/59.94/50 fps

Audio Decoder

Audio Codecs	: 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)
Audio Downmix	: Multichannel audio (5.1 or 7.1) will be downmixed to 2.0 as part of transcode process.

Video Encoder

MPEG-2 profiles	: MP@HL (HD) : MP@ML (SD)
MPEG-4 AVC profiles	: MP@L4.1, HP@L4.1 (HD) : MP@L3.1, HP@L3.1 (SD)
Rate Control Modes	: Constant Bit Rate (CBR) : Capped VBR (CVBR) with QP target : Statistical Multiplexing (in future release)
GOP structure	: Dynamic with Scene Change Detection and Adaptive GOP structure
Aspect Ratio Control	: Manual, Transparent input to output
PCR PID	: PCR on Video PID or as separate PID
End-to-end Encoder Delay	: Typically 5500ms

Audio Encoder

Audio CODECS	: MPEG1 Layer 2 (2.0) : AAC-LC (2.0) : HE-AACv1 (2.0) : HE-AACv2 (2.0) : Dolby® Digital pass-through : Dolby® Digital Plus pass-through
Audio Channel Modes	: Stereo, Mono
AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
Audio Lipsync Adjustment	: +/- 300ms
Audio Level Adjustment	: +/-6dB
Audio Transcode Density	: 12 transcodes per 2 blocks, max 4 per channel

Picture-in-Picture

Codec	: MPEG-4 AVC MP
Bitrate	: Min 96kbps, Max 400kbps (CBR)
Resolutions	: 320x240,192x192, 176x144, 128x96, 96x96

Video Re-scaling

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

Logo Insertion

Maximum Size	: 192x128 (SD) : 360x180 (HD 720P) : 480x270 (HD 1080i)
Positioning	: User selectable (pixel accuracy)
File format	: PNG (8-bit ARGB) file per encoded channel

Subtitling Burn In

DVB/EBU Subtitling	: Burned into Transcoded Video. Restricted to 4 channels per module

Auxillary Data

Auxillary data components (EBU Subtitling, DVB Subtitling, Teletext etc.) are passed through Lipsync to video is maintained.

Video Processing

WSS (line 23) blanking	: Yes

Statistical Multiplexing (Not supported in initial release)

Statmux Controller	: Local within chassis.
Maximum # Groups	: One per Universal Transcoder board in chassis
Maximum # Services within group	: 32

Licensed Features

: Video Transcode capacity in steps of blocks capable of 1xHD/4xSD
: Statistical Multiplexing - Number of Channels
: Dolby® Digital/Dolby® Digital Plus Decode
: High Density Mode (dense-sd for 4xSD per block)
: MPEG2/H264

Mediaroom: : Approved

Universal Transcoder - MS/OTT

Number of input channels : Up to 4 HD channels[7)]

Video Decoder

MPEG-2 profiles	: Ranging from MP@ML (SD) to MP@HL (HD)
MPEG-4 AVC profiles	: up to HP@L4.2 : up to MP@L4.2 : up to BP@L4.1

Audio Decoder

Input format	: MPEG-1 Layer 2. Modes: 1.0 (mono), 2.0 (stereo) : AAC-LC. Modes: 2.0, 5.1 (downmixed to 2.0) : HE-AAC v1/2. Modes: 2.0, 5.1 (downmixed to 2.0) : 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)
Pass-through	: MPEG1 Layer II : AAC-LC : HE-AACv1/2 : 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[8)]	: 720p › 1280, 960, 854
Resolutions @ 29.97 fps or 25.00 fps[8)]	: 1080p › 1920, 1440, 1280, 960, 720, 640 : 720p › 1280, 960, 854 : 640p › 960 : 576p › 1024, 768, 720, 352[9)] : 540p › 960 : 480p › 854, 720, 640, 352 : 432p › 768 : 360p › 640, 480 : 320p › 480 : 288p › 512 : 270p › 480, 360 : 256p › 144 : 240p › 320 : 216p › 384 : 180p › 320, 240
Resolutions @ 14.99 fps or 12.50 fps[8)]	: 640p › 960 : 576p › 1024, 768, 720, 352

7) Full HD (1080p) input restricts input density to 2 channels.
8) For complete table please contact Sencore.

		: 480p › 854, 720, 640, 352 : 432p › 768 : 360p › 640, 480 : 320p › 480 : 288p › 512 : 270p › 480, 360 : 256p › 144 : 240p › 320 : 216p › 384 : 180p › 320, 240
	Frame rate conversion	: From 60/59.94/50 reduced to ½, ¼ : From 50 reduced to ½ or ¼ : From 30/29.97/50 reduced to ½
	Number of profiles	: Ranging from 4 × HD to 28 × sub SD per module, depending on complexity of profiles
	Key Frame Alignment	: Frame accurate key frame alignment across all profiles. Fixed IDR to IDR distance.
	GOP control	: Dynamic GOP structure with Scene Change Detection.
	Audio Encode	
	Capacity	: Up to 8 per module
	Output format	: AAC-LC. Modes: 2.0, Bit rates: 32–384kbps : HE-AAC v1. Modes: 2.0, Bit rates: 32–192kbps : HE-AAC v2. Modes: 2.0, Bit rates: 32–96kbps
	Sample rates	: 32, 44.1, 48kHz
	Reformatting/Rescaling	
	De-interlacing	: Interlaced to progressive conversion
	Format conversion	: From HD to sub SD
	Aspect Ratio Control	
	Aspect Ratio Modes	: Transparent Input to Output, Manual 4:3 or 16:9
	AFD Modes	: Generated based on incoming AFD and format conversion.
	VBI	
	Pass-through	: Components such as EBU Teletext and DVB Subtitling can be passed through. Synchronization to video will be maintained.
	Closed Captioning	: EIA-608n and EIA-708 passed through.
	Graphics	
	Subtitling Insertion (burn-in)	: DVB Subtitling
	Licensed Features	: Dolby® Digital/Dolby® Digital Plus Decode
Transcoder	Number of channels	: Up to 2 HD or 4 SD channels
	Video Decoder	
	MPEG-2 profiles	: Ranging from MP@ML (SD) to MP@HL (HD)
	H.264/AVC profiles	: Ranging from MP@L3.0, HP@L3.0 (SD) to MP@L4.0, HP@L4.0 (HD)
	Audio Decoder	
	Input format	: MPEG-1 Layer 2 : AAC-LC : HE-AAC v1/2
	Video Pre-processing	
	Inverse Telecine Detection	: Yes
	De-blocking Filter	: Adjustable
	Motion Compensated Temporal Filter (MCTF)	: Adjustable
	Horizontal Rescaling	: From 1920 to 1440, 1280 or 960 : From 1280 to 960 or 640 : From 720 to 704, 640, 544, 528, 480 or 35
	Rescaling	: Downconversion HD to SD (requires SD license)
	Video Encoder	
	MPEG-2 profiles	: MP@HL (HD)
	H.264/AVC profiles	: MP@ML (SD) : MP@L4.1, HP@L4.1 (HD) : MP@L3.0, HP@L3.0 (SD)
	Rate Control Modes	: Constant Bit Rate (CBR) : Capped VBR (CVBR) with QP target : Statistical Multiplexing
	CBR Rate Range	: From 250kbps to limit by profile/level (max 19Mbps)
	GOP structure	: Automatic or Manual
	Clock Modes	: Locked to input
	Picture-In-Picture	: 416×240, 352×288, 352×240, 192×192, 128×128, 128×96 or 96×96
	Audio Encoder	
	MPEG-1 Layer 2	: Up to 8 stereo pairs per module (4 in statmux mode)
	ACC-LC	: Up to 4 stereo pairs per module (2 in statmux mode)
	AAC Data Encapsulation	: ADTS or LATM selectable per encoded channel
	Channel Modes	: Stereo/Dual Mono/Mono
	Pass-through	: MPEG1 Layer II : AAC-LC : HE-AACv1/2 : Dolby® Digital (AC-3) : Dolby® Digital Plus (E-AC-3)
	Private Data	: Synchronization (Teletext, DVB Subtitling etc) is maintained through transcoder.

8) For complete table please contact Sencore.
9) 352 only available for 25 fps

PROCESSING MODULES SPECIFICATIONS

Audio leveling	Number of audio tracks	: 250 stereo
	Pass-Through	: All components signaled in service
	Audio format	: MPEG-1 layer 2
	Adjustable range	: ±30 dB
	Step	: 2 dB
	Adjustment mode	: Static Integrated with 3rd party SW solutions for automatic adjustment
	Licensed Features	: Number of audio channels
Bulk Descrambling	Interface	: SW based smart card
	CA system support	: Please contact Sencore*
	BISS support	: Mode 1, Mode E
	Maximum data rate	: Up to 850 MBit/s
	Number of services per module	: 250
	Scrambling algorithms	: DVB-CSA and AES
	Licensed Features	: Number of descrambled channels : Biss, Verimatrix, Latens
SIM Bulk Descrambling	Interface	: SIM based smart card
	Number of SIM card readers	: 8 in front and 8 behind front plate (Only 8 in front can be replaced while in operation)
	CA system support	: Conax
	BISS support	: Mode 1, Mode E
	Maximum data rate	: Up to 850 MBit/s
	Number of services per module	: 250
	Scrambling algorithms	: DVB-CSA and AES
	Licensed Features	: Number of descrambled channels : Conax
DVB Descrambling	Interface	: DVB Common Interface
	CA system support*	: BetaCrypt, Conax, Cryptoworks, Irdeto, Mediaguard, Viaccess, NDS Viasat, Nagra
	Number of services per CAM	: 10 (requires multi service CAM)
Scrambling	Scrambling algorithm	: DVB-CSA and AES
	Maximum data rate	: Up to 850 MBit/s
	Number of services per scrambler card	: 250 (depending on SW license)
	Video format	: Transport stream, MPEG-2 SD/HD and MPEG-4 SD/HD
	Interface towards CA System	: Simulcrypt interface
	Number of CA systems	: 4 CA systems simultaneously
	EMM	: Yes
	Entropy reduction	: Yes for DVB No for AES
	Licensed Features	: Number of descrambled channels : PVR assist
EPG (ETSI EN 300 458 V1.9.1)	Ingest	: EIT table from any port
	Output	: Re-generated EIT table

COMMON OUTPUT SPECIFICATIONS

All Output Modules	Key reference specification	: ETSI TR 101 211 V1.9.1, ISO IEC 13818-1
	Multiplexing	
	Video format	: Transport stream, MPEG-2 SD/HD, MPEG-4 SD/HD, and HEVC
	PCR regeneration	: Yes
	PSI/SI	
	Function	: PSI/SI regeneration based on input and operations performed on the signal
	Pass-through of scrambled services	: Yes, on TS level. For SPTS output only
	PSI/SI handling	: Automatically regenerated
	Tables Supported:	
	PSI	: PAT, PMT, CAT
	SI	: SDT, NIT, EITpf ,TOT, TDT, BAT, AIT
	PSIP	
	Function	: PSIP input analysis
	Tables Supported:	
	PSI	: PAT, PMT, CAT
	PSIP	: MGT, TVCT,CVCT

* Sencore aims to integrate with all major CA providers. Please contact Sencore for an updated list over integrated CA systems.

OUTPUT MODULE SPECIFICATIONS

Dual IP IO	**IP Input/Output**	
	Interface	: 2×10/100/1000 Base-T Ethernet and SFP
	Operational mode	: The module can be configured to; - 1 input and 1 output - Seamless (Hitless) IP in - Cloned IP out - Dual IP in - Dual IP out
	Maximum data rate per port	: Up to 850 Mbit/s per port in Seamless (Hitless) in, cloned out or 1×IPIN+1×IPOUT : Up to 850 Mbit/s sum of both ports in Dual IP in or Dual IP out mode
	Maximum number of services per port	: 250
	Data format	: UDP/RTP Multicast/Unicast
	Transport stream	: SPTS and MPTS
	Service filtering	: Yes
	Video format	: Transport stream, MPEG-2/4 (H264) SD/HD
	IP Input	
	IP de-jittering	: Yes, based on PCR or CBR
	Forward Error Correction	: SMPTE 2022-1 250 input streams per data port
	IP Output	
	Forward Error Correction	: SMPTE 2022-1 250 output streams per data port
	Licensed Features	: Seamless IP In, Cloned IP Out : Multiplexing : FEC in, FEC out, FEC in/out : IP Out Redundancy
ASI Output	Key reference specification	: EN50083-9
	Connectors	: 4 BNC female, 75Ω
	Number of outputs per module	: 4 different Transport Streams
	Maximum bit-rate per port	: burst mode: 213.7Mbit/s spread mode: 72Mbit/s
	Transport stream output	: SPTS and MPTS
	Number of services per card	: 250 (sum of all 4 ports)
	Output format	: Constant bit-rate
QAM Output	Key reference specifications	: EN 300 429, ITU J.83.ABC
	Interface	: 2 × F connector female, 75 Ω
	Number of carriers	: 3 and 4 per group (adjacent channels)
	Number of QAM frequencies per module	: up to 16 carriers in 4 groups, 8 per port
	Modulation	: 32 / 64 / 128 / 256 - QAM
	Symbol rate	: 4.48 to 7.00 Mbaud (Annex A and C)
	Frequency range	: 47–862 MHz
	Spectrum inversion	: user selectable

	Test mode	: CW
	Channel spacing	: 5, 6, 7, 8 MHz (12 MHz available for 3 carrier groups)
	Frequency step size	: 1 Hz
	Frequency stability	: 2 ppm
	Output level	: -12 to +2.2dBm per carrier
	Output level stability	: ± 0.5 dB
	Output level adjustment step size (GUI)	: 0.1 dB
	MER	: > 42 dB
	Return loss	: >16 dB
	Spurious	: typ < -60 dBc
DVB-S/S2 Modulator, IF	Key reference specification	: EN 300 421 , EN 302 307
	Number of DVB-S/S2 outputs per module	: 2
	Monitoring ports	: 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	: typ < -60 dBc
	In-band flatness	: typ < ± 0.1 dB
	Spectrum inversion	: user selectable
	Precorrection	: Static linear pre-correction
	DVB-S Coding and Modulation	
	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	: 16200 bits (short), 64800 bits (long)
	Symbol rate	: 0.5–45 Mbaud
	Roll off	: 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35
	Licensed Features	: DVB-S/S2 :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	: 2
	Monitoring ports	: 1 per output (30 dB attenuated)
	Output connector	: SMA female, 50Ω (RF out) : F-type female, 75Ω (Test out)
	Output frequency	: 950–2150 MHz
	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-band flatness	: typ < ± 0.1 dB
	Precorrection	: Static linear pre-correction
	DVB-S Coding and Modulation	
	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	: 16200 bits (short), 64800 bits (long)
	Symbol rate	: 0.5–45 Mbaud
	Roll off	: 0.05, 0.10, 0.15, 0.20, 0.25, and 0.35
	Licensed Features	: DVB-S/S2 : 1 or 2 outputs
DVB-T Cable Modulator	Key reference specification	: ETSI EN 300744
	Number of carriers	: 4 independent carriers
	Number of output ports	: 2 (2 carriers per port)
	Output connector	: F-type
	Impedance	: 75 Ω
	Output frequency	: 47–862 MHz
	Frequency setting step size	: 1 Hz
	Output level	: -12 to 2.2 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	
	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 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	: -12 to 2.2 dBm (TBD)
	Output level stability	: ± 0.5 dB
	Frequency accuracy	: 2 ppm
	Return loss	: >16 dB
	MER	: > 42 dB
	Test mode	: CW
	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	: 1
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	
	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
DVB-T/T2 Gateway ASI[10)]	Connectors	: 4 x BNC 75Ω
	Number of MPTS's with MIP	: 4
	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, 1.2.1 and 1.3.1
	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, 16k extended, 32k, 32k extended
	Pilot Patterns	: P1 – P8
	L1 Constellations	: QPSK, 16-QAM, 64-QAM, BPSK
	Bandwidth	: 1.7, 5, 6, 7, 8, 10MHz
	DVB-T2 PLP support	
	Number of PLPs	: 240 in total between all T2MI streams
	PLP mode	: HEM, constant bit-rate
	PLP types	: 1 and 2
	TI types	: Within a T2 frame and across multiple T2 frames
	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	:DVB-T/T2

		:MIP, T2MI
		:1 or 2 outputs
		:Multi PLP, Regional PLP
DVB-T2 Gateway IP	Connectors	: 2 × 10/100/1000 Base-T Ethernet output or 2× Optical SFP (class 1 laser product)
	Number of MPTS's with MIP	: 4
	Number of T2MI streams	: 4
	Maximum data rate	: Up to 850 MBit/s
	Output mode	: CBR
	Data format	: UDP/RTP Multicast/Unicast
	Support for cloned output	: Yes
	Forward Error Correction	: SMPTE 2022-1 (Licensed)
	Re-multiplexing	: See common output module specifications
	DVB-T MIP inserter	
	Key specification	: ETSI EN 300 744, ETSI TS 101 191
	Relative timestamps	: <1s
	DVB-T2 T2MI	
	Key reference specifications	: EN50083-9, ETSI EN 302 755, ETSI TS 102 773
	T2 version	: 1.1.1, 1.2.1 and 1.3.1
	System redundancy	: 1+1 protection on unit with T2MI frame (licensed) Output redundancy based on OSPF (licensed) Network level redundancy (licensed)
	Regionalization	: Yes. Please contact Sencore for more information
	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,16k extended, 32k, 32k extended
	Pilot Patterns	: P1 – P8
	L1 Constellations	: QPSK, 16-QAM, 64-QAM, BPSK
	Bandwidth	: 1.7, 5, 6, 7, 8, 10MHz
	DVB-T2 PLP support	
	Number of PLPs	: 240 in total between all T2MI streams
	PLP mode	: HEM, constant bit-rate
	PLP types	: 1 and 2
	TI types	: Within a T2 frame and across multiple T2 frames
	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

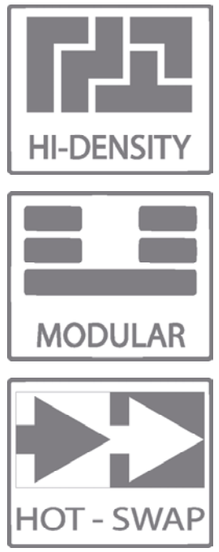
10) DVB-T and DVB-T2 gateway run on different HW versions for ASI out.

CHASSIS

4RU	Physical dimensions	: 19" × 4RU × 400mm (440 × 177 × 400 mm)
	Power supply	
	Power	: 800 Watt
	Input voltage	: 100-240 V AC, 50/60 Hz
	Redundancy	: Yes, dual hot swappable PS
	Monitoring	: Via WEB GUI and LED indicators on PS
	Cooling	
	Fans	: 4 fans
	Hot swap of fans	: Yes, fans are independently hot swappable
	Airflow direction	: Front to back
1RU	Physical dimensions	: 19" × 1RU × 400mm (440 × 44 × 480 mm)
	Power supply	
	Power	: 400 Watt
	Input voltage	: 100-240 V AC, 50/60 Hz : optional: -48V DC
	Redundancy	: Yes, dual hot swappable PS
	Monitoring	: Via WEB GUI and LED indicators on PS
	Cooling	
	Fans	: 6 fans
	Hot swap of fans	: Yes, common fan module with all 6 fans
	Airflow direction	: Front to back

ENVIRONMENTAL CONDITIONS

Operational conditions	Temperature	: 0 to +40 °C
	Humidity	: 5–95% (non-condensing)
Storage	Temperature	: -20 to +70 °C
	Humidity	: 5 to 95% (non-condensing)
Electrical safety	IEC 60950-1	
EMC	EN 55022, EN55013, EN50083-2, EN55024, EN61000-3-2, EN61000-3-3, FCC CFR 47 Part 15	
RoHS	Compliant	
WEEE	Compliant	



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VERSION 3.6

All–Standard All–Band Modulator for USB–3

DekTec DTU-315

- □ Modulator for all popular DTV standards
- □ Fully agile over VHF, UHF, and L–band
- □ USB cable supplies power, data, control

KEY FEATURES

- Pocket size modulator for all popular satellite, cable and terrestrial standards
- Fully agile from 36 to 2150MHz, covering VHF, UHF and L-band
- Modulation bandwidth up to 70MHz
- Excellent signal quality through direct digital synthesis of the RF output signal
- Single USB cable to the DTU-315 supplies power, data and control
- Supports all constellations and modulation modes for each supported DTV standard
- Digital channel simulartor option including multipath echo and AWGN insertion
- F and BNC cable assemblies included
- Use with DekTec's ***StreamXpress*** for easy generation of RF test signals
- Free Windows SDK (DTAPI) for writing your own custom application
- 19" rack-mount kit available for easy integration in fixed setups

APPLICATIONS

- RF test generator in your R&D lab or factory for developing, qualifying or repairing any equipment with a DTV antenna input
- Portable demo set for TV receivers, easy to carry to customer demos, trade shows, etc.
- TV transmission or distribution using modulated signals in shops, hotels, hospitals, etc.

KEY ATTRIBUTES

Parameter	Value
RF connector	75-Ω micro-BNC female
Frequency Range	36 to 2150MHz
Bandwidth (max)	70MHz
I/Q sample rate	0.08 to 70Msps
RF level	-45 to -25dBm (0.5dB steps)
MER (typical)	>40dB
Phase noise	<-105dBc @ 10kHz
Spectral purity	>50dB
USB port	USB-3**
USB connector	Micro-B female
OS	Windows 7, 8/8.1, 10

* For OFDM standards: up to 1GHz; for single-carrier standards up to 2GHz; above 2GHz the output level is max. 5dB lower.

** Must use a real USB-3 port; the DTU-315 will not operate with USB-2.

MODULATIONS STANDARDS

Standards
ADTB-T, ATSC, ATSC-M/H*, CMMB*, DAB(+)*, DMB-T/H*, DBV-C (QAM-A), DVB-C2*, DVB-S, DVB-S2, DVB-S2X*, DVB-T, DVB-T2 single-PLP, DVB-T2*, I/Q samples*, ISDB-S*, ISDB-T*, QAM-B (J.83 Annex B), QAM-C, T-DMB*

* Option

ORDERING INFORMATION

Type	Description
DTU-315-SP	All-standard all-band modulator for USB- with ***StreamXpress*** player/test-generator software
DTU-315-GOLD	DTU-315 with *all* current and future modulation options
DTR-315-RACK	1U 19"-rack mounting kit for holding up to 8x DTU-315

IP to QAM Quad Modulator

DekTec DTE-3114

- □ Four QAM-A/B/C modulators
- □ Agile over VHF/UHF up to 1GHz
- □ RTP with FEC decoding on each channel

KEY FEATURES

- Stand alone four channel QAM modulator with TS-over-IP (TSoIP) inputs and directly synthesized VHF/UHF outputs
- 2D FEC decoder for IP error correction
- Web and SNMP interface for setting parameters and observing status
- Unit can be powered via the Ethernet cable (Power over Ethernet) or through a DC power supply jack
- Removal of IP jitter with programmable size of jitter tolerance buffer
- Full support of SMPTE 2022-1/2
- LCD status display shows device identifier, QAM mode, carrier frequencies, output level and IP/MAC address
- Install up to 12 modules in 3U 19" rack space using DekTec rack mountable rail

APPLICATIONS

- Cable-TV modulator with TSoIP input
- QAM test generator

MODULATION

Modulation	Standard
QAM-A	EN 300 429 (DVB-C)
QAM-B	J.83 Annex B with support for all interleaver modes
QAM-C	J.83 Annex C

KEY ATTRIBUTES

Parameter		Value
Main RF port	Connector	75-Ω F Female
	Output level (total)	-32 to -9dBm
	Level accuracy	±1dB
Monitor port	Connector	75Ω F Female
	Output level (total)	-25.5±3dBm
RF	Range	32 to 1006MHz
	Channel spacing	5 to 8MHz
	Symbol rate	4.48 to 7.0MBd
	MER	43dB
GigE port	Physical layer	IEEE 802.3af
	Connector	RJ-45
Transport	TP per IP	1-7
	Encapsulation	UDP or RTP
	FEC	SMPTE 2022-1
Jitter tolerance range		1-20 ms

CONTROL

IP address assignment	DHCP or static
Multicast support	IGMP v2
Device management	browser based
Network management	SNMP v2c
Discovery	WS-discovery

ORDERING INFORMATION

Type	Description
DTE-3114	Networked Quad QAM Modulator

Multi-Standard Modulator for USB-2

DekTec DTU-215

- No power adapter required
- Fully agile from 47 to 1000MHz
- Channel simulation option

KEY FEATURES

- USB-2 based multi-standard modulator with support for most QAM, OFDM and VSB based modulation standards
- Powered from the USB-2 bus, no external power adapter is required
- For each standard, all modulation parameters are supported
- Direct digital conversion to 47 to 1000MHz for excellent signal quality
- Playout of I/Q sample files
- Output amplifier with programmable 0 to 31.5dB attenuator in 0.5dB steps
- API is fully compatible with other DekTec digital video output adapters

APPLICATIONS

- Multi-standard test generator
- Demonstrations
- Research and development

OPTIONS

Type	Description
DTC-305-CM	Channel simulation
DTC-370-ISDB	ISDB-T modulation
DTC-371-IQ	I/Q sample playout
DTC-374-DTMB	DTMB modulation
DTC-375-CMMB	CMMB modulation
DTC-378-T2	DVB-T2 modulation

KEY ATTRIBUTES

Parameter	Value
Frequency range	47 to 1000MHz ±1ppm
Bandwidth	2.7 to 8.0MHz
MER (OFDM)	>42dB
RF connector	75Ω F
Return loss	≥ 15dB (47 to 862MHz)
Level (QAM)	15dB (47 to 862MHz)
Level (OFDM)	15dB (47 to 862MHz)
Amplitude step size	0.5dB
Adjacent channel	-54dB (QAM) -54dB (QAM)
Phase noise	<-95dBc @ 10kHz
Spectral purity	>50dB (47 to 1000MHz)
USB port	USB-2
Power (through USB-2)	5V, 500mA
Dimensions (LxWxH)	123 x 62 x 22mm

MODULATION STANDARDS

Modulation	Standard
ATSC VSB	ATSC A/53E
ADTB-T / DTMB	GB 20600-2006
-54dB (QAM)	-54dB (QAM)
DVB-C	EN 300 429
DVB-T / DVB-H	EN 300 744
DVB-T2	EN 302 755
ISDB-T	ARIB STD-B31
QAM	J.83 Annex A/B/C

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