

MEMPHIS™ SD and HD MPEG-2 Encoder with Ph.C Motion Estimation and Compression Pre-Processor

Delivering the finest quality performance ever available to the television industry, the Snell & Wilcox Memphis Encoder sets a new standard for uncompromised high-definition playout applications today and in the future.



Incorporating two Emmy® Award-winning technologies from Snell & Wilcox - Ph.C™ phase correlation motion estimation and Prefix compression pre-processing - Memphis delivers superior quality at a given bitrate or smaller files for a given quality when compared to any competing system available today.

Built-in Prefix pre-processing optimizes video signals prior to compression, providing the dual benefits of improved picture quality for the viewer and lower bandwidth usage for the broadcaster. Ph.C Phase Correlation, originally introduced in the highly acclaimed Snell & Wilcox Alchemist™ Ph.C standards converter, brings to Memphis the industry's most powerful and accurate motion estimation technology. Together, these powerful technologies bring the compression efficiency and quality of the Memphis system to an unprecedented level.

Memphis encodes at a wide range of MPEG-2 profiles and produces high quality results at a variety of bitrates from low to very high. Its constant or variable bit rate encoding yields exceptionally robust and clean images. Because of this superior encoding, compelling, high-quality video pictures survive a succession of de-compressions, re-compressions and other conversion processes mandated by modern distribution and transmission requirements.

As with all Snell & Wilcox "smart" infrastructure products, Memphis can be set-up and operated using the *RollCall*™ network monitoring and control system.

This powerful management capability instantly makes it a component of the most flexible and scalable *IQ Modular*™ broadcast infrastructure system in the world. Memphis can also be controlled by several leading third-party automation systems.

Memphis is a next-generation open standards platform so advanced that it not only supports today's most popular third party broadcast play-out servers, but stands ready for easy upgrade to the file-based workflow of tomorrow.

Benefits at a glance

- Sustained picture quality at a wide range of bitrates from low to very high bitrates
- Proven solution. Easily integrates into existing and new environments
- Uncompromised storage efficiency
- Fully featured. The versatility of SD and HD 1080/720, Long-GOP and I-Frame, CBR/VBR, 422P (Studio) and Main Profiles on the same system
- Future proof with MXF upgradeability to Asteroid ingest workstation

An upgrade path to the future...

Memphis was designed by Snell & Wilcox with an eye on the file-based future of broadcasting. We made it future proof - part of our design philosophy that allows broadcasters to take control of their transition to new technology at their own pace.

To ensure long term value, Memphis meets the challenges of broadcasters planning a future migration from baseband to a networked, file-based infrastructure. It integrates perfectly in today's television plant - working flawlessly with popular play-out servers from Omneon, SeaChange and Pinnacle. However, when its owner is ready, Memphis can be fully upgraded to an Asteroid system, Snell & Wilcox's MXF™ ingest workstation.

In addition to maintaining its full encoding functions, an upgrade to Asteroid adds the ability to perform real-time automated Quality Control, annotate files with DMS-1 Descriptive Metadata and then package and wrap an MPEG-2 stream into the MXF open standard file format for distribution through an IT broadcast infrastructure.

Today and in the future...

Without peer, Memphis provides the highest quality video encoding solution available in the broadcast industry today. In addition, its built-in expandability ensures long term, future proof performance and maximum value for the next generation of television technology.

Compression Pre-Processor

Memphis features recursive filters that reduce noise by temporally averaging successive pictures only where the picture needs it. Noise can be reduced in stationary areas of the picture without loss of horizontal or vertical detail. An advanced noise-floor measurement algorithm is used to automatically adjust the filter threshold to a level just above the noise floor.

This ensures optimum noise reduction across a wide range of material. A suite of linear filters allows fine control over the horizontal and vertical bandwidth of the picture's luminance and chrominance components. Brick-wall low-pass filters provide good band-limiting facilities so that MPEG-2 bits are not wasted on compressing unwanted picture noise.

Each of these filters also provides a "boost" at the selected cut-off frequency. This increases the perceived "sharpness" of the picture to compensate for the reduction in bandwidth: it makes the bandwidth reduction less noticeable to the viewer.

Optimized Storage Efficiency

Designed for the demanding broadcast infrastructure, Memphis brings MPEG-2 compression to a new level of efficiency. Because MPEG-2 compression is mainly based on the reduction of temporally redundant information, the performance of an encoder is directly related to the quality of its motion estimation. Based on the same Ph.C technology as our flagship Alchemist Standards Converter, Memphis brings compression efficiency to unprecedented levels. This allows Memphis to achieve superior results at a given bitrate or yield smaller files when compared to the competition for an equivalent quality. This translates into higher quality, reduced storage requirements and lower bandwidth usage.

Memphis features

- Superior motion estimation based on Emmy® Award-winning Phase Correlation (Ph.C) technology
- Superior noise reduction and encoder control based on Emmy® Award-winning Prefix compression pre-processing technology
- Validated with popular third-party video playout servers and automation systems.
- Versatile capabilities: Accepts a variety of video and audio inputs formats

Technical Information

MEMPHIS SD and HD MPEG-2 Encoder with Ph.C Motion Estimation and Compression Pre-Processor

Signal Inputs

Serial Digital - SD	1 x 75Ω BNC SD 10-bit serial digital input at 270 MHz - Rec. 601/656 and embedded audio SMPTE 272 M
Serial Digital - HD	1 x 75Ω BNC HD 10-bit serial digital input at 1.48 GHz - SMPTE 292-1997 and embedded audio SMPTE 299 M
Audio	4 x 75Ω BNC unbalanced AES-3/IEC-958
Reference	2 x 75Ω BNC passive loop through Bi-level/tri-level sync at standard level

Signal Outputs

Serial Digital - HD	1 x 75Ω BNC HD 10-bit serial digital output at (loop-through) 1.48 GHz - SMPTE 292-1997 and embedded audio SMPTE 299 M
Serial Transport	2 x 75Ω BNC DVB ASI Transport Stream Stream

Video Standards

SD	SD SDI - ITU-R BT 601 / 656 <ul style="list-style-type: none"> • 625(576)/25 i • 525(480)/29 i
HD	SMPTE 274 M: 1125 (1080) @ 30 i, 29 i, 25 i SMPTE RP 211: 1125 (1080) @ 23 sF, 24 sF, 25 sF, 30 sF SMPTE 296 M: 750 (720) @ 60 P, 59 P, 50 P

Audio Standards

Uncompressed	AES3 PCM 16, 20 and 24 bit samples (48 KHz only) SMPTE-302 M Max. 4 pairs in single PES & 4 PES streams available in any combination
Compressed	SMPTE-340 M / 337 M for Dolby D (AC-3), Dolby E, MPEG-1 layer-2 Data mode for pre-compressed streams, single channel in PES stream Adjustable encoder delay

Pre-processing and Encoder Control

Filters	10-bit Processing Recursive Noise Reduction Filters <ul style="list-style-type: none"> • Luma • Chroma • Bias Linear Filters: Cutoff and Boost <ul style="list-style-type: none"> • Chroma Vertical / Horizontal • Luma Vertical / Horizontal
Proc Amp Controls	White / Mid / Black / Chroma gain
Encoder Control	Scene Change Detection 3:2 Pulldown and 2:2 Detection

Video Encoding and MPEG standards

Profile Level - SD	<ul style="list-style-type: none"> • MP@ML (4:2:0) • 422P@ML (4:2:2 or 4:2:0) (No D-10/IMX support)
Profile Level - HD	<ul style="list-style-type: none"> • MP@HL (4:2:0) • 422P@HL (4:2:2 or 4:2:0)
Bitrate - SD	From 1 to 50 Mbps I-Frame or Long-GOP
Bitrate - HD	From 10 to 175 Mbps I-Frame or Long-GOP
Modes	<ul style="list-style-type: none"> • Constant bitrate (CBR) • Variable bitrate / Constant quality (VBR)
GOP structure	<ul style="list-style-type: none"> • I-Frame (No D-10/IMX support) • Adaptive Long-GOP structure with CleanCut shot change detection and Film mode 3:2 and 2:2 detection / handling. User defined fixed GOP & closed GOP controls
Horizontal Sampling	Full, 3/4, 2/3, 1/2 Modes

Data and Metadata

Timecode	<ul style="list-style-type: none"> • D-VITC or RP188 source selection • User selectable SMPTE 328M compliant mode using MPEG Picture User Data to include timecode on every frame.
VBI services	<ul style="list-style-type: none"> • Generates a separate PES stream carrying user selected whole lines of Vertical Blanking Interval (VBI) sample data for SD video. Stream format to ETSI standard EN301 775, ref. section 4.9
Close Caption	<ul style="list-style-type: none"> • SD: Line 21 Close Caption EIA608 for 525(480)29i into EIA608-compliant Picture User Data stream • Support for EIA 708 (and pre-existing EIA 608 support) Ancillary Data "CDP" compliant as per EIA 708 specification. Valid ANC packets are output as an EIA708-compliant Picture User Data stream
Aspect Ratio	<ul style="list-style-type: none"> • Video Index with Active Format Descriptor (AFD) pass-through to SMPTE RP186 (SD only) • Wide Screen Signaling (WSS, Line 23) to EN300294 (625/50 i only)

Putting Pictures to Work™

SNELL & WILCOX™

Power and Mechanical

Input Voltage Range	100 V to 250 V rms., 50/60 Hz
Mains Fuse Rating	T 4 AH 250 V. (Each Power supply)
Maximum Input Current	3.5 A (Each Power supply)
Power Consumption approx.	200 W

Control

Memory	8 global memories
External Control	1 x D-9 for RS-422 RollCall 1 x D-9 for RS-422/485 Sony protocol edit controller 1 x 75Ω BNC for coaxial ArcNet RollCall 1 x RJ-45 Ethernet 100BaseT for RollIP

Mechanical

Temperature Range	0 to 40° C operating Cooling Axial fan, front-to-rear airflow
Weight Approximately	19 kg
Case Type	3 RU Rack Mounting
Dimensions	483 mm x 563 mm x 132 mm (w, d, h)

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