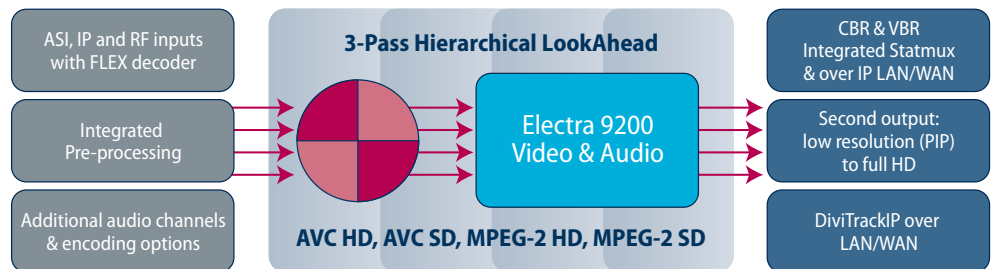# Electra™ 9200

Universal Multi-Service Encoder

HIGHLIGHTS

- High-quality low-bitrate MPEG-2 or MPEG-4 AVC encoding of SD or HD video with Harmonic's Hierarchical LookAhead and pre-processing technologies

- Optional dual independently compressed outputs per input

- Up to 8 broadcast services per chassis

- Flexible internal video router feeds any audio/video processing module from any source

- Broadcast-grade up/down converter and deinterlacer

- Integrated statmux, or statmux over IP for LAN and WAN

- High-quality integrated decoding with FLEX® technology option

- Harmonic's Iris advanced analytics for video quality monitoring

- Rich audio functionality

- 3DTV frame compatible

The latest evolution of Harmonic's market-leading Electra™ compression family, the Electra 9200 is a multi-channel, multi-service encoder in a compact, energy-efficient 1-RU chassis. Part of a complete video headend solution, the encoder supports main and secondary SD or HD channels of constant bitrate (CBR) or variable bitrate (VBR) video using either MPEG-2 or MPEG-4 AVC encoding. It offers high bandwidth efficiency and channel density—up to four audio/video input processing modules per chassis.

Superior video quality merges with Harmonic intelligent function integration in the Electra 9200 to deliver a high-performance unit that helps increase efficiency while lowering service providers' capital and operating expenses. Comprehensive features include integrated audio encoding tools, GbE networking, flexible internal video routing, and enhanced serviceability via removable power supplies, fan assembly, compression modules and processing cards.

MARKET BENEFITS

Flexible Solution for Cable
The Electra 9200 incorporates proven Harmonic compression technology to support legacy CBR and VBR applications in both HD and SD MPEG-2 formats, and offers support for new IPTV-over-cable applications.

4:1 HD MPEG-2 for Cable
The Electra 9200 can encode up to four statistically multiplexed HD MPEG-2 services within a single chassis, all from HD-SDI, IP or ASI inputs. This feature gives cable operators a high-density, high-value solution that also delivers exceptional video compression performance.

Maximize Channel Capacity for Satellite
Harmonic compression technology maximizes bandwidth efficiency to provide more channels per transponder.

Ideal for IPTV
Designed to deliver broadcast-quality HDTV at less than 5 Mbps, the Electra 9200 maximizes reach and supports Microsoft® Mediaroom® picture-in-picture.

BUSINESS BENEFITS

Reduced CAPEX and OPEX
Multiple services and functions can be delivered from a single high-density, low-power platform.

Pay As You Grow
Processing modules and licenses can be added to the Electra 9200 chassis as your market needs evolve, so you pay only for the features required.

SD MPEG-2 Business Continuity
Content is increasingly produced and distributed exclusively in HD, although legacy SD MPEG-2 set-top boxes are still in widespread use. The Electra 9200 resolves this issue by simultaneously generating both an HD AVC and an SD down-converted output signal from a single HD input.

Maximize Service Uptime
Electra 9200's field-replaceable power supply, fan assembly and processing modules improve serviceability while reducing maintenance costs.

TECHNICAL BENEFITS

Compression Performance
The Harmonic Hierarchical LookAhead™ multi-pass encoding architecture employs market-leading ASIC and programmable DSP/FPGA technologies to provide superior video quality at the lowest possible bitrates. This silicon architecture also provides high-quality deinterlacing.

Integrated Secondary Output
A secondary output on Electra 9200 effectively doubles encoder capacity while offering support for hybrid applications such as down-converting the main channel from HD to SD, or providing a primary VBR channel and a secondary CBR channel (or vice versa).

Dual Power Supplies
Optional redundant, hot-swappable power supplies offer high reliability and simplified serviceability.

Integrated Crosspoint Router
An internal video crosspoint router allows video to be routed at will from any input to any audio/video processing module.

Rich Feature Set
Available functionality includes IP or ASI outputs, support for multiple audio processing adapters, and optional FLEX integrated multiformat decoder with IP, ASI or 8-VSB inputs.

Integrated Statmux
The Electra 9200 streamlines system architectures and reduces the hardware footprint with DiviTrackMX™, Harmonic's widely deployed integrated statistical multiplexing solution.

Statmux Over IP
The Electra 9200 maximizes the efficiency and flexibility of statistical multiplexing with the Harmonic DiviTrackIP™ technology. Applicable for either LAN or distributed WAN environments, DiviTrackIP can support up to 300 ms of WAN roundtrip delay, auto-adjust to IP network variations, and form systems with up to 64 channels per pool. All pools may be monitored simultaneously with Harmonic's Iris® advanced video analytics software.

Preprocessing
Advanced integrated noise reduction capabilities include Harmonic's signature motion-compensated temporal filtering (MCTF), and an adaptive deblocking and mosquito noise reduction filter designed to attenuate compression artifacts that may be present in the video source. A sharpening filter can also enhance the appearance of incoming material. These same technical foundations support powerful deinterlacing to cleanly deliver progressive formats.

Audio Processing
Electra 9200 supports embedded audio and can natively encode up to three stereo pairs (or a single multichannel encode) of MPEG-1 Layer II audio. Dolby® Digital (AC-3), Dolby Digital Plus (E-AC-3) and Dolby E audio can be passed through, and AC-3 and AAC/HE-AAC encoding is available via firmware license. Optional audio input modules (AHC-RAC, IOM-RAC2) can extend Electra's functionality to address a variety of audio processing scenarios.

Audio Leveling
Integrated Jünger Level Magic™ enables compliance with the CALM Act by automatically eliminating audio level changes both within a channel and when switching from one channel to another.

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VIDEO SPECIFICATIONS

Video Compression and Bitrate (CBR/VBR) 4:2:0 Encoding Options

MPEG-2 MP @ ML	1-15
MPEG-2 MP @ HL	2-23 Mbps
	24-45 Mbps, MPEG-2 @ 29.97Hz
MPEG-4 AVC MP @ L3	0.3-8 Mbps
MPEG-4 AVC HP @ L4	1-20 Mbps
Video Processing	Hierarhical LookAhead multipass processing Scene-cut and fade/dissolve detection Dynamic GOP management with adaptive I-picture and B-picture placement Automatic input format (1080i or 720p) detetion and switching
Video Input Filtering	Motion-compensated temporal filtering (MCTF) Horizontal filter Mosquito noise reduction filter Sharpening filter Input deblocking filter
Aspect Ratios	4:3 and 16:9 AFD and WSS control
SD Resolutions and Frame Rates	576i @ 25 480i @ 29.97 x 720, 704, 640, 544, 528, 480, 352 pixels
HD Resolutions and Frame Rates	720p @ 50 and 59.94 x 1280 pixels 1080i @ 25 and 29.97 1080PsF24, x 1920, 1440 and 1280 pixels
Up/Down/Cross Conversion	480i @ 29.97, 720p @ 59.94, and 1080i @ 29.97 576i @ 25, 720p @ 50, and 1080i @ 25 720p @ 59.94 and 1080i @ 29.97 or 1080i @ 29.97 and 720p @ 59.94

ANCILLARY DATA SPECIFICATIONS

Closed Captioning	CEA 608 from Line 21 CEA 708 VANC extraction per SMPTE 334M CEA 708 external caption server per SMPTE 333M
Range of Legacy Support Options	608 to 708 conversion
Ancillary Data and VBI	Digitized waveform or VANC extraction per SMPTE 2031 AFD and Bar, VITC, AMOL, TV Guide, WST (Teletext), Inverted WST, WSS, VPS, PSIP spooling
Digital Program Insertion	SCTE 35 insertion via SCTE 35 and SCTE 104 DPI triggers

AUDIO SPECIFICATIONS

Channels	Up to three stereo pairs or one 5.1 multichannel per video service
Audio Formats	MPEG-1 Layer II, AC-3 (2.0), AAC, HE-AAC (v1 and v2) native encoding AC-3 (2.0 and 5.1), E-AC-3 (2.0 and 5.1) and AAC/HE-AAC (2.0 and 5.1) passthrough
Operating Modes	Mono, stereo

Encoding Bitrate

MPEG-1 Layer II	56-384 kbps
AC-3	56-640 kbps
AAC	32-384 kbps
HE-AAC	32-128 kbps
Optional Audio Modules	AHC-RAC, IOM-RAC2 (See Electra 9200 Audio Input Modules datasheet)
Audio Level Control	Jünger Level Magic™ (available with IOM-RAC2 Audio Input Module)

INPUTS AND OUTPUTS

Video Inputs	Up to four serial digital inputs per SMPTE 259M (SD-SDI) or SMPTE 292M (HD-SDI)
Default Audio Inputs	Embedded audio; up to three stereo pairs or one multichannel per video service
Transport Outputs	MPEG-2 transport stream over UDP/IP (redundant 100/1000 BaseT connectors)
Transport Stream Input Options	AVC over ASI or GbE MPEG-2 over ASI, GbE or 8VSB
Transport Stream Output Option	ASI

SYSTEM MANAGEMENT

Harmonic NMX™ Digital Service Manager

Stand-alone web user interface

POWER

Input Voltage Range	85-132 VAC or 170-264 VAC 42-60 VDC
Line Frequency	47-63 Hz
Typical Consumption	150 W (one channel) 200 W (two channels) 250 W (three channels) 300 W (four channels)
Dual Power Supply Option	

PHYSICAL

Dimensions (W x H x D)	19 in x 1.75 in x 27 in (1 RU) 48.26 cm x 4.45 cm x 68.69 cm
Weight	32 lbs/14.5 kg

ENVIRONMENTAL

Cooling	Eight fans, temperature controlled air flow front to right side
Operating Temperature	+32º to +122º F 0º to +50º C
Storage Temperature	-4º to +176º F -20º to +80º C
Operating Humidity	< 95% non-condensing
Electromagnetic Compliance	FCC Part 15 Class A CE Mark EN 55022:201 EN 55024:1998/A1:2001/A2:2003 EN 61000-3-2:2600+A1:2009+A2:2009 EN 61000-3-3:2008
Safety	UL 1950 and cUL C22.2#950 EN 60950-1:2006+A11:2009

HARDWARE OPTIONS

Part Number	Description
ELC-9200-CHS-AC	Electra 9200 SD or HD, MPEG-2/AVC encoder hardware platform. 1 RU rack mountable chassis. AC power supply.
ELC-9200-CHS-DC	Electra 9200 SD or HD, MPEG-2/AVC encoder hardware platform. 1 RU rack mountable chassis. DC power supply.
ELC-9200-CHS2-AC	Electra 9200 SD or HD, MPEG-2/AVC encoder hardware platform. 1 RU rack mountable chassis. Dual AC power supplies.
ELC-9200-CHS2-DC	Electra 9200 SD or HD, MPEG-2/AVC encoder hardware platform. 1 RU rack mountable chassis. Dual DC power supplies.
ELC-9K-SID	Electra 9200 serial digital video input module. Each module supports two HD/SD SDI inputs with up to three stereo pairs of embedded audio per video.
ELC-9K-AVPM1	Electra 9200 audio/video processing module, providing up to two broadcast or eight multiscreen output streams per module.
ELC-9K-AVPM2	Electra 9200 audio/video processing module, providing up to two broadcast or eight multiscreen output streams per module.
IOM-FLEX-DHC-1	Optional video/audio decoding module for Electra 9200 encoders. Supports up to two video and two audio services per card.
IOM-ASI	DVB-ASI input/output module for Electra and Ion encoders. Four DVB-ASI inputs or outputs. BNC connectors.
IOM-8VSB	ATSC receiver input module for Electra and Ion encoders. Includes four 8VSB tuners. MPEG-2 TS outputs with signal lock indication. For use in conjunction with the FLEX decoder module only.
IOM-AHC-RAC	Optional multichannel audio encoding module for Electra encoders, supporting AC-3 2.0, AC-3 5.1, AAC 2.0, AAC 5.1, HE-AAC v2 2.0 audio encoding
IOM-RAC2	Optional dense multichannel audio decoding board for Electra encoders, supporting up to 16 streams of AC-3 and E-AC-3 encoding; Dolby E, AC- 3, E-AC-3, AAC/HE-AAC and MPEG-1 Layer II decoding; and simultaneous Dolby E to AC-3 2.0 and 5.1 transcoding.
IOM-AB-PWR-SWITCH	A/B power switch module for Electra and Ion encoders. Allows connection of dual, switchable power sources to the same Ion/Electra chassis. Autosensing. AC 110-240V power sources only.