

Mako

HD H.264 Codec



Intelligent IP Video

“Zero Latency” High Definition H.264 Video The Telepresence Codec

The **Mako™** codec defines a new era of video communications where latency is imperceptible and full motion image quality is pristine. It is ideally suited for the demands of telepresence, medical, and interactive broadcast applications. The Mako supports up to 1080p high definition video with 70 milliseconds of end-to-end latency. This is the lowest latency ever achieved by an H.264 codec system providing truly interactive sessions between remote sites.



Zero Latency. Designed using revolutionary encoding technology, the Mako delivers ultimate high definition video quality, super wideband audio, and even computer graphics content over common networks. Some latency is introduced in any video encoding process, but the key is to minimize latency in order to provide seamless communication. Systems that contain excessive delay (such as traditional conferencing and satellite based systems) deliver extremely poor, ineffective, communications and cause dramatic participant fatigue. As a result, such systems can only be used for very short durations. With the Mako, “zero latency” high definition communications is now readily available for telepresence conferencing, medical training and consultation, and interactive broadcast solutions. “Zero Latency” can be considered within systems that operate assuring hand-eye coordination (below 90ms) or operating within a blink of an eye (100 ms). The Mako performs at least 5 to 10 times faster than traditional conferencing codecs and “low latency” broadcast encoders.

The Mako achieves its revolutionary latency performance through the implementation of progressive encoding technology. Unlike other video encoders that need to await a number of frames in order to commence the encoding process, Haivision’s progressive encoding engine starts encoding well before the first frame has even been completely delivered.

Industry Standard. Incorporating industry standard compression, encapsulation, and signaling protocols such as H.264 (MPEG-4 AVC or MPEG-4 part 10) video, AAC audio, and Transport Stream, the Mako not only enables the highest caliber of video communications, but also, where needed, provides simple integration with low cost set top box decode appliances, soft players, QuickTime™ and QuickTime Streaming Server™ (QTSS) environments, storage systems, and Haivision’s Furnace IP video system. Designing communication infrastructure around Haivision’s Mako enables clients to leverage the true power and ubiquity of IP video.

Up to 1080p High Definition with Dual Stream Media Sharing. The Mako is the highest performance HD codec available supporting up to 1080p and achieving end-to-end latency of 70 milliseconds. Each Mako has a digital (HD-SDI/SD-SDI) and an analog (RGBHV/YPbPr) input port. The output design is similar with the addition of DVI support. The Mako can encode up to 1080p video and up to 1280x768 on RGB. Uniquely, the Mako can share its compression power between both input ports simultaneously – each at adjusted frame rates. So, for example, one may wish to encode the video at 720p 30 frames per second and simultaneously encode an RGB source at 1024x768 30 frames per second with perfect synchronization between the video and computer graphics. Or perhaps encode the HD-SDI at 720p30 and the YPbPr at 720p30. Effectively, this gives integrators extreme flexibility in addressing their clients’ exact needs and maximizing resources.



TELEPRESENCE

Connecting conference rooms with pristine audio video connections over networks with multi-stream capabilities.



MEDICAL SYSTEMS

Replacing traditional audio video infrastructure with IP, reducing cost, increasing reach, and maintaining highest quality performance.



LIVE VENUES

Bringing together event sites, church campuses, and remote commentators and delivering seamless multi-site interactivity.



Hai1000 Multi-Stream Encoding Systems. The Mako is an HD encoder/decoder blade that resides in a Hai1000 series of encoding systems. These are available in two varieties: Hai1020 and Hai1060. The Hai1060 model supports up to 5 Mako blades and 10 HD video channels in a single 3 RU frame and a single IP port without the need for any external devices (no MCU required). The Hai1020 provides the most cost-effective solution for deploying a single encoder/decoder in a compact 1RU chassis with up to 2 HD video channels.

The Hai1000 is designed to meet the exact requirements of leading systems integrators. Matched with excellent audio visual products and attention to details with respect to room design, lighting, acoustics, and room control systems, the Hai1000 is the heart of the most critical A/V projects, where quality and reliability are paramount. With the Mako, the Hai1000 offers flawless bi-directional communications, achieves the lowest end-to-end latency, and adheres tightly to industry standards for H.264 video and AAC audio.

The Hai1000 offers the ultimate network video system and global standard for “extreme conferencing” within the world’s foremost boardrooms, telepresence suites, classrooms, control rooms, and medical operating theaters. With the Hai1000 and TRUE-H.264, such performance is now available using less than 50% of the required bandwidth, enabling deployments of this technology even to the most remote locations. The Hai1000 delivers a True-to-life video communication experience at remarkably low bandwidth.



Mako features

- Latency less than 70 milliseconds
- SD and HD up to 1080p
- Full frame rate video
- 150 kbps to 10 Mbps video bitrate
- Additional RGBHV input up to 1280x768 60Hz
- I/O #1 – HD-SDI, SD-SDI, embedded digital audio
- I/O #2 – RGBHV or YPbPr or DVI (output only)
- Separate 4 channel analog audio
- Unique Dual Stream – 2 Channel Encoding (Video & RGB)
- Encoder/decoder design

Hai1000 features

- Hai1060 – up to 5 Mako blades (10 channels)
- Hai1020 – for a single Mako blade (2 channels)
- Multi-Stream System
- Telecom grade reliability
- Robust and extensible frame & blade design
- Web, CLI, and SNMP interfaces
- 1080p, 1080i, 720p, 480i



HMF2 - Performance Standard Definition Video (OPTIONAL)

The hai1000 SD configurations are based on HMF2 codec blade technology supporting a variety of audio/video interfaces. In addition to standard analog (S-Video & composite) and digital (SDI) audio and video, the HMF2 can be ordered with a unique HDMI output module. The HDMI module incorporates very high quality real time image processing and upscaling to exactly match video to the requirements of flat panel (LCD/plasma) displays. The output of the HDMI is a pure 720p/1080i – beautiful flat panel presentation of your video transmission.

The HMF2 blade is multi-format as it can be firmware programmed to support either H.264 (MPEG-4 AVC) or MPEG-2 (optional). Dedicated to maintaining systems compatibility, the HMF2 MPEG-2 is fully compatible with HaiVision’s installed base of hai500 high performance MPEG-2 systems. Further, MPEG-2 and H.264 may co-exist within the same hai1000 chassis, and as well may co-exist with HaiVision’s MAKO-HD high definition H.264 codecs.

SD blade (HMF2) features

- SD D1 and Half D1 Resolution
- 150 kbps to 6 Mbps video bitrate
- As low as 150 millisecond latency
- I/O configurable (PIC) architecture
- Encoder, decoder, or encoder/decode
- SDI, S-Video, Composite Video I/O
- HDMI 720p/1080i output for flat panel
- Main and Enhanced Baseline Profile
- 20 Hz - 22 kHz Audio
- Balanced/unbalanced XLR or RCA Audio

Specifications – Mako, Hai1020, Hai1060

VIDEO ENCODING / DECODING

H.264 AVC (MPEG-4 part 10)

HD-SDI/SDI Resolution:

720x480/576i 25, 30 frames per second
1280x720p 25, 30, 50, 60 frames per second
1920x1080i 25, 30 frames per second
1920x1080p 25, 30 frames per second

YPbPr Resolution:

720x480/576i 25, 30 frames per second
1280x720p 25, 30, 50, 60 frames per second
1920x1080i 25, 30 frames per second

RGBHV Resolution:

SVGA 800x600 Up to 85 Hz
XGA 1024x768 Up to 85 Hz
WXGA 1280x768 Up to 60 Hz

Bit Rates:

HD from 256 kbps to 10 Mbps
SD from 256 kbps to 10 Mbps

Rate Control:

Traffic Shaping

Latency (end to end):

Less than 70ms

Compression Standard:

H.264 AVC (MPEG-4 part 10)
ISO/IEC 14496-10
Baseline and Main Profile
Level 4.1 and lower Intermediate Levels
I, IP framing
Variable Group of Picture (GOP) size

AUDIO ENCODING / DECODING

MPEG AAC

Compression Standard:

MPEG-2 AAC-LC ISO/IEC 13818-7
MPEG-4 AAC-LC ISO/IEC 14496-3

Audio Channels:

Up to 4 per video channel

Bit Rates:

From 32 to 448 kbps per audio pair

Frequency Response:

From 20 Hz to 22 kHz

A-V Synchronization:

Under 20 milliseconds

ADVANCED FEATURES

Logo Overlay

EIA-608-8 Closed Captioning (NTSC Line 21)

Deblocking Filter

Dual port encoding

(HD-SDI with YPbPr or RGBHV)

HiLo-Streaming™

Built-in Downscaling

AUDIO/VIDEO INTERFACES

SDI / HD-SDI (Input/Output):

SMPTE 259M-C 75Ω BNC
SMPTE 296M 75Ω BNC
SMPTE 274M 75Ω BNC
SMPTE 292M 75Ω BNC
Embedded Audio Supported

YPbPr (Input/Output):

CEA_770.2-C
CEA_770.3-C
DB15 to 3xBNC breakout required on input
DVI-I to 3xBNC breakout required on output

RGBHV (Input/Output):

VGA
SVGA
XGA
WXGA
No breakout required on input
DVI-I to VGA DB-15 (breakout required on output)

Audio (Input/Output):

4 analog audio channels
Balanced XLR connectors
Unbalanced RCA connectors
DB15 breakout required, specify when ordering
Embedded Audio Supported on SDI
SMPTE 272M
SMPTE 299M

NETWORK & MANAGEMENT INTERFACES

IP Network Interface:

Ethernet 10/100 Base-T, auto-detect,
Half/Full-duplex

Connector:

RJ45

Networking Protocols:

H.264 over RTP (RFC 3984)
Transport Stream over UDP / RTP
RTP / RTCP

Management Interface:

RS-232
RJ45 to RS-232 DB-9 Management Cable Req'd

Management:

HTTP (web browser)
Command line over Telnet/RS-232
FTP/TFTP
SNMP

Hai1060, 6 slot (3RU)

Temperature:

0° to 50° C [32° to 122° F] operating
-40° to 70° C [-40° to 158° F] non-operating

Dimensions (H x W x D) :

130 x 438 x 343 mm
5.125 x 17.25 x 13.5 inches

Power Requirements:

110-240V AC or -48V DC; 200 W max

Weight:

Approximately 9.1 kg [20 lbs] fully loaded

Relative Humidity:

Up to 95% without condensation

Certification :

UL/CSA/CE, RoHS/WEEE

Compliance:

EN 55022/55024;
FCC Part 15, Subpart B, Class A

Rackmount:

19" included

Hai1020, 2 slot (1RU)

Temperature:

0° to 50° C [32° to 122° F] operating
-40° to 70° C [-40° to 158° F] non-operating

Dimensions (H x W x D) :

44 x 438 x 305 mm
1.75 x 17.25 x 12.0 inches

Power Requirements:

110-240V AC; 125W max.

Weight:

Approximately 4.5 kg [10 lbs]

Relative Humidity:

Up to 95% without condensation

Certification:

UL/CSA/CE, RoHS/WEEE

Compliance:

EN 55022/55024;
FCC Part 15, Subpart B, Class A

Rackmount:

19" included

Ordering information (please obtain complete system quotations from Haivision or an authorized Haivision integration partner)

B-1000-HDED	Mako - MPEG-4 AVC (H.264) HD Encoder/Decoder Blade - HD-SDI w/ AES/EBU and YPbPr/RGBHV w/ 4 Channel Analog Audio - 720p/1080i/1080p
CA-HD-OUTSET	Output cable kit for Mako, includes DVI to HDMI, DVI to DB15, and DB15 to 5BNC
F-1060-AC	Hai1060 6 slots chassis with CPU & IP Ethernet Network Interface Blade (AC Power Supply)
F-1060-DC	Hai1060 6 slots chassis with CPU & IP Ethernet Network Interface Blade (DC Power Supply)
F-1020	Hai1020 2 slots chassis with CPU & IP Ethernet Network Interface Blade (AC Power Supply)
F-1020-MED	Hai1020 2 slots chassis with CPU & IP Ethernet Network Interface Blade (AC Medical Grade Power Supply)

Specifications – HMF2 codec blades

VIDEO ENCODING / DECODING

H.264 AVC (MPEG-4 part 10)

Resolution NTSC/PAL:

Full-D1 720x480/576

Half-D1 352x480/576

Bit Rates:

Encoder: 150 kbps to 6 Mbps

Decoder: 150 kbps to 5 Mbps

Traffic Shaping:

Constant (CBR)

Variable (VBR)

Latency (end to end):

From 190ms to 300ms

Compression Standard:

H.264 AVC (MPEG-4 part 10)

ISO/IEC 14496-10

Baseline and Main Profiles

Level 3.0 and lower Intermediate Levels

I, IP, IBP, IBBP framing

Variable Group of Picture (GOP) size with Intra-

frame insertion at scene cut

Support of CABAC & CA VLC

AUDIO ENCODING / DECODING

MPEG-4 AAC

Compression Standard:

MPEG-4 AAC-LC

ISO/IEC 14496-3

Bit Rates:

From 64 to 256 kbps

VIDEO ENCODING / DECODING

MPEG-2 (optional)

Standard

MPEG-2 according to ISO/IEC 13818-2

Sampling

4:2:0 Main Profile @ Main Level

Bit Rate

400 kbps to 15 Mbps

Framing

I, IP, IBP, IBBP Frame Structure

Group of Pictures

Flexible GOP size from 1 to 127

End to end delay

150 ms – 240 ms

Video Resolution

Full-D1 720x480/576

Half-D1 352x480/576

AUDIO ENCODING / DECODING

MPEG-2 Audio (optional)

Compression Standard:

MPEG-2 layer 1&2 according to ISO/IEC 13818-3

Bit Rate:

< 384 kbps

AUDIO/VIDEO INTERFACES

HMxxxF Analog Input Analog Output Blade

Video Inputs/Outputs

S-Video 4-pin Mini-DIN

Composite 75Ω BNC

Audio Inputs/Outputs

4 analog audio channels

Balanced XLR connectors

Unbalanced RCA connectors

DB15 breakout req'd, specify when ordering

PICSDx Digital Input or Output Interface

Video Inputs/Outputs

Composite 75Ω BNC

SDI SMPTE – 259M-C 75Ω BNC

Audio Inputs/Outputs

4 analog audio channels

Balanced XLR connectors

Unbalanced RCA connectors

DB15 breakout req'd, specify when ordering

Embedded Audio Supported on SDI

PICSCx Analog Input or Output Interface

Video Inputs/Outputs

S-Video 4-pin Mini-DIN

Composite 75Ω BNC

YPbPr 3 x 75Ω BNC

DB15 breakout req'd, specify when ordering

Audio Inputs/Outputs

4 analog audio channels

Balanced XLR connectors

Unbalanced RCA connectors

DB15 breakout req'd, specify when ordering

PICHDO HDMI Digital Output Interface

Video Outputs

HDMI Type A

EDID Display Capability Detect

1080i, 720p, 480p, 480i 50, 60

Audio Inputs/Outputs

4 analog audio channels

Balanced XLR connectors

Unbalanced RCA connectors

DB15 breakout req'd, specify when ordering

Embedded Audio Supported on HDMI

Ordering information (please obtain complete system quotations from Haivision or an authorized Haivision integration partner)

B-1000-HM4EDF	HMF2 MPEG-4 AVC (H.264) Encoder/Decoder Blade (HM4ED-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HM4DF	HMF2 MPEG-4 AVC (H.264) Decoder Blade (HM4D-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HM4EF	HMF2 MPEG-4 AVC (H.264) Encoder Blade (HM4E-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HM2EDF	HMF2 MPEG-2 Encoder/Decoder Blade (HM2ED-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HM4EDC	HMF2 H.264 MPEG-4 AVC Encoder/Decoder Carrier Blade (HM4ED-C) - Requires 1 Input PIC and 1 Output PIC
B-1000-HM4DC	HMF2 MPEG-4 AVC (H.264) Decoder Carrier Blade (HM4D-C) - Requires 1 Output PIC
B-1000-HM4EC	HMF2 MPEG-4 AVC (H.264) Encoder Carrier Blade (HM4E-C) - Requires 1 Input PIC
B-1000-HM2EDC	HMF2 MPEG-2 Encoder/Decoder Carrier Blade (HM2ED-C) - Requires 1 Input PIC and 1 Output PIC
B-1000-PICSCI	HMF2 Analog Input (SCI) PIC - Analog S-Video, Composite Video, Component Video YPbPr, 4 Channel Audio
B-1000-PICSCO	HMF2 Analog Output (SCO) PIC - Analog S-Video, Composite Video, Component Video YPbPr, 4 Channel Audio
B-1000-PICSDI	HMF2 Digital Input (SDI) PIC - SDI, Composite Video, 4 Channel Analog Audio, 4 Channel SDI Embedded Digital Audio
B-1000-PICSDO	HMF2 Digital Output (SDO) PIC - SDI, Composite Video, 4 Channel Analog Audio, 4 Channel SDI Embedded Digital Audio
B-1000-PICHDO	HMF2 HD Digital Output (HDO) PIC - HDMI, Embedded Digital Audio, 4 Channel Analog Audio, 720p/60 or 720p/50
SW-1000-MP2	HMF2 MPEG-2 Encoder/Decoder Firmware for any HMF2 MPEG-4 AVC Blade, enables MPEG-2 on a MPEG-4 AVC encode/decode Blade (switchable)