Makito

RUGGEDIZED HD H.263 ENCODER

AIR

Intelligent IP Video

AIRBORNE EXTREME LOW LATENCY HD H.264
With KLV / CoT Metadata

Makito™ encoders have revolutionized video-over-IP by bringing together high definition 1080p60 performance, excellent image quality, and outstanding performance to a compact and affordable level. Haivision now makes the same technology available for ISR (Intelligence, Surveillance, Reconnaissance) applications by combining the Makito pedigree with the KLV / CoT metadata capabilities of Haivision's widely deployed Piranha™ encoders in a ruggedized package – **the Makito Air™**.

H.264 up to 1080p60. The Makito Air is perfectly suited for today's and tomorrow's challenges. The Makito Air is based on the highly efficient H.264 compression standard saving over 50% of the bandwidth and disk space required by MPEG-2 IP video deployments. It supports HD up to 1080p60 (HD-SDI and 3G-SDI) or conventional SD (SDI or Composite). The Makito Air addresses ISR encoding to H.264 over IP on a resolution / bandwidth scale from CIF as low as 150 kbps to Full HD at 15 Mbps. The Makito Air is fully Compliant, Level A per MISB engineering guidelines.

Makito Air™

Built in Downscaling. In order to address differing data rate limitations, the Makito Air incorporates advanced scaling that can reduce the spatial resolution of the video without affecting image aspect ratios. The Makito Air can even produce two different bitrate (resolution/framerate) H.264 streams simultaneously from the same source. With the Makito Air you can adjust scaling and frame rate settings on-the-fly should controls be established from data rate sensing system.

55ms - Lowest Latency Available. The Makito Air is the fastest HD H.264 encoder available. It can encode HD video to IP in less than 55 milliseconds. The Makito Air produces industry standard MPEG Transport Streams (among other formats) and is compatible with most soft players and set top boxes (such as the ubiquitous Amino STB). However, Haivision also makes available the Makito Decoder technology. Tuned for speed, the Makito Air / Makito Decoder combination can yield an astonishing 70 milliseconds of end-to-end latency. The Makito Decoder is available in high density rack mount packages supporting up to 6 channels per rack unit with HD-SDI and HDMI output.

COTS Benefits. The heart of the Makito Air is the same hardware that is being widely deployed in Haivision's commercial segments, such as medical, education, and enterprise IP video solutions. As such, the Makito Air will not stagnate; it will naturally grow in capability as new challenges are discovered and overcome due to the power and flexibility of the Makito platform.

KLV Metadata. Metadata is critical in the real-time effectiveness and further exploitation of video assets. Encoders must combine all types of data directly within the IP stream, time-stamped synchronous with the video. The Makito Air supports industry standard MISP-compliant Key-Length-Value (KLV) metadata transport within the MPEG-2 transport stream. The metadata is captured by the encoder's serial port. Synchronous transport of the metadata with the associated image frames is guaranteed through Presentation Time Stamp (PTS). The Makito Air as well supports Cursor-on-Target (CoT) data formats, which is converted on-board into standard KLV format prior to being multiplexed in the MPEG Transport Stream..

Makito Air™ (rear)

In the Air or on the Ground. The Makito Air is ideal for onboard installations on manned and unmanned military aircrafts used for Intelligence, Surveillance and Reconnaissance (ISR) applications; where video and metadata are transmitted over either microwave (LOS) or satellite (BLOS) network to operations and exploitation centers. The Makito Air is also suitable for ISR applications on land vehicles such as Humvees also equipped with wireless transmitters. For emergency efforts, the Makito Air is useful for transmitting live video from helicopters above urban areas where a specific event occurred, to News TV stations and government entities such as FBI and/or Police Departments.

Compact and Efficient in Design. The Makito Air is a fully sealed, fanless unit obtaining all of its cooling needs through conduction/convection. Measuring just 5.6 inches wide and 1.6 inches high, 3 Makito Air units can be affixed together to occupy just a single rack unit.

Designing for the Makito Air. Connector Mapping:

J1 Connector Pinout (Ethernet)
(13 pin female Amphenol MIL-DTL-38999 / 20MB35SN)

Pin #	Pin Name	Type	Description
1	ETH_DAP	BI	10/100 BASE-T Transmit differential pair / Gigabit Ethernet differential pair A (bi-dir)
2	ETH_DAN	BI	
3	ETH_DBP	BI	10/100 BASE-T Receive differential pair / Gigabit Ethernet differential pair B (bi-dir)
4	ETH_DBN	BI	
5	ETH_DCP	BI	10/100 BASE-T (Unused) / Gigabit Ethernet differential pair C (bi-dir)
6	ETH_DCN	BI	
7	ETH_DDP	BI	10/100 BASE-T (Unused) / Gigabit Ethernet differential pair D (bi-dir)
8	ETH_DDN	BI	
9	NC		Not Connected
10	NC		Not Connected
11	NC		Not Connected
12	RESETN	IN	Hardware Reset (signal is asserted LOW)
13	GND	REF	Ground

J2 Connector Pinout (Serial Port / Analog Audio)
(13 pin female Amphenol MIL-DTL-38999 / 20MB35SA)

Pin #	Pin Name	Type	Description
1	COM_TXDP	OUT	Serial Interface: RS-232/RS-422 Transmit Data [only use J2-Pin2 in RS-232 mode (shaded in gray)]
2	COM_TXDN	OUT	
3	GND	REF	Shield
4	COM_RXDP	IN	Serial Interface: RS-232/RS-422 Receive Data [only use J2-Pin4 in RS-232 mode (shaded in gray)]
5	COM_RXDN	IN	
6	GND	REF	Shield
7	AUD_IN_LP	IN	Analog Audio interface: LEFT channel differential pair
8	AUD_IN_LN	IN	
9	AUD_LGND	REF	Audio Ground
10	AUD_IN_RP	IN	Analog Audio interface: RIGHT channel differential pair
11	AUD_IN_RN	IN	
12	AUD_RGND	REF	Audio Ground
13	NC		Not Connected

J3 Connector Pinout (Video Coaxial)
(75-ohm BNC)

Pin #	Pin Name	Type	Description
1	VID	IN	SDI / Composite video signal
2	VID_GND	REF	SDI / Composite ground (Cable shield)

J10 Connector Pinout (DC Power)[1]
(5 pin male as Amphenol MIL-DTL-38999/ 20MB5PN)

Pin #	Pin Name	Type	Description
A	PWR_IN	REF	PSU +28VDC Input
B	PWR_GND	REF	PSU ground return
C	NC		
D	CH_GND	REF	Chassis ground
E	NC		

1 The power input of the Makito AIR meets the MIL-STD-704F standard. This standard pertains to "AIRCRAFT ELECTRIC POWER CHARACTERISTICS" and states that a +28 VDC system shall have an input voltage between 22 and 29 VDC; with transients from 18 - 50V (no longer than 12.5ms).

SPECIFICATIONS

Makito Air (S-290E-AIR, S-290E-AIR-COT)
Video (Inputs):

Composite	NTSC/PAL
SD-SDI	SMPTE 259M-C
HD-SDI	SMPTE 292M
	SMPTE 274M
	SMPTE 296M
3G-SDI	SMPTE 424M
	SMPTE 425M

Video Resolutions:
1920x1080p 60/59.94/50/30/24/23.98/29.97/25 Hz
1920x1080i 60/59.94/50 Hz
1280x720p 60/59.94/50/30/29.97/25 Hz
720x480/576i 60/59.94/50 Hz
(interlaced shown in fields per second)
Audio (Input):
Balanced Stereo Analog Audio
Unbalanced Stereo Analog Audio
Embedded Audio
SD-SDI SMPTE 272M
HD-SDI SMPTE 299M

ADVANCED FEATURES
HiLo-Streaming
SD De-interlacing
Built-In Downscaling
Deblocking Filter
EIA-608-B Closed Captioning (NTSC Line 21)
Forward Error Correction
AES Encryption
Logo overlay
Still image transmission
SD aspect ratio configuration
SD AFD and WSS

VIDEO ENCODING
Compression Standard:
H.264 (MPEG-4 AVC part 10)
ISO/IEC 14496-10

Level 4.2 and lower Intermediate Levels
I, IP framing
Configurable Group of Picture (GOP) size
Configurable frame rate
Bit Rates:
SD/HD from 150 kbps to 15 Mbps
Rate Control:
Traffic Shaping
Latency (encode only):
Less than 70ms

AUDIO ENCODING
Compression Standard:
MPEG-2 AAC-LC ISO/IEC 13818-7
MPEG-4 AAC-LC ISO/IEC 14496-3
Audio Channels:
2 per video channel
Bit Rates:
From 32 to 448 kbps per audio pair
Frequency Response:
From 20 Hz to 22 kHz

IP NETWORK INTERFACES
Standard:
Ethernet 10/100/1000 Base-T, auto-detect, Half/Full-duplex
Networking Protocols:
Unicast Streaming
Multicast Streaming (IGMP v3)
Multiple Unicast Streaming
MPEG Transport Stream over UDP / RTP
Direct RTP - H.264 over RTP (RFC 3984)
RTP / RTCP (RFC 3550)
QuickTime RTSP* (RFC 3640)
SAP (RFC 2974)
* Progressive resolutions only

MANAGEMENT INTERFACES
Standard:
RS-232 (optional for x-290E-DVI)
RJ45 to RS-232 (DB-9 Management Cable Req'd.)
Management:
HTTP (web browser)
Command line over Telnet/RS-232
FTP/TFTP
Furnace Portal Server (VF Pilot)

KLV METADATA
MISB Compliant, considering:
IETF RFC 2250 -
Video over IP using MPEG-2 systems (TS mode)
MISB Engineering Guideline 0601.1 -
UAS Datalink Local Metadata Set, Section 5
MISB Recommended Practice 0604 -
Time Stamping Compressed Motion Imagery
SMPTE 336M-2007 Data Encoding Protocol
using Key-Length-Value

Makito Air (S-290E-AIR-x)
Dimensions:
41mm H x 143mm W x 216mm D (1.6"H x 5.6"W x 8.5"D)
Weight:
3.6 lbs.
Power:
28VDC, 17W
MIL-STD connector
MIL-STD-704
Temperature:
Operating: -55° to 50°C
Non-operating: -65° to 85°C
Compliances/Certifications:
Designed for specific sections of:
RTCA-DO-160F
MIL-STD-810F
MIL-STD-704F
IEC60529:2001-02

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

S-290E-AIR   **Makito Air Ruggedized HD/SD H.264 Encoder w/KLV** - SDI (SDI, HD-SDI, 3G-SDI) and Composite input; up to 1080p60 HD Video; 150 kbps to 15 Mbps; 10/100/1000 Ethernet; 28VDC with MIL-STD Connectors.

S-290E-AIR-COT   **Makito Air Ruggedized HD/SD H.264 Encoder w/KLV** - For US Federal Only - SDI (SDI, HD-SDI, 3G-SDI) and Composite input; up to 1080p60 HD Video; 150 kbps to 15 Mbps; 10/100/1000 Ethernet; 28VDC with MIL-STD Connectors.

Items ordered separately:

CA-MIL-SET   **Cable Set**

CA-MIL-CSET   **Connector Set**