Ultra-Compact ISR Video Encoder

The Makito X1 Rugged (MX1) is an ultra-compact H.265/HEVC and H.264/AVC low latency encoder for real-time streaming of MISB-compliant full motion video in the most demanding ISR environments.

**HEVC Encoding at the Edge** Make more informed decisions with better quality video imagery from tactical systems. With dual encoding cores, the Makito X1 can encode HD 1080p60 or SD with H.265/HEVC and H.264/AVC compression simultaneously, offering independent control of scaling, cropping, and encoding parameters. H.265/HEVC support delivers better picture quality at lower bit rates when compared to H.264/AVC, packing more visual information over constrained network links. And with Network Adaptive Encoding, the Makito X1 Rugged can address one of the fundamental challenges of mobile tactical networks: providing quality streams even when network bandwidth is variable or unpredictable. With the Makito X1 Rugged, downstream exploitation systems can receive the best video possible over IP networks, line-of-sight (LOS) and satellite links.

**Small Size, Mighty Encoding** The Makito X1 Rugged is a portable, SWaP-optimized video encoder available as a hardened appliance or OEM board for advanced integrations. About the size of a deck of cards, deploy the Makito X1 appliance in portable and wearable equipment or small platforms in harsh environments around the world. When systems call for tighter integration of ISR capabilities, the OEM board is ideally suited for deep integration within ISR sensor, datalink, or mission systems. The Makito X1 Rugged in either appliance or board form is the smallest, lightest, and most power-efficient (5W) ruggedized H.265/HEVC encoder on the market, leveraging the Makito X heritage for proven reliability, quality and innovation.

**Ultra Low Latency for ISR and Situational Awareness** For real-time decision-making, low latency video is essential. The Makito X1 Rugged video encoder streams high-quality full motion video at encoding latencies suitable for the most demanding Intelligence, Surveillance and Reconnaissance (ISR) applications. Combined with the excellent picture quality at low bit rates, the ultra low latency Makito X1 Rugged addresses the real-time requirements for air, ground, manned or unmanned platforms.

**Compliant Encoding with KLV Metadata from Haivision** Adhering to MISB/STANAG specifications for encoding and KLV metadata, and with support for KLV filtering, Makito X1 Rugged is designed to ensure downstream interoperability with exploitation systems and cross-domain applications. It provides the flexibility to combine H.265/HEVC and H.264/AVC encoded video with synchronous or asynchronous KLV metadata, and optimizes streaming bandwidth through highly efficient encoding options and selective filtering of KLV metadata parameters. Even in the most constrained network environments, it provides the imagery and metadata needed to meet mission requirements.

### FEATURES & BENEFITS

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<th>FEATURES</th>
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<td>Network Adaptive H.265/HEVC Encoding</td>
<td>Ensures the highest quality video even when streaming at lower bit rates over constrained networks</td>
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<td>Rugged Appliance or Board</td>
<td>Immediately deploy the Makito X1 Rugged appliance on small ISR platforms and manpack systems, or deeply integrate the OEM board into ISR sensors, datalinks and mission computers</td>
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<td>Ultra Low Latency</td>
<td>Respond in real-time to mission-critical full motion video</td>
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<td>Interoperable Video &amp; Metadata Filtering</td>
<td>MISB/STANAG-compliant streams and KLV metadata provide downstream compatibility with bit rate optimization via KLV filtering</td>
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<td>Makito X Heritage</td>
<td>Proven technology family for ISR workflows deployed in applications worldwide</td>
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**INPUT VIDEO INTERFACES**
- Composite NTSC/PAL/PAL-M
- SD-SDI SMPTE 259M-C
- HD-SDI SMPTE 292M, 274M, 296M
- 3G-SDI SMPTE 424M (Level A Only)
- SMPTE 425M

**INPUT VIDEO RESOLUTIONS**
- 1920x1080p 60/59.94/50/30/29.97/25/24/23.98 Hz
- 1920x1080i 60/59.94/50 Hz
- 1280x720p 60/59.94/50/30/29.97/25 Hz
- SMPTE 425M

**VIDEO ENCODING**
- 8-bit or 10-bit pixel depth
- Chroma sub-sampling 4:2:0 or 4:2:2
- BT.709 color space and WCG (BT.2020)
- Configurable Group of Picture (GOP) size
- Intra-refresh
- Slice-based encoding

**AUDIO INTERFACES**
- Embedded Audio: CoT to KLV conversion
- KLV or CoT over serial RS-232/422
- KLV or CoT over UDP
- KLV over SDI (SMPTE 336)
- lower intermediate levels
- Main, 10-Bit, Main 4:2:2
- 10-Bit Profiles up to Level 4.2 (1920x1080p60)
- lower intermediate levels

**IP NETWORK INTERFACES**
- Standard: Dual Ethernet 10/100/1000 Base-T
- auto-detect, Half/full-duplex
- Unicast streaming (IPv4 & IPv6)
- Multicast streaming (IGMPv3 & IPv6)
- Path Redundancy – SRT across multiple networks
- MPEG-4 AAC-LC ISO/IEC 14496-3

**MANAGEMENT INTERFACES**
- Standard: Ethernet (IPv4 & IPv6)
- Management: HTTPS (web browser)
- Haivision EMS and Haivision Hub
- Command line over SSH/Telnet/RS-232
- SFTP/TFTP/SCP
- SNMP v3

**SIZE, WEIGHT, POWER**
- Appliance Dimensions: 31.7 mm H x 72.5 mm W x 90.2 mm D
- Appliance Weight: 254g (0.56 lbs)
- 6W at 70°C
- 5W at 40°C
- Power: 5 VDC
- Board Dimensions: 58.0 mm H x 66.0 mm W
- Board Weight: 45g (0.11 lbs)
- Board Dimensions: 58.0 mm H x 66.0 mm W
- Board Weight: 254g (0.56 lbs)
- Temperature: Operating: -40° to 70°C (-25° to 160°F)
- Non-operating: -45° to 85°C (-49° to 185°F)
- Humidity: 0-100% condensing

**TEAMPLIANCE**
- IP67
- RTCA-DO-160G
- STANAG 4609
- MISP 2019
- MIL-STD-810G

**Makito X1 Rugged Product Portfolio & Ordering Information**

**Makito X1 Rugged Appliance**
HD Video Encoder w/ Metadata

**Makito X1 Board**
HD Video Encoder w/ Metadata

**DoDIN APL Certified**
Makito X1 Rugged is on the Department of Defense Information Network Approved Product List (DoDIN APL) under tracking number 2118301.