4K/Multi-HD Remote Production (REMI) Encoder and Decoder

Matrox® Monarch™ EDGE
4K/Multi-HD Remote Production (REMI) Encoder and Decoder

Coupled with the powerful Monarch EDGE decoder, the Monarch EDGE encoding device offers exceptional quality at the lowest latency while securely transporting your video feeds from the event to the centralized production facility. This compact, robust, and low-power remote production (REMI) encoder/decoder pair has made producing live, multi-camera events more affordable than ever by keeping talent in-house. Programs destined for web or over-the-top (OTT) delivery to the cloud can select the 4:2:0 8-bit encoder version, while the 4:2:2 10-bit capable version of the Monarch EDGE encoding device is ideal for demanding, broadcast-quality productions.

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Big Productions, Small Footprint

Easily produce multi-angle live events by extending the production studio to any remote location with a network connection. Monarch EDGE can encode up to four camera feeds from HD or 3G-SDI sources. When an in-studio 4K production requires a remote feed, Monarch EDGE can accept either 4K signals over 12G-SDI, or a quad 3G-SDI to deliver a full-4K stream. All of the supported SDI resolutions will be available on the upcoming ST 2110[1] networked I/O ports using SFP28 connectivity. For events that require more cameras, its compact footprint ensures that two units will fit into a single 1RU space.

Built for High Quality 10-bit H.264 Encoding

The optimized H.264 engine powering Monarch EDGE keeps data rates exceptionally low without sacrificing quality. If quality is of the highest importance, streams can be encoded up to 120 Mbps. Four inputs can be streamed at resolutions up to 1080p60, or one input at 2160p60 using the High 4:2:2 H.264 encoding profile. Furthermore, multiple processes can be performed on each input by powerful scaling and de-interlacing engines. This enables each input to be streamed at multiple resolutions and bitrates simultaneously, which is useful for remote monitoring.
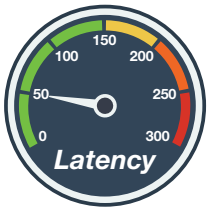
Exceptionally Low Latency

In live environments, high signal transport latencies are detrimental to remote production (REMI) quality. Audio and video may be hard to maintain, and return channels to the field are often too far behind the live action, hindering seamless staff interaction. With "glass-to-glass" latencies as low as 100ms between video input at encoder and video output at the decoder, Monarch EDGE achieves some of the lowest latencies on the market while using standard 1 GbE networks.

Keep it In-sync

All channels encoded by Monarch EDGE will be locked to a single clock, and the streams generated will have timestamps to allow the Monarch EDGE decoder to realign the streams at output. For the very best results, the cameras feeding the encoding appliance should be genlocked together to ensure each SDI source is in phase. Monarch EDGE offers a genlock output connector with a signal that can be distributed to those cameras if an on-site sync generator is not available.

Flexible Protocols

There are a variety of streaming protocols available to Monarch EDGE users for use during remote productions (REMI). On closed networks, MPEG-2 TS or RTSP streams can be selected for delivery. For cloud-based destinations, or when the network is congested, SRT or RTMP may be more appropriate. SRT is a new open-source format that provides the reliability of RTMP, while reducing latency, for use on open networks. SRT streams can also be encrypted if security is a concern. The Monarch EDGE decoder supports the processing of MPEG-2 TS, RTSP, and SRT protocols.

Simple, Easy-to-Use Tally and Talkback

The Monarch EDGE remote production (REMI) encoder and decoder pair provides the transfer of tally signals and talkback channels to facilitate bi-directional communication between on-site camera operators and in-studio personnel. Eight tally signals can be sent from the production switcher to the decoder, which transfers these signals to the encoder for output to the cameras. Two balanced analog inputs and two balanced analog outputs are found on both the encoder and decoder for interfacing with local intercom systems.

Comprehensive Connectivity

Both the Monarch EDGE encoder and decoder devices offer flexible, future-proof video connectivity with 3G, 12G SDI, and ST 2110[1] over 25 GbE network connections.

Convenient, Centralized Control

Monarch EDGE Control Hub is a powerful application that provides management and configuration over all Monarch EDGE encoder and decoder units on the network. This convenient software provides authorized users with high-level views of all devices on the network, and enables full access and control from a single, easy-to-use interface.

Localized Preview

Offering up to four simultaneous input (encoder) or output (decoder) previews on a single desktop monitor, Monarch EDGE's DisplayPort output allows operators to ensure that SDI and ST 2110 signals are valid and ready to use. Monarch EDGE Control Hub allows users to effortlessly configure how they would like to preview audio sources of input. From the DisplayPort and line out, users can choose to monitor one audio input at a time, or mute all.

Robust and Practical Design

Both the Monarch EDGE encoder and decoder were built with reliability in mind. An LCD screen on the front of the appliance allows the user to quickly access its status and configuration settings. A locking power connector safeguards against connection loss during remote productions (REMI). Redundant Ethernet (1 GbE) ports allow users to control the device from one port while the second port transfers media. Alternatively, with the encoder, users can opt to send the same streams taking completely separate network paths from each port. Finally, Monarch EDGE's compact design ensures it can be installed in a fly-pack or with a second Monarch EDGE unit in a 1RU-rack space.

Matrox Monarch EDGE Encoder Decoder Connections

1. USB 1	**7.** Analog Audio Output	**14.** *SFP28 Ports
2. USB 2	**8.** Analog Audio Input	**15.** Display Port
3. Power LED	**9.** Genlock	**16.** USB 3
4. Reset Button	**10.** Balanced Audio	**17.** Gigabit Ethernet Port
5. LCD Panel	**11.** Tally Signals	**18.** Power Connection
6. Navigation and Configuration Buttons	**12.** 3G SDI	**19.** Power Switch
	13. 12G SDI	

*SFP module supplied by third party

Technical Specifications

Connectivity

Input connections
- 1x 12G SDI per SMPTE ST 2082
- 3x 3G SDI per SMPTE ST 425 (Level A mapping only)
- UHD support using 4x SDI per SMPTE ST 425-5
  - Square division
  - 2x sample interleave[1]
- 2x SFP 28 network ports (up to 25 Gbps)[1]
- Capture up to four independent 3 Gbps video streams or one 12 Gbps (4Kp60) stream encapsulated per SMPTE ST 2110-10, -20, and -21. Seamless protection (redundancy) according to SMPTE ST 2022-7.

Output connections
- 1x 12G SDI per SMPTE ST 2082
- 3x 3G SDI per SMPTE ST 425 (Level A mapping only)
- UHD support using 12G SDI per SMPTE ST 2082
  - Square division
  - 2x sample interleave[1]
- 2x SFP 28 network ports (up to 25 Gbps)[1]
- Output up to four independent 3 Gbps video streams or one 12 Gbps (4Kp60) stream encapsulated per SMPTE ST 2110-10, -20, and -21. Seamless protection (redundancy) according to SMPTE ST 2022-7.

Resolutions
- 2160p at 50, 59.94, 60 fps
- 1080p at 25[1], 29.97[1], 30[1], 50, 59.94, 60 fps
- 1080i at 25, 29.97, 30[1] fps
- 720p at 50, 59.94, 60 fps

Configurable genlock
- Bi-level genlock output (encoder)
- Bi-level or tri-level genlock input (decoder)

Digital audio
- 8x channels of embedded audio support per SDI. Two channels per input supported with first release.[1]

Analog audio[2]
- 2x channels of balanced analog audio input via XLR connector
- 2x channels of balanced analog audio output via XLR connector[1]
- 1 channel of unbalanced stereo audio output via 1/8" TRS connector
- All sampled at 48 kHz

Audio processing
- Embedded or analog audio channels can be compressed as a stereo pair or processed as PCM[1] (uncompressed audio)
- Multi-channel audio support as separate audio pairs[1]

Control and management

Access
- Monarch EDGE Control Hub dedicated Windows® application
- RESTful HTTP API[3]

Physical
- On-device buttons and screen for basic set up and monitoring operations

Monitoring output
- 1x DisplayPort (HD output only)

Compression

Codecs
- Video: H.264/MPEG-4 part 10 (AVC)
- Audio: AAC-HE and AAC-LC

Bitrate per stream
- Video: Up to 120 Mbps
- Audio: From 32 to 256 Kbps

Chroma sub-sampling
- 4:2:2 (8-bit and 10-bit), 4:2:0 (8-bit and 10-bit) – MDG4/E10/I
- 4:2:0 (8-bit only) – MDG4/E8/I
- 4:2:2 (8-bit and 10-bit), 4:2:0 (8-bit and 10-bit) – MDG4/D/I

Encoding controls
- Up to 5.2 level support
- GOP size and structure
- Variable and constant bit rate support
- Average max/min data rate controls
- Encoding frame rates offered independent of input frame rates

Decoding controls
- Scaling of HD/UHD resolutions
- Frame rate conversions

Profile
- Up to High 4:2:2 profile (Hi422P)

Latency
- Encode latency as low as 100ms glass-to-glass (network transfers not included in value)

Encode density/workflow examples
- One (1) 3840 x 2160p @60 fps (encoded as 4:2:0 or 4:2:2) plus one 1080p (4:2:0 8 bit) proxy stream
  OR
- Four (4) 1920 x 1080 @60 fps (encoded as 4:2:0 or 4:2:2) plus four 720p30 (4:2:0) proxy stream

  There are a number of additional encoding profiles that can be generated per input.

VANC ancillary data processing (SDI and IP)[1]
- Closed captioning (CC) embedded in VANC processing as CEA-608/708
- Vertical interval timecode (RP-188)
- HDR and colorimetry metadata

Tally
- 8x tally signals (sent to cameras - encoder)
- 8x tally signals (sent from switcher - decoder)
- Tally ports available via a 15-pin D-SUB Connector

Streaming protocols
- MPEG-2 TS over UDP
- RTP/RTSP
- Native RTP[1] (unicast or multicast)
- SRT
- RTMP

Network
- 2x RJ45, 100/1000BASE-T Ethernet
- 2x MSA-compatible SFP28 cage supporting 10 GbE and 25 GbE modules[1]

Physical and power

Product dimensions (length x width x height)
- 8.53x7.45x1.68 in (21.7x18.9x4.3 cm)
- Rack-mountable; two Monarch EDGE appliances can fit in 1 RU space

Product weight
- 3.65 lbs (1,660 g)

Operating conditions
- 32 to 104 deg. F (0 to 40 deg. C), 20 to 80% relative humidity (non-condensing)

Power
- Line voltage: 12 volts
- Total power consumption: 45 watts [avg.]
- Connector: DIN 4

Power supply
- Line voltage: 100-240 VAC
- Frequency: 50-60 Hz
- Input: external AC/DC adapter - IEC320-C14
- DIN4 locking power connector

Regulatory
- EMI: FCC Class A, CE Mark Class A, ACMA C-Tick Mark, VCCI
- Power-supply safety: UL/CUL(UL60950-1), TUV-GS(EN60950-1), T-LICENSE(BS EN60950-1), CCC(GB4943.1-2011), PSE(J60950), SAA(AS/NZS60950-1), KC-MARK(K60950), S-MARK(IEC60950-1)
- RoHS directive 2002/95/EC

Warranty
- Two-year limited warranty with free online or telephone support

Ordering information

MDG4/E10/I
- Monarch EDGE appliance with 4:2:0 8-bit, 4:2:0 10-bit, and 4:2:2 10-bit encoding
- Includes IEC-C14 power cord (US, UK, AUS, EUR)

MDG4/E8/I
- Monarch EDGE appliance with 4:2:0 8-bit encoding
- Includes IEC-C14 power cord (US, UK, AUS, EUR)

MDG4/D/I
- Monarch EDGE appliance with 4:2:0 8-bit, 4:2:0 10-bit, and 4:2:2 10-bit decoding
- Includes IEC-C14 power cord (US, UK, AUS, EUR)

MRCH/RACK/KIT
- Monarch Rack Mount Kit. Can fit up to two Monarch EDGE units in a 1RU space

PWR/SUP/MDG
- Monarch EDGE power supply unit. Does not include IEC-C14 power cord. These cables must be sourced locally.

MDG/AUD/CBL
- Monarch EDGE break out audio cable. Provides two input channels and two output channels. DB15 to XLR I/O.

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1. Enabled with future firmware update.
2. Available via optional audio cable.
3. Contact Matrox representative for availability.

Matrox is a market leader in the 4K and HD digital video hardware and software fields, offering accelerated H.264 encoding, streaming, AV signal conversion, capture/playout servers, and CGs. Matrox's Emmy award-winning technology powers a range of multi-screen content creation and delivery platforms used by broadcasters, telcos, cable operators, post-production facilities, live event producers, videographers, and AV professionals worldwide. Founded in 1976, Matrox is a privately held company headquartered in Montreal, Canada.
For more information, visit **www.matrox.com/video**.

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