

# 4K/MULTI-HD REMOTE PRODUCTION (REMI) ENCODER AND DECODER



## Matrox® Monarch™ EDGE 4K/multi-HD Video Encoder and Decoder for Remote Production

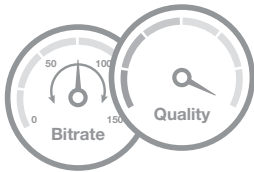
The Monarch EDGE E4 encoder is ideal for demanding, broadcast-quality productions and live, multi-camera events, with encoding of up to four synchronized HD streams or one UHD 4Kp60 stream of securely encrypted, low latency, HDR 10-bit 4:2:2 video on industry-standard transport protocols like SRT. Improve production efficiency with Tally and Talkback and easily tackle the largest shows with multi-unit ganging to transmit dozens of sync streams. Use a Monarch EDGE D4 decoder for ultra-low latency and high-quality video transport. Programs destined for over-the-top (OTT) or cloud delivery can encode low bit rate 4:2:0 8-bit streams.

Or choose Monarch EDGE S1, a simultaneous encode/decode appliance that provides return feeds to multi-camera production crews in the field.



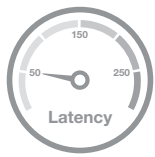
## Big Productions, Small Footprint

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. For events that require more cameras, its compact footprint ensures that two units will fit into a single 1RU space. The Monarch EDGE 10-bit encoder is reconfigurable.



## 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.

## 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 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

## 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.



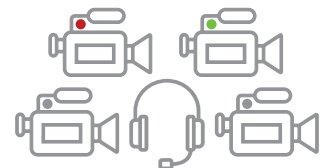
## Versatile Recording

Monarch EDGE offers the ability to record SDI inputs – at the user’s quality of choice – while simultaneously streaming using the user’s preferred transport protocol. Recordings can be saved to USB 3.0 attached storage or to local networks. Monarch EDGE makes sharing post-event recordings easier than ever with the ability to record to the popular H.264 codec with MOV and MP4 wrapper options. This Monarch EDGE feature allows for ISO recordings of SDI inputs, which can be used for post-event editing or serve as backup recordings.



## Simple, Easy-to-Use Tally<sup>1</sup> 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 21101 over 25 GbE network connections. Each of the Monarch EDGE encoder’s SDI inputs supports 16 channels of embedded audio. Eight of these channels can be included in each stream using MPEG-2 or SRT protocols. Delivering multi-lingual or multi-channel productions is easy with Monarch EDGE.

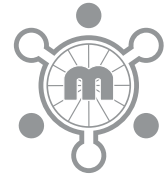
## Ancillary data for automation and viewer experience

Monarch EDGE supports contribution and distribution workflows by sending and receiving ancillary data, including closed captioning and SCTE messaging. Easily integrate into automated workflows for playout and ad insertion and transmit closed captions to enhance audience engagement. Monarch EDGE improves operational efficiency and strengthens the overall viewer experience, all with the highest video quality, making it a trusted choice for broadcasters.



## Centralized command, convenient contro

Enhance your experience with Monarch EDGE devices through Monarch EDGE Commander Center. Manage and access your Monarch EDGE devices locally or online via a web browser, without additional software installation requirements. Benefit from web-based firmware updates and included technical support to ensure your devices are up-to-date and running smoothly. Monarch EDGE Control Hub software enables you to discover all Monarch EDGE units on a local network through a Windows® desktop application.



## 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 21101 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
2. USB 2
3. Power LED
4. Reset Button
5. LCD Panel
6. Navigation and Configuration Buttons
7. Analog Audio Output
8. Analog Audio Input
9. Genlock
10. Balanced Audio
11. Tally Signals
12. 3G SDI
13. 12G SDI
14. SFP28 Ports
15. DisplayPort
16. USB 3
17. Gigabit Ethernet Port
18. Power Connection
19. Power Switch

1. 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 and B mapping)
- UHD support using 4x SDI per SMPTE ST 425-5
  - Square division
  - 2x sample interleave<sup>1</sup>

### 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<sup>1</sup>

### Resolutions

- 2160p at 50, 59.94, 60 fps
- 1080p at 23.98, 24, 25, 29.97, 30, 50, 59.94, 60 fps
- 1080i at 25, 29.97, 30 fps
- 720p at 50, 59.94, 60 fps

### Genlock

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

### Digital audio

- 16x channels of embedded SDI audio is supported per input
- 16x channels of audio support per encode using SRT or MPEG-2 TS

### Analog audio<sup>2</sup>

- 2x channels of balanced analog audio input via XLR connector
- 2x channels of balanced analog audio output via XLR connector
- 1 channel of unbalanced stereo audio output via 1/8" TRS connector

### Audio processing

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

### USB ports

- 2x USB 2.0 (front)
- 1x USB 3.0 (back)

### Confidence preview

- 1x DisplayPort 1.1
- Maximum resolution: 1920x1080

### Multi-unit synchronization support

- Yes

### Reconfigurable I/O

- Yes. Monarch EDGE E4 10-bit SKU only

## Control and management

### Access

- Matrox Monarch EDGE Command Center (web UI)
- Monarch EDGE Control Hub dedicated Windows® application
- RESTful HTTP API<sup>3</sup>

### Physical

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

## Compression

### Codecs

- Video: H.264/MPEG-4 part 10 (AVC)
- Audio: AAC-HE, AAC-LC and PCM S302M

### 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/I2
- 4:2:0 (8-bit only) – MDG4/E8/I2
- 4:2:2 (8-bit and 10-bit), 4:2:0 (8-bit and 10-bit) – MDG4/D/I2

### 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

- 4:2:2 workflows
  - 1x 3840x2160p @60fps plus 1x 1080p30 proxy stream (8-bit) or
  - 4x 1920x1080p @60fps plus 4x 720p30 proxy stream (8-bit)
- 4:2:0 workflows
  - 2x 3840x2160p @60fps or 8x 1920x1080p @60fps or 16x 1920x1080p @30fps

## VANC ancillary data transport as per ST-2038

- Closed captioning (CC) embedded as CEA-608/708
- SCTE-104 messages (Matrox encoder to decoder)
  - SCTE-104 to SCTE-35 translation
  - SCTE-35 to SCTE-104 translation
- Vertical interval timecode (ST 12-2)<sup>1</sup>
- HDR and colorimetry metadata<sup>1</sup>

## Tally<sup>4</sup>

- 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 or RTP
- RTP/RTSP
- Native RTP (unicast or multicast)
- SRT (Caller, Listener, Rendez-Vous and Stream ID modes)
- RTMP (encoder only)

## Network

- 2x RJ45, 100/1000BASE-T Ethernet
- 2x MSA-compatible SFP28 cage supporting 10 GbE and 25 GbE modules<sup>1</sup>

## 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/I2

- 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/I2

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

### MDG4/D/I2

- 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.

## Accessories

### NRG Redundant Power Supply

- NRG-5-1DB: Rack tray with one NRG RPSU pre-installed
- NRG-5-2DB: Rack tray with two NRG RPSU pre-installed

1. Enabled with future firmware update.

2. Available via optional audio cable.

3. Contact a Matrox Video representative for availability.

4. This feature is offered via a 15 Position Pin D-Sub Standard Connector. With the help of a Pinout diagram, a cable can be assembled to interface to any tally output interface on the vision mixer.

## Contact Matrox Video

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