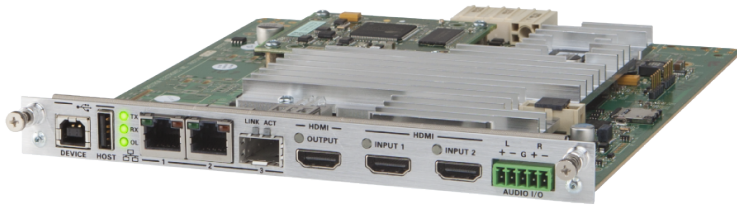


DM NVX® 4K60 4:4:4 HDR Network AV Encoder/Decoder Card with Downmixing



- 4K60 4:4:4 video over standard Gigabit Ethernet
- HDR10 video support
- Real-time video performance over the network
- Pixel Perfect Processing technology
- Enterprise-grade security including 802.1X, Active Directory® credential management, TLS, and AES-128
- HDCP 2.2 compliant
- Configurable as an encoder or decoder
- Two auto-switching HDMI® inputs
- One HDMI output with 4K60 4:4:4 scaler
- Video wall processing
- Dynamic text overlay capability
- Adaptive bit rate
- Analog audio embedding or de-embedding
- 7.1 surround sound audio with downmixing
- AES67 audio embedding or de-embedding
- Breakaway audio
- USB 2.0 and KVM signal extension and routing
- Copper and fiber Ethernet connectivity
- Network port selection
- Automatic point-to-point connectivity
- CEC device control
- Easy setup via built-in web pages
- Compatibility with a Crestron® 3-Series® or later control system
- Streamlined management using DM NVX Director™ virtual switching appliances
- .AV Framework™ technology support
- XiO Cloud® service support
- Crestron Home™ OS support
- API for full control of the DM-NVX-351C
- Designed for installation into a DMF-CI-8 chassis

Crestron® DM NVX® technology transports ultra high-definition 4K60 4:4:4 video over standard Gigabit Ethernet with no perceptible latency or loss of quality. Using standard network switches and CAT5e UTP wiring, a DM NVX system delivers a high-performance virtual matrix routing solution that is economically advantageous and infinitely scalable for any enterprise or campus-wide 4K content distribution application. Professional onboard scaling, High Dynamic Range support (HDR10), and HDCP 2.2 compliance ensure the ultimate in picture quality and compatibility for all of today's varied media sources.^{1,2}

The DM-NVX-351C is an AV over IP encoder/decoder card that occupies one slot of a DMF-CI-8 card chassis. The card is designed to function as either a transmitter or receiver in a high-density rack-mount installation. Capable of handling a network AV installation of any size, the DM-NVX-351C includes features such as secure web-based control and management, auto-switching HDMI® inputs, a scaling HDMI output, video wall processing, an analog audio input or output, surround sound to stereo downmixing, native AES67 transmit and receive capability, USB 2.0 and KVM integration, and support for copper and fiber Ethernet connectivity.^{2,3}

Real-Time 4K60 Video Distribution

Engineered for demanding conference room and classroom applications, DM NVX technology ensures real-time, full-motion 4K60 video performance for the presentation of multimedia, videoconferencing, and live camera images. Interactive functions such as gameplay and the use of a mouse are fluid and natural.

A DM NVX system is engineered for stability and reliability. Line-synchronized outputs ensure perfect synchronization of content across multiple displays for applications such as digital signage and video walls. Variable Multicast TTL (Time To Live) enables traversing multiple network routers for optimal flexibility.

Pixel Perfect Processing Technology

A DM NVX system incorporates Pixel Perfect Processing technology, which provides flawless video transport in all applications. Depending on the operating mode, the DM-NVX-351C can encode or decode a video signal to achieve imperceptible end-to-end latency of less than 1 frame. The image quality of the source is maintained across a 1-Gigabit network at any resolution up to 4K60 4:4:4.

Enterprise-Grade Security

Using advanced security features and protocols such as 802.1X authentication, Active Directory® credential management, AES-128 content encryption, PKI authentication, TLS, SSH, and HTTPS, a DM NVX system delivers a true enterprise-grade network AV solution engineered to fulfill demanding IT policies.

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Encoder or Decoder Functionality

The DM-NVX-351C is configurable to operate as either a network AV encoder or decoder:

- As an encoder, the DM-NVX-351C allows the HDMI signal of the output of a switcher, computer, [AirMedia®](#) gateway, or other media source to be transmitted over the network to one or many decoders.¹
- As a decoder, the DM-NVX-351C receives the signal from a DM NVX encoder and feeds it to the input of a switcher or display device via the HDMI output. The decoder can quickly and easily switch between multiple encoders on the network alongside locally connected HDMI sources.¹

The DM-NVX-351C provides a versatile, cost-effective solution for applications that require encoder and decoder operating modes in a single card. The operating mode can be reconfigured dynamically in less than 1 minute via a control system or web browser or via the [DMF-CI-8](#) front panel.

Auto-Switching HDMI® Inputs

The DM-NVX-351C includes two HDMI inputs. Switching between the two inputs can be performed automatically using auto-switching mode, programmatically via a control system, manually via the [DMF-CI-8](#) front panel, or through a computer using a web browser.¹

HDMI Output with 4K60 4:4:4 Scaler

When the DM-NVX-351C is configured as a decoder, the HDMI output feeds the decoded signal to the HDMI input of a local display device, switcher, or other equipment. The built-in scaler ensures an optimal image, scaling the encoded source resolution up or down to match the native resolution of the display device. When the DM-NVX-351C is configured as an encoder, the HDMI output can be used to feed a local display, confidence monitor, or audio system.^{1,4}

Video Wall Processing

A video wall composed of up to 64 individual displays can be configured using multiple DM NVX endpoints. Each endpoint provides fully adjustable zoom capability and bezel compensation to accommodate a range of video wall configurations and display types. One DM NVX endpoint is required per display, supporting configurations of up to eight wide by eight high.

Text Overlay

The ability to display dynamic or fixed text on screen provides a means to label the video source or to display special instructions, schedules, announcements, alerts, and other messaging.

Adaptive Bit Rate

In DM NVX encoder mode, adaptive bit rate can be enabled or disabled using the web interface or a control system. Adaptive bit rate enables the encoder to automatically set the bit rate required for the input resolution of the stream; for example, the adaptive bit rate for a common resolution such as 1920x1080p@60Hz (1080p60) is automatically set to 400 Mbps. Adaptive bit rate makes better use of the available bandwidth.

Analog Audio Embedding or De-embedding

A balanced stereo analog audio port is included, which can be configured as either an input or output. As an input, the port allows a stereo audio source to be connected and combined with the video signal from either HDMI input or the incoming network video stream. As an output, the port can provide a stereo line-level signal to feed a local sound system or analog audio switcher. The output volume is adjustable via a control system or web browser.⁵

7.1 Surround Sound Audio with Downmixing

DM NVX technology supports the lossless transport of 7.1 surround sound audio signals, including Dolby® TrueHD, Dolby Atmos®, DTS HD®, DTS:X®, and uncompressed linear PCM. The DM-NVX-351C can decode the incoming multichannel surround sound signal, whether from the network or an HDMI input, and downmix that signal to stereo. The stereo downmix signal is automatically routed to the onboard analog output⁵, while the HDMI output can be configured to output either stereo or multichannel signals. As an encoder, the DM-NVX-351C distributes both stereo and multichannel signals simultaneously over the network, allowing either signal to be selected at any decoder on the network.

AES67 Audio Embedding or De-embedding

AES67 support allows the selected audio source to be transmitted as a 2-channel AES67 source while another AES67 2-channel audio stream is received from a Crestron DSP or other third-party device and combined with the video signal.

In DM NVX encoder mode, the received AES67 audio stream can be output via the local HDMI output, primary AV stream, secondary audio stream, and analog audio output. In DM NVX decoder mode, the received AES67 audio stream can be combined with the video and then output via the HDMI output and analog audio output.

NOTE: An AES67 stream that is received by a DM NVX endpoint cannot be transmitted from that endpoint.

Breakaway Audio

A DM NVX decoder can select and combine separate video and audio signals from two different inputs—even two different encoders.⁶

DM NVX® 4K60 4:4:4 HDR Network AV Encoder/Decoder Card with Downmixing

Copper and Fiber Ethernet Connectivity

The DM-NVX-351C includes two RJ-45 1000BASE-T LAN ports (Ethernet ports 1 and 2) and one SFP port (Ethernet port 3). The SFP port enables connection to a fiber-optic network with the use of the appropriate Crestron [SFP-1G](#) Series transceiver module (sold separately). A selection of modules is offered to accommodate various multimode and single-mode fiber types.³

Ethernet port 1, 2, or 3 can be used to transport video over a Gigabit Ethernet network. Ports 1 and 2 can also be used to provide network connections for an [AirMedia](#) gateway, display device, or other local device. In addition, the ports can be used to daisy-chain multiple endpoints feeding a single-source video wall or individual displays that show the same video image.²

A DM NVX system can be deployed on an existing corporate or campus network or on a dedicated network. For information about network requirements and guidelines, refer to the [DM NVX AV-over-IP System Design Guide](#), Doc. 7977.

Network Port Selection

Network port selection enables network traffic to be managed and segregated based on traffic type. Internal VLANs are used to route different traffic types to specific external Ethernet ports, which can be assigned to the various traffic types. AES67 audio can be separated from the primary video and control network resulting in a dedicated audio network.

Automatic Point-to-Point Connectivity

Point-to-point connectivity enables a DM NVX encoder to be connected directly to a DM NVX decoder to stream video, audio, and USB signals. Rather than being connected to a Gigabit Ethernet network, a 1000BASE-T Ethernet port of an encoder is connected directly to a 1000BASE-T port of a decoder. By default, point-to-point mode is enabled and can be disabled if desired.

When point-to-point mode is enabled and a direct connection between an encoder and decoder is automatically detected, no additional configuration is required for the encoder or decoder to operate in point-to-point mode; however, the operating mode of a DM-NVX-351C card must be configured correctly. If the card is to function as an encoder, the operating mode of the card must be configured as an encoder. If the card is to function as a decoder, the operating mode must be configured as a decoder.

USB 2.0 and KVM Integration

DM NVX technology supports the extension of USB signals, which can be switched and routed alongside the AV signal or separately via a control system. USB 2.0 HOST and DEVICE ports are provided on the DM-NVX-351C, allowing a USB mouse, keyboard, or other peripheral device to be connected to a remote endpoint and routed to a computer or other host at the local endpoint. In addition to KVM switch functionality, various types of USB peripherals are supported, including

whiteboards, touch screens, game controllers, cameras, mobile devices, headsets, and flash drives.⁷

USB 2.0 data transport can be configured for Layer 2 or Layer 3. Layer 2 supports USB signal extension in point-to-point and multipoint applications. USB signals can be routed from the HOST port of up to seven remote DM NVX endpoints to the DEVICE port of a single local DM NVX endpoint. Layer 2 also supports Crestron USB extenders ([USB-NX2-LOCAL-1G](#), [USB-NX2-REMOTE-1G](#), [USB-EXT-DM-LOCAL](#), and [USB-EXT-DM-REMOTE](#)). The USB extenders can be used in locations that do not include DM NVX endpoints. USB signals can be routed between DM NVX endpoints and USB extenders under the management of a control system.⁸

USB 2.0 Layer 3 data transport supports USB signal extension in DM NVX point-to-point applications across VLANs. USB-NX2 and USB-EXT-DM devices do not support Layer 3.

CEC Device Control

The DM-NVX-351C provides a gateway for controlling devices via CEC (Consumer Electronics Control) over the HDMI connections. Under the management of a control system, the DM-NVX-351C can control display devices and other equipment via CEC, potentially eliminating the need for any dedicated serial cables or IR emitters.

CEC over the HDMI output can also enable the display device to be turned on or off automatically without the use of a control system.

Web-Based Setup

Setup of the DM-NVX-351C is accomplished by using a web browser. Full control and monitoring of the card is enabled through integration with a control system or with a DM NVX Director™ virtual switching appliance.

Streamlined Management Using DM NVX Director Virtual Switching Appliances

For applications that are small to moderate in size, a network of DM NVX endpoints can be configured and controlled with the use of a control system. For larger enterprise and campus-wide signal routing applications, adding a DM NVX Director virtual switching appliance ([DM-NVX-DIR-80](#), [DM-NVX-DIR-160](#), or [DM-NVX-DIR-ENT](#)) enhances and streamlines the entire configuration and control process. A DM NVX Director appliance provides a central point of management and enables the creation of multiple virtual matrix switchers through one easy-to-use web-based portal.

High-Density, Card-Based Solution

The DM-NVX-351C is designed for installation into a [DMF-CI-8](#) card chassis, providing a scalable high-density solution for applications requiring multiple encoders and decoders in one equipment rack.

For additional design tools and reference documents, refer to the DM NVX web page at <https://www.crestron.com/nvx>.

DM NVX® 4K60 4:4:4 HDR Network AV Encoder/Decoder Card with Downmixing

Specifications

Encoding/Decoding

Video Codec: Pixel Perfect Processing

Video Resolutions: Up to 4096x2160@60Hz (DCI 4K60), 4:4:4 color sampling, HDR10 and Deep Color support

Audio Formats: Primary multichannel (up to 8-channel LPCM or encoded HBR 7.1 surround sound), secondary 2-channel LPCM

Bit Rates: 200 to 950 Mbps⁹

Streaming Protocols: RTP, SDP

Container: MPEG-2 transport stream (.ts)

Session Initiation: Multicast via secure RTSP

Copy Protection: HDCP 2.2, AES-128, PKI

Video

Input Signal Types: HDMI with HDR10, Deep Color, and 4K60 4:4:4 support^{1,10} (Dual-Mode DisplayPort™ interface and DVI compatible¹¹)

Output Signal Types: HDMI with HDR10, Deep Color, and 4K60 4:4:4 support¹ (DVI compatible¹¹)

Switcher: 3x1 in decoder mode (HDMI 1, HDMI 2, Stream), 2x1 in encoder mode, manual or auto-switching, breakaway audio⁶, Crestron QuickSwitch HD™ technology

Scaler: 4K60 4:4:4 video scaler with motion-adaptive deinterlacing, intelligent frame rate conversion, Deep Color support, HDR10 support, widescreen format selection (zoom, stretch, maintain aspect ratio, or 1:1), video wall processing up to 8 wide x 8 high, static or dynamic text overlay

Copy Protection: HDCP 2.2

Maximum Resolutions: Common resolutions are shown in the table below. Custom resolutions are supported at pixel clock rates up to 600 MHz.

Scan Type	Resolution	Frame Rate	Color Sampling	Color Depth
Progressive	4096x2160 DCI 4K and 3840x2160 4K UHD	24 Hz	4:4:4	36 bit
		30 Hz	4:4:4	36 bit
		60 Hz	4:2:2	36 bit
		60 Hz	4:4:4	24 bit
	2560x1600 WQXGA	60 Hz	4:4:4	36 bit
	1920x1080 HD 1080p	60 Hz	4:4:4	36 bit
Interlaced (Input Only)	1920x1080 HD 1080i	30 Hz	4:4:4	36 bit

Audio

Input Signal Types: HDMI (Dual-Mode DisplayPort interface compatible¹¹), analog stereo⁵

Output Signal Types: HDMI (multichannel pass-through or 2-channel downmix), analog stereo (2-channel downmix)⁵

Digital Formats: Dolby Digital®, Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, Dolby Atmos, DTS®, DTS ES, DTS 96/24, DTS HD High Res, DTS HD Master Audio, DTS:X, LPCM up to 8 channels

Analog Formats: Stereo 2-channel

Analog-To-Digital Conversion: 24-bit 48 kHz

Digital-To-Analog Conversion: 24-bit 48 kHz

AES67: 24-bit 48 kHz

Analog Performance:

Frequency Response: 20 Hz to 20 kHz ±0.5 dB
S/N Ratio: >95 dB 20 Hz to 20 kHz A-weighted
THD+N: <0.005% @ 1 kHz
Stereo Separation: >90 dB

Analog Output Volume Adjustment: -80 to +20 dB

Audio Delay: 0 to 1200 ms

Communications

Ethernet: 100/1000 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, TCP/IP, UDP/IP, CIP, DHCP, SSL, TLS, SSH, SFTP (SSH File Transfer Protocol), IEEE 802.1X, IPv4, Active Directory authentication, variable Multicast TTL, HTTPS web browser setup and control, Crestron 3-Series or later control system integration

USB: USB 2.0 host or device signal extension and routing, Layer 2 or Layer 3

HDMI: HDCP 2.2, EDID, CEC

DM NVX (via Ethernet): HDCP 2.2, AES-128 AV content encryption with PKI authentication, RTP, secure RTSP, SDP, ONVIF, IGMPv2, IGMPv3, SMPTE 2022, FEC (Forward Error Correction)

DM NVX® 4K60 4:4:4 HDR Network AV Encoder/Decoder Card with Downmixing

Connectors

USB DEVICE: (1) USB Type-B connector, female;
USB 2.0 device port;
USB signal extender port for connection to a computer or other USB 2.0 host⁷

USB HOST: (1) USB Type-A connector, female;
USB 2.0 host port;
USB signal extender port for connection to a mouse, keyboard, or other USB 2.0 device;⁷
Available Power: 500 mA at 5 VDC

ETHERNET 1– 2: (2) 8-pin RJ-45 connectors, female;
100BASE-TX/1000BASE-T Ethernet ports²

ETHERNET 3: (1) SFP port;
Accepts one Crestron [SFP-1G](#) Series transceiver module³

HDMI OUTPUT: (1) HDMI Type A connector, female;
HDMI digital video/audio output¹ (DVI compatible¹¹)

HDMI INPUT 1 – 2: (2) HDMI Type A connectors, female;
HDMI digital video/audio inputs;¹
(DVI and Dual-Mode DisplayPort interface compatible¹¹)

AUDIO I/O: (1) 5-pin 3.5 mm detachable terminal block;
Balanced/unbalanced stereo line-level audio input or output;⁵
Input Impedance: 24k Ohms balanced/unbalanced;
Maximum Input Level: 4 Vrms balanced, 2 Vrms unbalanced;
Output Impedance: 200 Ohms balanced, 100 Ohms unbalanced;
Maximum Output Level: 4 Vrms balanced, 2 Vrms unbalanced

Controls and Indicators

TX: (1) Green LED, indicates unit is in encoder (transmitter) mode

RX: (1) Green LED, indicates unit is in decoder (receiver) mode

OL: (1) Green LED, indicates an online connection to a control system via Ethernet

Ethernet 1 – 2: (4) LEDs, green indicates Ethernet link status, amber indicates Ethernet activity

Ethernet 3 LNK: (1) Green LED, indicates Ethernet link status

Ethernet 3 ACT: (1) Green LED, indicates Ethernet activity

HDMI OUTPUT: (1) Green LED, indicates video signal transmission at the HDMI output

HDMI INPUT 1 – 2: (2) Green LEDs, each indicates sync detection at the corresponding HDMI input

Construction

Plug-in card, occupies (1) card slot in a [DMF-CI-8](#) card chassis, includes metal faceplate

Weight

15.1 oz (427 g)

Compliance

UL® Listed for US and Canada, CE, IC, FCC Part 15 Class B digital device

Models and Accessories

Model

DM-NVX-351C: DM NVX 4K60 4:4:4 HDR Network AV Encoder/Decoder Card with Downmixing

Available Accessories

For a list of available accessories, visit the [DM-NVX-351C](#) product page.

Management Tools

DM-NVX-DIR-80: DM NVX Director Virtual Switching Appliance for 80 Endpoints

DM-NVX-DIR-160: DM NVX Director Virtual Switching Appliance for 160 Endpoints

DM-NVX-DIR-ENT: DM NVX Director Virtual Switching Appliance for 1000 Endpoints

DM NVX® 4K60 4:4:4 HDR Network AV Encoder/Decoder Card with Downmixing

Notes:

1. 4K60 4:4:4 performance and HDR support require the use of HDMI cables and couplers with a minimum TMDS bandwidth of 18 Gbps. If 4K60 4:2:0 or 4K30 4:4:4 performance is acceptable, cables and couplers with a minimum bandwidth of 10.2 Gbps may be used. Bandwidth loss is cumulative; therefore, performance may be reduced when inserting multiple cables and couplers inline.
2. The minimum cable required for DM NVX over 1000BASE-T Ethernet (copper) is unshielded CAT5e. All Ethernet ports on the DM-NVX-351C are for connection to an Ethernet network or device; they cannot be connected to the DM® ports of other Crestron devices.
3. The use of a fiber-optic Ethernet port requires the purchase of a Crestron [SFP-1G](#) Series transceiver module (sold separately). All Ethernet ports on the DM-NVX-351C are for connection to an Ethernet network or device; they cannot be connected to the DM ports of other Crestron devices.
4. When the DM-NVX-351C is in encoder mode, the HDMI output resolution is matched to the resolution of the encoded source.
5. The analog audio port can function as an input or output—not both.
6. Audio from one onboard HDMI input cannot be combined with video from the other onboard HDMI input. Combining audio from one encoder with video from another encoder is possible using the secondary 2-channel audio stream only. Multichannel audio from one encoder cannot be combined with video from another encoder.
7. The DM-NVX-351C can be configured to accept the connection of a USB device or a USB host—not both. Crestron DM NVX products are engineered to deliver maximum compatibility with the widest possible range of USB products. Crestron does not guarantee that all USB products are compatible with DM NVX products. Consult the [DM NVX AV-over-IP System Design Guide](#), Doc. 7977, for USB bandwidth considerations.
8. The DM-NVX-351C is not compatible with the USB HID signal extender technology found in other Crestron DM products.
9. The minimum bit rate for 4K60 video is 350 Mbps. A bit rate below 350 Mbps may display a black screen.
10. 3D formats are not supported.
11. HDMI connections require an appropriate adapter or interface cable to accommodate a DVI or Dual-Mode DisplayPort signal. [CBL-HD-DVI](#) interface cables are available separately.

This product may be purchased from select authorized Crestron dealers and distributors. To find a dealer or distributor, please contact the Crestron sales representative for your area. A list of sales representatives is available online at www.crestron.com/How-To-Buy/Find-a-Representative or by calling 855-263-8754.

This product is covered under the Crestron standard limited warranty. Refer to www.crestron.com/warranty for full details.

The specific patents that cover Crestron products are listed online at patents.crestron.com.

Certain Crestron products contain open source software. For specific information, please visit www.crestron.com/opensource.

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