

PRIME Matrox IP Playout Configuration User Guide

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OVERVIEW

This user guide is an addendum to the Prime Payout Configuration Guide. It describes the additional Payout Configuration required for Matrox IP Devices.

The current Prime MX and HX platforms support SMPTE 2110 using Matrox ST 2110 Network Adapters (Network Interface Controllers). The hardware supported by Prime are the Matrox DSXLE5 IP Q25 or the DSXLE4 IP E.

SMPTE 2110

Matrox IP supports Video, Key, Audio, and Ancillary Data in separate data streams for each Video Channel conforming to ST 2110-20, ST-2110-30, ST-2110-40, including support for ST 2022-7 redundancy.

SMPTE 2059

Matrox IP supports Genlock over IP conforming to SMPTE 2059-2.

SMPTE 2022-6

For transitional compatibility with SDI systems, the DSXLE4 IP E supports SMPTE 2022-6, colloquially known as SDI IP, where Audio and Ancillary Data streams are bound to the Video Data Stream.

MATROX DRIVER AND SUPPORTED OPERATING SYSTEM

Matrox IP is supported on Windows 10 using Matrox DSX.Topology-Utils Driver version 10.1.101. This driver is automatically installed as a component within the Prime Installer. It is downloadable through the Compact Installer.

Existing MX and HX platforms using the DSXLE4 IP E will require the firmware to be upgraded from 9.9.1 to be compatible with Prime 3.8 and later.

MATROX IP2110 CONNECTOR CONFIGURATION

DSXLE5 IP Q25

The Matrox IP DSXLE5 Q25 supports 2 Primary and 2 Redundant Network Connections over 25 GbE using SFP (*Small Form-factor Pluggable*) Transceivers.

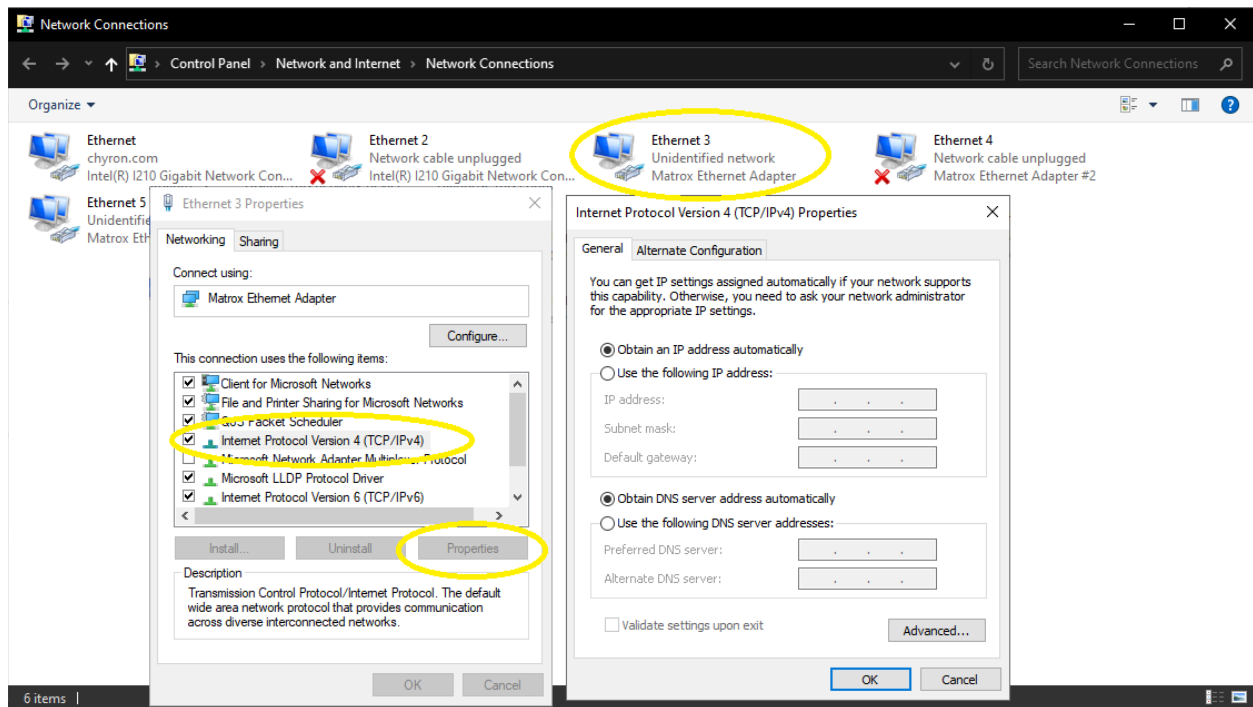
There are two sets of IP settings for each SFP; one for the Matrox network adapter for ST 2110 and one for the genlock over IP settings conforming to SMPTE ST 2059-2. The IP settings consist of an IPv4 address, a network mask, and an IPv4 address for the gateway.

Network Adapter Configuration

The Matrox network adapters can be configured statically by manually setting the IP settings in the Windows Network Connections control panel, or dynamically using a DHCP server. The Matrox network adapters are configured dynamically by default.

To do so manually, your Network Administrator must use the Network Connections Control Panel. The Matrox Ethernet Adapters are listed in order, representing SFP A to SFP D.

To configure a Static IPv4 Address, the user must select Internet Protocol Version 4 (TCP/IPv4) Properties, and then apply properties manually.



Matrox Network Adapter Configuration for the DSXLE5 IP Q25 using Windows

Genlock over IP Configuration (SMPTE 2059)

The screenshot shows the 'Matrox IP2110 Connectors' configuration window. It includes a sidebar with navigation options like Video Channels, Clip Players, Clip Recorders, Playlists, Atlas, Matrox IP2110 Connectors, External Data, Settings, and Advanced. The main area is divided into sections for SFP A, SFP B, SFP C, SFP D, and Genlock. Each SFP section has fields for Address, Gateway, Subnet Mask, DHCP (Enabled/Disabled), Address, Gateway, Subnet Mask, Domain, IP Mode, Delay, and DSCP. The Genlock section has a dropdown for SFP A and a Genlock dropdown menu. The window also has a File menu (CG) and buttons for New, Save As..., and Delete. The License is CG.

	SFP A	SFP B	SFP C	SFP D	Genlock
Address	169.254.246.46	169.254.201.94	169.254.101.142	169.254.37.126	SFP A
Gateway	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	
Subnet Mask	255.255.0.0	255.255.0.0	255.255.0.0	255.255.0.0	
DHCP	Enabled	Enabled			
Address	0.0.0.0	0.0.0.0			
Gateway	0.0.0.0	0.0.0.0			
Subnet Mask	0.0.0.0	0.0.0.0			
Domain	127	127			127
IP Mode	Multicast	Multicast			Multicast
Delay	End to End	End to End			End to End
DSCP	0	0			0

Genlock over IP Configuration with SMPTE 2059 for the DSXLE5 IP Q25

For Matrox IP Devices, the Prime Playout Configuration has an additional **Matrox IP2110 Connectors** tab available, presenting display of the Matrox Network Adapters as configured by Windows, as well as allowing additional configuration of Genlock over IP using SMPTE 2059 for the Primary and Redundant Networks.

The Q25 has dedicated SFP A and C for the Primary Network, and SFP B and D for the Redundant Network. As such, configuration of Genlock over IP using SMPTE 2059-2 is supported independently for the Primary and Redundant Network Adapters (SFP A and B, respectively)..

The IP settings for the Matrox Network Adapters as configured by Windows, corresponding to each SFP (A through D), are visible for display as read only settings for ease of use only: These settings can be configured statically by manually setting the IP settings in the Windows Network Connections control panel, or dynamically using a DHCP server

Address. Indicates the IPv4 Address of the Network Adapter as configured by Windows.

Gateway. Indicates the IPv4 Gateway of the Network Adapter as configured by Windows.

Subnet Mask. Indicates the IPv4 Subnet Mask of the Network Adapter as configured by Windows.

The IP settings for Genlock over IP using SMPTE 2059-2 are available to configure for the Primary Network (SFP A) and the Redundant Network (SFP B):

DHCP. Indicates that DHCP (Dynamic Host Configuration Protocol) is enabled for this system.

Address. Indicates the static IPv4 address, if DHCP is disabled.

Gateway. Indicates the static IPv4 Gateway, if DHCP is disabled.

Subnet Mask. Indicates the static IPv4 Netmask, if DHCP is disabled.

Domain. Indicates the time server clock domain number to use. Range is 0 to 127.

IP Mode. Indicates the type of internet protocol mode to use for the time server connection.

Delay. Indicates the type of delay mechanism to use for the time server connection.

DSCP. Indicates that the Type of Service (ToS) is Differentiated Service Code Point (DSCP). Range is 0 to 63.

The **Genlock** dropdown presents which SFP Network Adapter is specified as the Matrox IP Device's master genlock clock. The default is Auto, which provides a Best Network Master Selection.

DSXLE4 IP E

The Matrox IP DSXLE4 E supports 1 Primary and 1 Redundant Network Connection over 10 GbE using SFP (*Small Form-factor Pluggable*) Transceivers.

The Matrox IP network adapters can be configured statically by manually setting the IP settings or dynamically using a DHCP server. The Matrox network adapters are configured dynamically by default.

The Matrox DSXLE4 IP E is fully configured from within the Prime Payout Configuration. The Matrox network adapter is configured using either DHCP or a Static IPv4 Address.

The screenshot shows the 'Matrox IP2110 Connectors' configuration window. On the left is a sidebar with a tree view containing: Video Channels, Clip Players, Clip Recorders, Playlists, Matrox IP2110 Connectors (selected), External Data, and Settings. The main window has a title bar with standard OS controls and buttons for Import, Export, and Help. The configuration is organized into three columns: SFP A, SFP B, and Genlock. Each column has a DHCP dropdown (all set to 'Enabled') and text input fields for Address, Gateway, and Subnet Mask (all set to '0.0.0.0'). Below these, there are three columns for SMPTE 2059 settings, each with a Domain spinner (set to '0'), an IP Mode dropdown (all set to 'Multicast'), a Delay dropdown (all set to 'End to End'), and a DSCP spinner (all set to '0'). At the bottom right are 'OK', 'Cancel', and 'Apply' buttons.

	SFP A	SFP B	Genlock
DHCP	Enabled	Enabled	Auto
Address	0.0.0.0	0.0.0.0	
Gateway	0.0.0.0	0.0.0.0	
Subnet Mask	0.0.0.0	0.0.0.0	

	SMPTE 2059	SMPTE 2059	SMPTE 2059
Domain	0	0	0
IP Mode	Multicast	Multicast	Multicast
Delay	End to End	End to End	End to End
DSCP	0	0	0

Matrox Network Adapter and Genlock over IP Configuration with SMPTE 2059 for the DSXLE4 IP E

Network Adapter Configuration

DHCP. Indicates that DHCP (Dynamic Host Configuration Protocol) is enabled for this system.

Address. Indicates the static IPv4 address.

Gateway. Indicates the IPv4 Gateway.

Subnet Mask. Indicates the IPv4 Netmask.

Genlock over IP Configuration (SMPTE 2059)

Domain. Indicates the time server clock domain number to use.

IP Mode. Indicates the type of internet protocol mode to use for the time server connection.

Delay. Indicates the type of delay mechanism to use for the time server connection.

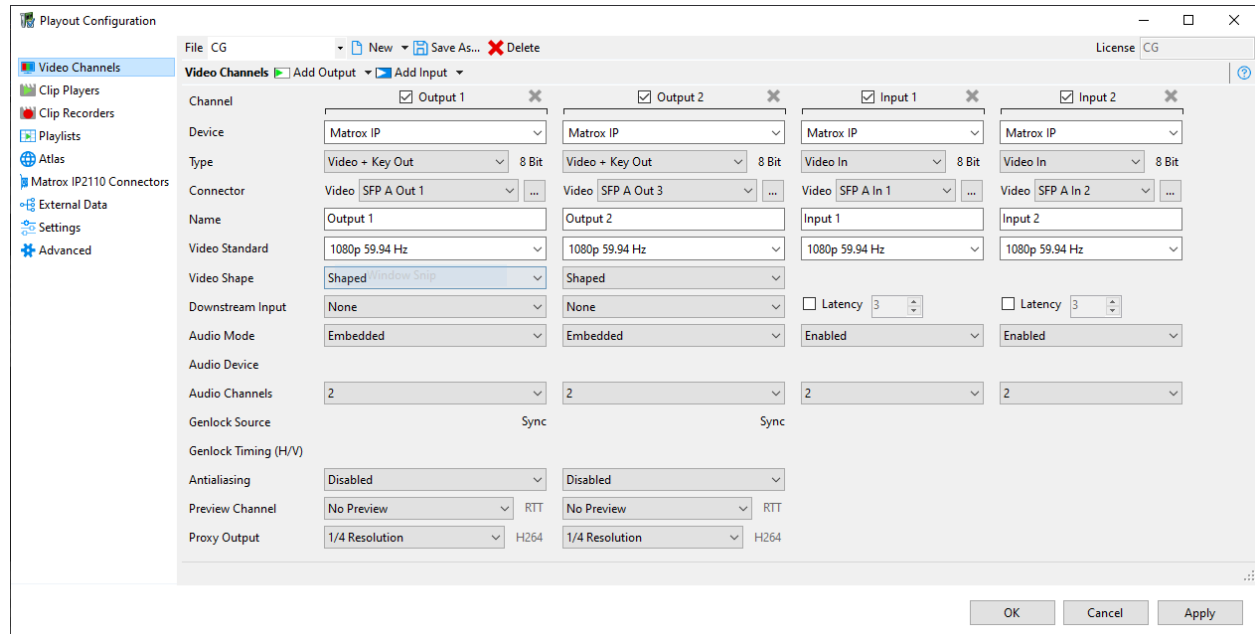
DSCP. Indicates that the Type of Service (ToS) is Differentiated Service Code Point (DSCP).
Range is 0 to 63

SMPTE 2022-6

The Matrox DSXLE4 IP E supports a firmware toggle between SMPTE 2110 and SMPTE 2022-6. The Playout Configuration reflects the current firmware state of the Device. The DSXLE5 IP Q25 firmware can not be reconfigured to support SMPTE 2022-6.

MATROX IP VIDEO CHANNELS

The Matrox IP Device is presented alongside other Devices in the Video Channels tab of the Prime Payout Configuration. The Matrox IP Device is unique from other IO Devices in that it requires the selection of an individual Connector of the Device's available SFPs.



Matrox IP Video Channels using the DSXLE5 IP Q25 Device

IP Video Channel Configuration

Each Video Channel is separately configured by specifying individual IP streams for Video, Key, Audio, and Ancillary Data (see *Matrox IP Input and Output Connector below*) using the Connector dropdown.

A single Audio and Ancillary Stream is linked to the Video Stream. If the Channel Type is Video + Key, then a separate Video Stream is reserved for the Key. When viewed external to Prime, such as through an NMOS Node, the streams are paired accordingly.

	Q25		
SFP A			
Video Stream	Key Stream	Audio Stream	Ancillary Stream
IP Video In/Out 1	IP Video In/Out 2	IP Audio In/Out 1	IP Ancillary In/Out 1
IP Video In/Out 3	IP Video In/Out 4	IP Audio In/Out 3	IP Ancillary In/Out 3
SFP C			
IP Video In/Out 17	IP Video In/Out 18	IP Audio In/Out 129	IP Ancillary In/Out 33
IP Video In/Out 19	IP Video In/Out 20	IP Audio In/Out 131	IP Ancillary In/Out 35

Examples of paired IP Video, Key, Audio, and Ancillary Streams visible to NMOS.

IP Input Audio Configuration

For an IP Input Channel, the expected Audio Channel Count is able to be configured depending on the Audio Format of the associated IP Input Audio Stream.

Similar to improperly configured Video, if the expected Audio Channel Count is improperly set, then malformed Audio will be present in the Audio Mix.

According to IP 2110-30, when the IP Audio Stream uses an Audio Packet Duration of 125 microseconds, then additional options of 32 or 64 channels are able to be assigned to the IP Input Channel's Audio Channel Count. However, as Prime Engine does not yet support more than 16 Channels in its Audio Mix, if an IP Audio Stream with 32 or 64 Channels is fed to the Input, then the Audio Mix will decimate the content to the first 16 Channels.

Modifying the IP Input Channel's Video Standard and Audio Channel Count in response to an NMOS IS-05 Input Connection Request (through an SDP session profile) is not yet supported. Refer to the separate *Prime IP NMOS Configuration Guide* for more detail.

IP BANDWIDTH AND SUPPORTED CONFIGURATIONS

The Q25 supports up to 16 Video Channels for each SFP, for a total of 32 Input and 32 Output Channels.

The 25GbE bandwidth of the Q25 supports 2160p Video Standards, up to 2 using Video and Key, with Redundancy..

Care must be taken to not exceed bandwidth limitations on the card when using multiple channels in 1080p or 2160p Video Standards.

	Q25	
Video Standards	Channel Count	Connector Name
720p, 1080i, 1080p30 (Video)	32	SFP A 1 to 16 SFP C 1 to 16
720p, 1080i, 1080p30 (Video + Key)	16	SFP A 1 to 8 SFP C 1 to 8
1080p50, 1080p60 (Video)	16	SFP A 1 to 8 SFP C 1 to 8
1080p50, 1080p60 (Video + Key)	8	SFP A 1 to 4 SFP C 1 to 4
2160p50, 2160p60 (Video)	4	SFP A 1 to 2 SFP C 1 to 2
2160p50, 2160p60 (Video + Key)	2	SFP A 1 SFP C 1

Video Channels Supported (Bidirectionally) for the DSXLE5 IP Q25. The Q25 supports up to 32 Input and 32 Output Channels in HD, or 4 in UHD when used Downstream (eg Key is not Enabled).

	E (Default Flow)			E (Alternate Flow)		
Video Standards	Total	Name	Redundancy	Total	Name	Redundancy
525i, 625i, 720p, 1080i, 1080p30 (Video)	4	SFP A 1 to 4	Yes	4	SFP A 1 to 2 SFP B 1 to 2	Yes
525i, 625i, 720p, 1080i, 1080p30 (Video + Key)	2	SFP A 1 to 2	Yes	2	SFP A 1 SFP B 1	Yes
1080p50, 1080p60 (Video)	3	SFP A 1 to 3	Yes	4	SFP A 1 to 2 SFP B 1 to 2	No
1080p50, 1080p60 (Video + Key)	1	SFP A 1	Yes	2	SFP A 1 SFP B 1	No

Video Channels Supported for the DSXLE4 IP E. The E supports up to 4 Input and 4 Output Channels in SD/HD. Redundancy is limited in 1080p (3G) due to bandwidth constraints.

Connectors are assigned automatically when adding a Video Channel, and can be re-assigned by the user. Connector availability is limited for the channel based on its bandwidth requirement.

Video Standard	Video	Video and Key
720p, 1080i, 1080p30	~1..5G	~3G
1080p50, 1080p60	3G	6G
2160p25, 2160p30	6G	12G
2160p50, 2160p60	12G	24G

IP Bandwidth Requirements Required for Validation Purposes on the DSXLE5 IP

Due to the flexibility of assigning IP Input and Output Connectors to individual SFPs, the user may mistakenly assign an invalid configuration during the configuration process. In this case, the Prime Payout Configuration will warn the user that a validation error was encountered.

When the **IP Bandwidth Is Exceeded**, the user must remove Video Input or Output Channels or lower their bandwidth by changing the Video Standard.

When **Redundant Connectors are In Use**, the user must re-assign Video Input or Output Channels to use a unique connector index. This is a requirement as each Channel must have a unique Flow assignment (see *Matrox IP Input and Output Connector below*).

Genlock

Genlock configuration has been moved to the Matrox IP 2110 Connector Configuration tab, as Genlock over IP using SMPTE 2059-2 is the only Genlock setting available for Matrox IP Devices.

MATROX IP INPUT AND OUTPUT CONNECTORS

IP Stream Configuration

SMPTE 2110 supports a separate flow for each Video, Key, Audio, and Ancillary Data stream, which must be configured individually for each Video Channel. This configuration is available beside the Video Channel's SFP Connector Name.

The IP Stream configuration requires at minimum a Multicast or Destination Address and Port.

Refer to guidance from your IP Network Administrator to determine IPv4 assignment for each individual IP Stream. All other available settings are also documented below, which are guided by the requirements of your particular IP network infrastructure.

Ease of Use Settings

When Redundancy is enabled, settings are initially copied from the respective Primary stream. This includes the Destination Address and Port, which must be modified by the user.

For ease of use, Lock Mode can be enabled, so that only the assignment of settings for the Video Flow is required by the user. Settings for Key, Audio, and Ancillary Data are cloned. The Primary and Redundancy Destination Port follows a defined incremental pattern offset from the user defined Video value eg. when Video is 3000, Key is defined as 3001, Audio as 3002, and Ancillary Data as 3003.

INPUT CONNECTOR FLOW CONFIGURATION

	Video	Key	Audio	Ancillary Data
Multicast Address	232.145.20.1	232.145.20.1	232.145.20.1	232.145.20.1
Destination Port	3000	3001	3002	3003
RTP Payload Filter	96	96	96	96
Multicast Join Type	IGMP Version 3	IGMP Version 3	IGMP Version 3	IGMP Version 3
IGMP Version 3 Filter	Inclusion	Inclusion	Inclusion	Inclusion
	196.254.62.138	196.254.62.138	196.254.62.138	196.254.62.138
	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0
	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0
	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0
Packet Interval Threshold	65534	65534	65534	65534
Redundancy	Enabled	Enabled	Enabled	Enabled
Multicast Address	232.145.21.1	232.145.21.1	232.145.21.1	232.145.21.1
Destination Port	3000	3001	3002	3003
IGMP Version 3 Filter	Inclusion	Inclusion	Inclusion	Inclusion
	196.254.62.138	196.254.62.138	196.254.62.138	196.254.62.138
	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0
	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0
	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0
Packet Interval Threshold	65534	65534	65534	65534
Audio Packet Duration	125us			

Matrox IP Input Connector Flow Configuration

Primary SFP

Multicast Address. Indicates the reception multicast IPv4 address.

Destination Port. Indicates the reception User Datagram Protocol (UDP) port.

RTP Payload Filter. Indicates the RTP (Real-time Transfer Protocol) Payload ID to capture.

Multicast Join Type. Indicates the type of membership request made when the IPv4 address is a multicast address. Either None, eg. Unicast or IGMP Version 2 or Version 3 to flag Multicast is supported.

IGMP Version 3 Filter. When the Multicast Join Type is IGMP Version 3, provides additional configuration of a Filter List for Source Specific Multicast (SSM). This also Indicates whether the Filter List is an Exclusion or Inclusion list or IPv4 Source Addresses.

Packet Interval Threshold. Indicates the threshold for generating the time interval between the IP packets alarm on the main IP stream. For video, the increment is 6.4 nanoseconds, for audio the increment is 102.4 nanoseconds, and for ancillary data the increment is 819.2 nanoseconds.

Audio Packet Duration. Indicates the duration of the incoming audio packet. The audio channel count supported on the Audio Stream is based on this packet timing.

Redundancy. Enable the redundant stream for seamless reconstruction conforming to SMPTE ST 2022-7.

Redundancy SFP

Multicast Address. Indicates the redundant reception multicast IPv4 address.

Destination Port. Indicates the redundant reception User Datagram Protocol (UDP) port.

IGMP Version 3 Filter. When the Multicast Join Type is IGMP Version 3, provides additional configuration of a Filter List for Source Specific Multicast (SSM) on the redundant stream. This also Indicates whether the Filter List is an Exclusion or Inclusion list or IPv4 Source Addresses.

Packet Interval Threshold. Indicates the threshold for generating the time interval between the IP packets alarm on the redundant IP stream. For video, the increment is 6.4 nanoseconds, for audio the increment is 102.4 nanoseconds, and for ancillary data the increment is 819.2 nanoseconds.

NMOS IS-05 - Dynamic Input Connection Support

The IP Input Connector settings may be modified dynamically using an **NMOS IS-05 Input Connection Request**. To use dynamic connector configuration in this way, the system must first be configured for NMOS IS-05. Refer to the *Prime IP NMOS Configuration Guide* section *NMOS IS-04 and IS-05 Workflows* for more information.

With dynamic connector configuration, the **Primary** and **Redundant Multicast Address** and **Destination Port**, as well as the **IGMPv3 Filter's Primary** and **Redundant Source Address** are provided dynamically as part of the NMOS IS-05 Input Connection Request. By default, the IPv4:Port may be defaulted to 0.0.0.0:0. It will be assigned a default IPv4 so that the flow will be visible through NMOS IS-04, but the flow will be disabled by default.

The remaining settings are not part of the Input Connection Request and must be configured statically. This includes the **RTP Payload Filter**, **Multicast Join Type**, **Packet Interval Threshold**, and the **Audio Packet Duration**.

OUTPUT CONNECTOR FLOW CONFIGURATION

	Video	Key	Audio	Ancillary Data
Destination Address	255.169.20.1	255.169.20.1	255.169.20.1	255.169.20.1
Destination Port	3000	3001	3002	3003
Source Port	0	0	0	0
RTP Payload Filter	0	0	0	0
RTP Sync Source	0	0	0	0
Type of Service	DSCP	DSCP	DSCP	DSCP
DSCP	0	0	0	0
Packet Time to Live	0	0	0	0
Redundancy	Enabled	Enabled	Enabled	Enabled
Destination Address	255.169.20.1	255.169.20.1	255.169.20.1	255.169.20.1
Destination Port	3000	3001	3002	3003
Source Port	0	0	0	0
Audio Packet Duration	250us			

Matrox IP Output Connector Flow Configuration

Primary SFP

Destination Address. Indicates the IPv4 address of the destination (that is, receiver).

Destination Port. Indicates the UDP port of the destination (that is, receiver).

Source Port. Indicates the User Datagram Protocol (UDP) port of the sender (that is, transmitter).

RTP Payload Filter. Indicates the RTP (Real-time Transfer Protocol) payload ID.

RTP Sync Source. Indicates the RTP (Real-time Transfer Protocol) Synchronization Source Identifier (SSRC).

Type of Service. Indicates that the Type of Service (ToS) is Differentiated Service Code Point (DSCP) or Explicit Congestion Notification (ECN).

DSCP. Specify the Differentiated Service Code Point (DSCP). Range is 0 to 63.

Packet Time to Live. Indicates the time in which packets can be used in seconds. That is, it indicates the packets' Time to live (TTL).

Audio Packet Duration. Indicates the outgoing audio packet duration. The audio channel count supported on the Audio Stream is based on this packet timing.

Redundancy. Enable the redundant stream for seamless reconstruction conforming to SMPTE ST 2022-7.

Redundancy SFP

Destination Address. Indicates the redundant stream IPv4 address of the destination (that is, receiver).

Destination Port. Indicates the redundant stream UDP port of the destination (that is, receiver).

Source Port. Indicates the redundant stream UDP port of the sender (that is, transmitter).

NMOS IS-05 - Dynamic Output Connection Support

The IP Output Connector settings may be modified dynamically using an **NMOS IS-05 Output Connection Request**. To use dynamic connector configuration in this way, the system must first be configured for NMOS IS-05. Refer to the *Prime IP NMOS Configuration Guide* section *NMOS IS-04 and IS-05 Workflows* for more information.

With dynamic connector configuration, the **Primary** and **Redundant Destination Address**, **Destination Port**, and **Source Port** are provided dynamically as part of the NMOS IS-05 Input Connection Request. By default, the IPv4:Port may be defaulted to 0.0.0.0:0. It will be assigned a default IPv4 so that the flow will be visible through NMOS IS-04, but the flow will be disabled by default.

The remaining settings are not part of the Output Connection Request and must be configured statically. This includes the **RTP Payload Filter**, **RTP Sync Source**, **Type of Service (DSCP, ECN)**, **DSCP**, **Packet Time to Live**, and **Audio Packet Duration**.

FIRMWARE CONFIGURATION (FOR THE DSXLE4 IP E)

Depending on network infrastructure requirements, the Matrox IP Device may need to be reconfigured by flashing the firmware. The DSXLE4 IP E supports toggle for either SMPTE 2110 or SMPTE 2022-6. It also supports a separate data flow in which the Primary and Redundant SFP are shared, increasing the IO bandwidth limit by disabling Redundancy.

- Navigate to C:\Program Files\Matrox DSX-TopologyUtils\drivers
- To flash the board between SMPTE 2022-6 and 2110, use commands:
 - mvDriverFGPAUpdater.exe -st2022
 - mvDriverFGPAUpdater.exe -st2110
- To flash the board between Default and Alternate Flow
 - For Default Flow, in which SFP A is the Primary, and SFP B is its Redundancy, use command:
 - mvConnectorConfig.exe -FlowRouting=def
 - For Alternate Flow, which has mixed redundancy where SFP B has Redundancy of SFP A, and SFP A has Redundancy of SFP B
 - mvConnectorConfig.exe -FlowRouting=alt
 - **This configuration is required for 2 Video + Key channels of 1080p50 or 1080p59.94. Redundancy is not supported. This is due to bandwidth limitations.**

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