PRIME Matrox IP Playout Configuration User Guide

Version 5.3

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SINCE DAY ONE.

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Overview

This user guide is an addendum to the Prime Playout Configuration Guide. It describes the additional Playout 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 D25 and Q25.

The DSXLE4 IP E is no longer supported as of Prime 5.2.

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

SMPTE 2022-6, colloquially known as SDI IP, has been deprecated with Prime 5.2.

Matrox Driver and Supported Operating System

Matrox IP is supported on Windows 10 and Windows 11 using Matrox DSX.Topology-Utils Driver version 10.5.201. This driver is automatically installed as a component within the Prime Installer. It is downloadable through the Compact Installer.

Matrox IP2110 Connector Configuration

DSXLE5 IP D25

The Matrox IP DSXLE5 D25 supports a Primary and a Redundant Network Connection over 25 GbE using SFP (*Small Form-factor Pluggable*) Transceivers.

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.

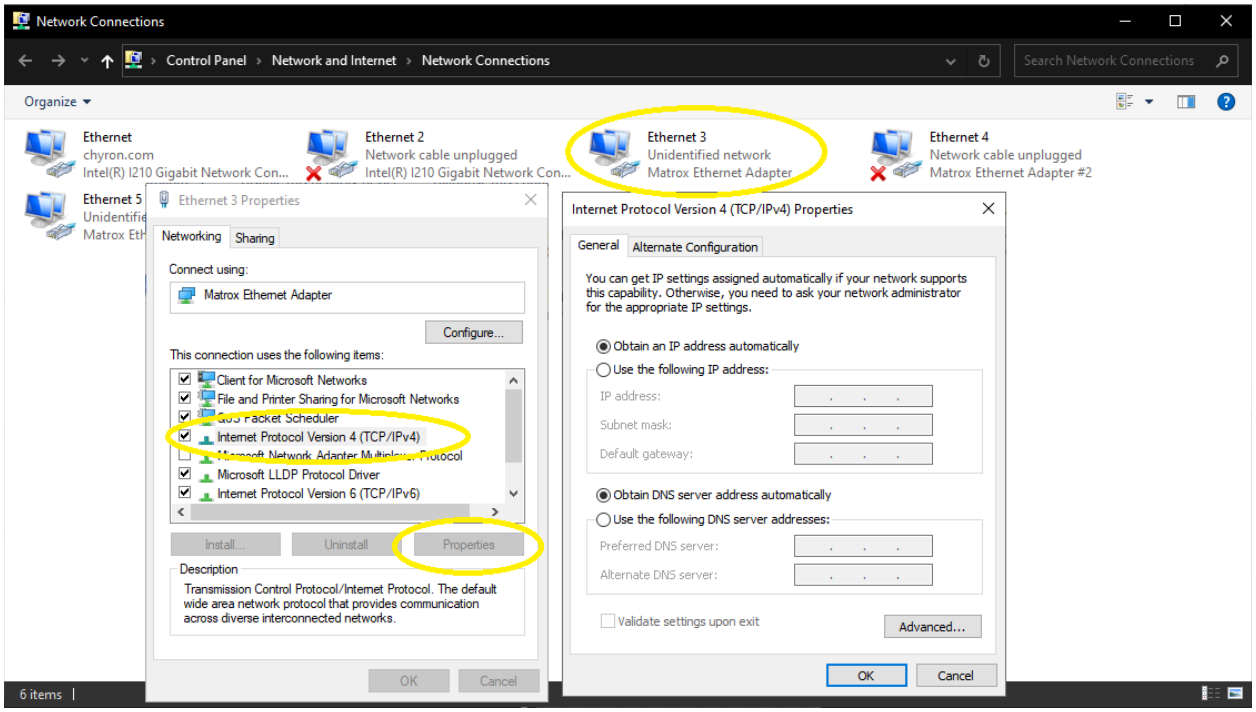
There are two sets of IP settings for each SFP; one for the Matrox network adapter for ST 2110 and one for the genlock over IP settings conforming to SMPTE ST 2059-2. The IP settings consist of an IPv4 address, a network mask, and an IPv4 address for the gateway.

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.

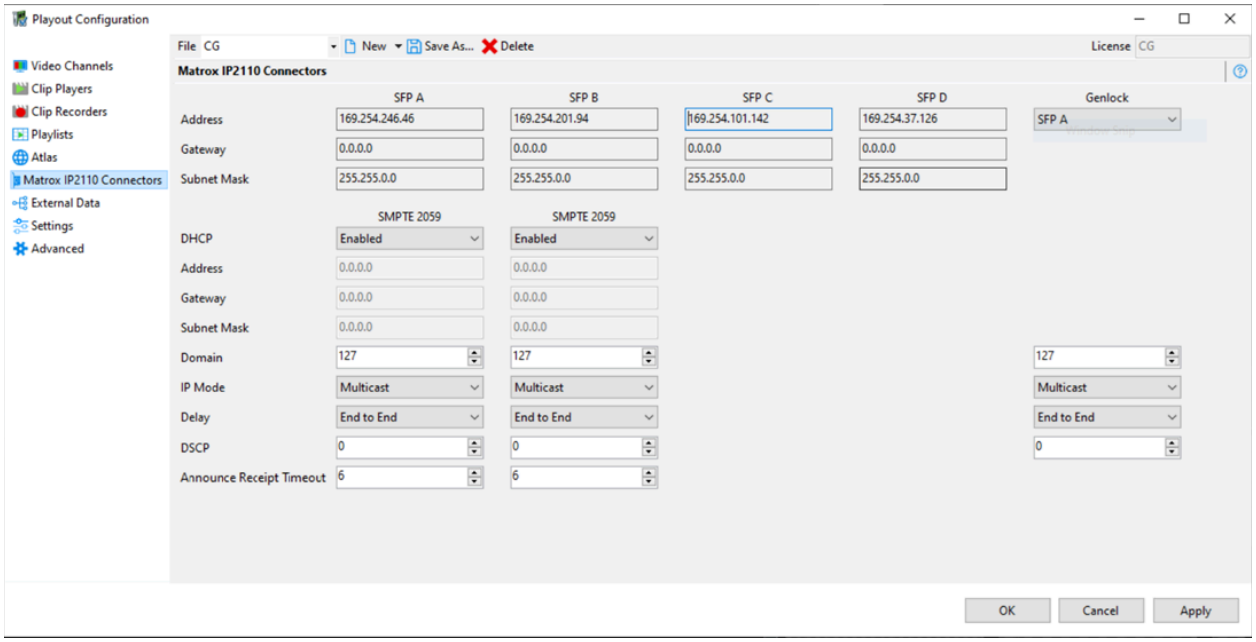
To do so manually, your Network Administrator must use the Network Connections Control Panel. The Matrox Ethernet Adapters are listed in order, representing SFP A to SFP D.

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)



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 (The D25 has only SFP A and B).

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. This is enabled by default.
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. This is 255.255.255.0 (/24) by default. *A minimum /29 subnet mask is required to properly negotiate the Best Master Clock Algorithm (BMCA) using Delay Request / Delay Response.*
Domain. Indicates the time server clock domain number to use. Range is 0 to 127. 127 is the default (refer to SMPTE 2059-2 6.5.2).
IP Mode. Indicates the type of internet protocol mode to use for the time server connection. Multicast is the default.
Delay. Indicates the type of delay mechanism to use for the time server connection. End to End is the default.
DSCP. Indicates that the Type of Service (ToS) is Differentiated Service Code Point (DSCP). Range is 0 to 63. 46 is the default, to indicate *Expedited Forwarding* (refer to SMPTE 2059-2 6.9).

Announce Receipt Timeout. Indicates the number of intervals that must pass without receiving a message before a new master clock is selected by the *Best Master Clock Algorithm (BMCA)*. Range is 2 to 10. 6 is the default.

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 between the Primary and Redundant Networks based on the Best Master Clock Algorithm (BMCA).

Genlock Status Indicator

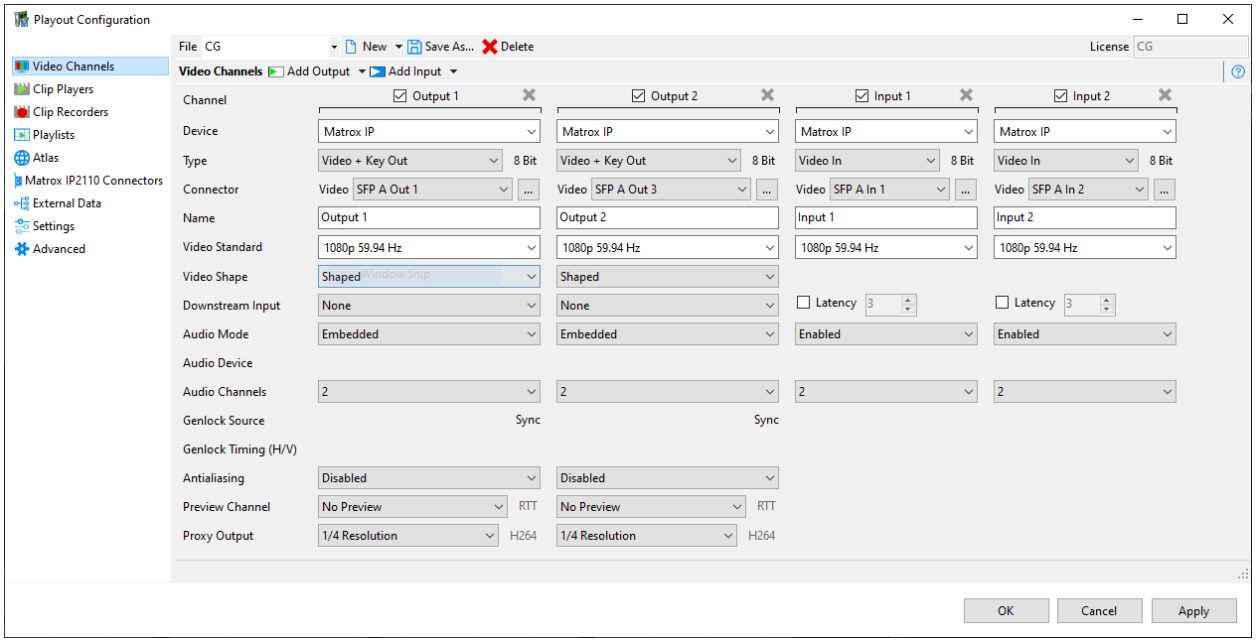
The Genlock Status Indicator in Prime Playout has been extended to display SMPTE 2059 metadata when the mouse hovers. This includes:

Status - *Locked*: The device is synchronized to a valid Grandmaster clock. *Not Present:* No valid PTP signal is detected.
Best Master Clock ID. Displays the unique Clock Identity (Clock ID) of the currently selected Best Master Clock (BMC), as determined by the Best Master Clock Algorithm (BMCA).
Grandmaster Clock ID. Shows the Clock Identity (Clock ID) of the current Grandmaster Clock, which may differ from the Best Master Clock in certain network topologies.
Best Master Clock SFP Label. Indicates the physical interface (SFP A or SFP B) over which the current Best Master Clock is being received.

Note: SMPTE 2059 Status can also be verified in the NMOS IS-04 Node as part of its registration.

Matrox IP Video Channels

The Matrox IP Device is presented alongside other Devices in the Video Channels tab of the Prime Playout 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).

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 Playout 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.

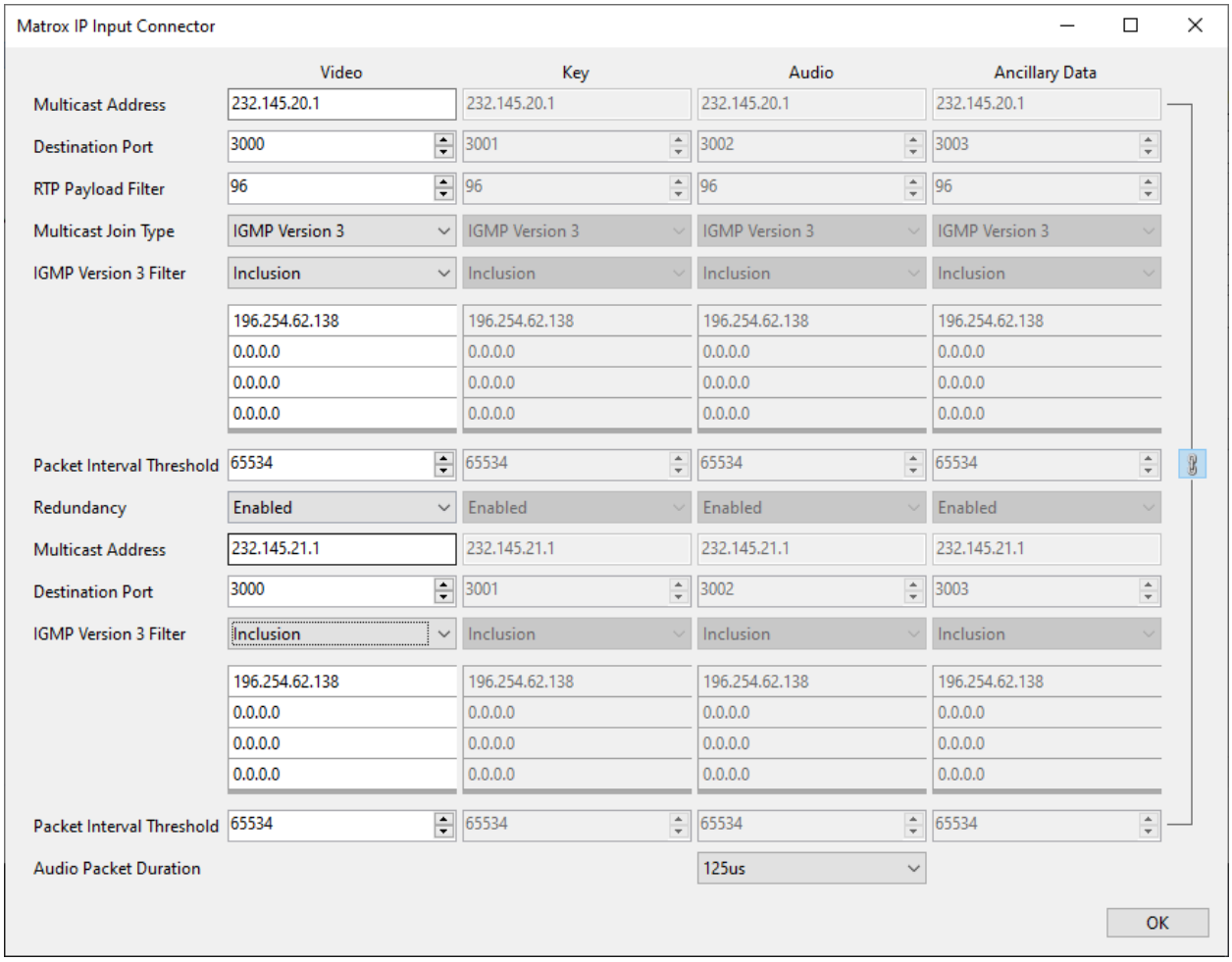
Refer to guidance from your IP Network Administrator to determine IPv4 assignment for each individual IP Stream. All other available settings are also documented below, which are guided by the requirements of your particular IP network infrastructure.

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



Matrox IP Input Connector Flow Configuration

Primary SFP

Multicast Address. Indicates the reception multicast IPv4 address. This must be in the range 224.0.0.0 to 239.255.255.255. The default is 0.0.0.0, indicating that the flow will be enabled using an NMOS IS-05 Device Connection Management.
Destination Port. Indicates the reception User Datagram Protocol (UDP) port. This must be greater than or equal to 1024. The default is 0, indicating that the flow will be enabled using an NMOS IS-05 Device Connection Management.
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. The audio packet duration must be 125us if the audio channel count is greater than 8.
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.

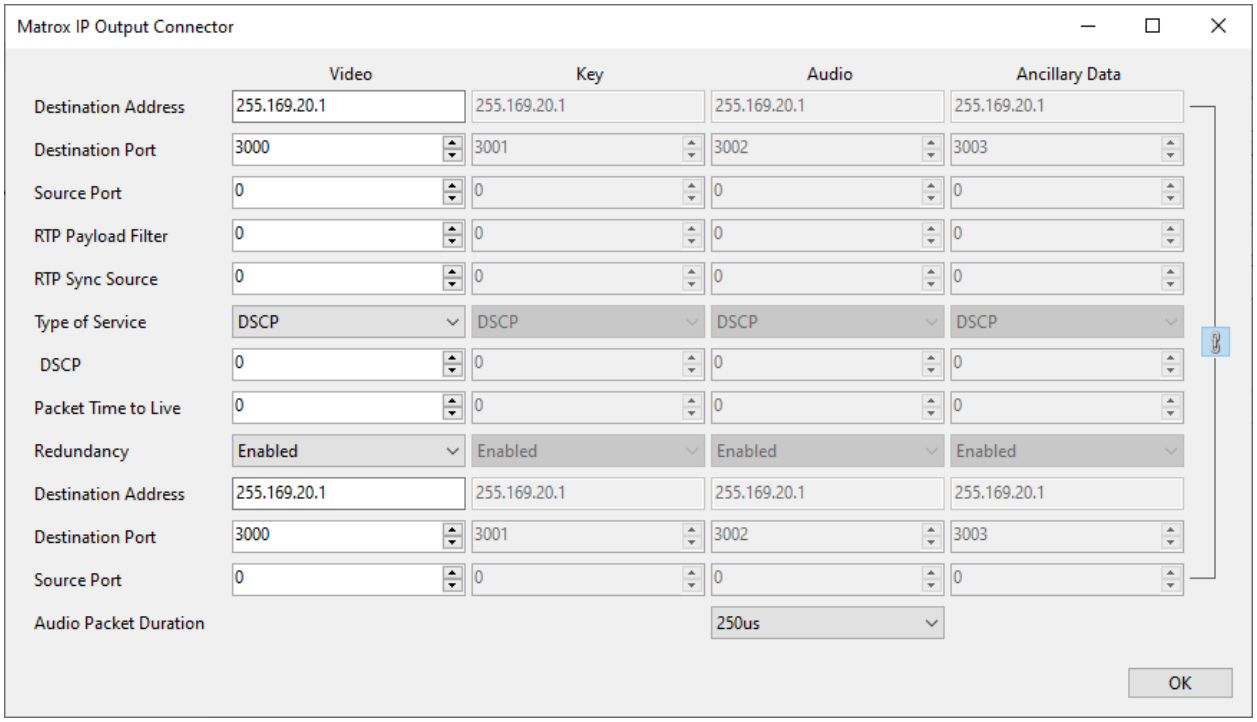
NMOS IS-05 - Dynamic Input Connection Support

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



Matrox IP Output Connector Flow Configuration

Primary SFP

Destination Address. Indicates the IPv4 address of the destination (that is, receiver). This must be in the range 224.0.0.0 to 239.255.255.255. The default is 0.0.0.0, indicating that the flow will be enabled using an NMOS IS-05 Device Connection Management.
Destination Port. Indicates the UDP port of the destination (that is, receiver). This must be greater than or equal to 1024. The default is 0, indicating that the flow will be enabled using an NMOS IS-05 Device Connection Management.
Source Port. Indicates the User Datagram Protocol (UDP) port of the sender (that is, transmitter).
RTP Payload Filter. Indicated 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). Range is 0 to 128. This is set to 64 by default.
Audio Packet Duration. Indicates the outgoing audio packet duration. The audio channel count supported on the Audio Stream is based on this packet timing. The audio packet duration must be 125us if the audio channel count is greater than 8.
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.**

TROUBLESHOOTING

The system is visible by Network Orchestration, but I am not able to connect an Input Flow by Static IPv4
If IGMPv3 Filtering is enabled on the network, you must set the Source IP for the IP Connector Flows in an Inclusion Filter.

The system is visible by Network Orchestration, but I am not able to connect to Output Flow by Static IPv4
Verify the Packet Time to Live has been set for each Flow. A good default value is 64.

I want to connect to an Audio Flow but the expected Audio Channel Count is not available in the Playout Configuration
The LE5 IP supports ST 2110-30 Audio Channel Counts at 1, 2, 3, 4, 6, 8 at 1 ms Audio Packet Duration, or 1, 2, 3, 4, 6, 8, 16, 32, 64 at 125 us Audio Packet Duration. If a desired value is not present in the Playout Configuration, this will be resolved in the next version of software.

The Genlock Indicator is not locked (green) even though I have DHCP configured
An Input or Output Channel must be configured for Genlock to work. This is particularly important for the European market using 50hz standards as 60hz is set by default for the genlock clock.

The Genlock Indicator takes several minutes to indicate lock (green)
The Genlock over IP (ST 2059) settings must either be enabled using DHCP, or configured statically, using a /29 subnet mask. The Best Master Clock Algorithm (BMCA) negotiates Genlock using Delay Response / Delay Request PTP messages. If IPv4 is not assigned for ST 2059 using a /29 subnet mask, this algorithm will not negotiate spontaneously.

The Video and Key Flow on my Receiver is offset vertically within the frame
Verify the Best Master Clock ID is the same for the Sender (Prime) and the Receiver (such as the Switcher). You can do this using Topology Builder. If they are not the same, the Receiver will require Frame Sync to be enabled to synchronize the video within the frame; otherwise, the Receiver is likely assuming the Sender is using the same Best Master Clock.

Set the Announce Receipt Timeout on the Prime to the same value as the Receiver, so that the Best Master Clock Algorithm will negotiate the same Best Master Clock as the Receiver.

If the Clocks are the same for the Sender and Receiver; take a PCAP of the IP Traffic of the Receiver for that Flow, such as with a Prism or Matrox Vero. If the Receiver is a Matrox LE5 IP, take a PCAP using Matrox internal tools. Refer to the User Guides in the Matrox TopologySdk.

I can not create the expected number of Input or Output flows based on my Video Standard.

The LE5 IP D25 and Q25 operate at either 10ge or 25ge.

25ge transceivers / optical fiber must be installed prior to system boot; otherwise the device will only operate at 10ge. If you install transceivers after boot, or hot swap transceivers / optical fiber from 10ge to 25ge, a system reboot is required.

ABOUT US

Chyron is ushering in the next generation of storytelling in the digital age. Founded in 1966, the company pioneered broadcast titling and graphics systems. With a strong foundation built on over 50 years of innovation and efficiency, the name Chyron is synonymous with broadcast graphics. Chyron continues that legacy as a global leader focused on customer-centric broadcast solutions. Today, the company offers production professionals the industry's most comprehensive software portfolio for designing, sharing, and playing live graphics to air with ease. Chyron products are increasingly deployed to empower OTA & OTT workflows and deliver richer, more immersive experiences for audiences and sports fans in the arena, at home, or on the go.

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