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**K-Frame XP**

# Application Note

## Advanced IP Boards - AIP

By:
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# 1) Introduction:

This document provides a comprehensive overview of the AIP1 and AIP2 Rear 16x8 and 8x4 boards, highlighting their key differences, configuration procedures, and essential details related to SFP and QSFP components. It is intended to support technical teams in understanding, setting up, and troubleshooting these Rear IO Modules effectively.



**Features:**

- 25GbE SFP and 100GbE QSFP ports supported where one is active at one time.

- 100Gb Ports support; 720p, 1080i, 1080p & 2160p.

- 25Gb Ports supports; 720p, 1080i, 1080p.

- In-band NMOS IS-04 & IS-05 (See NMOS K Frame NMOS Setup and Debug Guide for more details)

- GearBox

- UltraMatch Note Phase 2 – extends UltraMatch conversion to 720p and 1080i

- MatchSync

- 1 Full Frame of Buffer in all standards.

- ST 2110-22 JPEG XS Encoding/Decoding (IntoPix Codec).

- Tally / GPI

# 2) 16x8 AIP1

To configure the AIP1s ports, you need to be in the Eng Setup – Video I/O –IP I/O Config - Port Configs SFPs menu:

The AIP consists of 100Gb QSFP Ports and 25Gb SFP Ports where only one is active at once (100Gb or 25Gb)
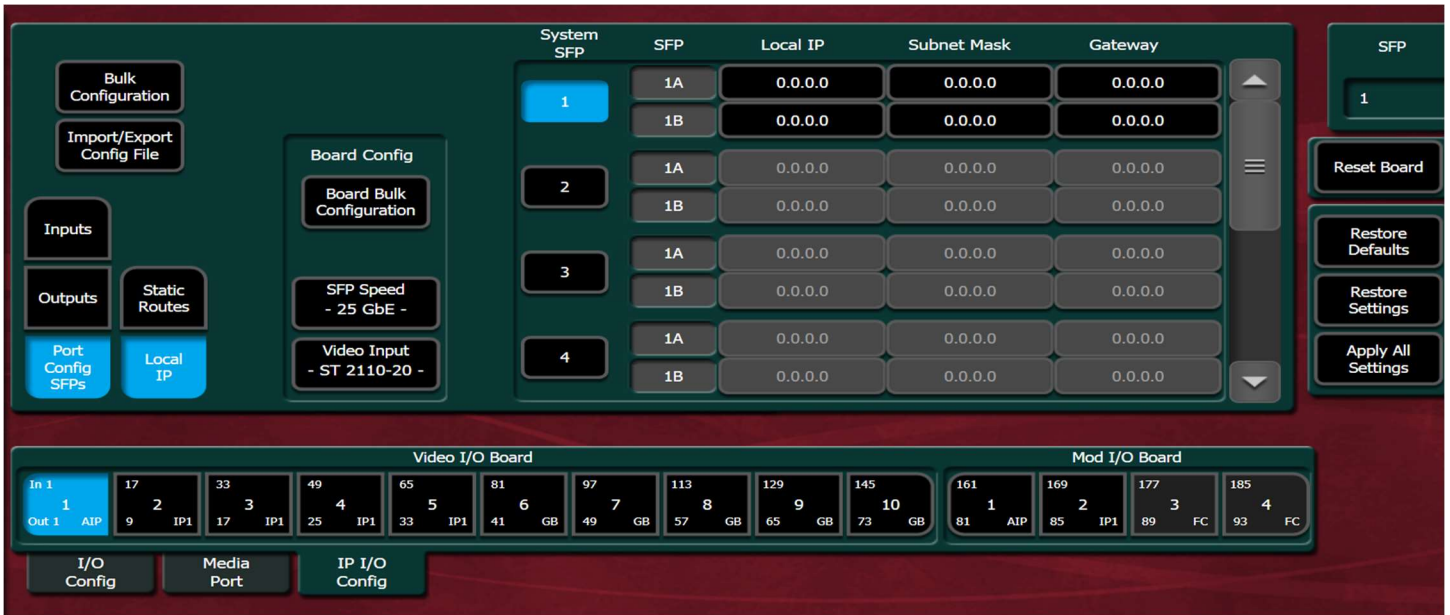
## 2a) AIP 1 25Gb Mode:

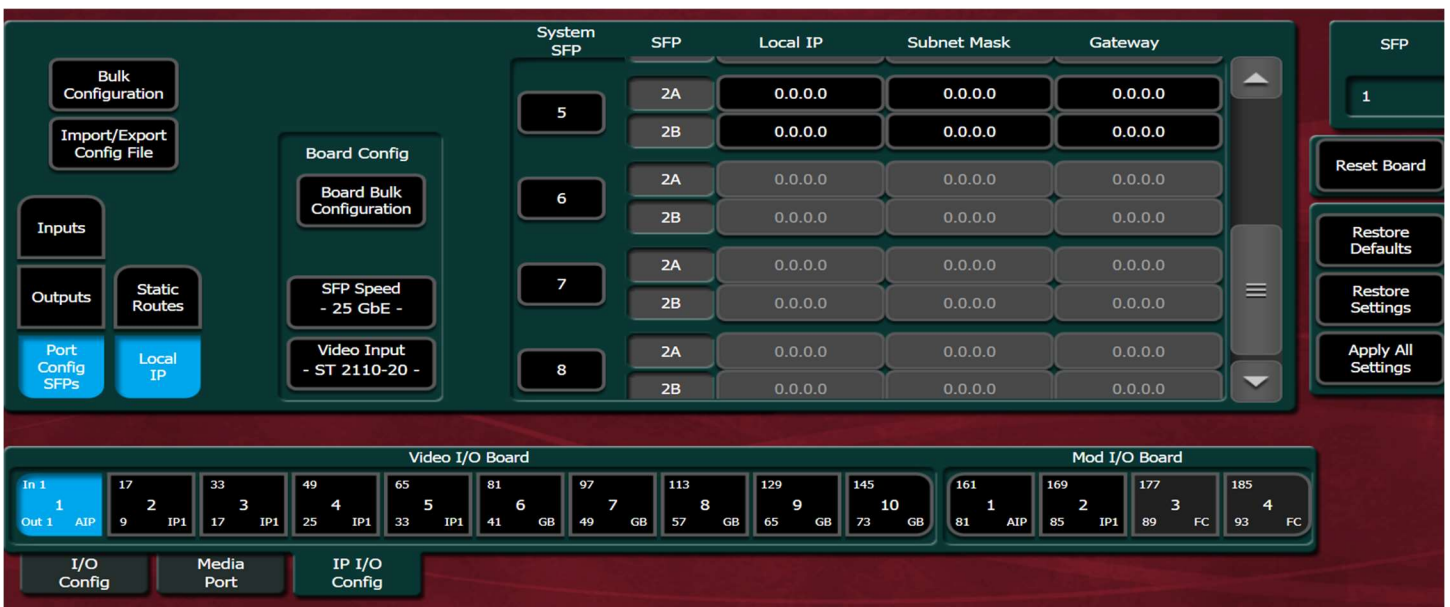- To Activate 25Gb Mode simply press the "SFP Speed" button and select 25 GbE and press "Done"
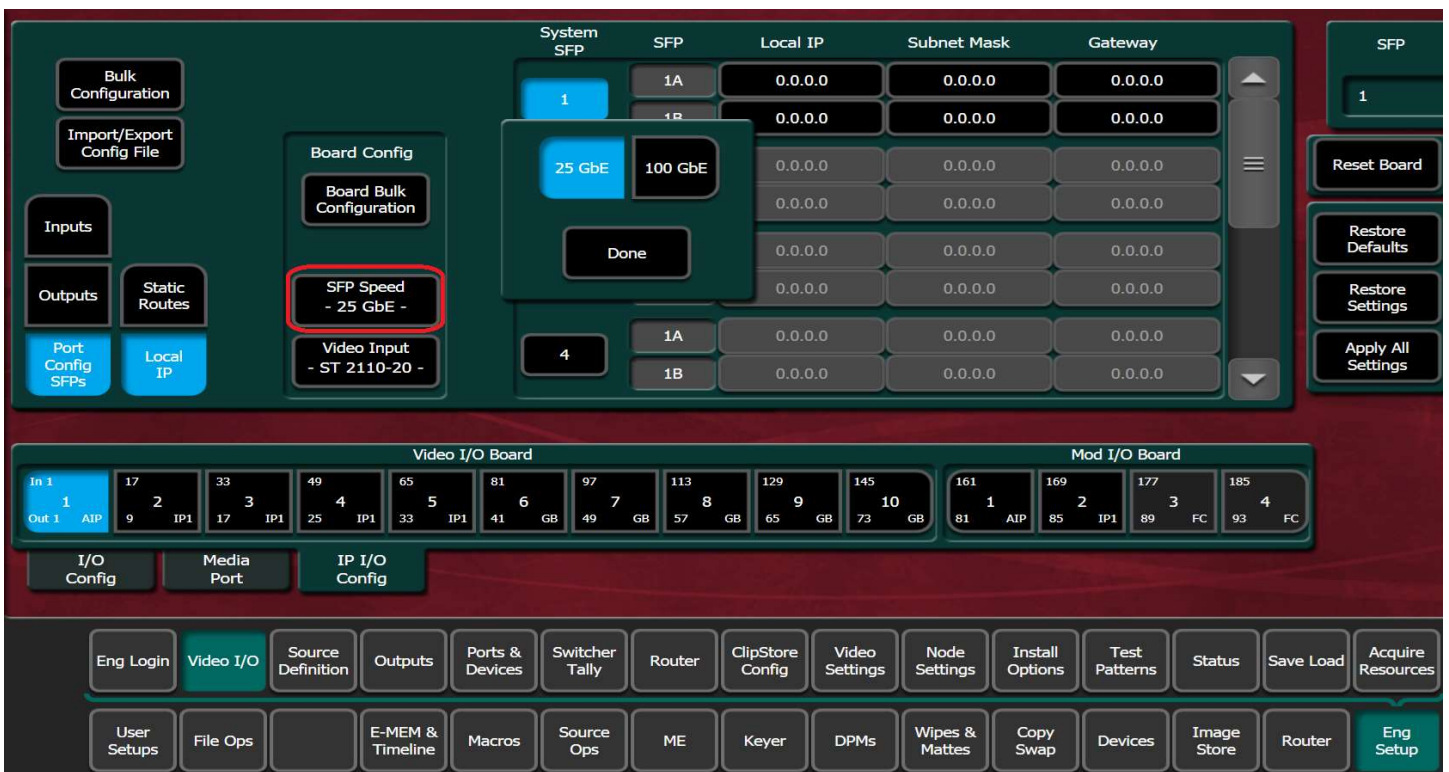


You can now configure the Local IP address of the 25Gb Ports:

- 25gb SFP 1A & 1B:



- 25Gb SFP 2A & 2B

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- You can make use of the Bulk Configurator to configure all SFP IPs in one handy take:



For Bulk Configuration please refer to the User Manual.

## 2b) AIP1 25Gb Inputs:

To configure the AIPs Input Multicast, you need to be in the Eng Setup – Video I/O –IP I/O Config – Inputs Menu.

- 25Gb SFP 1 processes Inputs 1 thru 8 of that Rear.

- 25Gb SFP 2 processes Inputs 9 thru 16 of that Rear.

## 2c) AIP1 25Gb Outputs:

To configure the AIPs Output Multicast, you need to be in the Eng Setup – Video I/O –IP I/O Config – Outputs Menu.

- 25Gb SFP 1 processes Outputs 1 thru 4 of that Rear:

- 25Gb SFP 2 processes Outputs 5 thru 8 of that Rear:



Note: When ST 2110-22 JPEG XS Encoding/Decoding is available the board will offer an extra Monitor Output per Output Spigot.

## 2d) AIP1 Quad 100Gb Mode:

- To Activate 100Gb Mode simply press the "QSFP Speed" button and select 100 GbE and press "Done"
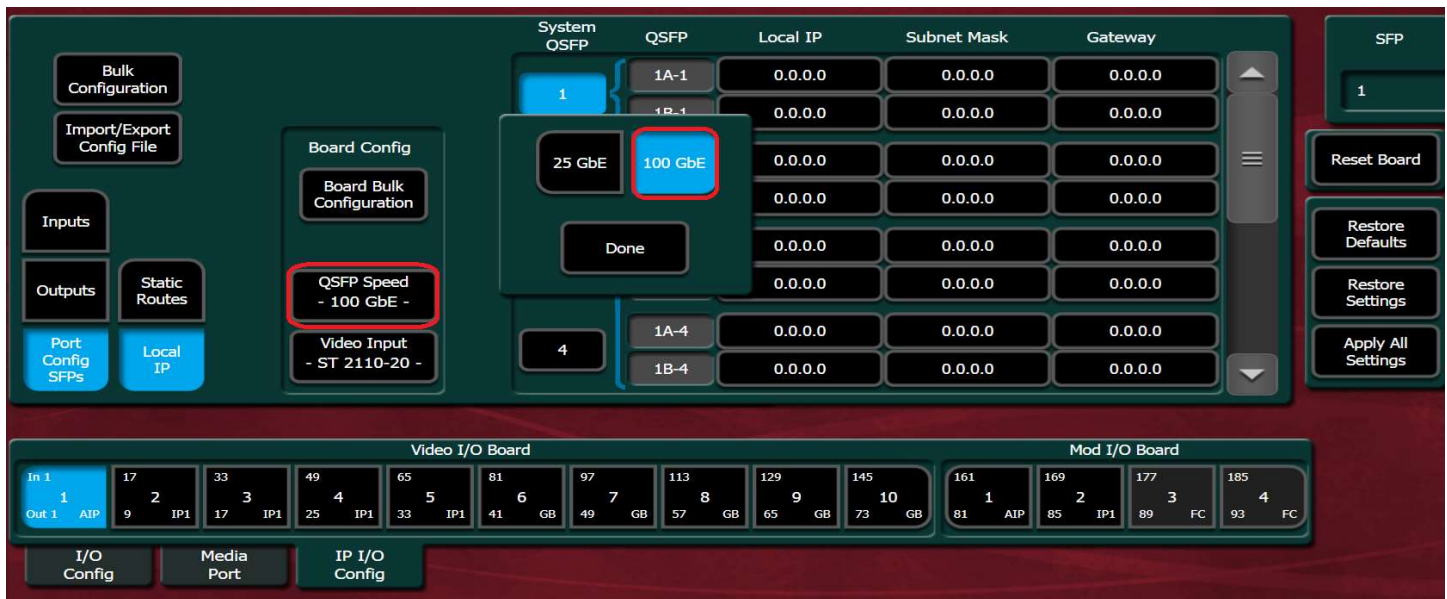


The AIP1 board **only** supports Quad 100Gb Mode which means each 100Gb QSFP Port is split into 4 x 25Gb Lanes and therefore requires 4 x 25Gb IP addresses. See AIP2 for Single 100Gb Mode.

You can now configure the Local IP address of all the 25Gb Lanes for each 100Gb Port:

Note: For details on Static Routes please see "K Frame NMOS Setup and Debug Guide.
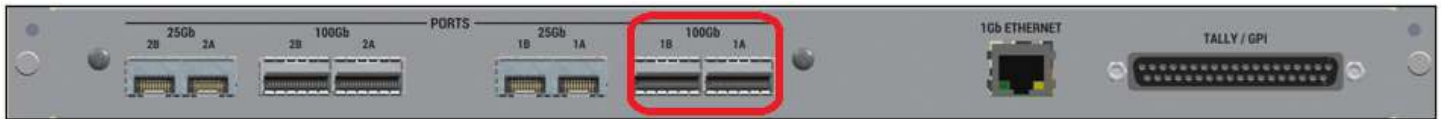
- **100Gb QSFP 1A & 1B:**



- **25Gb Lanes - 1A-1, 1A-2, 1A-3, 1A-4 & 25Gb 1B-1, 1B-2, 1B-3, 1B-4:**



| System OSFP | QSFP | Local IP | Subnet Mask | Gateway |
|---|---|---|---|---|
| 1 | 1A-1 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 1B-1 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| 2 | 1A-2 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 1B-2 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| 3 | 1A-3 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 1B-3 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| 4 | 1A-4 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 1B-4 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
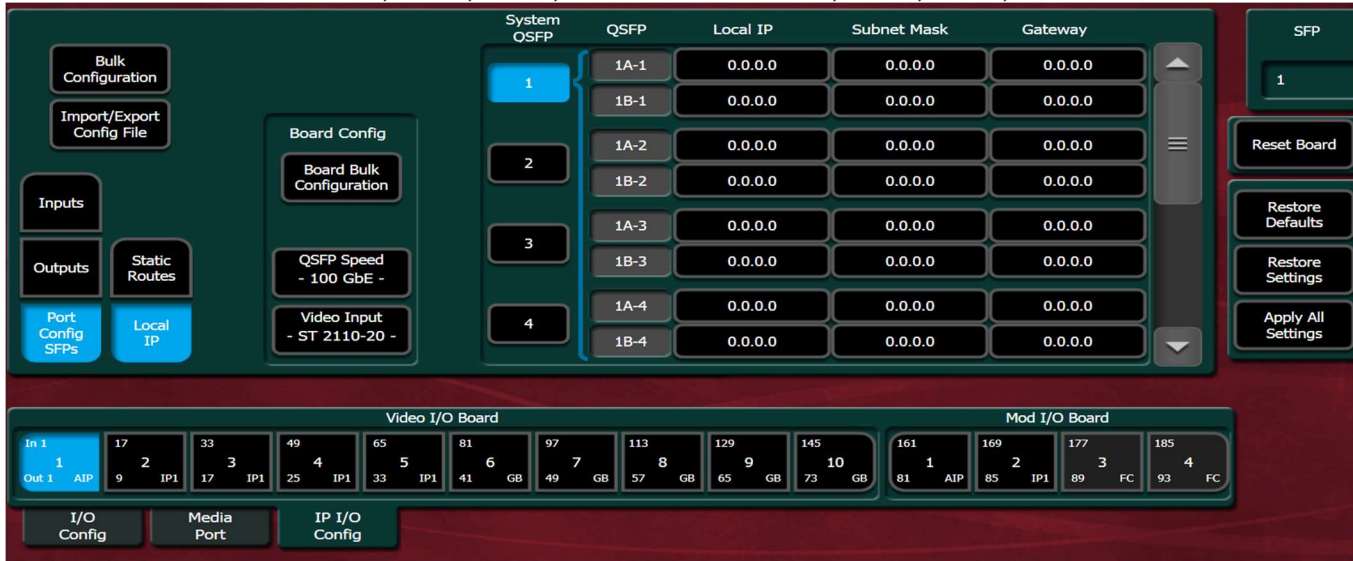
- **100Gb QSFP 2A & 2B:**



- **25Gb Lanes - 2A-1, 2A-2, 2A-3, 2A-4 & 25Gb 2B-1, 2B-2, 2B-3, 2B-4:**



| System OSFP | QSFP | Local IP | Subnet Mask | Gateway |
|---|---|---|---|---|
| 5 | 2A-1 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 2B-1 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| 6 | 2A-2 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 2B-2 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| 7 | 2A-3 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 2B-3 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| 8 | 2A-4 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
| | 2B-4 | 0.0.0.0 | 0.0.0.0 | 0.0.0.0 |
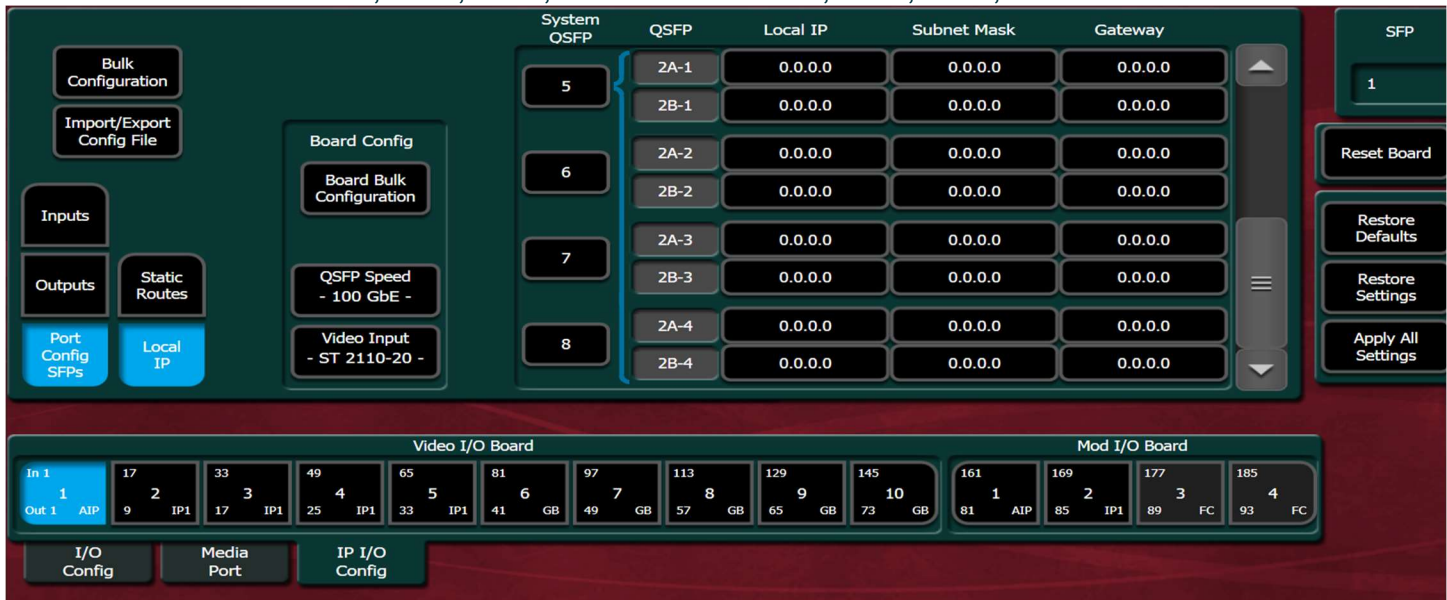
## 2e) AIP1 100Gb Quad Mode Inputs:

To configure the AIPs Input Multicast, you need to be in the Eng Setup – Video I/O –IP I/O Config – Inputs Menu.

- 100Gb QSFP 1A & 1B processes Inputs 1 thru 8 of that Rear in a configuration of 2 Inputs per 25Gb lane.

- 100Gb QSFP 2A & 2B processes Inputs 9 thru 16 of that Rear in a configuration of 2 Inputs per 25Gb lane.

### Inputs — Video (System Inputs 1–4)

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | ST 2110-20 | 97 | Enable | 1A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 2 | 2 | ST 2110-20 | 97 | Enable | 1A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 3 | 3 | ST 2110-20 | 97 | Enable | 1A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 4 | 4 | ST 2110-20 | 97 | Enable | 1A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |

Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

### Inputs — Video (System Inputs 5–8)

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 5 | 5 | ST 2110-20 | 97 | Enable | 1A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 6 | 6 | ST 2110-20 | 97 | Enable | 1A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 7 | 7 | ST 2110-20 | 97 | Enable | 1A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 8 | 8 | ST 2110-20 | 97 | Enable | 1A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 1B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |

Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

### Inputs — Video (System Inputs 9–12)

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 9 | 9 | ST 2110-20 | 97 | Enable | 2A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 10 | 10 | ST 2110-20 | 97 | Enable | 2A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 11 | 11 | ST 2110-20 | 97 | Enable | 2A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 12 | 12 | ST 2110-20 | 97 | Enable | 2A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |

Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

### Inputs — Video (System Inputs 13–16)

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 13 | 13 | ST 2110-20 | 97 | Enable | 2A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 14 | 14 | ST 2110-20 | 97 | Enable | 2A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 15 | 15 | ST 2110-20 | 97 | Enable | 2A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 16 | 16 | ST 2110-20 | 97 | Enable | 2A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
|   |   |   |   |   | 2B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |

Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

## 2f) AIP1 100Gb Quad Mode Outputs:

To configure the AIPs Output Multicast, you need to be in the Eng Setup – Video I/O –IP I/O Config – Inputs Menu.

- 100Gb QSFP 1A & 1B processes Outputs 1 thru 4 of that Rear in a configuration of 1 Inputs per 25Gb lane.

- 100Gb QSFP 2A & 2B processes Outputs 5 thru 8 of that Rear in a configuration of 1 Inputs per 25Gb lane.

**Panel 1**

Left navigation: Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 1 | 1 | ST 2110-20 | 97 | Enable | 1A-1 | 0.0.0.0 | 1000 |
| | | | | | 1B-1 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-1 | 0.0.0.0 | 1000 |
| | | | | | 1B-1 | 0.0.0.0 | 1000 |
| 2 | 2 | ST 2110-20 | 97 | Enable | 1A-2 | 0.0.0.0 | 1000 |
| | | | | | 1B-2 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-2 | 0.0.0.0 | 1000 |
| | | | | | 1B-2 | 0.0.0.0 | 1000 |

**Panel 2**

Left navigation: Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 3 | 3 | ST 2110-20 | 97 | Enable | 1A-3 | 0.0.0.0 | 1000 |
| | | | | | 1B-3 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-3 | 0.0.0.0 | 1000 |
| | | | | | 1B-3 | 0.0.0.0 | 1000 |
| 4 | 4 | ST 2110-20 | 97 | Enable | 1A-4 | 0.0.0.0 | 1000 |
| | | | | | 1B-4 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-4 | 0.0.0.0 | 1000 |
| | | | | | 1B-4 | 0.0.0.0 | 1000 |

**Panel 3**

Left navigation: Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 5 | 5 | ST 2110-20 | 97 | Enable | 2A-1 | 0.0.0.0 | 1000 |
| | | | | | 2B-1 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-1 | 0.0.0.0 | 1000 |
| | | | | | 2B-1 | 0.0.0.0 | 1000 |
| 6 | 6 | ST 2110-20 | 97 | Enable | 2A-2 | 0.0.0.0 | 1000 |
| | | | | | 2B-2 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-2 | 0.0.0.0 | 1000 |
| | | | | | 2B-2 | 0.0.0.0 | 1000 |

**Panel 4**

Left navigation: Bulk Configuration | Import/Export Config File | Inputs | Video | Outputs | Audio | Port Config SFPs | Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 7 | 7 | ST 2110-20 | 97 | Enable | 2A-3 | 0.0.0.0 | 1000 |
| | | | | | 2B-3 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-3 | 0.0.0.0 | 1000 |
| | | | | | 2B-3 | 0.0.0.0 | 1000 |
| 8 | 8 | ST 2110-20 | 97 | Enable | 2A-4 | 0.0.0.0 | 1000 |
| | | | | | 2B-4 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-4 | 0.0.0.0 | 1000 |
| | | | | | 2B-4 | 0.0.0.0 | 1000 |

# 3) 16x8 AIP2 – With Single 100Gb support:

To configure the AIP2's ports, you need to be in the Eng Setup – Video I/O –IP I/O Config - Port Configs SFPs menu:

The AIP2 consist of 100Gb QSFP Ports and 25Gb SFP Ports where only one is active at once (100Gb or 25Gb)

- Note1 - For 25Gb Mode, refer to AIP1 25gb Mode.

- Note2 - For Quad 100Gb (4 x 25Gb) Mode, refer to AIP1 100Gb Quad Mode.

## 3a) Single Stream 100Gb Mode:

The QSFP-DR-100Gb that is used for the single-lambda operation includes a chip to convert from NRZ to PAM4 optically. Electrically it still is 25Gb NRZ.

Provides compatibility with 400Gb Network Switches allowing one MAC address to handle all of the traffic instead of requiring four.

**100G Single Stream Benefits:**

Simpler optical design with fewer components and less complexity in network management.
Lower costs for optical components and reduced overall system cost.

Facilitates easier migration to 400G and 800G Ethernet by using a single-channel 100G PAM4 technology. 100G single-lambda can enhance the stability of network connections in applications like live streaming, eliminating latency and buffering.

```
Single-Lambda (100G)

|_____|     ← λ1 (100 Gbps)


Multi-Lambda (4x25G)
|_____|     ← λ1 (25 Gbps)

|_____|     ← λ2 (25 Gbps)

|_____|     ← λ3 (25 Gbps)

|_____|     ← λ4 (25 Gbps)
```
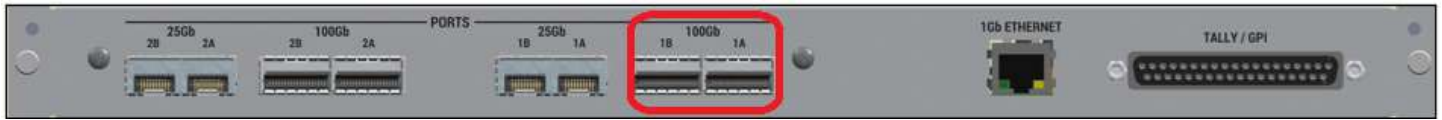
- To Activate 100Gb Mode simply press the "QSFP Speed" button and select "100 GbE Single" and press "Done"
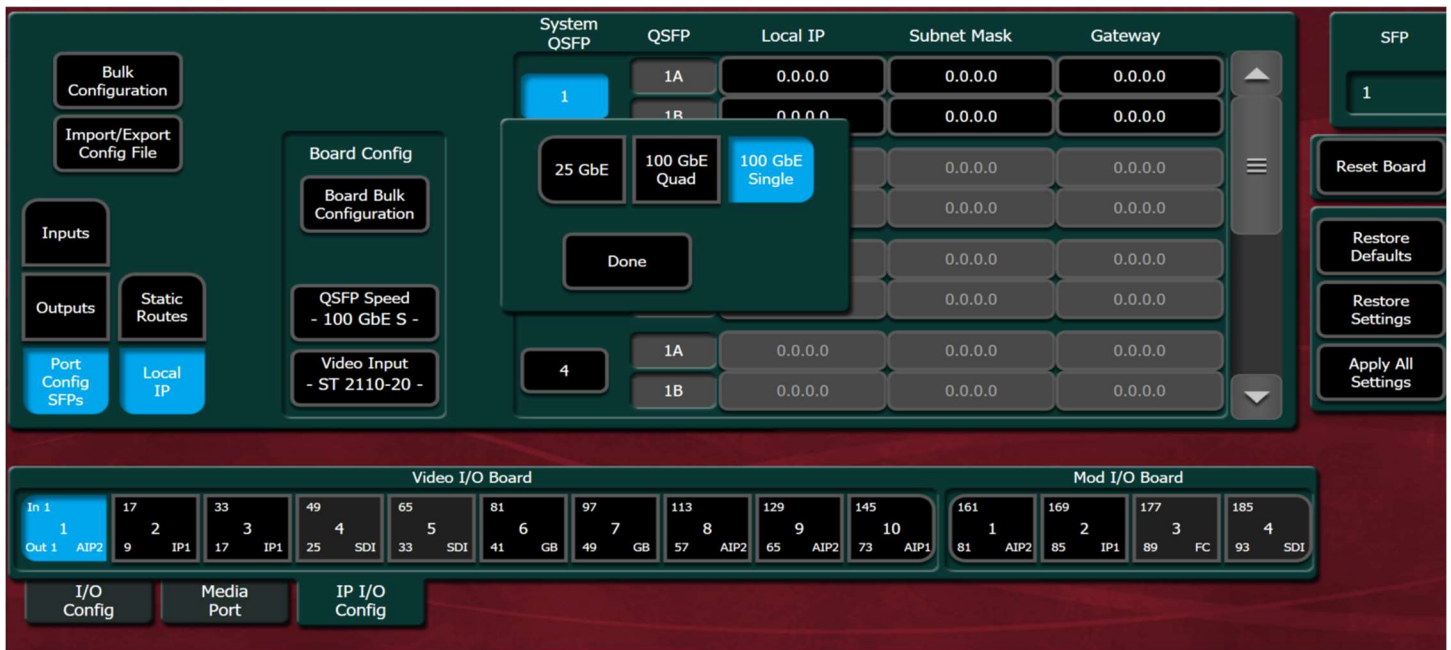


You can now configure the Local IP address for the 100Gb Port:

Note: For details on Static Routes please see "K Frame NMOS Setup and Debug Guide".

- **100Gb QSFP 1A & 1B:**





- **100Gb QSFP 2A & 2B**

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## 3b) AIP2 Single Stream Inputs:

To configure the AIPs Input Multicast, you need to be in the Eng Setup – Video I/O –IP I/O Config – Inputs Menu.

- 100Gb QSFP 1A & 1B processes Inputs 1 thru 8 of that Rear.

- 100Gb QSFP 2A & 2B processes Inputs 9 thru 16 of that Rear.

**Screen 1**

Left navigation buttons: Bulk Configuration, Import/Export Config File, Inputs, Video, Outputs, Audio, Port Config SFPs, Ancillary

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | ST 2110-20 | 97 | Enable | 1A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 2 | 2 | ST 2110-20 | 97 | Enable | 1A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 3 | 3 | ST 2110-20 | 97 | Enable | 1A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 4 | 4 | ST 2110-20 | 97 | Enable | 1A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |

**Screen 2**

Left navigation buttons: Bulk Configuration, Import/Export Config File, Inputs, Video, Outputs, Audio, Port Config SFPs, Ancillary

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 5 | 5 | ST 2110-20 | 97 | Enable | 1A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 6 | 6 | ST 2110-20 | 97 | Enable | 1A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 7 | 7 | ST 2110-20 | 97 | Enable | 1A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 8 | 8 | ST 2110-20 | 97 | Enable | 1A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 1B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |

**Screen 3**

Left navigation buttons: Bulk Configuration, Import/Export Config File, Inputs, Video, Outputs, Audio, Port Config SFPs, Ancillary

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 9 | 9 | ST 2110-20 | 97 | Enable | 2A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 10 | 10 | ST 2110-20 | 97 | Enable | 2A-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-1 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 11 | 11 | ST 2110-20 | 97 | Enable | 2A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 12 | 12 | ST 2110-20 | 97 | Enable | 2A-2 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-2 | 0.0.0.0 | 1000 | 0.0.0.0 |

**Screen 4**

Left navigation buttons: Bulk Configuration, Import/Export Config File, Inputs, Video, Outputs, Audio, Port Config SFPs, Ancillary

| System Input | Board Input | Stream Format | Payload Type | Redundancy Mode | QSFP | Receive IP | UDP Port | IGMPv3 SSM |
|---|---|---|---|---|---|---|---|---|
| 13 | 13 | ST 2110-20 | 97 | Enable | 2A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 14 | 14 | ST 2110-20 | 97 | Enable | 2A-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-3 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 15 | 15 | ST 2110-20 | 97 | Enable | 2A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| 16 | 16 | ST 2110-20 | 97 | Enable | 2A-4 | 0.0.0.0 | 1000 | 0.0.0.0 |
| | | | | | 2B-4 | 0.0.0.0 | 1000 | 0.0.0.0 |

## 3c) AIP2 Single Stream Outputs:

To configure the AIPs Output Multicast, you need to be in the Eng Setup – Video I/O –IP I/O Config – Outputs Menu.

- 100Gb QSFP 1A & 1B processes Outputs 1 thru 4 of that Rear.

- 100Gb QSFP 2A & 2B processes Outputs 5 thru 8 of that Rear.

**Panel 1**

Navigation: Bulk Configuration · Import/Export Config File · Inputs · Video · Outputs · Audio · Port Config SFPs · Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 1 | 1 | ST 2110-20 | 97 | Enable | 1A-1 | 0.0.0.0 | 1000 |
| | | | | | 1B-1 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-1 | 0.0.0.0 | 1000 |
| | | | | | 1B-1 | 0.0.0.0 | 1000 |
| 2 | 2 | ST 2110-20 | 97 | Enable | 1A-2 | 0.0.0.0 | 1000 |
| | | | | | 1B-2 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-2 | 0.0.0.0 | 1000 |
| | | | | | 1B-2 | 0.0.0.0 | 1000 |

**Panel 2**

Navigation: Bulk Configuration · Import/Export Config File · Inputs · Video · Outputs · Audio · Port Config SFPs · Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 3 | 3 | ST 2110-20 | 97 | Enable | 1A-3 | 0.0.0.0 | 1000 |
| | | | | | 1B-3 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-3 | 0.0.0.0 | 1000 |
| | | | | | 1B-3 | 0.0.0.0 | 1000 |
| 4 | 4 | ST 2110-20 | 97 | Enable | 1A-4 | 0.0.0.0 | 1000 |
| | | | | | 1B-4 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 1A-4 | 0.0.0.0 | 1000 |
| | | | | | 1B-4 | 0.0.0.0 | 1000 |

**Panel 3**

Navigation: Bulk Configuration · Import/Export Config File · Inputs · Video · Outputs · Audio · Port Config SFPs · Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 5 | 5 | ST 2110-20 | 97 | Enable | 2A-1 | 0.0.0.0 | 1000 |
| | | | | | 2B-1 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-1 | 0.0.0.0 | 1000 |
| | | | | | 2B-1 | 0.0.0.0 | 1000 |
| 6 | 6 | ST 2110-20 | 97 | Enable | 2A-2 | 0.0.0.0 | 1000 |
| | | | | | 2B-2 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-2 | 0.0.0.0 | 1000 |
| | | | | | 2B-2 | 0.0.0.0 | 1000 |

**Panel 4**

Navigation: Bulk Configuration · Import/Export Config File · Inputs · Video · Outputs · Audio · Port Config SFPs · Ancillary

| System Output | Board Output | Stream Format | Payload Type | Redundancy Mode | QSFP | Transmit IP | UDP Port |
|---|---|---|---|---|---|---|---|
| 7 | 7 | ST 2110-20 | 97 | Enable | 2A-3 | 0.0.0.0 | 1000 |
| | | | | | 2B-3 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-3 | 0.0.0.0 | 1000 |
| | | | | | 2B-3 | 0.0.0.0 | 1000 |
| 8 | 8 | ST 2110-20 | 97 | Enable | 2A-4 | 0.0.0.0 | 1000 |
| | | | | | 2B-4 | 0.0.0.0 | 1000 |
| | | ST 2110-20 Monitor Output | 99 | Enable | 2A-4 | 0.0.0.0 | 1000 |
| | | | | | 2B-4 | 0.0.0.0 | 1000 |

# 4) 8x4 AIP1&2 Mod I/Os:

Both 8x4 Mod IO AIP variants are the same as their 16x8 counterparts with just half the IO count. Each have 8 in and 4 out.
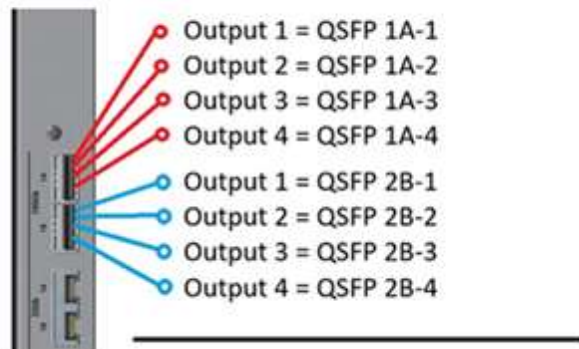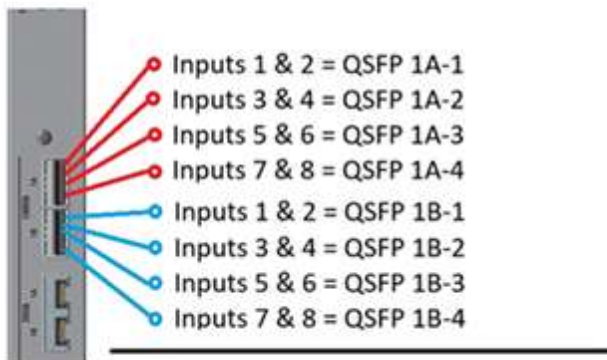
For example, a single Stream AIP2 Mod IO:

## AIP2 8x4 MOD IO

Inputs 1 to 8 = QSFP 1A
Inputs 1 to 8 = QSFP 1B

Outputs 1 to 4 = QFSP 1A
Outputs 1 to 4 = QFSP 1B
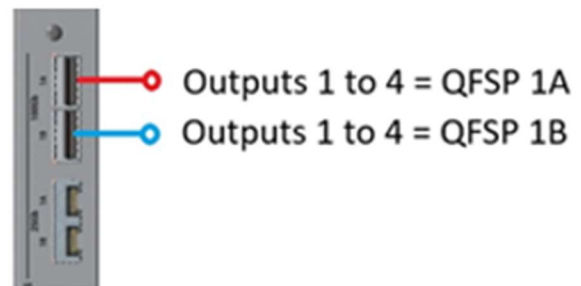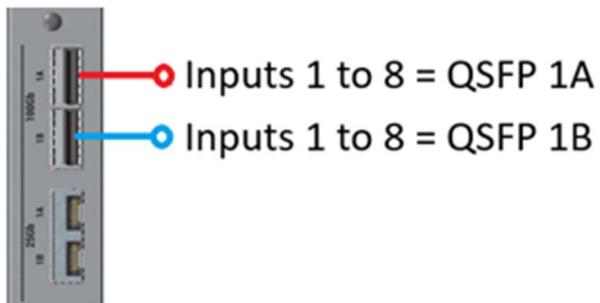
Quad Stream AIP1 Mod IO:

## AIP1 8x4 MOD IO

Inputs 1 & 2 = QSFP 1A-1
Inputs 3 & 4 = QSFP 1A-2
Inputs 5 & 6 = QSFP 1A-3
Inputs 7 & 8 = QSFP 1A-4
Inputs 1 & 2 = QSFP 1B-1
Inputs 3 & 4 = QSFP 1B-2
Inputs 5 & 6 = QSFP 1B-3
Inputs 7 & 8 = QSFP 1B-4

Output 1 = QSFP 1A-1
Output 2 = QSFP 1A-2
Output 3 = QSFP 1A-3
Output 4 = QSFP 1A-4
Output 1 = QSFP 2B-1
Output 2 = QSFP 2B-2
Output 3 = QSFP 2B-3
Output 4 = QSFP 2B-4

## 4a) Mod IO Input Numbers

Regardless of the Mainframe size, the first 8x4 MOD IO Input will start at Input 161.



This is to keep consistent with a fully loaded SXP Frame having 10 x 16x8 IO Rears.

## 4b) Mod IO Output Numbers

Regardless of the Mainframe size, the first 8x4 MOD IO Output will start at Input 81.



This is to keep consistent with a fully loaded SXP Frame having 10 x 16x8 IO Rears

# 5) 100GB QSFPs

## 5a) Single MAC / Quad MAC 100Gb Operations vs Single-mode / Multi-mode Fiber and 400G breakout compatibility:

When discussing optical transceivers in the context of 100G and 400G Ethernet, there are several key distinctions to understand across:

1. Single MAC vs Quad MAC 100G Operations
2. Single-mode vs Multi-mode Fiber
3. 400G Breakout Compatibility

Let's break each one down:

### 1. Single MAC vs Quad MAC 100G Operations:

- Single MAC 100G:
  - Uses a single 100G MAC (Media Access Control) interface.
  - Typically seen in 100GBASE-LR4 or 100GBASE-SR4 transceivers.
  - The MAC handles the full 100G stream, and the transceiver may use 4x25G lanes internally (e.g., via CAUI-4 interface).
  - Common in point-to-point 100G links.

- Quad MAC 100G (4x25G):
  - Uses four independent 25G MACs, each mapped to a lane.
  - Often used in breakout scenarios, such as a 100G port breaking out into 4x25G connections.
  - Common in top-of-rack switches or leaf-spine architectures where port flexibility is needed.

### 2. Single-mode vs Multi-mode Fiber

- Single-mode Fiber (SMF):
  - Designed for long-distance transmission (up to 10 km or more).
  - Uses laser-based optics (e.g., LR4, ER4).
  - Smaller core diameter (~9 µm).
  - Lower attenuation and dispersion.

- Multi-mode Fiber (MMF):
  - Designed for short-distance transmission (up to 100-400 meters).
  - Uses VCSEL-based optics (e.g., SR4).
  - Larger core diameter (~50 µm).
  - More cost-effective for short links but not suitable for long-haul.

### 3. 400G Breakout Compatibility

- 400G Transceivers (e.g., QSFP-DD, OSFP) can support:
    - 4x100G breakout: One 400G port split into four 100G ports.
    - Requires optics and switch support for breakout mode.
    - Common standards:
        - 400GBASE-DR4: 4x100G PAM4 lanes over SMF, breakout into 4x100G.

- Breakout Use Cases:
    - High-density interconnects in data centres.
    - Cost-effective scaling by using fewer transceivers and switch ports.

## Summary Table

| Feature | Single MAC 100G | Quad MAC 100G | Single-mode Fiber | Multi-mode Fiber | 400G Breakout |
|---|---|---|---|---|---|
| MAC Interfaces | 1x100G | 4x25G | N/A | N/A | 4x100G |
| Fiber Type | Either | Either | Yes | Yes | Depending on optics |
| Distance | Up to 10 km+ | Short/Medium | Long | Short | Varies |
| Use Case | Point-to-point | Breakout | Long-haul | Intra-rack | High-density |

## 5b) GV tested QSFPs:

| | 10G/25G/100G | Brand | Part # | Single Mode (LR) / Multi Mode (SR) | 100G Single MAC Compatible | 100G Quad MAC Compatible | 400G Switch Port Breakout Compatible | K-Frame Compatible |
|---|---|---|---|---|---|---|---|---|
| QSFP | 100G | Innolite | TR-FC85S-N00 | Multi (SR) | Yes | Yes | No | Yes |
| QSFP | 100G | Fiberstore | QSFP-DR-100G | Single (LR) | Yes | Yes | Yes | Yes |
| SFP | 10/25 Dual | Innolite | TR-PZ85S-N00 | Multi (SR) | N/A | N/A | No | Yes |
| SFP | 10/25 Dual | Fiberstore | SFP-25GMLR-31 | Single (LR) | N/A | N/A | No | Yes |

- **InnoLight TR-FC85S-N00:**

The InnoLight TR-FC85S-N00 is a 100Gb/s QSFP28 SR4 optical transceiver module designed for high-speed data communication over multimode fibre (MMF).

**Features**

- 4 independent full-duplex channels

- Up to 28Gb/s data rate per channel

- QSFP28  MSA compliant

- Up to 100m OM4 MMF transmission

- Operating case temperature: 0 to 70°C

- Single 3.3V power supply

- Maximum power consumption 3.5W

- MTP/MPO optical connector

- RoHS-6 compliant

**Applications**

- Rack to Rack

- Data Center

- Infiniband QDR, DDR and SDR

- 100G Ethernet

- **Fiberstore (FS) QSFP-DR-100G:**

The Fiberstore (FS) QSFP-DR-100G is a 100GBASE-DR QSFP28 optical transceiver designed for high-speed single-mode fiber (SMF) connections.



| | |
|---|---|
| Center Wavelength | 1310nm |
| Connector | Duplex LC |
| Cable Distance (Max.) | 500m (with Host FEC) |
| Cable Type | SMF |
| Modulation | PAM4 |
| Transmitter Type | EML |
| Packaging Technology | BOX Packaging |
| Chip | Broadcom Chip |

| | |
|---|---|
| Application | Data Center<br>100GBASE Ethernet<br>400G to 4x100G Breakout |

- **InnoLight TR-PZ85S-N00:**

The InnoLight TR-PZ85S-N00 is a 10G/25G dual-rate SFP28 optical transceiver, designed for short-range data transmission over multimode fiber. It supports both 10Gbps and 25Gbps Ethernet applications

### 🔧 Key Specifications

- **Form Factor:** SFP28
- **Data Rates:** 10Gbps and 25Gbps (dual-rate)
- **Wavelength:** 850nm (VCSEL laser)
- **Reach:**
  - Up to 70m over OM3 MMF
  - Up to 100m over OM4 MMF
- **Connector:** Duplex LC
- **Transmitter:** VCSEL (Vertical-Cavity Surface-Emitting Laser)
- **Receiver:** PIN photodiode
- **Power Consumption:** ≤ 1.0W
- **Digital Diagnostics:** Supported (SFF-8472 compliant)
- **Operating Temperature:** 0°C to 70°C
- **Compliance:** IEEE 802.3by (25GBASE-SR), backward compatible with 10G SFP+

- **Fiberstore SFP-25GMLR-31**:

The FS.com SFP-25GMLR-31 is a 25GBASE-LR SFP28 optical transceiver designed for long-range single-mode fiber applications.



**Key Specifications**

- **Form Factor:** SFP28
- **Data Rate:** 25Gbps
- **Wavelength:** 1310nm
- **Reach:** Up to 10 km over OS2 single-mode fiber
- **Connector:** Duplex LC
- **Transmitter:** DFB laser
- **Receiver:** PIN photodiode
- **Power Consumption:** ≤ 1.2W
- **Digital Diagnostics:** DOM (Digital Optical Monitoring)
- **Compliance:** IEEE 802.3by, IEEE 802.3cc, SFF-8472
- **Compatibility:** Works with major brands like Cisco, Juniper, Arista, Dell, and more

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