USER MANUAL

Vision SYSTEM

M-VIVID

IP/SDI video delays

Crystal Vision

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Contents

Revision 1	Updated block diagrams on pages five and six. Updated VIDEO LOSS CONTROLS wording on page 32.	12/06/20
Revision 2	Added VR07 relay bypass to M-VIVID200-2, M-VIVID400-2 and M-VIVID800. Added second output to M-VIVID800.	11/05/21

Revision 3	User interface screen shots updated to align with V2.3 MARBLE-V1 and V1.19 Vision 3 software releases. Added new audio monitoring and audio mute features. Added new preset features. Updated use of flow terminology.	18/08/22

1 Introduction

M-VIVID is a range of 3G/HD/SD-SDI video frame delay software apps that run on the MARBLE-V1 media processor – purpose-built GPU/CPU hardware that fits in the Vision frame. They can be used to match any short or long system delays in IP, SDI or mixed installations, such as those caused by virtual studio graphics, MPEG encoders and decoders, audio processing, HD radio links, satellite links and aggregated signal path delays.

The delay is adjustable in steps of frames, with the length of the delay in seconds dependent on the video standard. The triple channel M-VIVID100-3 provides up to 100 frames of delay per channel, the dual channel M-VIVID200-2 up to 200 frames of delay per channel, the dual channel M-VIVID400-2 up to 400 frames per channel and the single channel M-VIVID800 up to 800 frames.

Like all MARBLE-V1 video processing software apps, the M-VIVID can be used with IP (ST 2022 or ST 2110 video), with SDI or with both IP and SDI at the same time (thereby providing gateway functionality).

M-VIVID:

- Video delay software app that runs on the MARBLE-V1 media processor
- Supports SDI and IP inputs and outputs
- **M-VIVID100-3** triple channel with up to 100 frames delay per channel
- **M-VIVID200-2** dual channel with up to 200 frames delay per channel
- **M-VIVID400-2** dual channel with up to 400 frames delay per channel
- **M-VIVID800** single channel with up to 800 frames delay

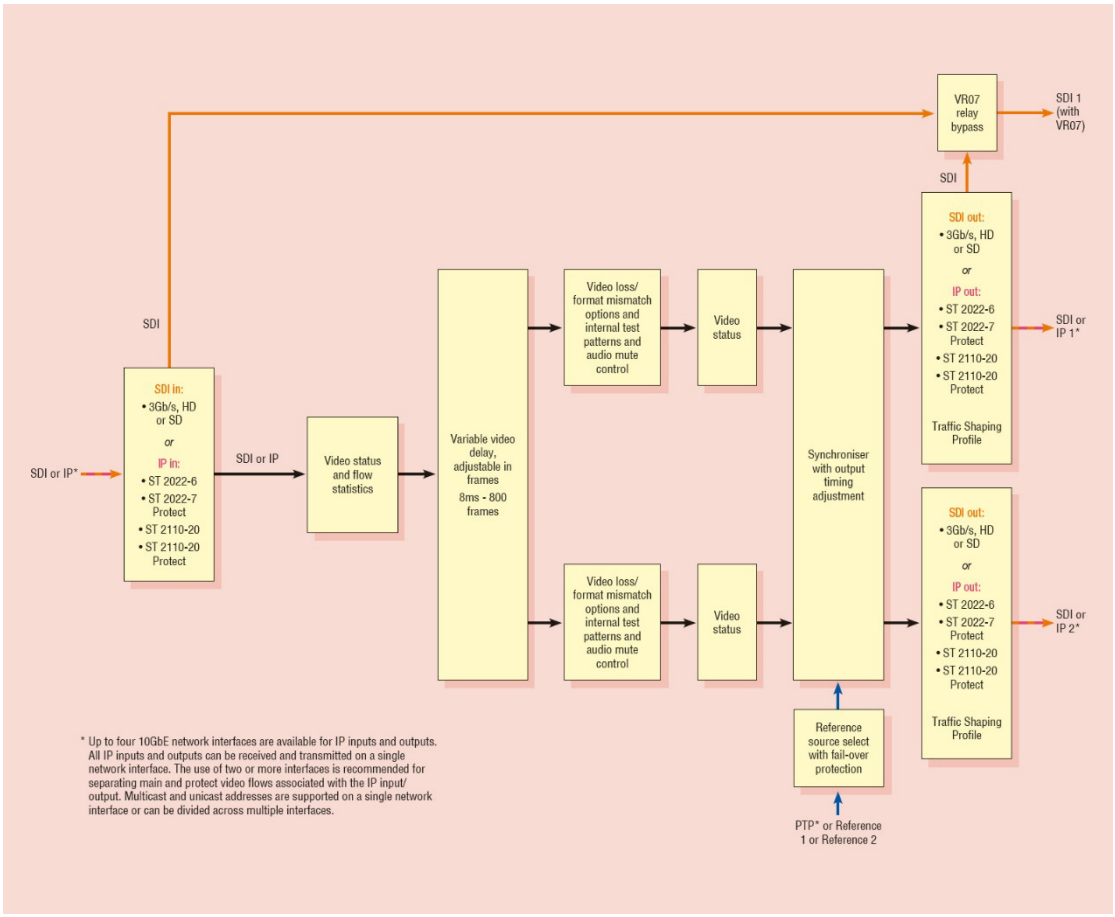
Common MARBLE-V1 feature set:

- Supports SMPTE ST 2022-6 and ST 2022-7 protocols and video within ST 2110 (supporting ST 2110-10, -20 and -21 standards)
- 10GbE SFP+ connectivity supporting 1310nm single-mode long range and 850nm multi-mode short range fibre
- Supports 31 video standards
- Framestore synchroniser. Choice of multiple timing sources with fail-over: PTP and two analogue Black and Burst or tri-level syncs references via Vision frame
- Sub frame output timing adjustment locked to chosen reference source
- Input and output present, black and frozen monitoring
- Input video and network error detection
- Input audio group monitoring
- IP inputs tolerant of any input packet distribution
- Instant clean switching between input flows, whatever their timing
- IP flow monitoring including packet loss, duplicated packets and packet delay variation

- Internal test patterns
- Support for unicast and multicast transmission
- Full range of VLAN support
- Supports IGMP V1, V2 and V3
- Flexible remote control and monitoring using frame integrated control panel, VisionPanel remote control panel, ASCII and JSON protocols, SNMP and the web browser-based VisionWeb Control
- Dual slot card allowing 10 cards in Vision 3 frame

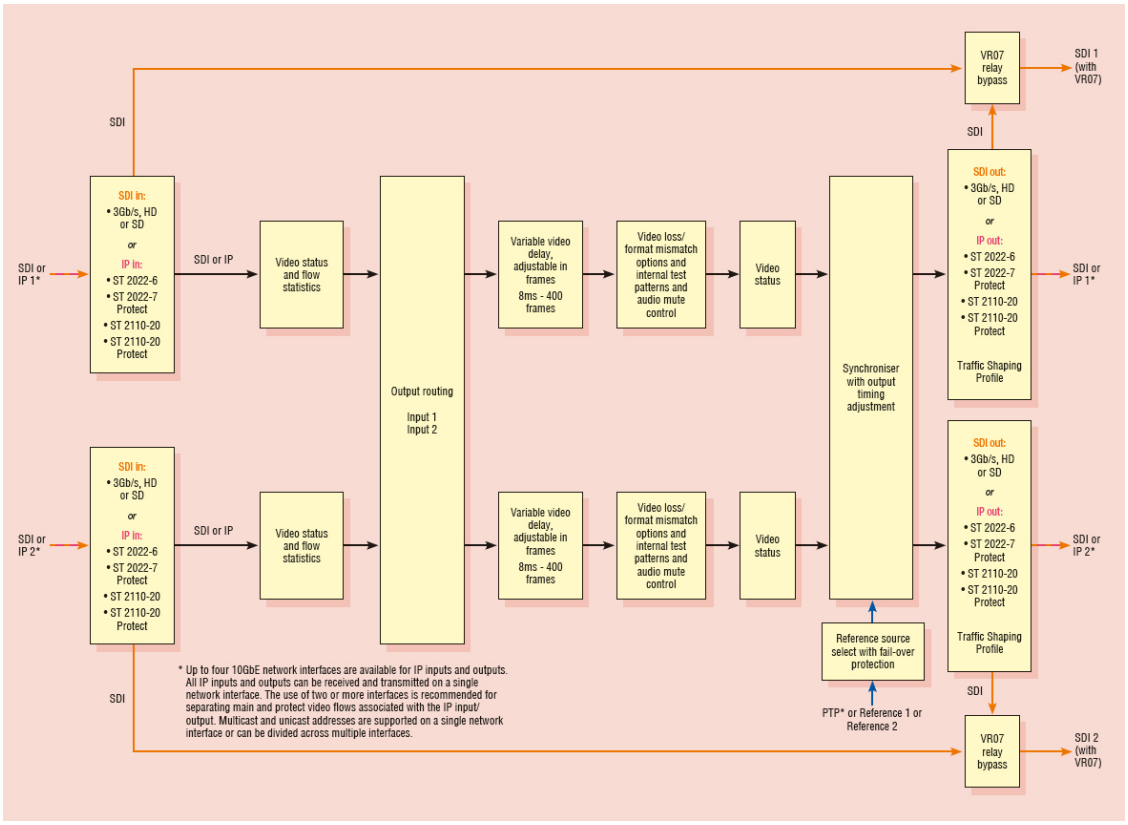
2 Block Diagrams

M-VIVID800

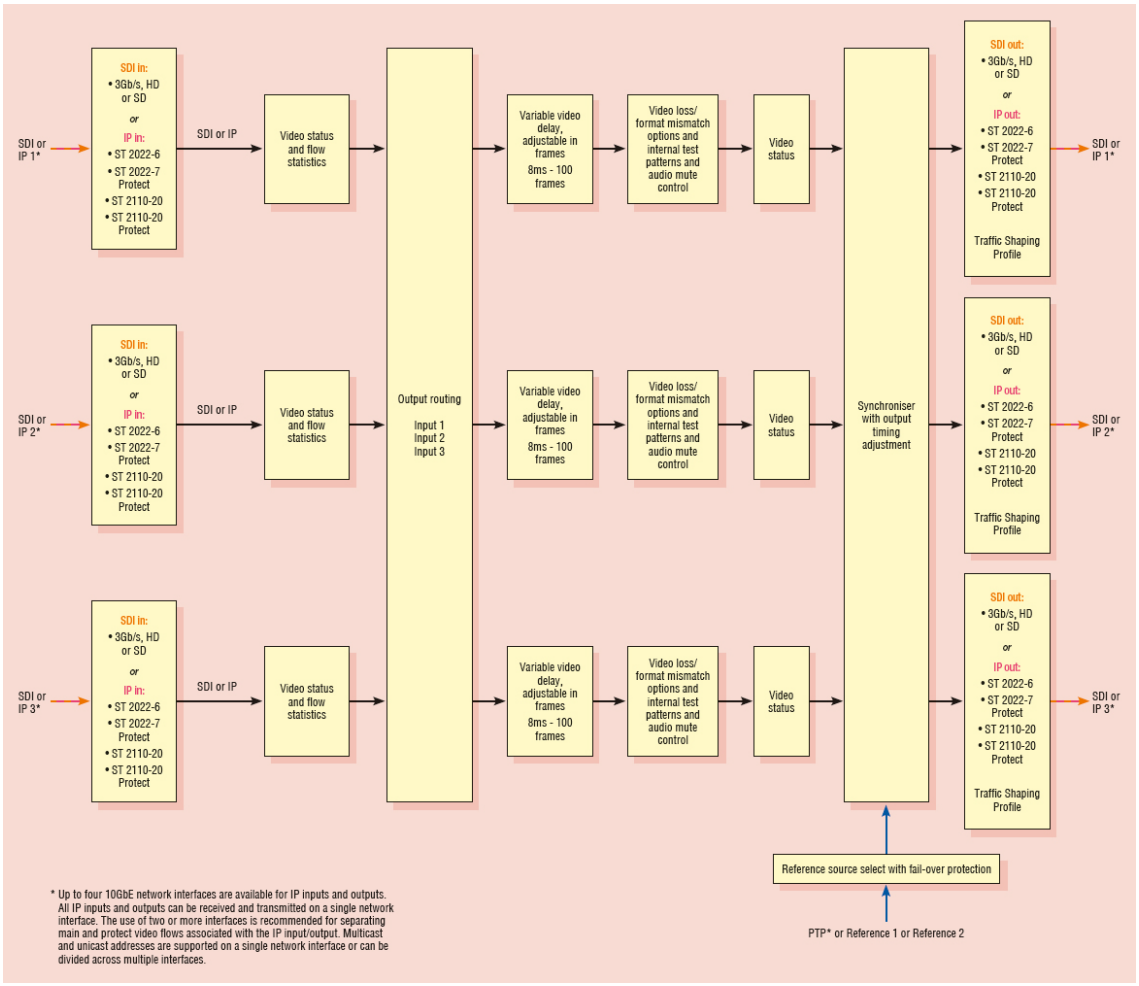


M-VIVID400-2

(M-VIVID200-2 same, except 200 frames delay per flow)



M-VIVID100-3


SDI or IP 1*
SDI in:
• 3Gb/s, HD or SD
or
IP in:
• ST 2022-6
• ST 2022-7 Protect
• ST 2110-20
• ST 2110-20 Protect
SDI or IP
Video status and flow statistics
Output routing
Input 1
Input 2
Input 3
Variable video delay, adjustable in frames
8ms - 100 frames
Video loss/ format mismatch options and internal test patterns and audio mute control
Video status
Synchroniser with output timing adjustment
SDI out:
• 3Gb/s, HD or SD
or
IP out:
• ST 2022-6
• ST 2022-7 Protect
• ST 2110-20
• ST 2110-20 Protect
Traffic Shaping Profile
SDI or IP 1*
SDI or IP 2*
SDI or IP 2*
SDI or IP 3*
SDI or IP 3*
Reference source select with fail-over protection
PTP* or Reference 1 or Reference 2
* Up to four 10GbE network interfaces are available for IP inputs and outputs. All IP inputs and outputs can be received and transmitted on a single network interface. The use of two or more interfaces is recommended for separating main and protect video flows associated with the IP input/output. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces.

3 Hardware Installation

The potentiometers on the card are factory set and should not be adjusted. There are no user-selectable links.

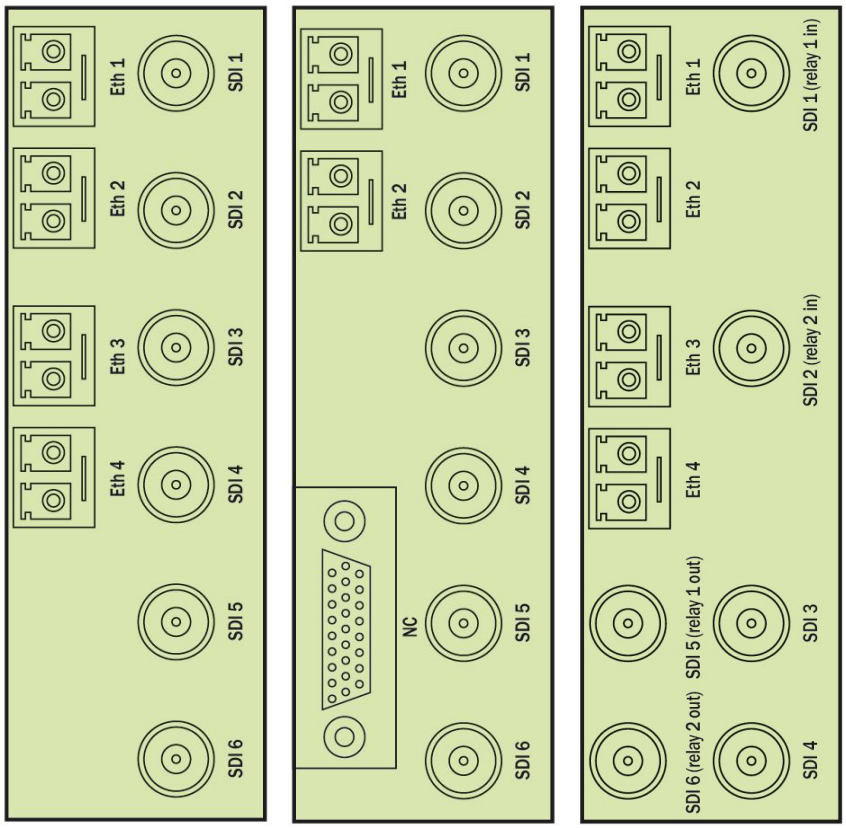
The app based MARBLE-V1 cards are intended for use only in the Crystal Vision 'Vision' frame range and not in older style frames such as 'Indigo'.

Insert the card by pushing the white handle on the card edge, being careful to ensure the card is inside the guide rails. Remove it by pulling the metal hook. Do not force the card if resistance is met as the card may not be correctly aligned with the rear connectors.

Ensure that the Vision frame has the correct rear module fitted. Only the VR04, VR06 and VR07 rear modules offer the correct input/output functionality for the M-VIVID app.

The cards and rear modules can be inserted and removed without powering down the frame.

3.1 Rear module signal IO



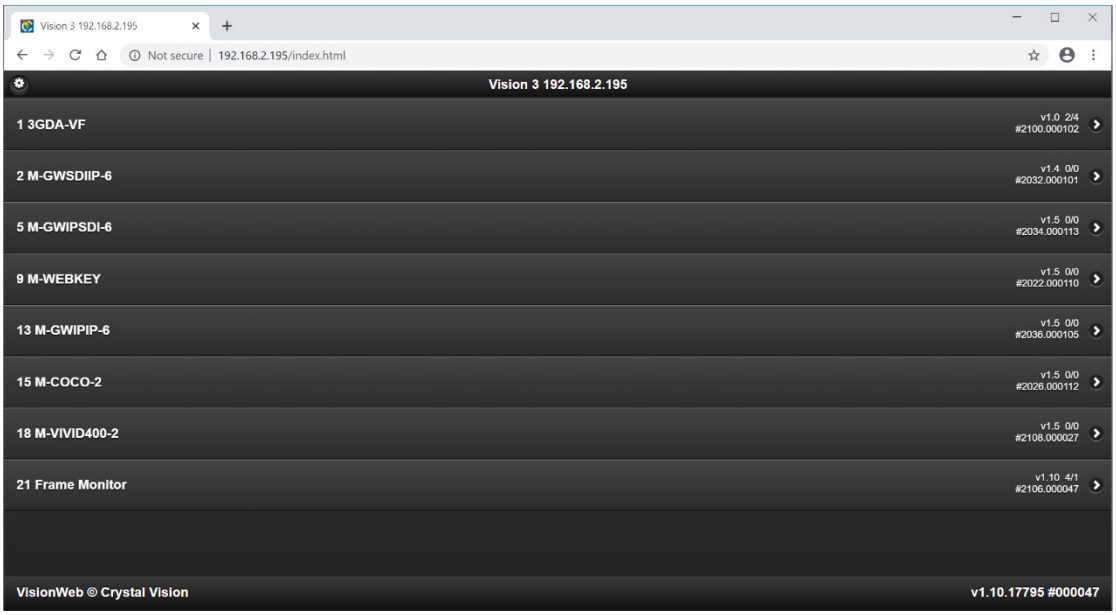
VR04 *VR06* *VR07*

	M-VIVID100-3	M-VIVID200/400-2	M-VIVID800
SDI 1	SDI Input 1	SDI Input 1	SDI Input 1
SDI 2	SDI Input 2	SDI Input 2	
SDI 3	SDI Input 3		
SDI 4	SDI Output 1		
SDI 5	SDI Output 2	SDI Output 1	SDI Output 1
SDI 6	SDI Output 3	SDI Output 2	SDI Output 2
Eth 1 to 4	10GbE video over IP	10GbE video over IP	10GbE video over IP
D-Type (VR06 only)	No connection	No connection	No connection

The VR07 provides dual relay bypass protection when M-VIVID200-2, M-VIVID400-2 and M-VIVID800 are used with both SDI inputs and SDI outputs. It is not available for the M-VIVID100-3. The relay bypass protection protects the video output on frame power failure or if the MARBLE-V1 card loses power or is removed. When using the VR07 with the M-VIVID200-2 and M-VIVID400-2, SDI 1 is connected to SDI 5 and SDI 2 is connected to SDI 6. When using the VR07 with the M-VIVID800, SDI 1 is connected to SDI 5.

4 I/O Configuration

VisionWeb web browser control software is recommended for the configuration of the MARBLE-V1 software apps. This is achieved by entering the IP address of the frame into a web browser (10.0.0.201 on Ethernet port 1 of the frame by default). See the Vision 3 frame manual for more information on VisionWeb and frame configuration and operation.



Example 'VisionWeb' homepage

4.1 Configuring the Ethernet Interfaces

MARBLE-V1 ST 2022 and ST 2110 video over IP flows are received and transmitted using the VR04/VR06/VR07 10GbE network interface connections. VR06 provides two network interfaces while the VR04 and VR07 provide four. A typical usage case is to use Eth 1 interface for the 'primary' IP traffic and Eth 2 for the 'protect'. The additional Eth 3 and 4 interfaces on the VR04 and VR07 allow input flows to be separated from output flows.

Within each Ethernet interface there are six virtual interfaces. These are useful for software apps which process six individual IP flows, such as the IP gateways, as each flow can be assigned to its own unique IP address. It is, however, possible to use the same virtual interface for all input and output flows. If using SDI I/O with an analogue reference no virtual interfaces will need configuring.

In a fully IP environment, the following example shows how the M-VIVID400-2 primary and protect input and output flows could be assigned to individual virtual interfaces. As previously mentioned, it is also possible to assign all flows to the same interface.

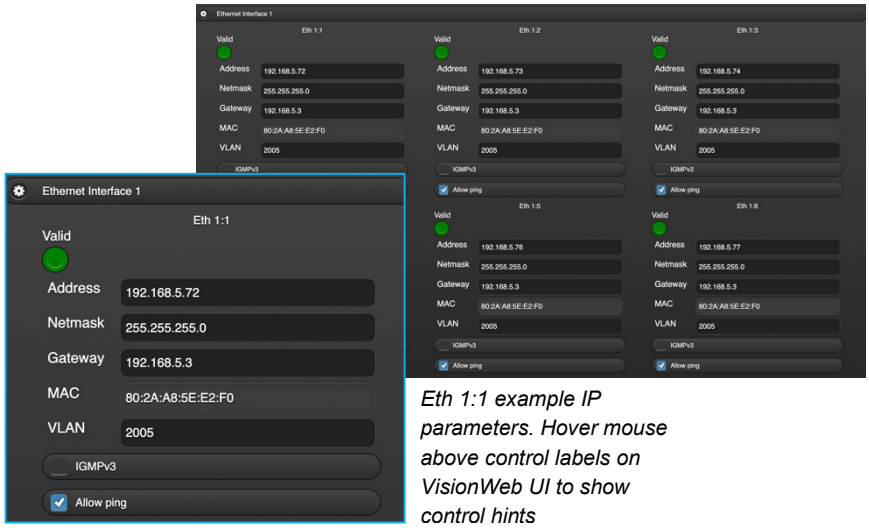
Flow Inputs

Eth 1:1 Primary IP Input 1	Eth 2:1 Protect IP Input 1
Eth 1:2 Primary IP Input 2	Eth 2:2 Protect IP Input 2

Flow Outputs

Eth 1:3 Primary IP Output 1	Eth 2:3 Protect IP Output 1
Eth 1:4 Primary IP Output 2	Eth 2:4 Protect IP Output 2

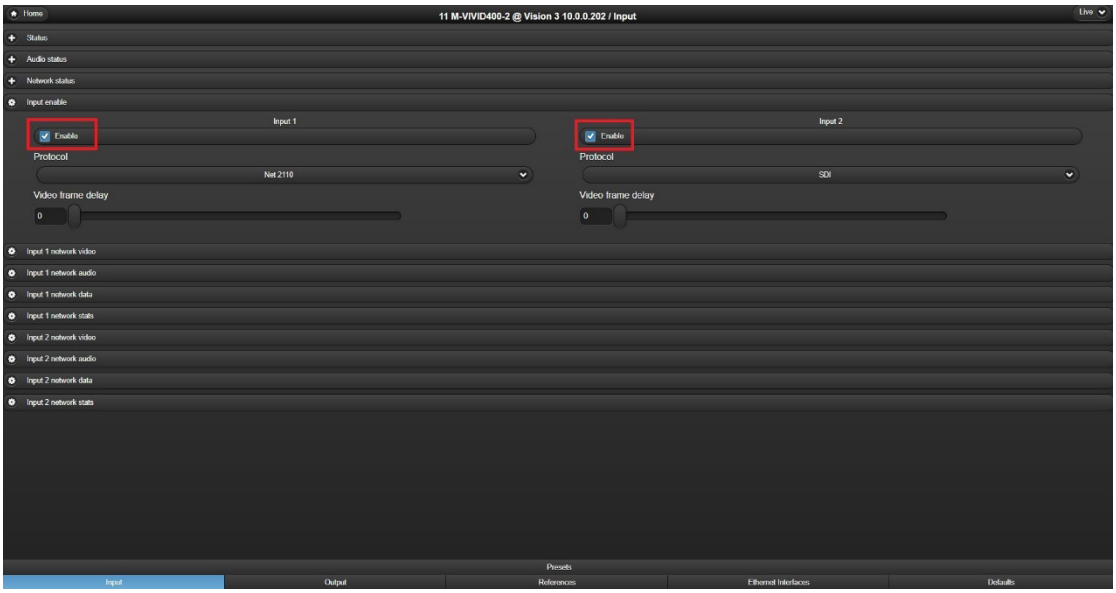
Alternatively, if using the VR04 or VR07, the IP flow outputs can be separated onto Eth 3 and 4.



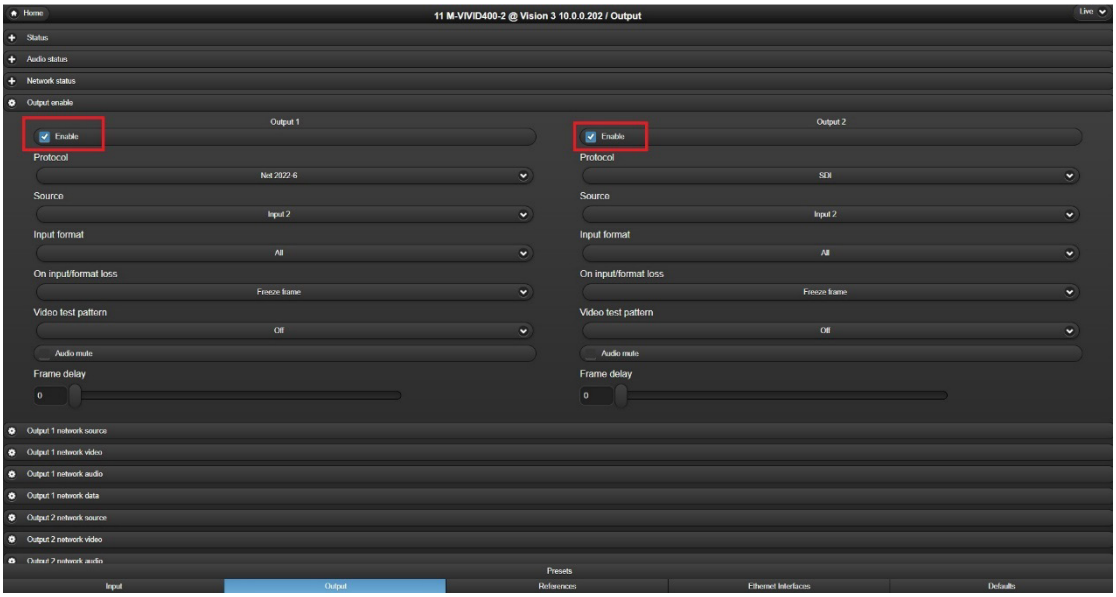
Eth 1:1 example IP parameters. Hover mouse above control labels on VisionWeb UI to show control hints

4.2 Enabling Inputs & Outputs

By default M-VIVID inputs and outputs are disabled. Use the Enable control within the Input and Output menus to enable them.



M-VIVID Input Enable

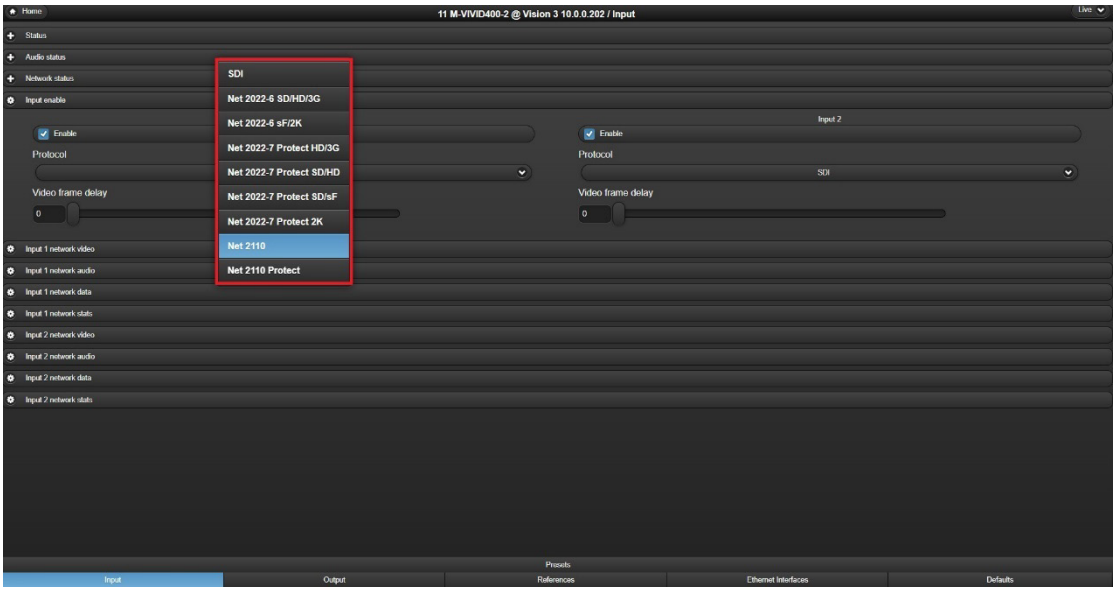


M-VIVID Output Enable

4.3 Select I/O Protocol

M-VIVID supports SDI and uncompressed video over IP protocols ST 2022 and ST 2110-20. It is possible to mix protocols between inputs and outputs. For example, an ST 2022 input can be output as SDI.

Once the inputs and outputs have been enabled, the required Protocol can be selected using the drop down menus within the Input and Output control tabs. The protocol type will need selecting for each input and output.



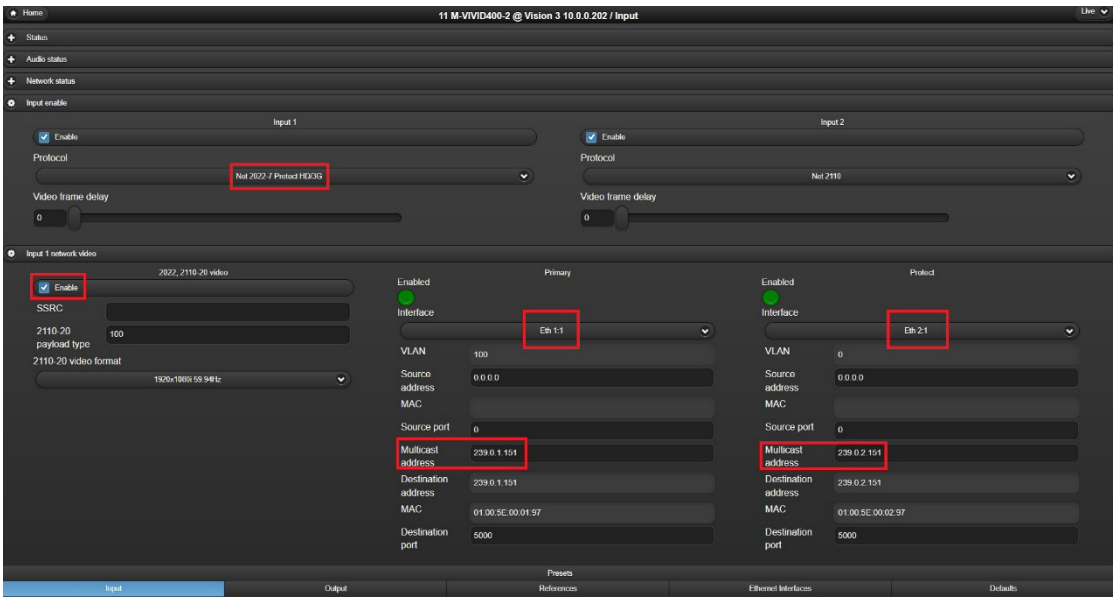
M-VIVID Input Protocol Selection

IP output flow transmission supports both Block Packing Mode (BPM) and General Packing Mode (GPM) for ST 2110-20 encapsulation. BPM, which packs multiple (up to 7) 180 byte blocks into an RTP payload, is a restricted subset of GPM, and GPM is the more general case.

4.4 Receiving an IP Flow

M-VIVID receives ST 2022 or ST 2110-20 video over IP flows using the 10GbE network interfaces on the VR04, VR06 or VR07 Vision frame rear connector. Typically Eth 1 is used for receiving and transmitting the ‘primary’ IP flows, with Eth 2 being used for the ‘protect’ in -7 protect applications.

The following example shows an M-VIVID configured to receive Input 1 using SMPTE ST 2022-7 protocol. When selecting ST 2022-7 it is necessary to configure both the ‘Network In’ and ‘Protect Network In’.



M-VIVID Input 1 Flow In

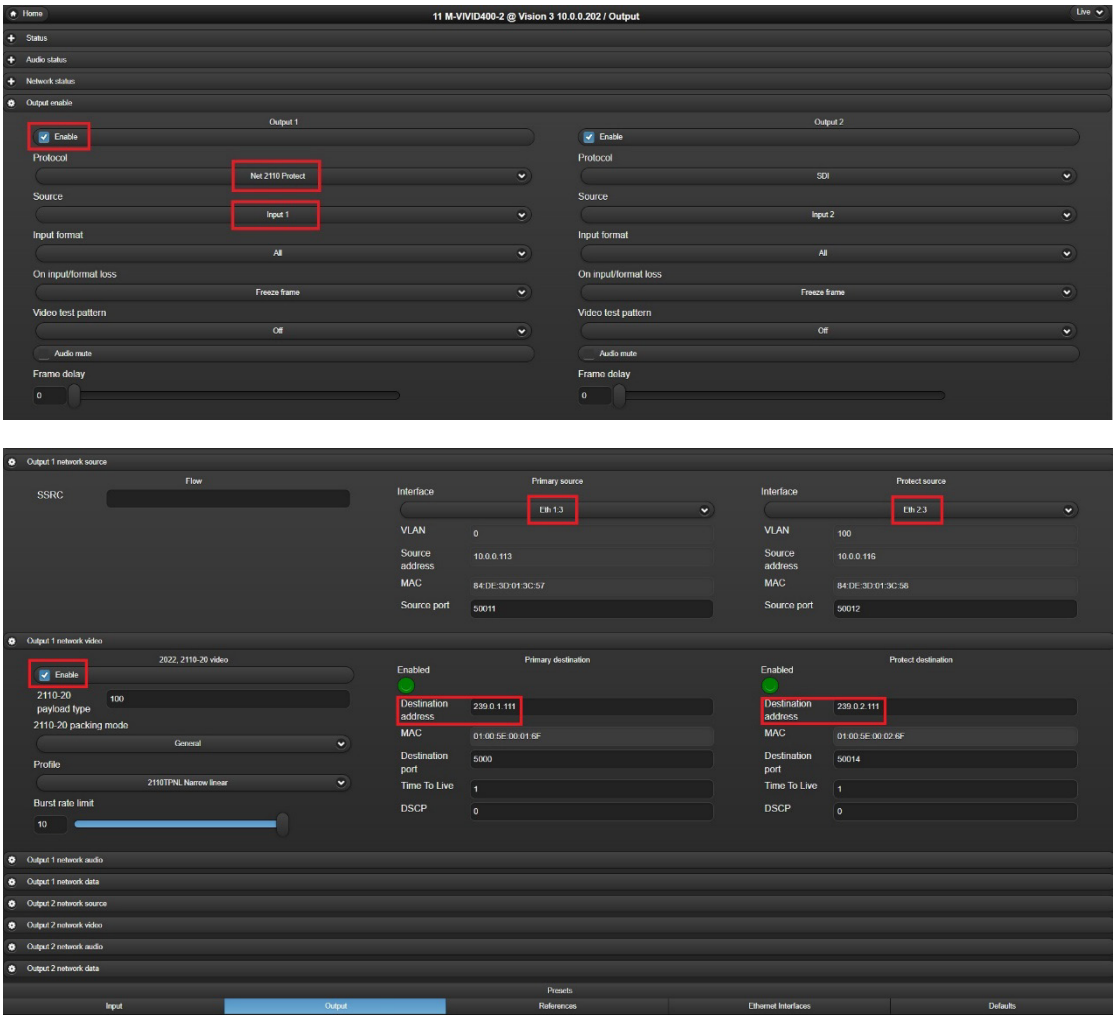
The controls highlighted in the above configuration show Input 1 of the M-VIVID set to receive the ‘main’ flow packets on Ethernet Interface 1:1 and ‘protect’ packets of the ST 2022-7 protocol on 2:1. In this example multicast IP addresses are in use.

To successfully receive an IP flow, all IP parameters must agree with those of the transmitter. If receiving ST 2110, the 2110 payload type and 2110 format will need to match the transmitter.

4.5 Transmitting an IP Flow

M-VIVID transmits ST 2022 or ST 2110-20 video over IP flows using the 10GbE network interfaces on the VR04, VR06 or VR07 Vision frame rear connector. Typically Eth 1 is used for receiving and transmitting the ‘primary’ IP flows, with Eth 2 being used for the ‘protect’ in -7 protect applications.

The following example shows an M-VIVID configured to transmit Output 1 using ST 2110-20 GPM Protect protocol. When selecting a protect protocol it is necessary to configure both the ‘Network Out’ and ‘Protect Network Out’.



M-VIVID Output 1 IP Flow Out

The controls highlighted in the above configuration show Output 1 of the M-VIVID routing Input 1 to Ethernet Interface 1:3 and 2:3 using ST 2110-20 GPM Protect protocol. In this example multicast destination addresses are being used for the main and protected flows which, if required, could be replaced by single point unicast addresses.

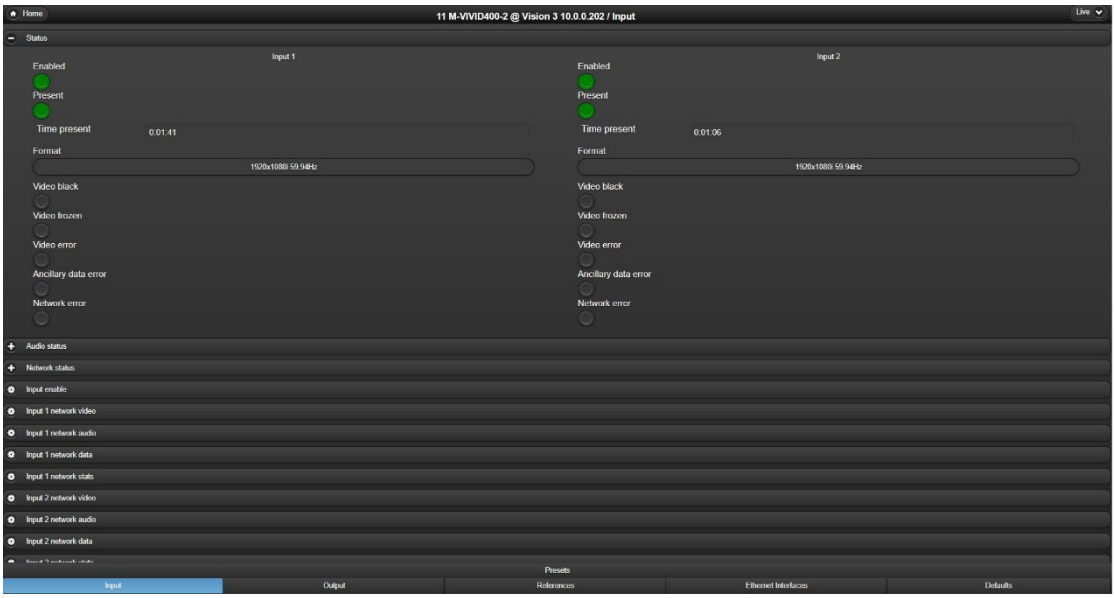
VLANs, ports and Time To Live (TTL) should be configured as per the network switch requirements.

If required a valid SSRC (Synchronisation source identifier) can be entered, otherwise left blank or set to 0 will accept all.

When transmitting ST 2110 the required payload type value should be set. The value for payload type is arbitrary and decided by the user. For example, value 100 could be used to indicate 1920x1080i 50Hz content and value 101 used to indicate 625i 50Hz content.

5 Status

5.1 Input Video status



Input video status

Video Status

Enabled LED: Green when input is enabled, otherwise off

Present LED: Green when input is present, otherwise off

Time present: Length of time input has been present

Format: Read only text showing video format e.g. 1920x1080i 50Hz

Video black LED: Yellow if input is full frame black, otherwise off

Video frozen LED: Yellow if input is frozen, otherwise off

Video error LED: Red if CRC errors detected at input, otherwise off

Ancillary data error LED: Red if ANC data errors detected at input, otherwise off

Network error LED: Red if lost or duplicate packets are detected on primary or protect network input.

5.2 Input Audio status

Input audio status

Audio Status

Audio Group 1 to 4 present LED: Green when audio groups present, otherwise off

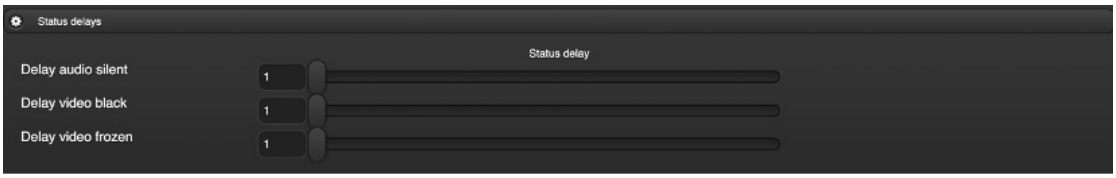
Audio Channel 1 to 16 present LED: Green when audio channels present, otherwise off

Audio Group 1 to 16 silent LED: Yellow when audio channels silent (-93dBFS trigger point), otherwise off

The equivalent output status is also provided for video enabled, video present, video format, video black, video frozen, audio groups present, audio channels present and audio channels silent.

5.3 Status Delay

Audio silent, video black and video frozen status can be prevented from triggering until a user selectable delayed period between 1 to 120 seconds has expired. These controls are located within the ‘Defaults’ tab.



Status delay

5.4 Network Status & Statistics

Input network status

Enabled LED: Green when input is enabled, otherwise off

Present LED: Green when input is present, otherwise off

Error LED: Red if lost or duplicate packets detected at input, otherwise off

Input flow network statistics

Flow Statistics

Protect %: Percentage of packets used from the ‘protected’ network input

Skew: Difference in packet arrival. –ve indicates protect packets are arriving first

Network In/Protect Network In pkts

Lost: Number of lost packets

Duplicate: Number of duplicate packets

Min gap: Minimum gap between packets (nSec)

Max gap: Maximum gap between packets (nSec)

Mean gap: Mean gap between packets of a frame (nSec)

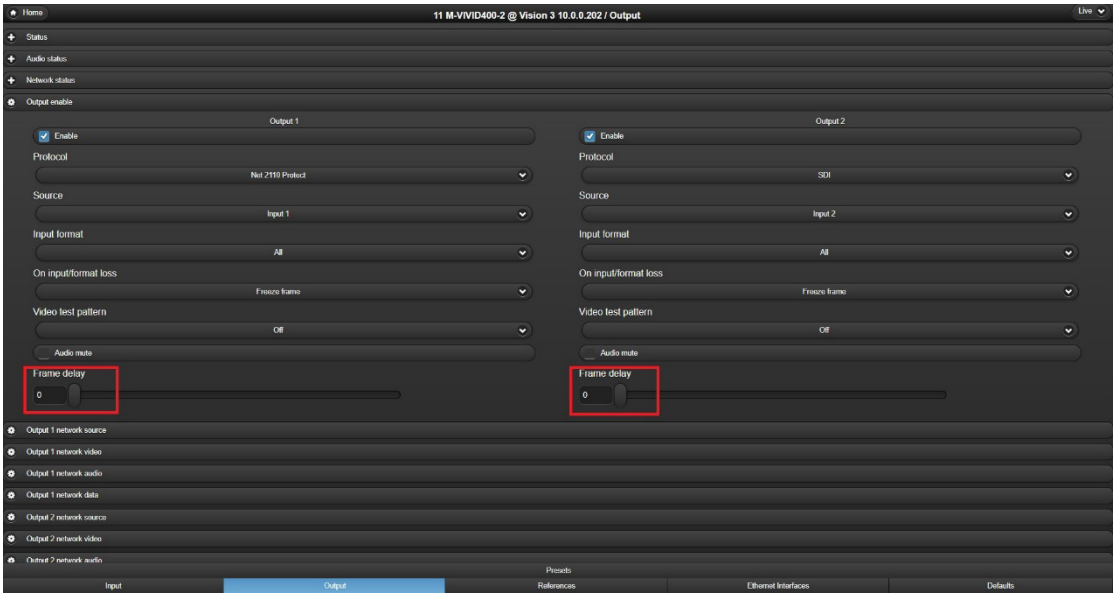
6 Video Delay

6.1 Applying Frame Delay

M-VIVID is available as the following options:

- **M-VIVID100-3** triple channel with up to 100 frames delay per channel
- **M-VIVID200-2** dual channel with up to 200 frames delay per channel
- **M-VIVID400-2** dual channel with up to 400 frames delay per channel
- **M-VIVID800** single channel with up to 800 frames delay

The video delay is adjustable in one frame increments. Use the Output – Output Enable menu to apply the delay.

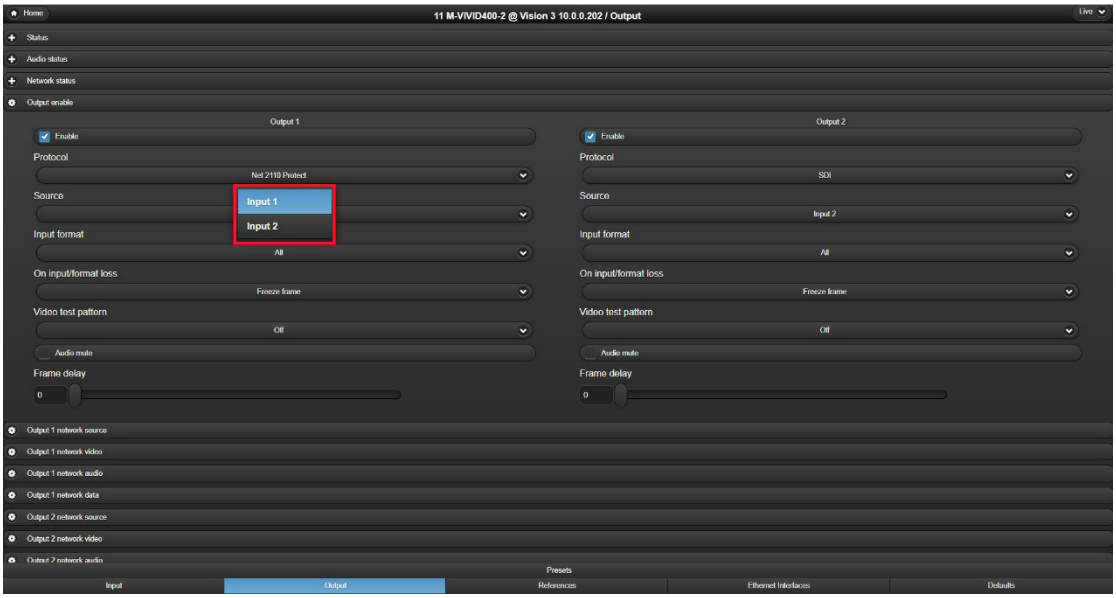


Output frame delay setting (M-VIVID400-2 shown)

Delay adjustments can be made live. The apps apply the adjustments slowly over time, with small delay adjustments therefore going virtually unnoticed. Increasing the delay slows down the video until the delay is correct, while reducing the delay speeds up the video until the delay is correct.

6.2 Output Routing

The dual channel M-VIVID400-2/M-VIVID200-2 and triple channel M-VIVID100-3 feature independent video delay on each of the outputs. Default routing is 1>1, 2>2 and 3>3. However, it is possible to route one input to all outputs, with different frame delays set for each output.



Output routing (M-VIVID400-2 shown)

7 References and Output Timing

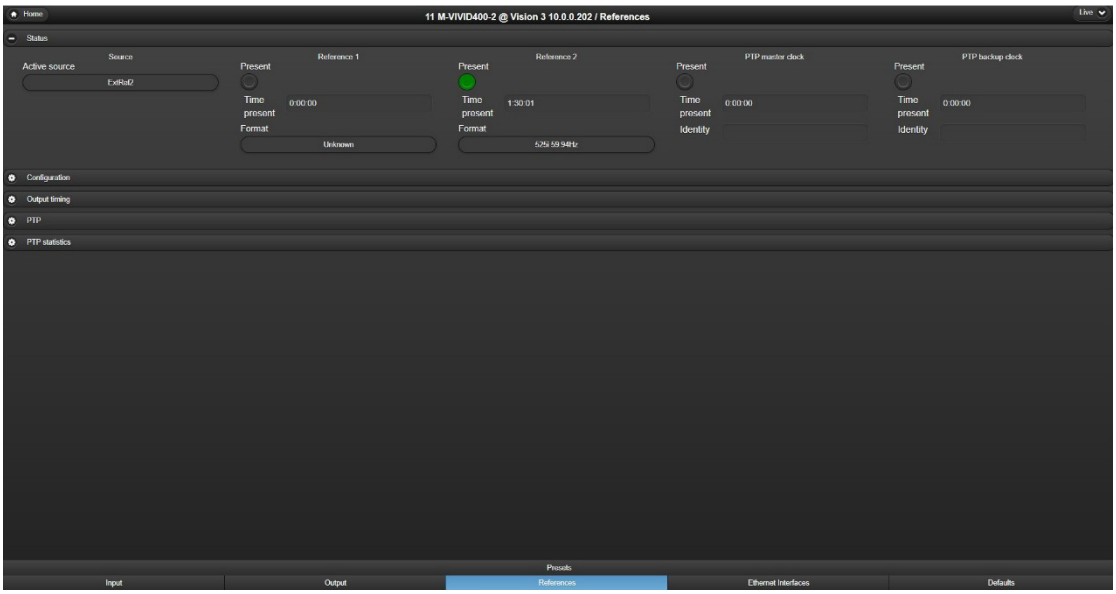
7.1 References

M-VIVID outputs can be locked to a PTP clock, an analogue tri-level or Black & Burst sync or the SDI input if present and selected as the input protocol. If the chosen reference sources are absent at power up, the outputs will freerun to an internally generated clock.

All outputs are locked to the same reference clock. It is not possible to lock different outputs to different clocks.

Inputs are not required to be the same frame rate as the chosen reference. It is possible, for example, to input 59.94Hz video locked to a 50Hz reference. However, frames will be dropped and repeated as necessary when cross-locking frame rates in order to maintain a valid output.

Status



Reference Status

Active source: Reference source outputs are locked to

Reference & PTP clock Present LEDs: Green when present, otherwise off

Time present: Length of time input has been present

Reference 1 & 2 Format: Read only text showing reference format e.g. 625i 50Hz

Reference configuration

Reference Configuration

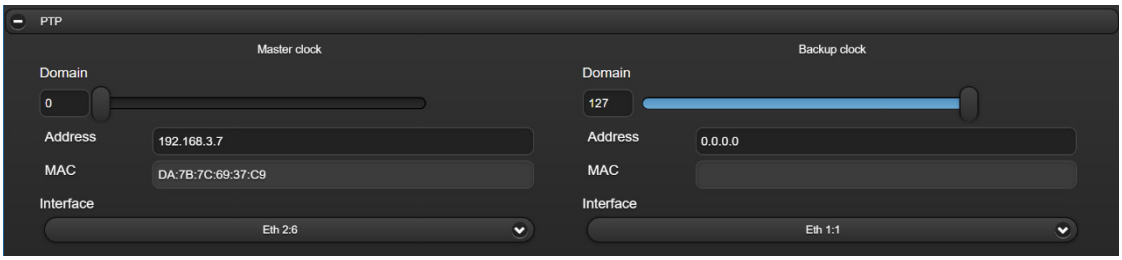
Reference source: Select priority order of reference source. Will automatically fail-over to next source in list if priority source missing

Auto relock enable: Automatically relocks to priority reference source upon its return

Active source: Read only text showing which reference source is in use

Force relock: Returns to priority reference source if auto relock is not enabled

PTP Configuration



PTP Configuration

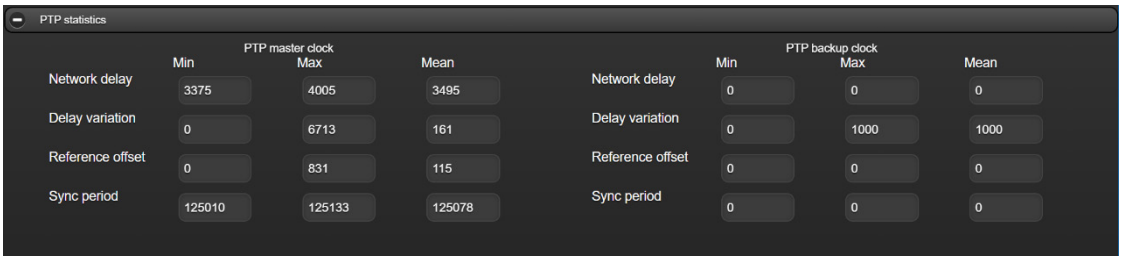
Domain: Domain number of the PTP clock

Address: IP address of the master and backup PTP clocks

MAC: Read only text showing the MAC address of the PTP clocks

Interface: Ethernet interface chosen to receive the PTP clock. The interface chosen must be configured for the same IP range and as the PTP clock

PTP Statistics



PTP statistics

Network delay: Calculated delay between MARBLE-V1 card and the master PTP clock. Expected to be small if network switch is PTP-aware, otherwise will reflect number of switches between MARBLE-V1 card and the master PTP source

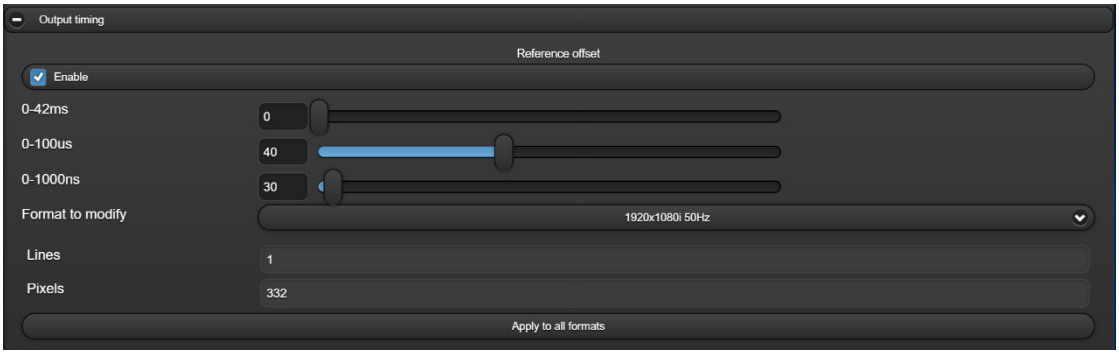
Delay variation: Indicates system noise and how accurately MARBLE-V1 can lock. For example, to lock within 500ns, the delay variation should be less than 500ns

Reference offset: Offset between MARBLE-V1 card and master PTP clock. Expected to be less than 500ns

Sync Period: How often the PTP sync packets are seen. Indicates whether the master PTP clock is configured correctly, e.g. 8 packets a second, and whether there are any packets missing which could indicate a network issue

7.2 Output timing

The output timing controls adjust the offset delay of all outputs relative to the chosen reference source. All outputs are locked to the same reference source, it is not possible to offset each output individually. However, the offset can be set per video format, allowing for example, different output timing for HD and SD signals. If the input to chosen reference timing is close enough to fall below the card's minimum processing delay, a one frame delay will be applied. The output timing controls are sub-frame time based (ms and us). Status is provided for the equivalent lines and pixels delay.



Output timing

Output Timing

Enable: Select to enable the output timing controls. Minimum possible delay applied when deselected

Time adjustment sliders: Sub-frame adjustment of output timing relative to reference source

Format to modify: Independently adjust output timing for each video format

Apply to all formats: Select to apply the output timing adjustment to all video formats

Lines/Pixel: Read only status of the output timing in equivalent lines and pixels

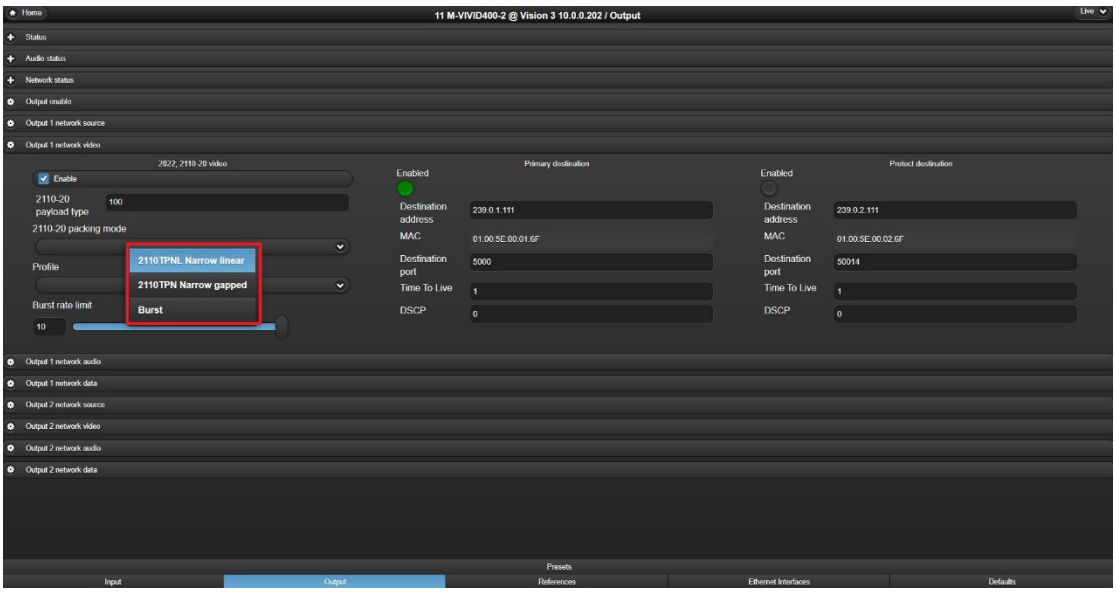
8 Traffic Shaping Profile

8.1 Traffic Shaping Profiles

SMPTE ST 2022 transmits using a narrow linear profile, with all packets evenly spaced throughout the duration of each entire traditional corresponding SDI video frame.

SMPTE ST 2110-20 supports both narrow linear (TPNL) and narrow gapped (TPN) transmission. As per SMPTE ST 2022 transmission, TPNL transmits the packets evenly spaced throughout the duration of each entire video frame, but starting one line after the first Start-of-Frame (SOF) VANC period. TPN, however, does not transmit packets during the VBI or VANC period of the traditional corresponding SDI video frame.

For both SMPTE ST 2022 and ST 2110-20 protocols it is possible to ‘burst’ the packets out as fast as possible, using the ‘Burst rate limit’ control to determine the maximum bandwidth the burst traffic will limit to.



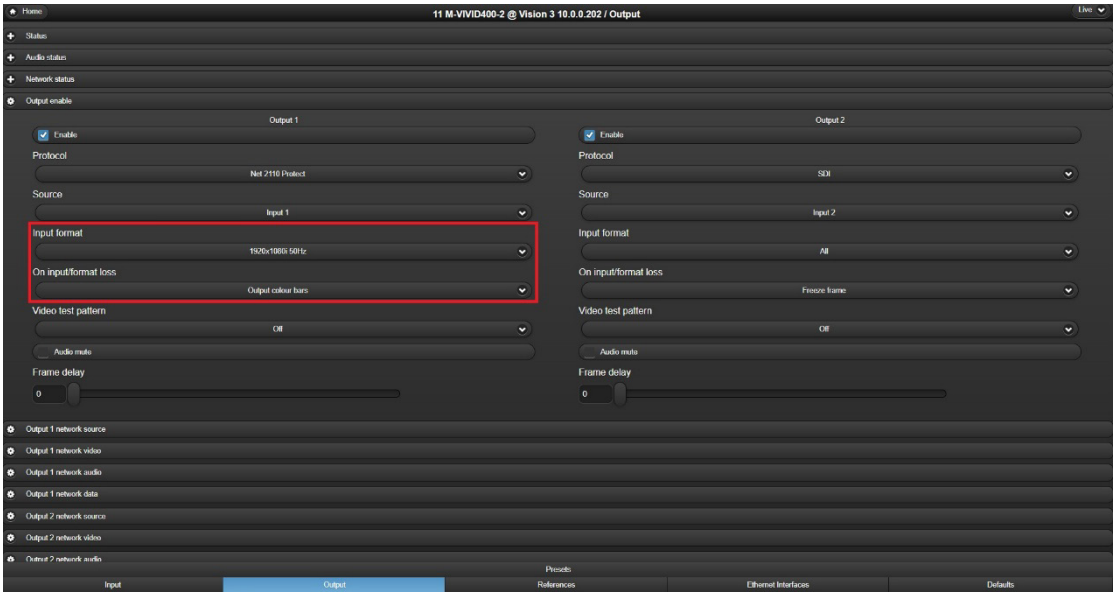
Traffic Shaping Profile

9 Input Format, Input Loss and Test Pattern Options

9.1 Input Format and On Loss of Input

All apps provide an Input Format control. If set to ‘All’, any input format present is deemed valid. If set to a single format, any input format present which does not match the selected format is deemed invalid, upon which the ‘On loss of input’ function is triggered.

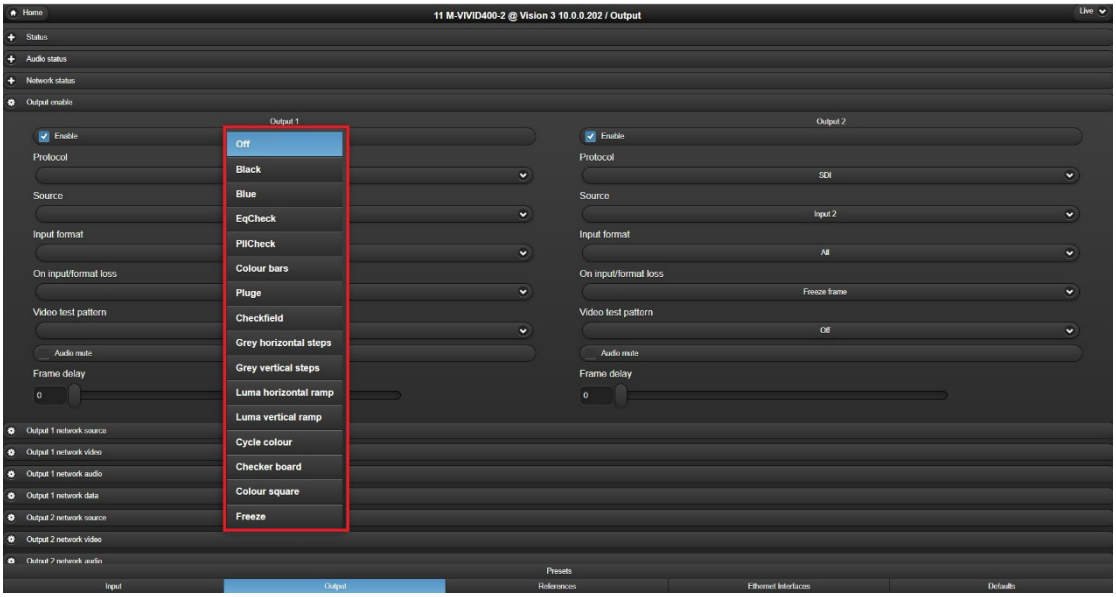
In the example below, if the source input format is not 1920x1080i 50Hz, the output will be replaced with colour bars.



Input Format and On Loss Options

9.2 Internal Test Patterns

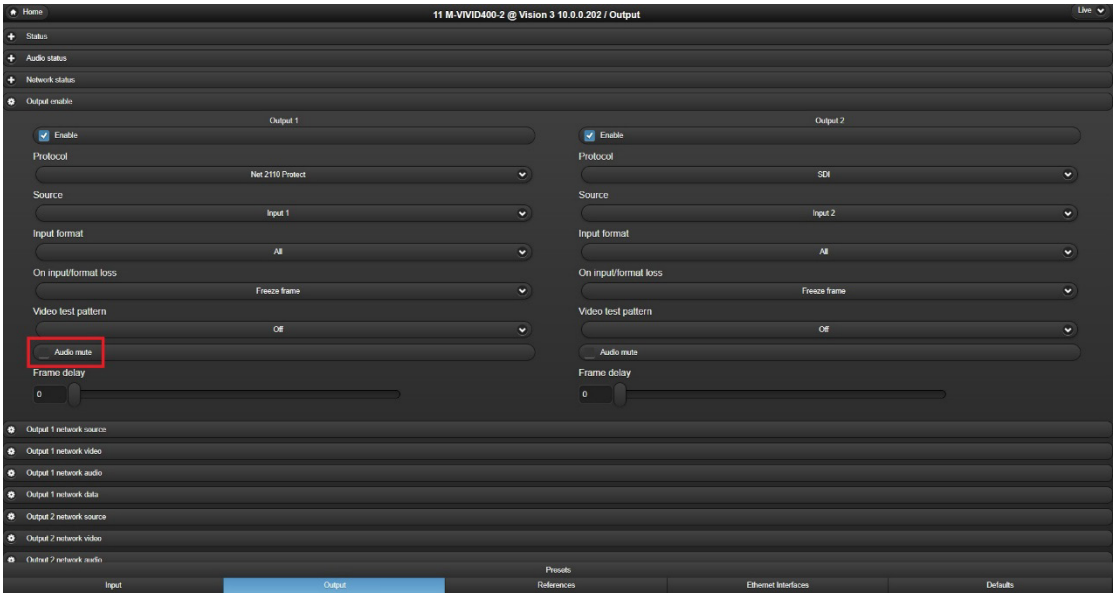
The following internal test patterns are provided which, when enabled, replace the outgoing video content with the selected test pattern.



Internal Test Pattern option

9.3 Audio mute

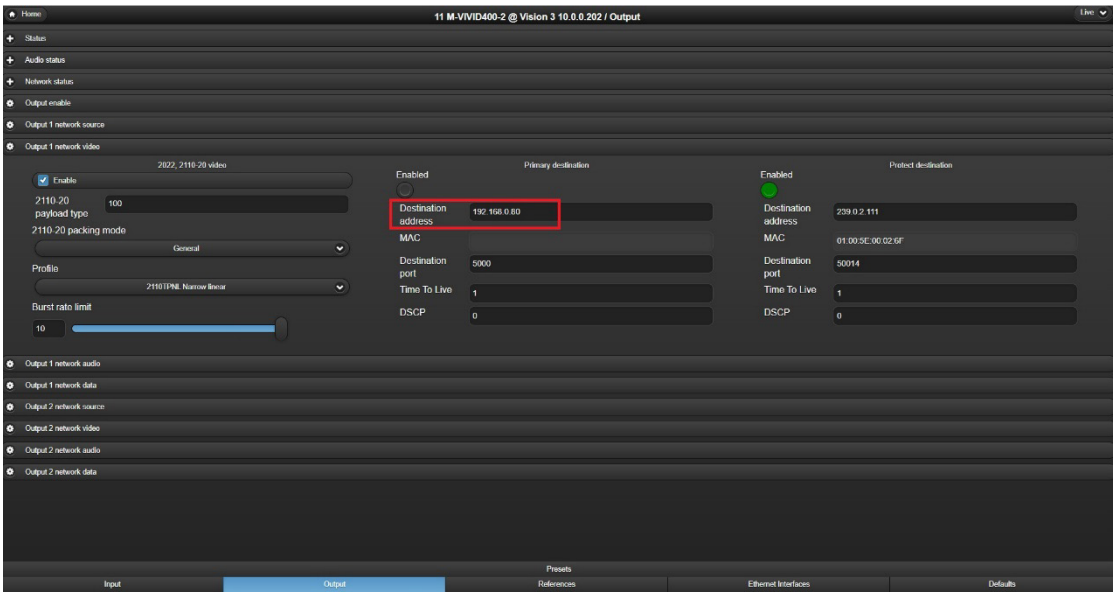
Embedded audio present in SDI or ST 2022 inputs will be passed through to the outputs. Use the Audio mute controls to mute embedded audio present on the output.



Audio mute

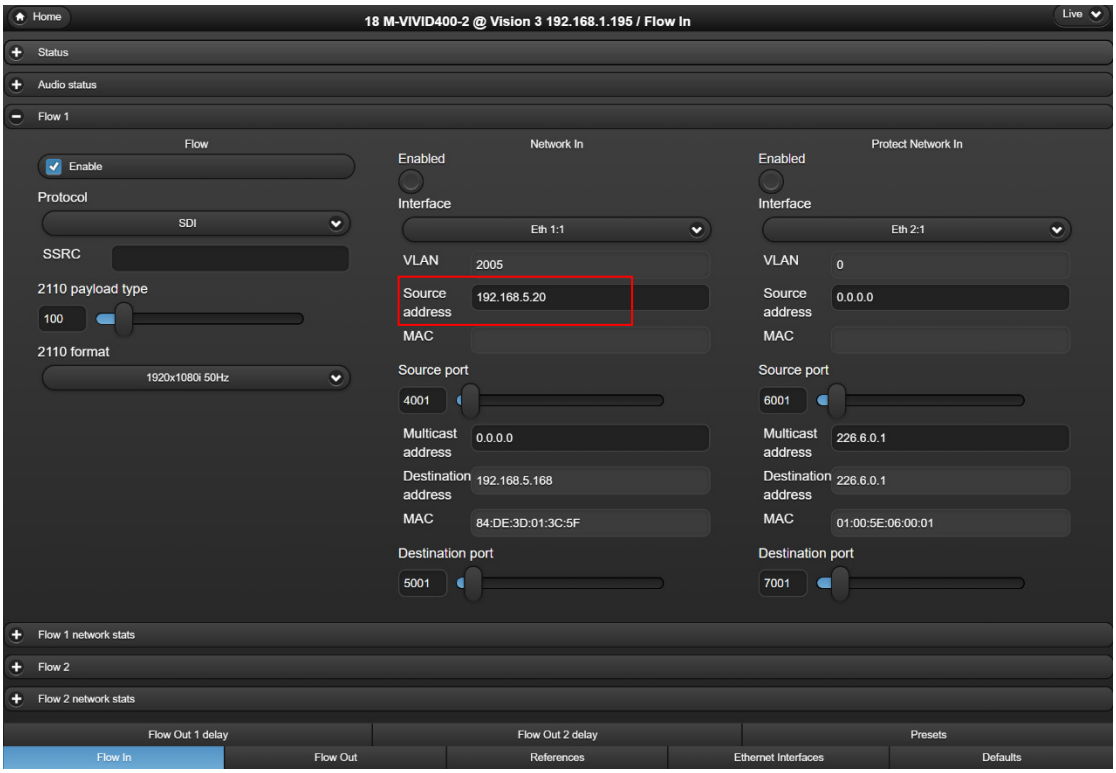
10 Unicast Flow Configuration

To transmit a unicast flow, the output network video ‘Destination address’ should be the IP address of the downstream Ethernet Interface you want to transmit to. The example below shows that rather than transmitting using a multicast address, interface 1:2 on the M-VIVID is now set to transmit the flow to a downstream device with IP address 192.168.0.80.



Unicast IP Address transmit

When receiving a unicast flow, the input network video ‘Multicast address’ should be set to 0.0.0.0. The ‘Source address’ can be one of two options. If set to 0.0.0.0 it will accept any source transmitting to its virtual interface IP address. This is acceptable if it is known only one device at a time will be transmitting to it. Alternatively the ‘Source address’ can be limited to only receive from one IP address, as shown in the example below, where the source address is limited to only receiving traffic from a device with IP Address 192.168.5.20.



Unicast IP Address receive

11 Basic Trouble Shooting

11.1 No input or output signals present

- Confirm using GUI status LEDs whether the problem is input or output related
- Check SDI and fibre cabling
- Check inputs are enabled (off by default)
- Check outputs are enabled (off by default)
- Check correct IP protocol has been selected
- Check IP flow parameters (protocol type, IP address, VLANs, ports etc.) are configured correctly
- Check Ethernet Interface IP parameters are configured correctly
- Check Ethernet Interface link present LED is illuminated on GUI

11.2 Errors in the IP flow's video content

- Check the 'Ignored packets' count on the Ethernet Interfaces tab of GUI is incrementing in no more than values of 10s. Incrementing in values of 100s indicates a network flooding problem.
- Check the 'Ignored multicast' LED on the Ethernet Interfaces tab of GUI is not illuminated. If illuminated, this indicates multicast packets are being flooded to the card's Ethernet Interface port, a likely cause of which is incorrectly configured IGMP on the network switch.
- Check input flow network status for lost or duplicate packets. Check maximum gap is less than 12000ns (0.012us). Larger gaps could indicate bursts in the IP packets.

11.3 IP flows keep stopping after a few minutes

- Check IGMP is enabled and correctly configured on the network switch.

12 Specification

M-VIVID100-3, M-VIVID200-2, M-VIVID400-2 AND M-VIVID800 APPS RUNNING ON MARBLE-V1 MEDIA PROCESSOR

MECHANICAL

'Double slot' Vision card 96mm x 303mm (96mm x 325mm including finger pull)
Weight: 355g
Power consumption: 25 Watts, plus 1 Watt for each SFP+ fitted to MARBLE-V1

INPUTS AND OUTPUTS

Inputs can be IP and/or SDI
Outputs can be IP and/or SDI
Up to six BNCs for SDI (depending on version) and up to four fibre SFP+ 10GbE IP network interfaces. Choice of fibre modules: either 850nm multi-mode (for up to 300m) or 1310nm single-mode (for up to 10km)
Inputs and outputs can be mixture of ST 2022 and ST 2110. Video can be passed between ST 2022 and ST 2110, although audio and any other non-video data will be lost
IP only, SDI to IP and IP to SDI applications require at least one SFP+ transceiver option, up to a maximum of four. All IP inputs and outputs can be received and transmitted on a single network interface. The use of two or more interfaces is recommended for separating main and protect video flows associated with the IP input/output. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces
SDI only applications do not require any SFP+
M-VIVID200-2, M-VIVID400-2 and M-VIVID800 use VR04, VR06 or VR07 frame rear modules. M-VIVID100-3 uses VR04 or VR06 frame rear modules. VR04 or VR07 must be used when more than two SFP+ are fitted

SDI VIDEO INPUTS

(NB. Some or all of the inputs can be IP instead)
M-VIVID100-3: Up to three 3Gb/s or HD or SD SDI inputs
M-VIVID200-2 and M-VIVID400-2: Up to two 3Gb/s or HD or SD SDI inputs
M-VIVID800: Up to one 3Gb/s or HD or SD SDI input
270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A
3Gb/s cable equalisation up to 100m using Belden 1694A. HD cable equalisation up to 140m with Belden 1694A or equivalent (approx. 100m with Belden 8281). SD cable equalisation >250m Belden 8281 or equivalent

IP INPUTS

(NB. Some or all of the inputs can be SDI instead)
M-VIVID100-3: Up to three 3Gb/s or HD or SD video over IP inputs
M-VIVID200-2 and M-VIVID400-2: Up to two 3Gb/s or HD or SD video over IP inputs
M-VIVID800: Up to one 3Gb/s or HD or SD video over IP input

Packet distribution is not important as variable input buffer will compensate for any timing irregularities. Any traffic shaping option from ST 2110-21 can be used, or packets can come from a device which does not meet the shaping requirement of ST 2110-21
A protect input for SMPTE ST 2022-7 seamless protection switching or the equivalent protect input in ST 2110-20 can come from any of the 10GbE IP network interfaces. This protects the video flow from lost packets by creating two streams of the same data using different routing to the destination. IP packet analyser handles the analysis and reconstruction of the protected video flow. Any IP input can come from any of the 10GbE IP network interfaces and can either be multicast or unicast

SDI VIDEO OUTPUTS

(NB. Some or all of the outputs can be IP instead)
M-VIVID100-3: Up to three 3Gb/s or HD or SD SDI outputs, one per channel
M-VIVID200-2 and M-VIVID400-2: Up to two 3Gb/s or HD or SD SDI outputs, one per channel
M-VIVID800: Up to one 3Gb/s or HD or SD SDI output
270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A

IP OUTPUTS

(NB. Some or all of the outputs can be SDI instead)
M-VIVID100-3: Up to three 3Gb/s or HD or SD video over IP outputs, one per channel
M-VIVID200-2 and M-VIVID400-2: Up to two 3Gb/s or HD or SD video over IP outputs, one per channel
M-VIVID800: Up to two 3Gb/s or HD or SD video over IP outputs
Any of the 10GbE IP network interfaces can be used to provide a protected output for SMPTE ST 2022-7 or ST 2110 seamless protection switching, which protects the stream from lost packets by creating two streams of the same data using different routing to the destination
Alternatively it is possible to have a unicast on some network interfaces and a multicast on others

RELAY BYPASS PROTECTION (SDI ONLY)

The VR07 frame rear module provides dual relay bypass protection when M-VIVID200-2, M-VIVID400-2 and M-VIVID800 are used with both SDI inputs and SDI outputs
The relay bypass protection protects the video output on frame power failure or if the MARBLE-V1 card loses power or is removed
An electromechanical relay switch on the VR07 needs power to hold the switch in one state and will revert to the other state (card bypass) on loss of power. It prevents signal loss by mechanically connecting an SDI input to an SDI output:
M-VIVID200-2: SDI 1 In is connected to SDI 1 Out and SDI 2 In is connected to SDI 2 Out
M-VIVID400-2: SDI 1 In is connected to SDI 1 Out and SDI 2 In is connected to SDI 2 Out
M-VIVID800: SDI In is connected to SDI 1 Out
NB. Use of the VR07 requires issue 5 or later of MARBLE-V1

VIDEO FORMATS SUPPORTED

The video formats supported are 625i, 525i, 720p50, 720p59.94, 720p60, 1080i50, 1080i59.94, 1080i60, 1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60, 1080PsF23.98, 1080PsF24, 1080PsF25, 1080PsF29.97, 1080PsF30, 2048x1080p23.98*, 2048x1080p24*, 2048x1080p25*, 2048x1080p29.97*, 2048x1080p30*,

2048x1080PsF23.98*, 2048x1080PsF24*, 2048x1080PsF25*, 2048x1080PsF29.97*, 2048x1080PsF30* (*= YUV 4:2:2 10 bit)

IP PROTOCOLS

Protocols supported on network interfaces: SMPTE ST 2022-6, SMPTE ST 2022-7, SMPTE ST 2110-20 (uncompressed video), SMPTE ST 2110-10 (system architecture and synchronisation), SMPTE ST 2110-21 (traffic shaping), IGMPv3, ARP, ICMP ping, IPv4, IEEE802.1q, VLAN, IEEE802.3-2012 (10G Ethernet), LLDP

Packing options of the ST 2110 output are selectable per flow between BPM and GPM (Block Packing Mode or General Packing Mode)

Packet shaping and distribution of the video flow (compulsory in ST 2110 and optional in ST 2022) is selectable per IP output between TPNL and TPN (narrow linear or narrow gapped packet distribution). There is also a mode for burst packet distribution with a control for the burst rate limit. This is for connecting between Crystal Vision and other compatible devices that allow for a reduced transmission delay

SMPTE ST 2022-7 and ST 2110 video flow protection facilitates the dual stream output

ROUTING

M-VIVID200-2 and M-VIVID400-2:

There are two clean switches that can select between the two inputs for each of the output video delay function blocks

The default setting – which gives a dual channel video delay – is Input 1 to Output 1 and Input 2 to Output 2

It is also possible to give both video delay function blocks the same input to get multiple outputs. The setting for this – which gives a single channel video delay with two outputs – would be Input 1 to both Output 1 and Output 2

An alternative application is to cleanly live switch the input of a single channel video delay without any output signal disturbance. The setting for this would be Input 1 to Output 1 cleanly followed by Input 2 to Output 1. The second video delay function block can be used, but it is limited to using the inputs already reserved for the first video delay function block. This might be useful if it is required to have the same input delayed by different amounts by the two delay functions, in which case the setting would be Input 1 to Output 1 and Output 2 cleanly followed by Input 2 to Output 1 and Output 2

M-VIVID100-3:

There are three clean switches that can be used to select between the three inputs for the three output video delay function blocks

The default setting – which gives a triple channel video delay – is Input 1 to Output 1, Input 2 to Output 2 and Input 3 to Output 3

It is also possible to give multiple video delay function blocks the same input to get multiple outputs or different delay settings of the same input. To get a single channel video delay with three outputs the setting would be Input 1 to Output 1, Output 2 and Output 3. To get a dual channel video delay with two outputs of the first channel and one output of another, the setting could be Input 1 to Output 1 and Output 2 and Input 3 to Output 3. An alternative application is to cleanly live switch the input of one or more of the video delays without any signal disturbance. However without spare inputs, clean switching can only be carried out if one or more of the outputs is either not used or is common to one of the other outputs. For example if the first two delays were using the same input the setting for this would be Input 1 to Output 1 and Output 2 cleanly followed by Input 2 to Output 1 and Output 2

M-VIVID100-3 DELAY

Delay adjustable in steps of frames
Each channel has its own delay control
Minimum delay: 8ms
Maximum delay: 100 frames per channel, which is:

- 4.16 seconds (1080p23.98, 1080p24, 1080PsF23.98, 1080PsF24, 2048x1080p23.98, 2048x1080p24, 2048x1080PsF23.98, 2048x1080PsF24)
- 4 seconds (625i, 1080i50, 1080p25, 1080PsF25, 2048x1080p25, 2048x1080PsF25)
- 3.33 seconds (525i, 1080i59.94, 1080i60, 1080p29.97, 1080p30, 1080PsF30, 2048x1080p30, 2048x1080PsF30, 2048x1080p29.97, 2048x1080PsF29.97)
- 2 seconds (720p50, 1080p50)
- 1.66 seconds (720p59.94, 720p60, 1080p59.94, 1080p60, 1080PsF29.97)

M-VIVID200-2 DELAY

Delay adjustable in steps of frames
Each channel has its own delay control
Minimum delay: 8ms
Maximum delay: 200 frames per channel, which is:

- 8.33 seconds (1080p23.98, 1080p24, 1080PsF23.98, 1080PsF24, 2048x1080p23.98, 2048x1080p24, 2048x1080PsF23.98, 2048x1080PsF24)
- 8 seconds (625i, 1080i50, 1080p25, 1080PsF25, 2048x1080p25, 2048x1080PsF25)
- 6.67 seconds (525i, 1080i59.94, 1080i60, 1080p29.97, 1080p30, 1080PsF30, 2048x1080p30, 2048x1080PsF30, 2048x1080p29.97, 2048x1080PsF29.97)
- 4 seconds (720p50, 1080p50)
- 3.33 seconds (720p59.94, 720p60, 1080p59.94, 1080p60, 1080PsF29.97)

M-VIVID400-2 DELAY

Delay adjustable in steps of frames
Each channel has its own delay control
Minimum delay: 8ms
Maximum delay: 400 frames per channel, which is:

- 16.67 seconds (1080p23.98, 1080p24, 1080PsF23.98, 1080PsF24, 2048x1080p23.98, 2048x1080p24, 2048x1080PsF23.98, 2048x1080PsF24)
- 16 seconds (625i, 1080i50, 1080p25, 1080PsF25, 2048x1080p25, 2048x1080PsF25)
- 13.33 seconds (525i, 1080i59.94, 1080i60, 1080p29.97, 1080p30, 1080PsF30, 2048x1080p30, 2048x1080PsF30, 2048x1080p29.97, 2048x1080PsF29.97)
- 8 seconds (720p50, 1080p50)
- 6.67 seconds (720p59.94, 720p60, 1080p59.94, 1080p60, 1080PsF29.97)

M-VIVID800 DELAY

Delay adjustable in steps of frames
Minimum delay: 8ms
Maximum delay: 800 frames, which is:

- 33.33 seconds (1080p23.98, 1080p24, 1080PsF23.98, 1080PsF24, 2048x1080p23.98, 2048x1080p24, 2048x1080PsF23.98, 2048x1080PsF24)
- 32 seconds (625i, 1080i50, 1080p25, 1080PsF25, 2048x1080p25, 2048x1080PsF25)
- 26.67 seconds (525i, 1080i59.94, 1080i60, 1080p29.97, 1080p30, 1080PsF30, 2048x1080p30, 2048x1080PsF30, 2048x1080p29.97, 2048x1080PsF29.97)

- 16 seconds (720p50, 1080p50)
- 13.33 seconds (720p59.94, 720p60, 1080p59.94, 1080p60, 1080PsF29.97)

LIVE DELAY ADJUSTMENTS

Delay adjustments can be made live. The apps apply the adjustments slowly over time, with small delay adjustments therefore going virtually unnoticed. Increasing the delay slows down the video until the delay is correct, while reducing the delay speeds up the video until the delay is correct

VIDEO LOSS CONTROLS

The video loss/format mismatch controls allow the user to select what will happen to an output in the event that the input is lost or the video format does not match the specified format. The user can specify to freeze the last good frame or show a black or blue screen or 100% colour bars (with or without an initial delay of three seconds). No output can also be selected. This is independently adjustable on each output

TEST PATTERNS

The test pattern controls allow the user to override an input and force the output to output a test pattern including Colour Bars, Blue, Black, EqCheck, PllCheck, Pluge, Checkfield, Grey Horizontal Steps, Grey Vertical Steps, Luma Horizontal Ramp, Luma Vertical Ramp, Cycle Colour, Checker Board or Colour Square, or to freeze the picture. This is independently adjustable on each output

AUDIO MUTE CONTROL

The output audio mute control allows the user to mute the audio embedded within any of the SDI or ST 2022 outputs

SYNCHRONISER AND TIMING ADJUSTMENTS

Video sources are synchronised to common reference timing source

Choice of timing options:

- PTP (SMPTE ST 2059-2) master and backup, via 10GbE IP network interface
- Two tri-level syncs or analogue Black and Burst references (Reference 1 and Reference 2), connected via the Vision 3 frame
- SDI video input, where available (defaults to SDI 1)

Chosen reference is the global reference source for all inputs and outputs

There are up to ten options for the reference selection, selectable via VisionWeb. The hierarchy runs from left to right – should the timing source at the top of the list become missing or invalid, the app will move down the list until it finds a valid timing reference source. When used with IP inputs, the SDI reference option is not applicable and therefore the reference will move to the next valid timing source:

- PTP>Ref1>Ref2>Hold
- PTP>Ref1>Hold
- PTP>Ref2>Ref1>Hold
- PTP>Ref2>Hold
- PTP>Hold
- PTP>Ref1>Ref2>SDI>Hold
- PTP>Ref1>SDI>Hold
- PTP>Ref2>Ref1>SDI>Hold
- PTP>Ref2>SDI>Hold

- PTP>SDI>Hold

("PTP" means PTP Master>PTP Backup. "SDI" means SDI1>SDI2>SDI3>SDI4>SDI5>SDI6, dependent on number of SDI available. "Hold" means it will hold the timing of the last good reference)

When using video reference, video inputs can be different formats but only inputs with the same frame rate as reference video will be locked to that reference. Input signals of same frame rate as reference will be locked together and locked to external reference. Inputs with a differing frame rate will be locked and maintain timing with no drift, but their sync point will be undefined (all same frame rate signals will, however, be locked to each other)

When using PTP reference, input sources of different format and/or frame rate will all be correctly locked to the PTP reference

PTP timing reference should be used when there is a ST 2110-20 output to ensure the RTP timestamp is related to the time of day. However without a PTP reference, a valid ST 2110-20 signal will still be generated using a free running RTP timestamp

When Auto relock enable is selected, the card will automatically relock when a lost reference is restored. Selecting Force lock (with Auto relock disabled) will force the synchroniser to relock after a reference is restored, and can be activated at a non-critical time to avoid video disturbance

Output timing can be fully adjusted with respect to the reference using three time-based controls: 0 - 42ms adjustable in 0.1ms steps, 0 - 100us adjustable in 1us steps and 0 - 1us adjustable in 5ns steps. Sub frame timing alignment to chosen reference is global to all outputs

ANCILLARY DATA

All ancillary data (including audio and locked Dolby E) is passed from SDI or ST 2022 input to SDI or ST 2022 output. When ST 2110 input or output is selected, all ancillary data is discarded

LED INDICATION OF:

Power okay

PRESETS

The current app settings can be saved in one of 16 locations to be recalled as required

App settings and Input/Output configuration settings can be stored and recalled independently

SIGNAL MONITORING

Comprehensive SDI, IP and PTP monitoring information is available and can be used to generate SNMP traps

Checks can be performed on the following video and audio parameters:

- Video present and time present
- Video format
- Video black
- Video frozen
- Video error
- Audio group 1 present
- Audio group 2 present
- Audio group 3 present
- Audio group 4 present

- Audio present on group 1 channel 1
- Audio present on group 1 channel 2
- Audio present on group 1 channel 3
- Audio present on group 1 channel 4
- Audio present on group 2 channel 5
- Audio present on group 2 channel 6
- Audio present on group 2 channel 7
- Audio present on group 2 channel 8
- Audio present on group 3 channel 9
- Audio present on group 3 channel 10
- Audio present on group 3 channel 11
- Audio present on group 3 channel 12
- Audio present on group 4 channel 13
- Audio present on group 4 channel 14
- Audio present on group 4 channel 15
- Audio present on group 4 channel 16
- Silence group 1 channel 1
- Silence group 1 channel 2
- Silence group 1 channel 3
- Silence group 1 channel 4
- Silence group 2 channel 5
- Silence group 2 channel 6
- Silence group 2 channel 7
- Silence group 2 channel 8
- Silence group 3 channel 9
- Silence group 3 channel 10
- Silence group 3 channel 11
- Silence group 3 channel 12
- Silence group 4 channel 13
- Silence group 4 channel 14
- Silence group 4 channel 15
- Silence group 4 channel 16

Black or frozen video will be indicated by an amber LED. This alert can be delayed by 1-120 seconds to prevent false warnings during brief video pauses

The audio silence alert is triggered at an audio level of -93dbFS and can be delayed by 1-120 seconds to prevent false warnings during quiet audio periods

The following IP parameters are monitored for input flows:

- Network error
- Packet loss
- Duplicated packets
- Packet delay variation. Shown as the skew (difference in time of packet arrival) between the main and protected input, and also as the min and max nano second gap between the packets on each input

The Ethernet interfaces are monitored for:

- Count of packets ignored by the app (general network traffic non-media packets, which do not require processing by the app). Jumps in 100 step increments indicate network traffic flood

- Ignored multicast packets. LED indicates multicast traffic not requested by the app is present on the Ethernet Interface, indicating incorrectly configured IGMP at the network switch

References are monitored for:

- Reference 1 and 2 present and time present
- Reference 1 and 2 format
- PTP master and backup clock present and time present
- PTP statistics – network delay, delay variation, reference offset and sync period

REMOTE CONTROL

Software:

VisionWeb Control is available via the web server on the frame and allows control and monitoring using a standard web browser on a computer, tablet or phone

SNMP monitoring and control available as standard

Control using ASCII and JSON protocols

Hardware:

Control from integrated control panel on Vision 3 frame

Control from VisionPanel 3U remote panel

SBB-4 smart button box connects to the frame via Ethernet and provides four programmable LCD switches (which are configured for each order). The SBB-4 uses information from VisionWeb for settings. Uses Power over Ethernet so must be used with PoE enabled switch