USER MANUAL

Vision
SYSTEM

M-GWSDIIP-6, M-GWIPSDI-6 and M-GWIPIP-6

IP gateways

Crystal Vision

Contents

Revision 1	User interface screen shots updated to align with V2.3 MARBLE-V1 and V1.19 Vision 3 software releases. Added VR04 rear module for M-GWSDIIP-6 and M-GWIPSDI-6. Added new audio monitoring and audio mute features. Added new preset features. Updated use of flow terminology.	05/08/22

1 Introduction

M-GWSDIIP-6, M-GWIPSDI-6 and M-GWIPIP-6 are uncompressed video over IP gateway software apps which run on the MARBLE-V1 media processor. Supporting both SMPTE ST 2022 and SMPTE ST 2110-20 IP protocols, up to six channels of HD/SD-SDI or three channels of 3G-SDI can be encapsulated/de-encapsulated to or from IP.

M-GWSDIIP-6:

- Encapsulates SDI to IP to allow signal transportation over 10GbE IP networks

- Converts six HD/SD or three 3Gb/s SDI input connections and allows flexible assignment of the converted flows to any of up to four output 10GbE IP network interfaces

- Additional 10GbE network interfaces can be configured for redundant streaming

- Instant clean switching between SDI inputs, whatever their timing

M-GWIPSDI-6:

- De-encapsulates SDI from 10GbE IP networks

- Converts to six HD/SD or three 3Gb/s SDI output connections, with flexible assignment of the converted flows from any of up to four input 10GbE IP network interfaces

- Additional 10GbE network interfaces can be configured for redundant input streaming

- Tolerant of any input packet distribution

- Instant clean switching between inputs, whatever their timing

- IP flow monitoring including packet loss, duplicated packets and packet delay variation

M-GWIPIP-6:

- De-encapsulates and re-encapsulates video (up to six HD/SD or three 3Gb/s) between up to four bi-directional 10GbE IP network interfaces

- Ideal for applications such as network address translation, unicast to multicast address translation, protocol translation and for setting firewall restrictions

- Additional 10GbE network interfaces can be configured for redundant input or output streaming

- Tolerant of any input packet distribution, and includes output traffic shaping

- Instant clean switching between inputs, whatever their timing

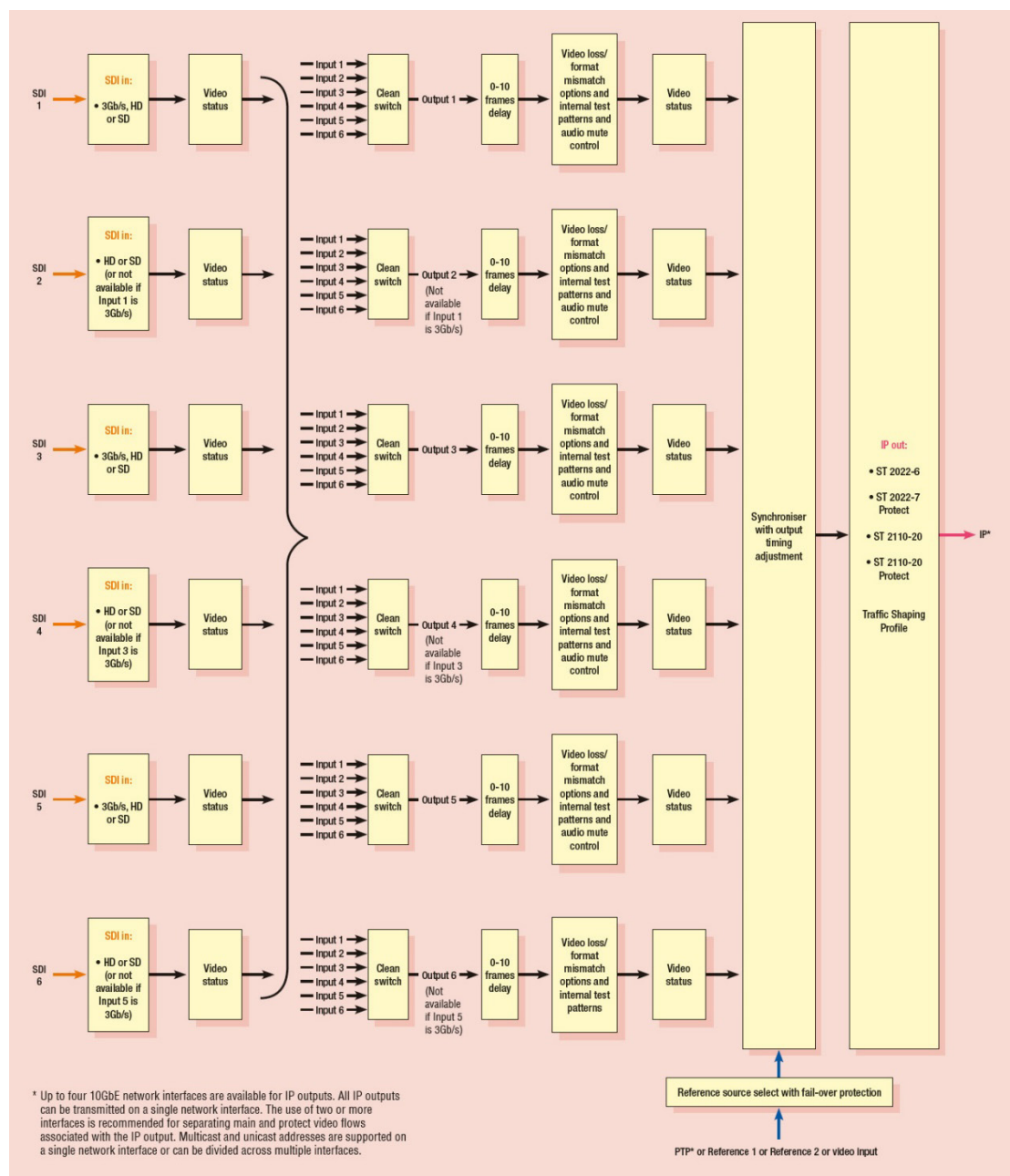- IP flow monitoring including packet loss, duplicated packets and packet delay variation
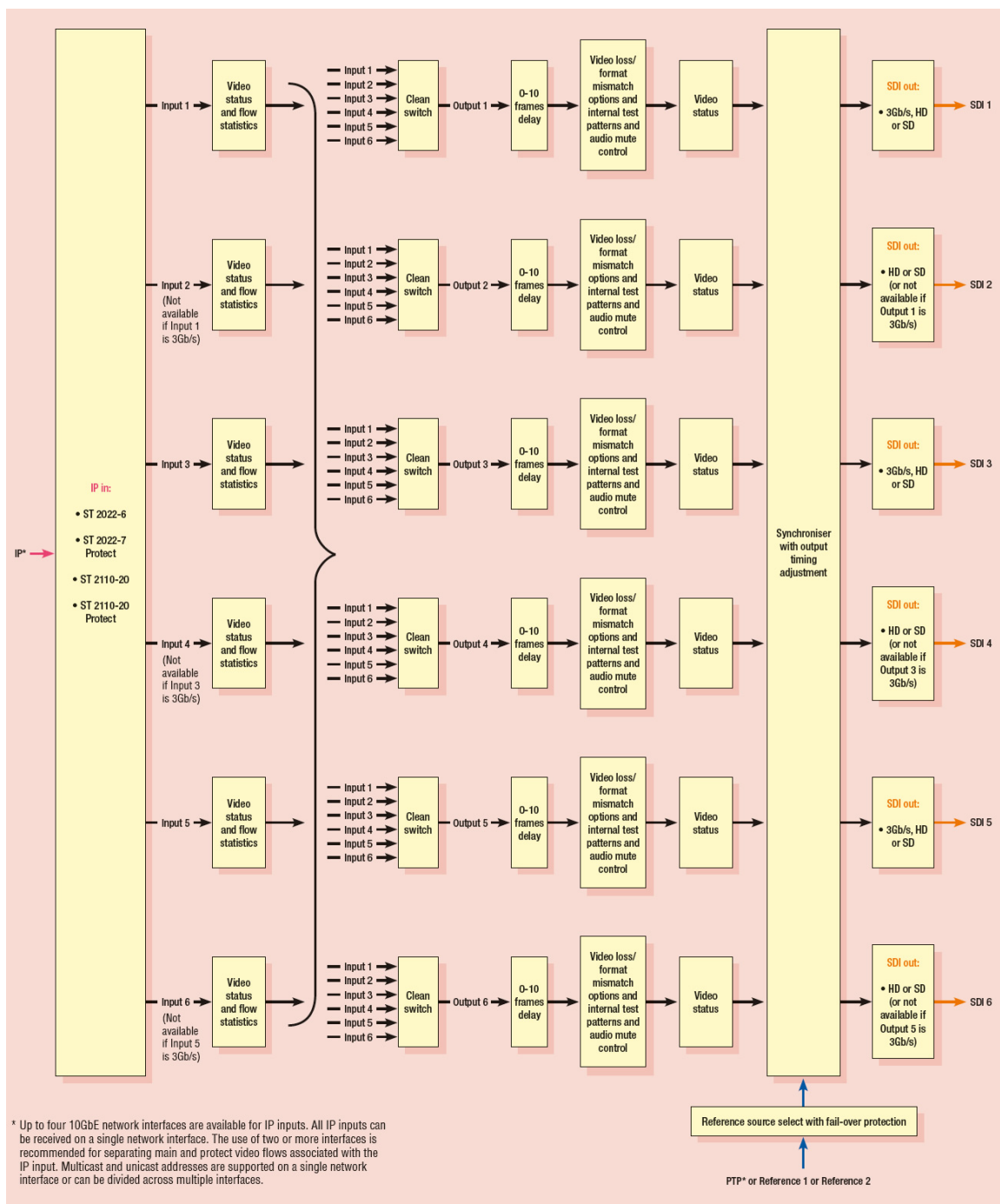
Common feature set:

- Supports SMPTE ST 2022-6 and ST2022-7 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

- Input and output present, black and frozen monitoring

- Input CRC error detection

- Input audio group monitoring

- Sub frame output timing adjustment locked to chosen reference source

- Ten frames adjustable delay in one frame steps per output

- Choice of multiple timing sources with fail-over: PTP and two analogue Black and Burst or tri-level syncs references via Vision frame

- Support for unicast and multicast transmission

- Full range of VLAN support

- Supports IGMP V1, V2 and V3

- Supports 31 video standards

- 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

2.1 M-GWSDIIP-6

* Up to four 10GbE network interfaces are available for IP outputs. All IP outputs can be 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 output. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces.

2.2 M-GWIPSDI-6

* Up to four 10GbE network interfaces are available for IP inputs. All IP inputs can be received 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. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces.
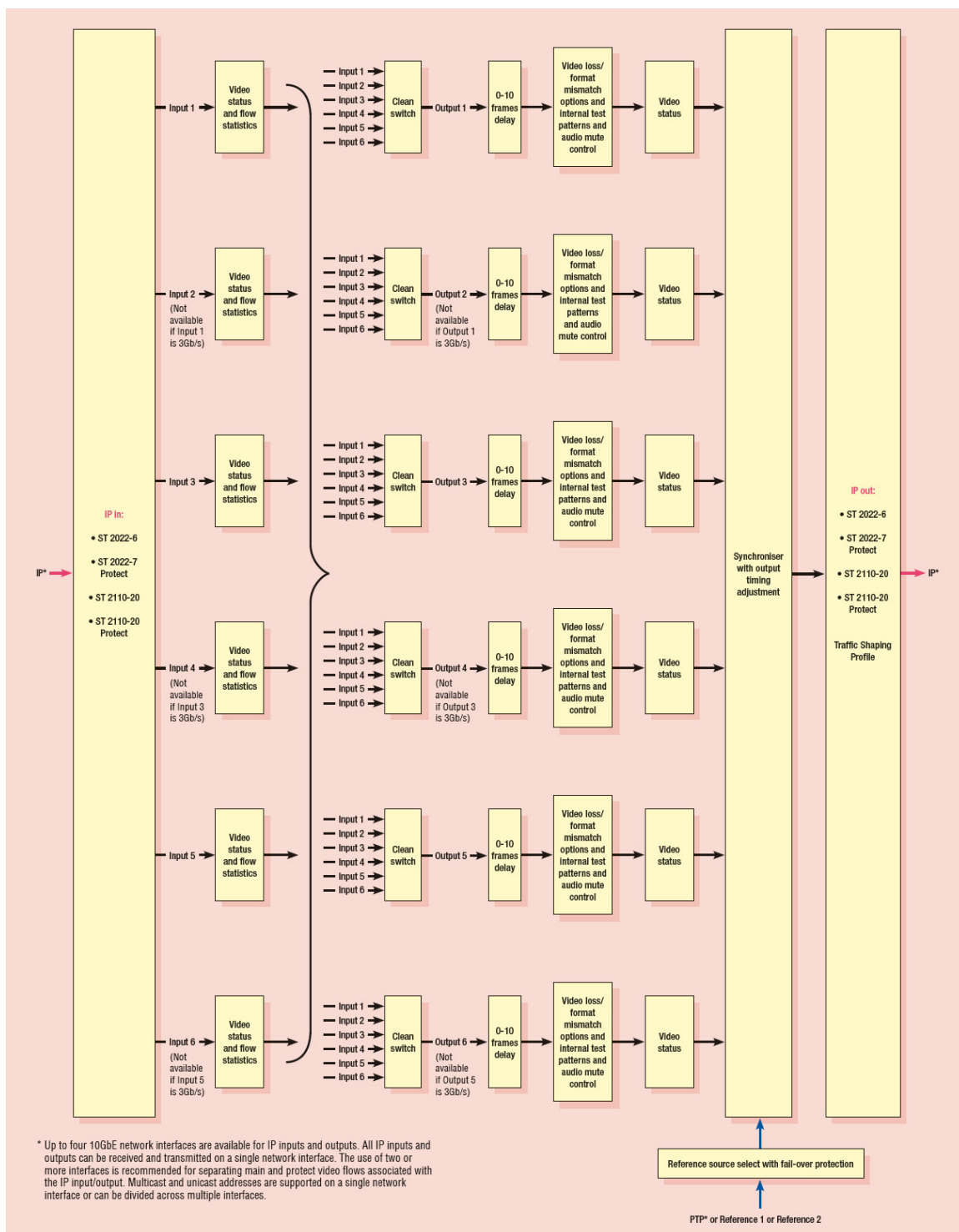
2.3 M-GWIPIP-6

3 Hardware Installation

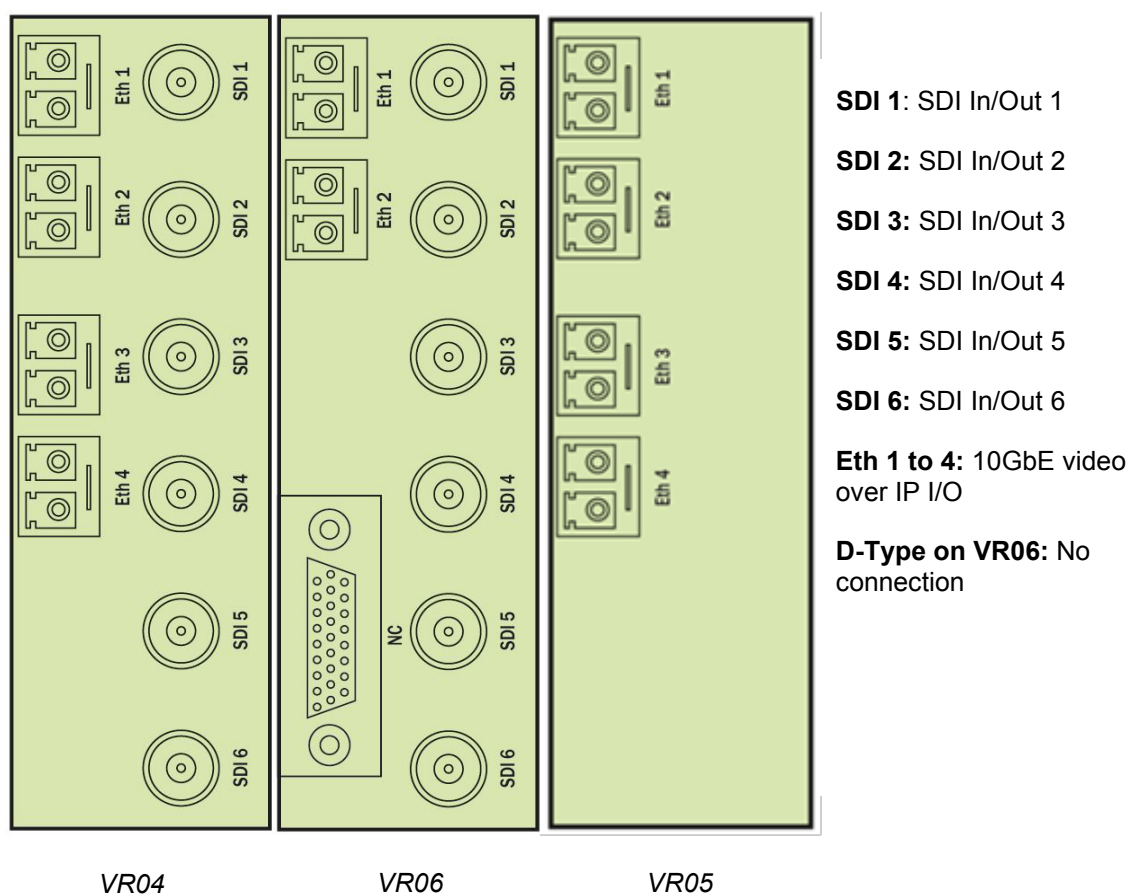The potentiometers on the card are factory set and should not be adjusted. There are no user-selectable links.

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, VR05 and VR06 rear modules offer the correct input/output functionality for the video over IP apps.

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

3.1 Rear module signal IO

SDI 1: SDI In/Out 1

SDI 2: SDI In/Out 2

SDI 3: SDI In/Out 3

SDI 4: SDI In/Out 4

SDI 5: SDI In/Out 5

SDI 6: SDI In/Out 6

Eth 1 to 4: 10GbE video over IP I/O

D-Type on VR06: No connection

VR04   VR06   VR05

N.B. SDI 1 to 6 are inputs only for M-GWSDIIP-6 and outputs only for M-GWIPSDI-6.

4 I/O Configuration

VisionWeb web browser control software is recommended for the configuration of the video over IP 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.
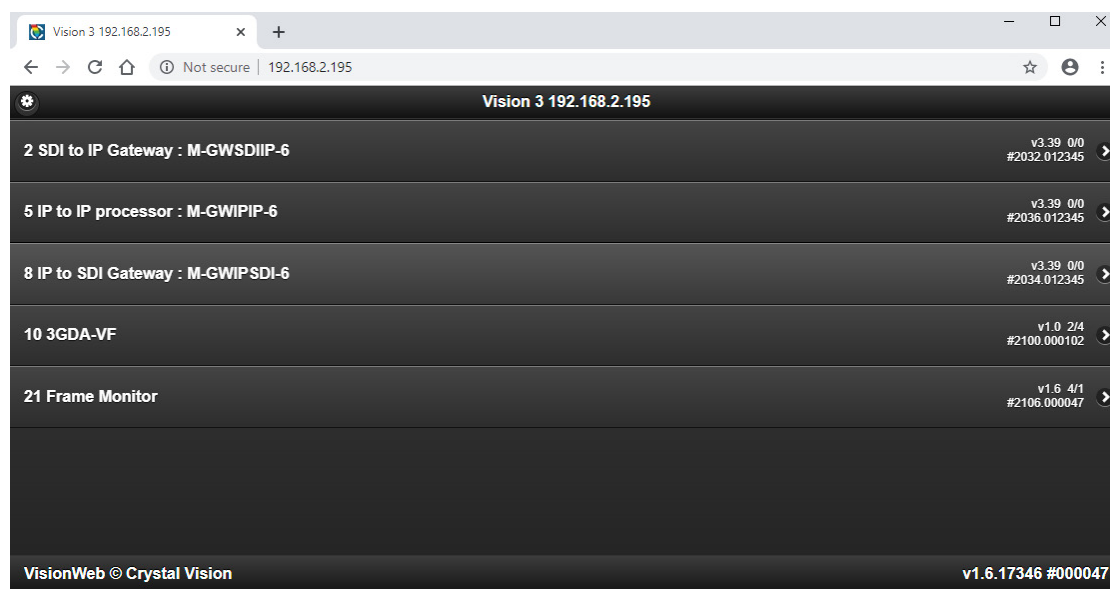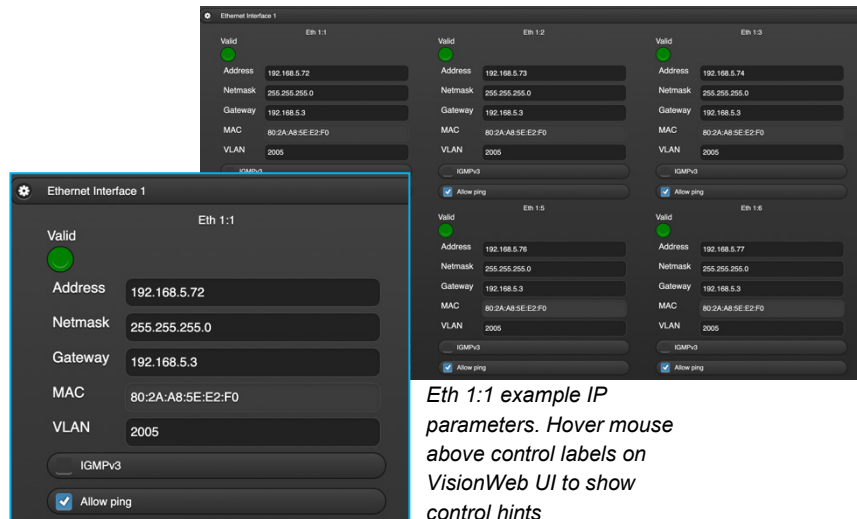

Example 'VisionWeb' homepage

## 4.1 Configuring the Ethernet Interfaces

MARBLE-V1 ST 2022 and ST 2110 video over IP flows are received and transmitted using the VR04, VR05 and VR06 10GbE network interface connections. VR06 provides two network interfaces while the VR04 and VR05 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 VR05 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.

Eth 1:1 example IP parameters. Hover mouse above control labels on VisionWeb UI to show control hints
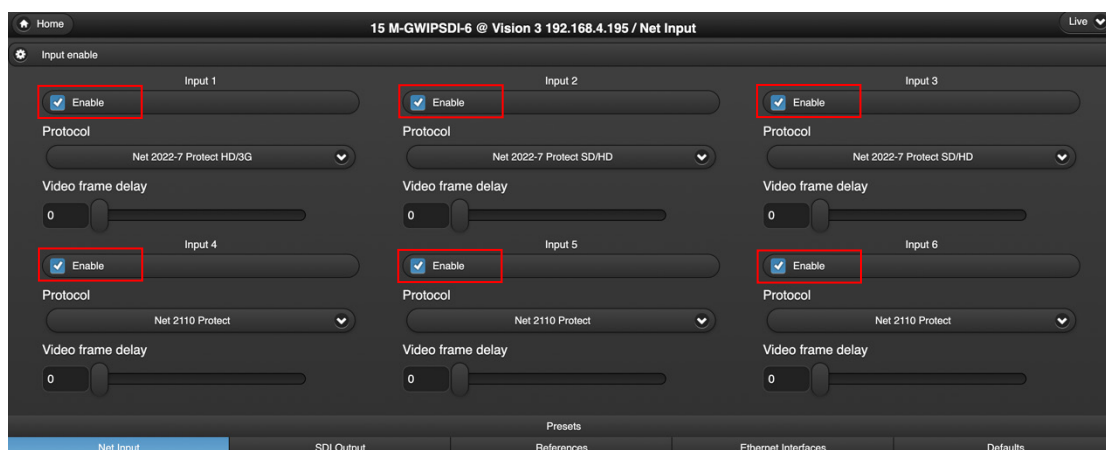
4.2 Enabling IP Inputs & Outputs

By default the IP inputs and outputs are disabled. Use the Enable control within the Net Input and Output menus to enable them.
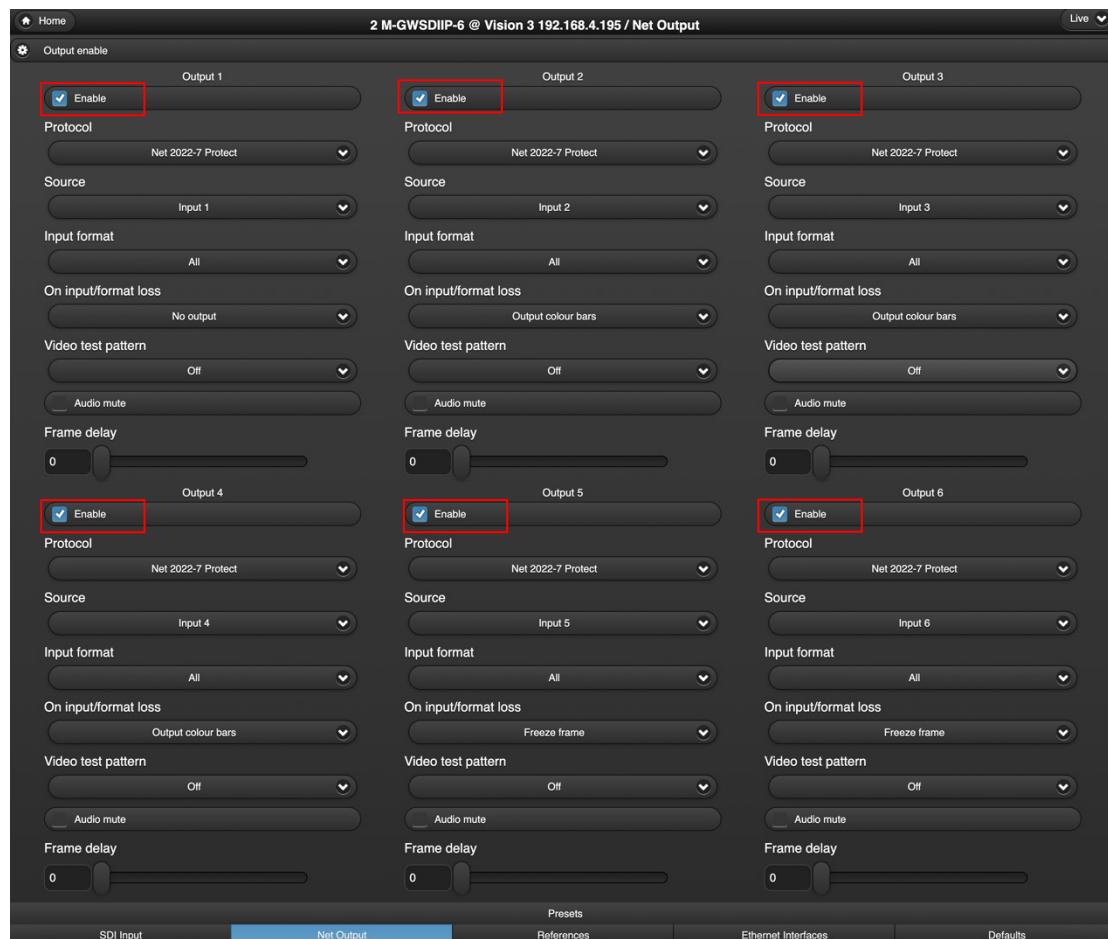

M-GWSDIIP-6 IP Output Enable

M-GWIPSDI-6 IP Input Enable

4.3 Select IP I/O Protocol

The M-GW IP Gateways support uncompressed video over IP protocols ST 2022 and ST 2110-20. It is possible to mix protocols; IP inputs and outputs can be a mixture of ST 2022 and ST 2110-20. M-GWIPIP-6 supports protocol translation. For example, a ST 2022 input can be output as ST 2110-20.

Once the inputs and outputs have been enabled, the required protocol can be selected using the drop down menus within Input and Output control tabs. The protocol type will need selecting for each input and output.
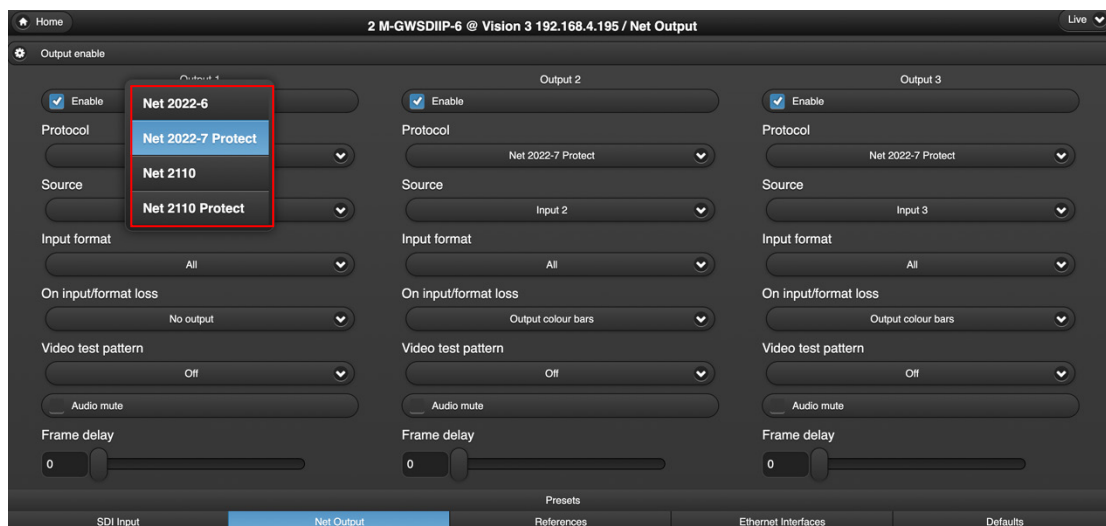
M-GWSDIIP-6 Output Protocol Selection
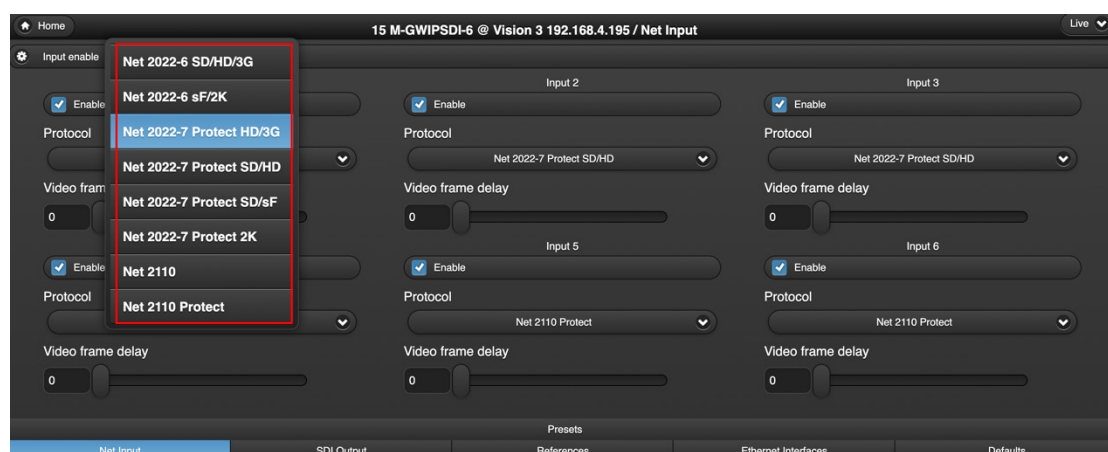
M-GWIPSDI-6 Input Protocol Selection

4.4 Transmitting an IP Flow

The M-GWSDIIP-6 and M-GWIPIP-6 apps are capable of transmitting up to six HD/SD-SDI or three 3G-SDI IP flows. These can be transmitted on a single 10GbE network interface or split between additional interfaces located on the rear connector.

The following example shows an M-GWSDIIP-6 configured to transmit Input 1 to Output 1 using SMPTE ST 2022-7 protocol. When selecting ST 2022-7 it is necessary to configure both the 'Network Out' and 'Protect Network Out'. For maximum redundancy it is recommended to output 'primary' and 'protect' flows to two different network interfaces e.g. Interface 1 and 2 on M-GWSDIIP-6 and M-GWIPIP-6.

M-GWSDIIP-6/M-GWIPIP-6 Output 1 Net Out

The controls highlighted in the above configuration show Output 1 of the M-GWSDIIP-6 routing Input 1 to Ethernet Interface 1:1 and 2:1 using SMPTE ST 2022-7 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.

M-GWIPIP-6 provides the same Net Out controls as M-GWSDIIP-6.

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.

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

If no SSRC (Synchronisation source identifier) value is required, it can be left blank.

If 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.

4.5 Receiving an IP Flow

The M-GWIPSDI-6 and M-GWIPIP-6 apps are capable of receiving up to six HD/SD-SDI or three 3G-SDI IP flows. These can be received on any of the 10GbE network interfaces located on the rear connector.

The following example shows an M-GWIPSDI-6 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'. For maximum redundancy it is recommended to receive 'primary'

and 'protect' on two different network interfaces e.g. Interface 1 and 2 on M-GWIPIP-6 and M-GWIPSDI-6.
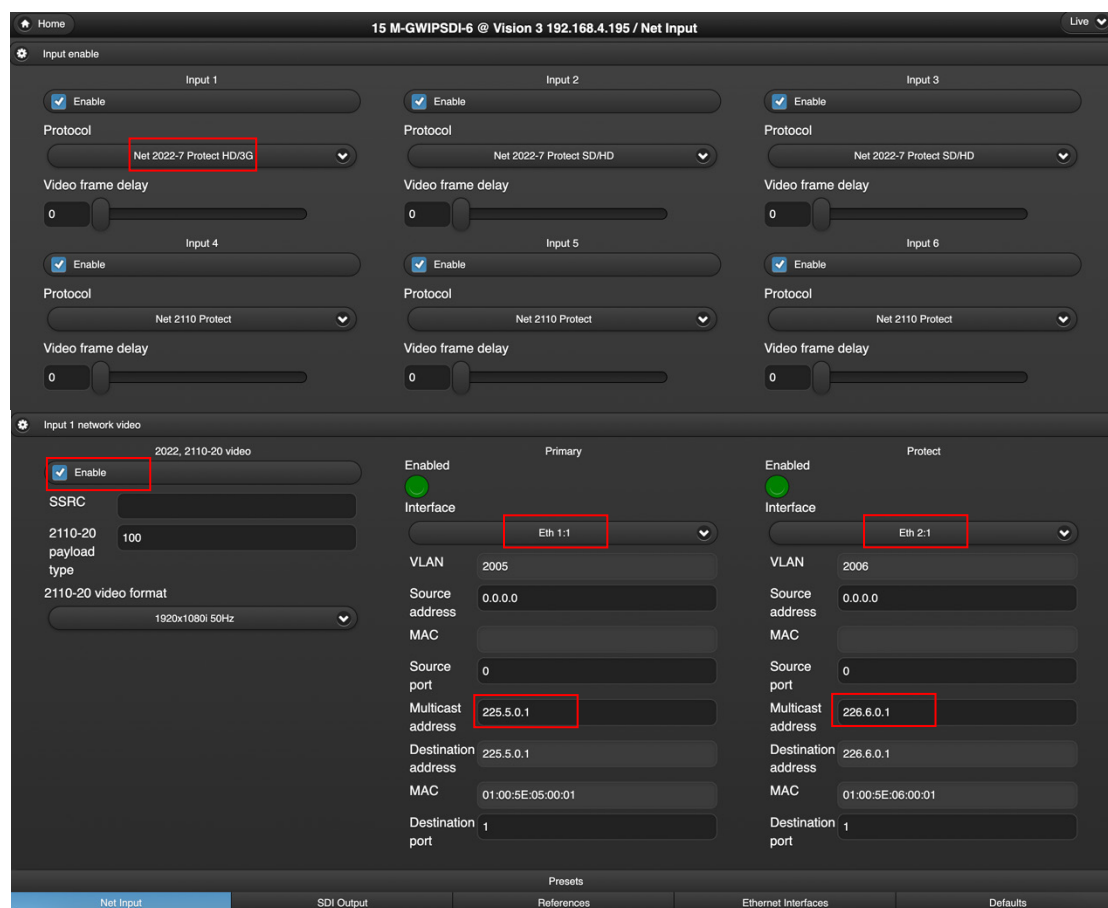
M-GWIPSDI-6/M-GWIPIP-6 Input 1 Net In

The controls highlighted in the above configuration show Input 1 of the M-GWIPSDI-6 set to receive the 'main' flow packets on Ethernet Interface 1:1 and 'protect' packets of the ST 2022-7 protocol on 2:1.

To successfully receive a flow, all IP parameters must agree with those of the transmitter. In the above example we can see that the IP addresses, VLANs, ports and SSRC match those given in the M-GWSDIIP-6 flow transmission example on the previous page.

M-GWIPIP-6 provides the same Net In controls as M-GWIPSDI-6.

If receiving ST 2110, the 2110 payload type and 2110 format will need to match the transmitter.

4.6 Enabling SDI Outputs (M-GWIPSDI-6)

The M-GWIPSDI-6 provides six SDI outputs. They are individually routable to from any of the IP input flows. By default the SDI outputs are disabled, therefore should be enabled as required.

In the example below SDI Output 1 is enabled with its source routed to Input 1 of the IP network input.
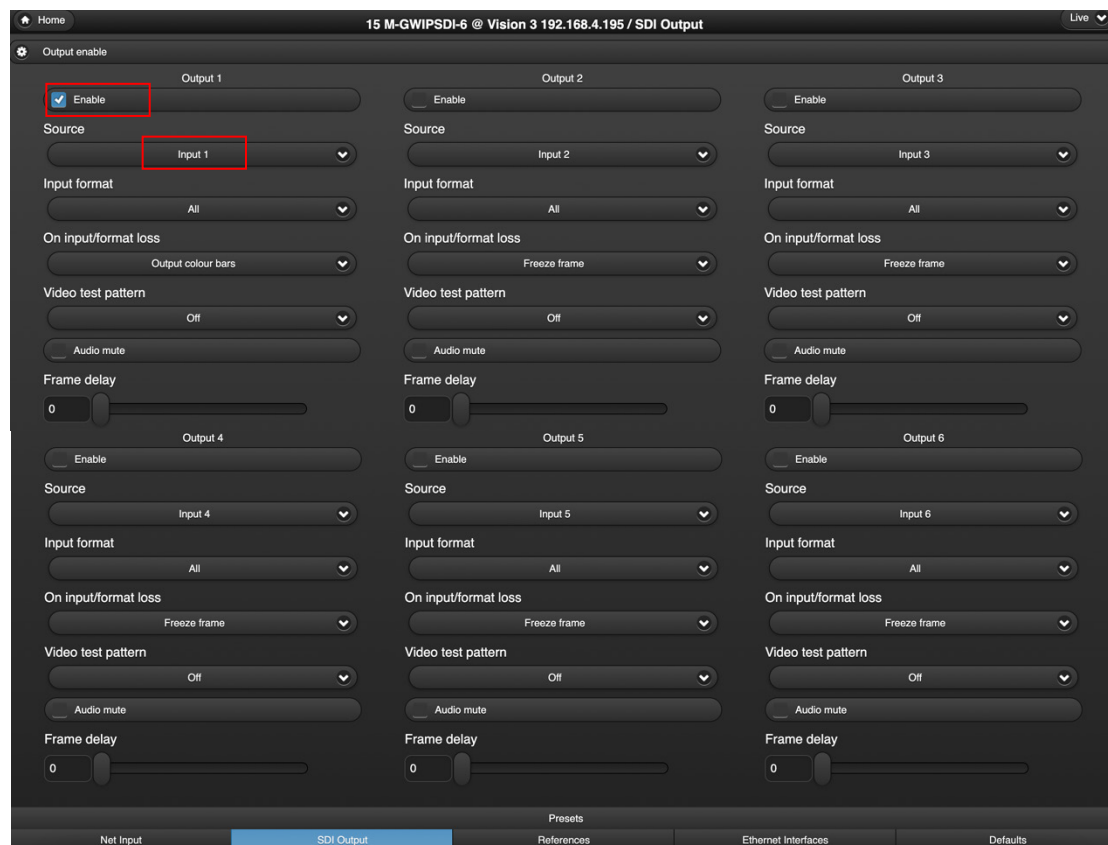
M-GWIPSDI-6 SDI Output enable

4.7 Video format

By default the video format mode is set to process six HD or SD-SDI channels. Channels 1, 3 and 5 can be set to process 3G-SDI using the 'Mode' control on the 'Presets, Defaults, Alarms' tab. Enabling 3G on channels 1, 3, and 5 disables processing on channels 2, 4 and 6.
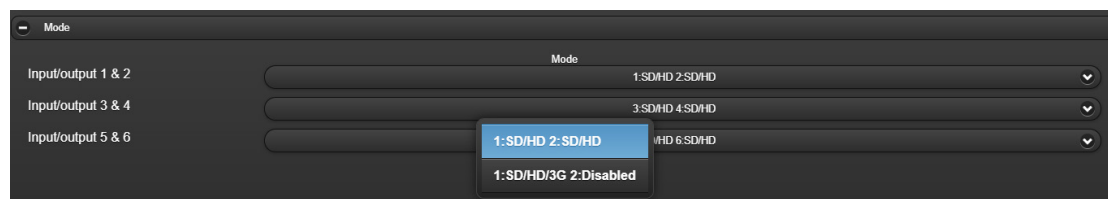
Video Format Mode (all Apps)

5 Status

5.1 Input Video status

The following video status is displayed for each input. M-GWSDIIP-6 does not include the Network error LED nor the Enabled LED, as SDI inputs are always enabled.
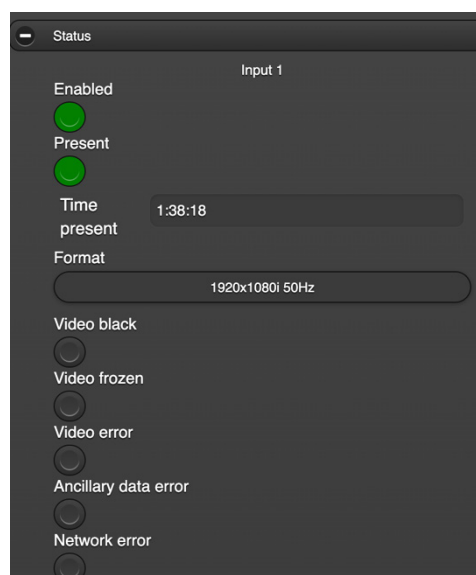
Input Video status

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

The following video status is displayed for each input.
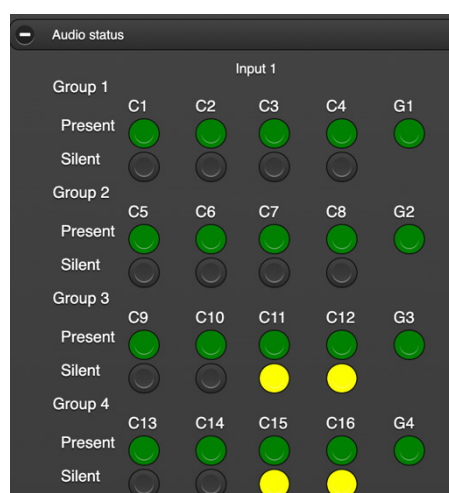
Input Audio status

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.
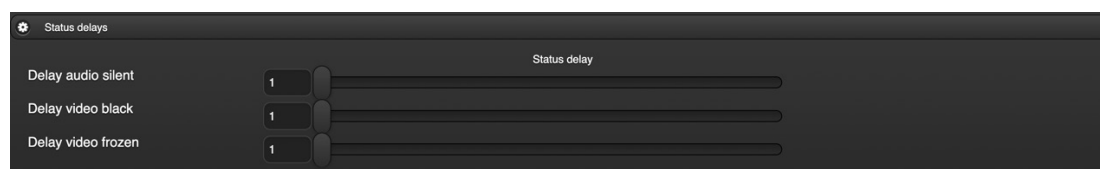
Status delay

5.4 Network Status and Statistics

The following network status & statistics are displayed for each input of the M-GWIPSDI-6 and M-GWIPIP-6
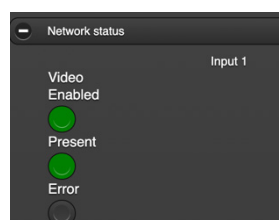
Enabled LED: Green when IP input is enabled, otherwise off

Present LED: Green when IP input is present, otherwise off

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

M-GWIPIP-6/M-GWIPSDI-6
Input flow network status
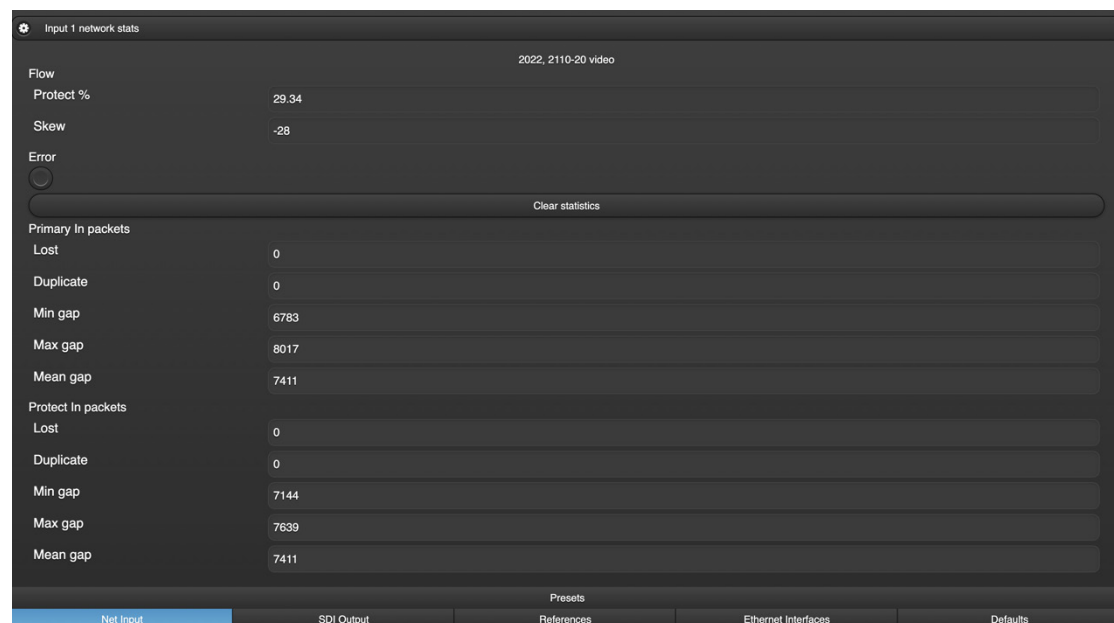
M-GWIPIP-6/M-GWIPSDI-6 Input flow network statistics

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 References and Output Timing

6.1 References

All apps are able to lock the outputs to a PTP clock, an analogue tri-level or Black & Burst sync, or freerun the outputs to an internally generated clock. Additionally M-GWSDIIP-6 is able to lock to an SDI input.

All outputs are locked to the same reference clock. It is not possible to lock different outputs to different clocks. If locking the M-GWSDIIP-6 outputs to an SDI input, the first present SDI input is chosen, starting from SDI Input 1.

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

All apps provide the following reference status.
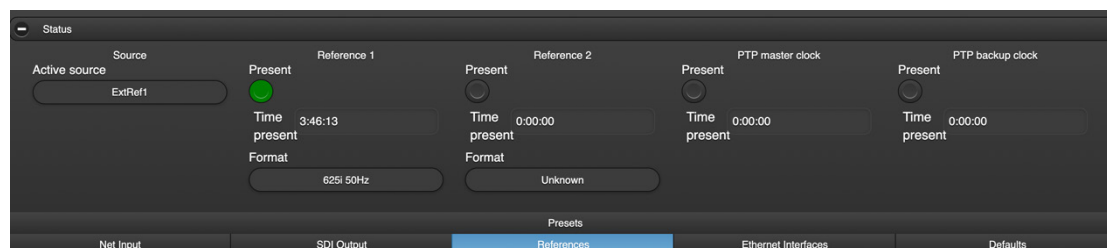
Reference Status

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

All apps provide the following reference configuration options.

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

All apps provide the following PTP configuration options.

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 (Eth 1:1 to 2:6 or 4:6 if M-GWIPIP-6). The interface chosen must be configured for the same IP range and as the PTP clock

PTP Statistics

All apps provide the following 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

6.2 Output timing

The output timing controls adjusts 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.

All apps provide the following Output timing adjustments.
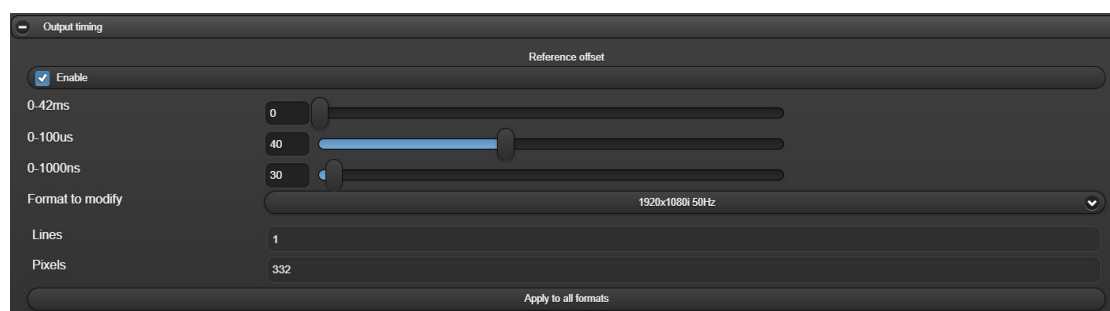
Output timing

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

6.3 Frame delay

All apps provide up to ten frames of delay adjustable in one frame steps for each individual output.
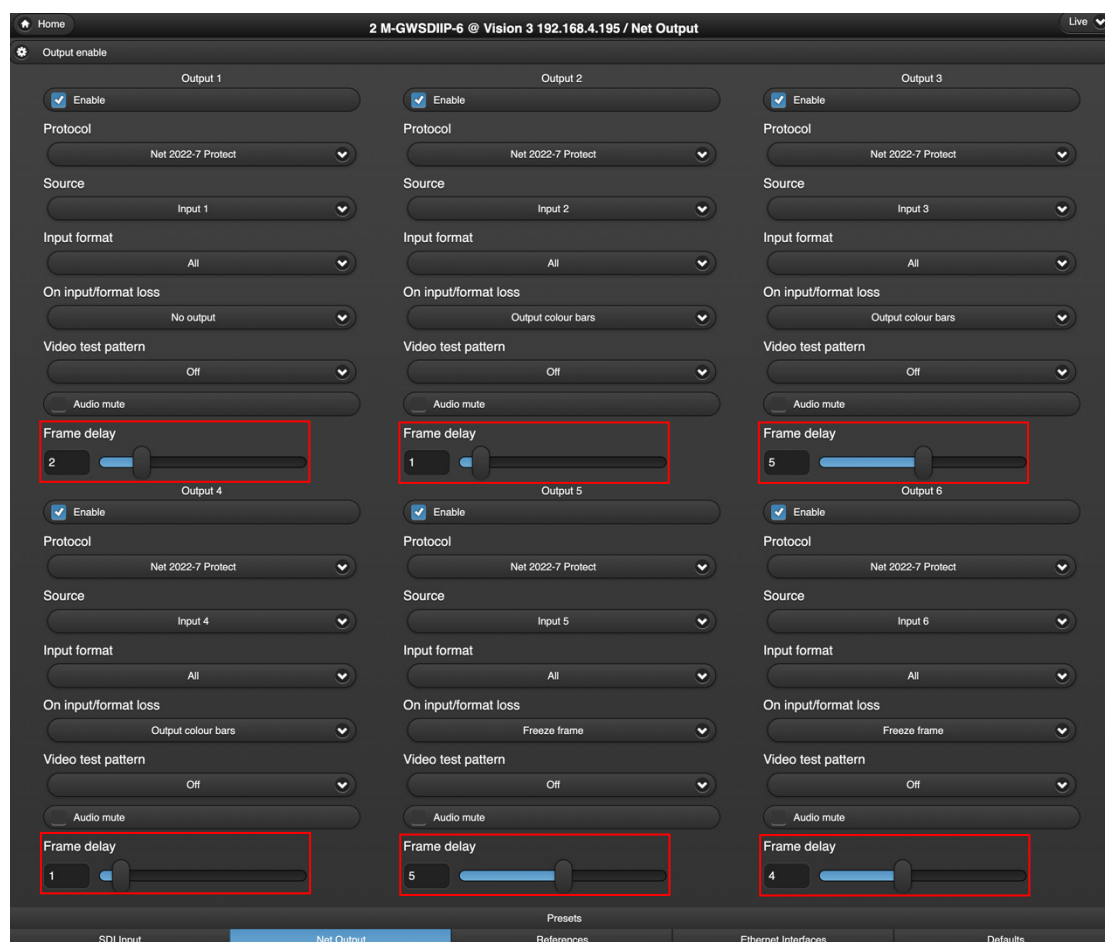
Output Frame Delay

7 Traffic Shaping Profile

7.1 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.
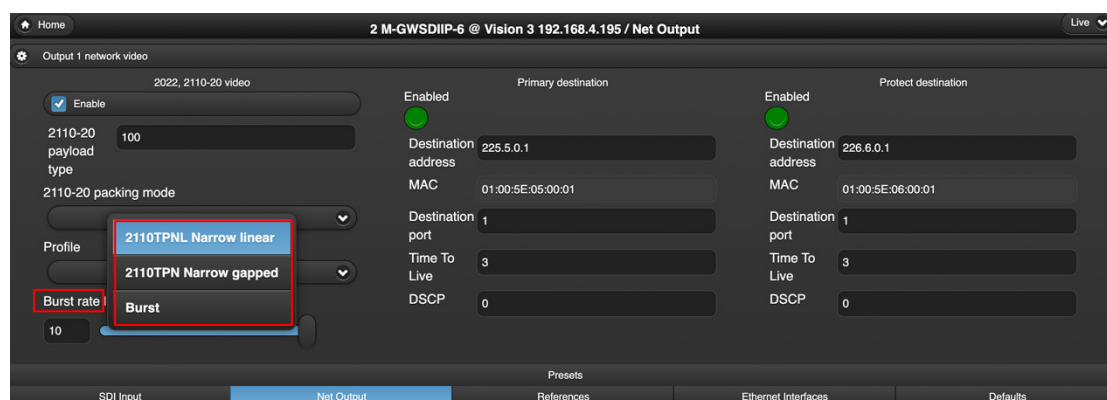
M-GWSDIIP-6/M-GWIPIP-6 Traffic Shaping Profile

8 Input Format, Input Loss and Test Pattern Options

8.1 Input Format and On Loss of Input

All apps provide an Input Format control located within the 'Output enable' control group. 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, Output 1 will be replaced with colour bars.
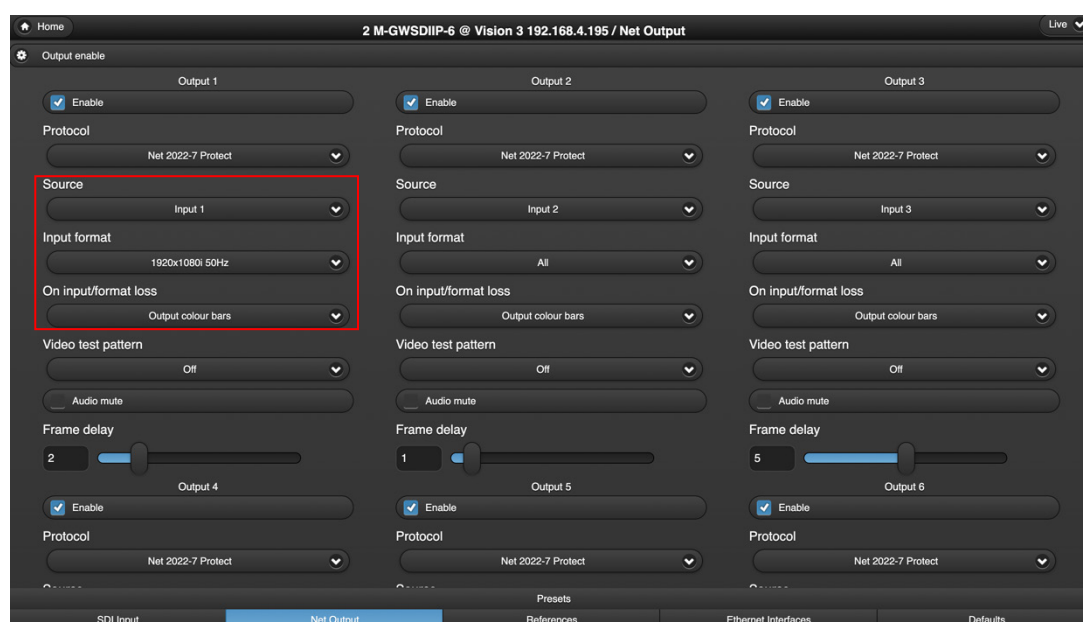
Input Format and On Loss Options

8.2 Internal Test Patterns

All apps provide the following internal test patterns which, when enabled, replace the outgoing video content with the selected test pattern.
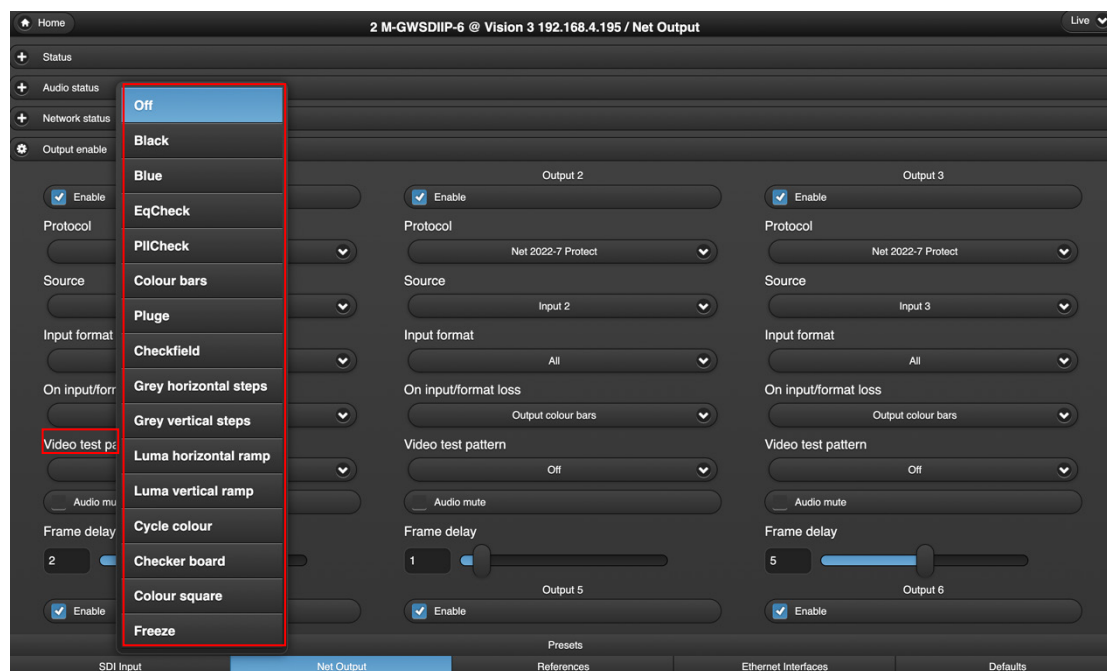
Internal Test Pattern options

8.3 Audio mute

Embedded audio present in SDI or ST 2022 inputs will be passed through to the outputs. All apps provide an audio mute control which, when enabled, will mute embedded audio present on the output.
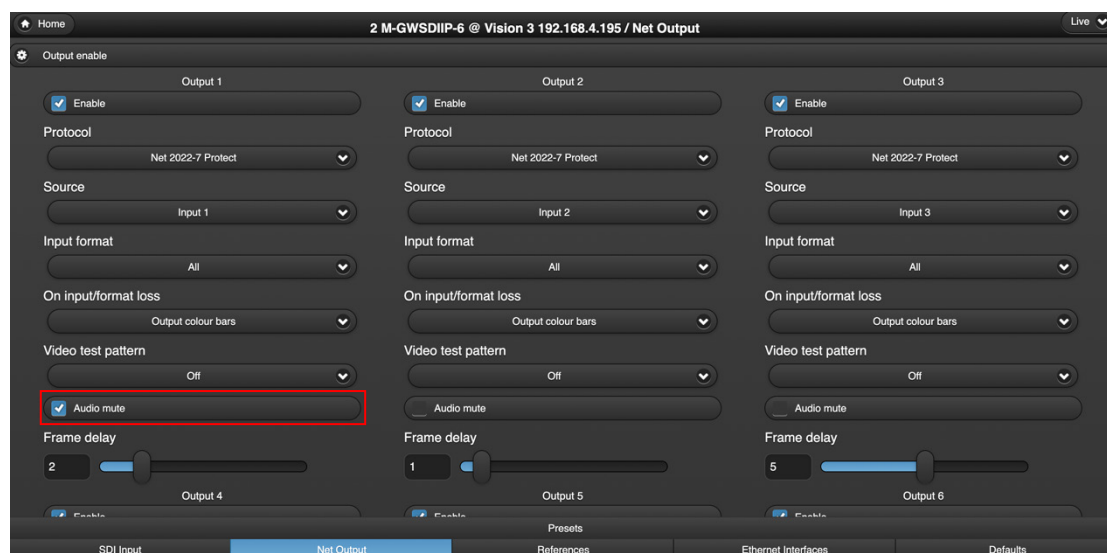
Audio mute

9 Unicast Flow Configuration

To transmit a unicast flow, the output '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 1:1 on the M-GWSDIIP-6 is now set to transmit the primary flow to a downstream device with IP address 192.168.5.30, which is the IP address of interface 1:1 on the receiving M-GWIPSDI-6.
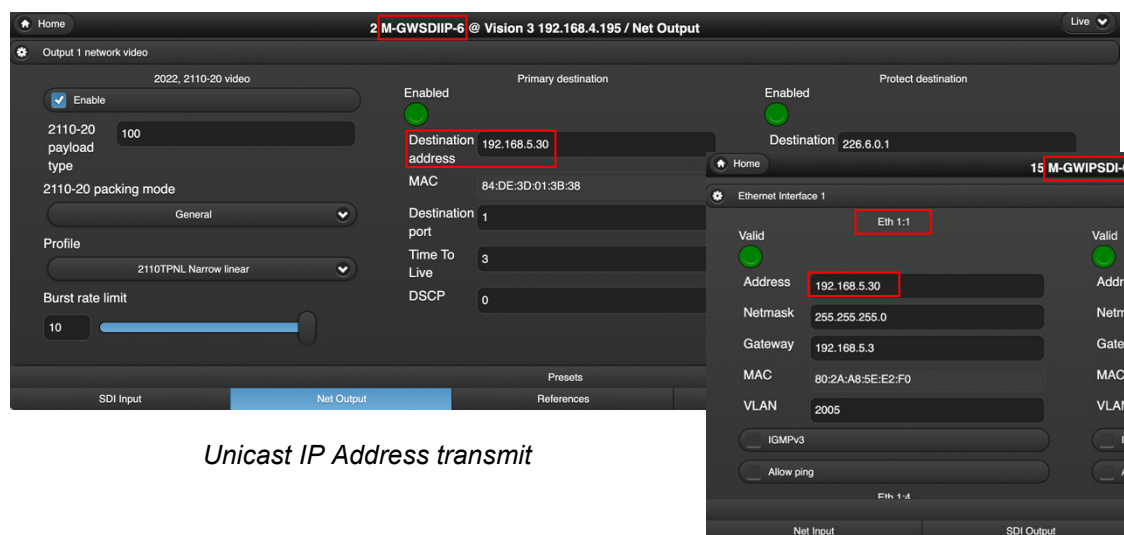
Unicast IP Address transmit

When receiving a unicast flow, the M-GWIPSDI-6/M-GWIPIP-6 input flow 'Multicast address' should be set to 0.0.0.0. The input flow '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 the M-GWSDIIP-6 IP address of the virtual interface transmitting the unicast flow.
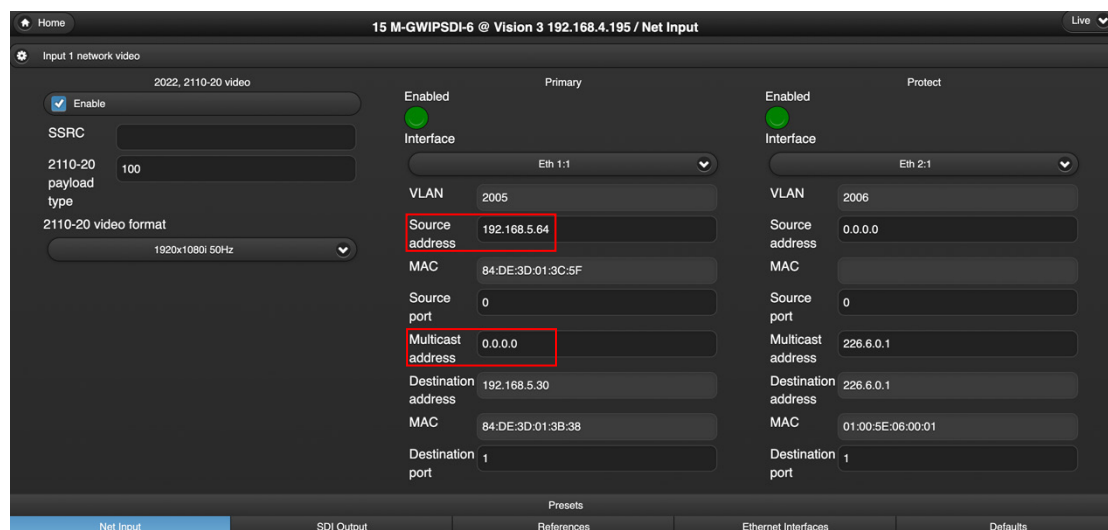
M-GWIPSDI-6 Unicast IP Address receive

10 Basic Trouble Shooting

10.1 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 card mode is set to correct format (3G disabled by default)

- Check IP inputs are enabled (off by default)

- Check SDI/IP outputs are enabled (off by default)

- 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

10.2 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.

10.3 IP flows keep stopping after a few minutes

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

11 Specification

11.1 M-GWSDIIP-6

MECHANICAL
'Double slot' Vision card 96mm x 303mm (96mm x 325mm including finger pull)
Weight: 355g
Power consumption: 25 Watts

INPUTS AND OUTPUTS
Inputs are SDI
Outputs are IP
Input connections: Six BNCs for SDI
Output connections: 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)
Outputs can be mixture of ST 2022 and ST 2110
Video, audio and data can be passed between SDI and ST 2022. Video can be passed between SDI and ST 2110, while audio and any other non-video data will be lost
Requires at least one SFP+ transceiver option, up to a maximum of four. All IP outputs can be 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 output. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces
Uses VR04 or VR06 frame rear modules. VR04 must be used when more than two SFP+ are fitted

SDI INPUTS
Three 3Gb/s SDI inputs or six HD or SD SDI inputs
If the input is 3Gb/s then inputs 1, 3 and 5 should be used, and inputs/outputs 2, 4 and 6 should be disabled
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 OUTPUTS
Three 3Gb/s video over IP outputs or six 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

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 2110-20 video flow are selectable per IP output 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
There are six clean switches
Any of the SDI sources can be switched to any output. The default setting is Input 1 to Output 1, Input 2 to Output 2, Input 3 to Output 3, Input 4 to Output 4, Input 5 to Output 5 and Input 6 to Output 6

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 ST 2022 outputs

SYNCHRONISER AND TIMING ADJUSTMENTS
Video sources are synchronised to common reference timing source

Choice of timing options:

- PTP (SMPTE 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 (defaults to SDI 1)

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

There are 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 card will move down the list until it finds a valid timing reference 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

An additional ten frames of video delay (adjustable in one frame steps) allows compensation for any big system delays. This delay can be configured individually for each output

ANCILLARY DATA

All ancillary data (including audio and locked Dolby E) is passed from input to ST 2022 output. When ST 2110 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 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

11.2 M-GWIPSDI-6

MECHANICAL

'Double slot' Vision card 96mm x 303mm (96mm x 325mm including finger pull)
Weight: 355g
Power consumption: 25 Watts

INPUTS AND OUTPUTS

Inputs are IP
Outputs are SDI
Input connections: 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)
Output connections: Six BNCs for SDI
Inputs can be mixture of ST 2022 and ST 2110
Video, audio and data can be passed between ST 2022 and SDI. Video can be passed between ST 2110 and SDI, while audio and any other non-video data will be lost
Requires at least one SFP+ transceiver option, up to a maximum of four. All IP inputs can be received 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. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces

IP INPUTS

Three 3Gb/s video over IP inputs or six HD or SD video over IP inputs
If the input is 3Gb/s then inputs 1, 3 and 5 should be used, and inputs/outputs 2, 4 and 6 should be disabled
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 OUTPUTS

Three 3Gb/s SDI outputs or six HD or SD SDI outputs
270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A

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

ROUTING

There are six clean switches
Any of the IP inputs can be switched to any SDI output. The default setting is Input 1 to Output 1, Input 2 to Output 2, Input 3 to Output 3, Input 4 to Output 4, Input 5 to Output 5 and Input 6 to Output 6

VIDEO LOSS CONTROLS

The video loss/format mismatch controls allow the user to select what will happen to an SDI 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 SDI output

TEST PATTERNS

The test pattern controls allow the user to override an input and force the SDI 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

AUDIO MUTE CONTROL

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

SYNCHRONISER AND TIMING ADJUSTMENTS

Video sources are synchronised to common reference timing source
Choice of timing options:
- PTP (SMPTE 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

Chosen reference is the global reference source for all inputs and outputs
There are five 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 card will move down the list until it finds a valid timing reference source:
- PTP>Ref1>Ref2>Hold
- PTP>Ref1>Hold
- PTP>Ref2>Ref1>Hold
- PTP>Ref2>Hold
- PTP>Hold

("PTP" means PTP Master>PTP Backup. "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

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

An additional ten frames of video delay (adjustable in one frame steps) allows compensation for any big system delays. This delay can be configured individually for each SDI output

ANCILLARY DATA
All ancillary data from ST 2022 (including audio and locked Dolby E) is passed from input to output. ST 2110 input is video only

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

11.3 M-GWIPIP-6

MECHANICAL
'Double slot' Vision card 96mm x 303mm (96mm x 325mm including finger pull)
Weight: 355g
Power consumption: 25 Watts

INPUTS AND OUTPUTS
Inputs are IP
Outputs are IP
Input and output connections: 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 can be mixture of ST 2022 and ST 2110
Outputs can be mixture of ST 2022 and ST 2110
Video can be passed between ST 2022 and ST 2110, while audio and any other non-video data will be lost
Requires 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

IP INPUTS
Three 3Gb/s video over IP inputs or six HD or SD video over IP inputs
If the input is 3Gb/s then inputs 1, 3 and 5 should be used, and inputs/outputs 2, 4 and 6 should be disabled
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 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

IP OUTPUTS
Three 3Gb/s video over IP outputs or six 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

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 2110-20 video flow are selectable per IP output 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

There are six clean switches
Any input can be switched to any output. The default setting is Input 1 to Output 1, Input 2 to Output 2, Input 3 to Output 3, Input 4 to Output 4,

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 ST 2022 outputs

SYNCHRONISER AND TIMING ADJUSTMENTS

Video sources are synchronised to common reference timing source
Choice of timing options:
- PTP (SMPTE 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

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

There are five 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 card will move down the list until it finds a valid timing reference source:

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

("PTP" means PTP Master>PTP Backup. "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

An additional ten frames of video delay (adjustable in one frame steps) allows compensation for any big system delays. This delay can be configured individually for each output

ANCILLARY DATA
All ancillary data from ST 2022 (including audio and locked Dolby E) is passed from input to 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 video, 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