USER MANUAL

Vision SYSTEM

M-KEY

IP/SDI linear keyer

Crystal Vision

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Contents

1 Introduction

M-KEY is a 3G/HD/SD-SDI linear keying software app that runs on the MARBLE-V1 media processor – purpose-built GPU/CPU hardware that fits in the Vision frame. It can key one externally-generated graphic over an IP or SDI video stream or a matte, making it ideal for channel branding as well as providing news, weather, advert and emergency information overlays.

Like all MARBLE-V1 video processing software apps, the M-KEY 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-KEY:

- Linear keyer for adding one externally-generated graphic to an IP or SDI video signal
- Use external key input to force areas of key or mask, or key directly from luminosity of foreground input
- Easy to adjust opacity of the key for a semi-transparent effect, using Min and Max Clip controls
- Fade the keyed graphics up and down
- Override the key signal: use two internal crops to force areas of foreground and background
- Use the quad split to assist setup: Output video, Output key, Keyed foreground and Keyed background can be viewed simultaneously, with zoom available for fine-detail checking
- Ten frame adjustable video input delay per input, in one frame increments

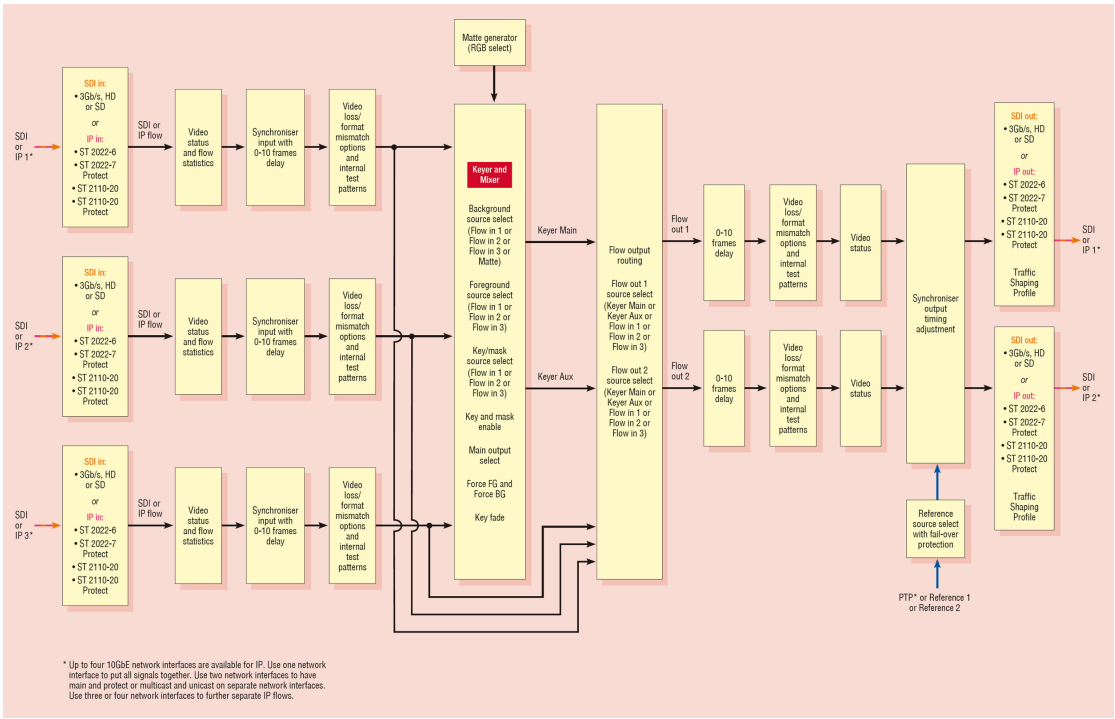
Common MARBLE-V1 feature set:

- 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
- 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
- Sub frame output timing adjustment locked to chosen reference source

- Ten frame adjustable video output delay per output, in one frame increments
- 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 Diagram

M-KEY



3 Hardware Installation

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

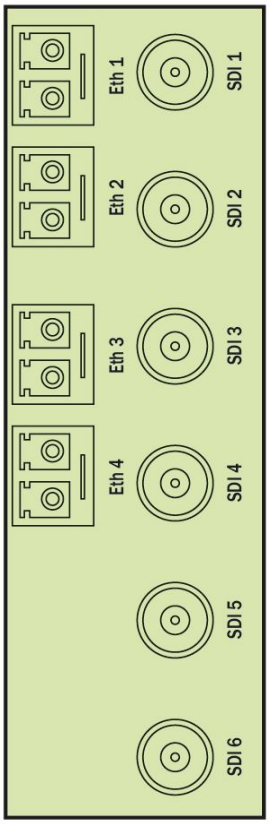
The app based MARBLE-V1 cards are intended for use only in the Crystal Vision 'Vision' frame range and not in older style frames such as 'Indigo'.

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.

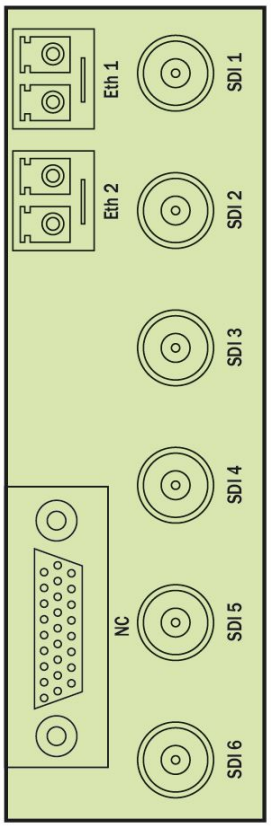
Ensure that the Vision frame has the correct rear module fitted. Only the VR04 and VR06 rear modules offer the correct input/output functionality for the M-KEY app.

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

3.1 Rear module signal IO



VR04



VR06

SDI 1: SDI Flow In 1

SDI 2: SDI Flow In 2

SDI 3: SDI Flow In 3

SDI 4: No Connection

SDI 5: SDI Flow Out 1

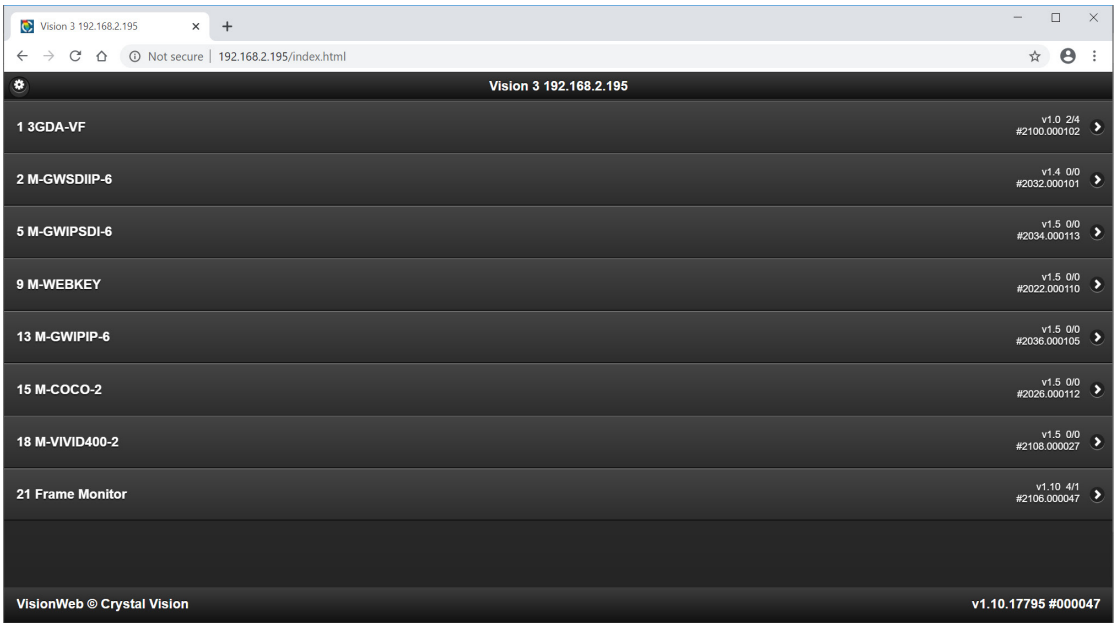
SDI 6: SDI Flow Out 2

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

D-Type on VR06: No connection

4 Flow 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 10GbE network interface connections. VR06 provides two network interfaces while the VR04 provides 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 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. For the M-KEY app fewer connections will require configuration. If using SDI I/O with an analogue reference no virtual interfaces will need configuring.

If using IP I/O main and protect protocols, typically five virtual interfaces across two physical interfaces will require configuration. For example:

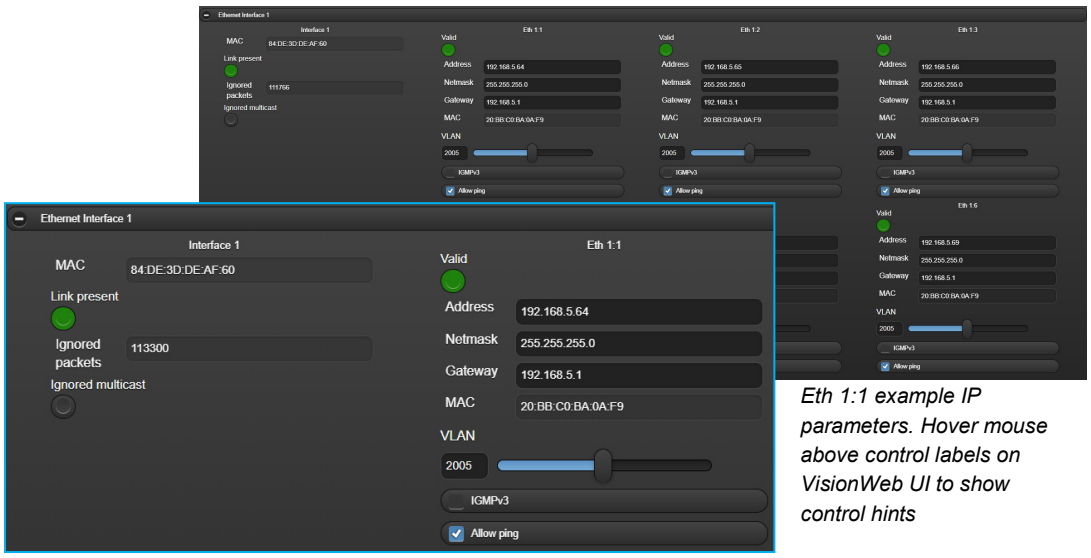
Flow Inputs

Eth 1:1 Flow 1 primary IP input	Eth 2:1 Flow 1 protect IP input
Eth 1:2 Flow 2 primary IP input	Eth 2:2 Flow 2 protect IP input
Eth 1:3 Flow 3 primary IP input	Eth 2:3 Flow 3 protect IP input

Flow Outputs

Eth 1:4 Flow 1 primary IP output	Eth 2:4 Flow 1 protect IP output
Eth 1:5 Flow 2 primary IP output	Eth 2:5 Flow 2 protect IP output

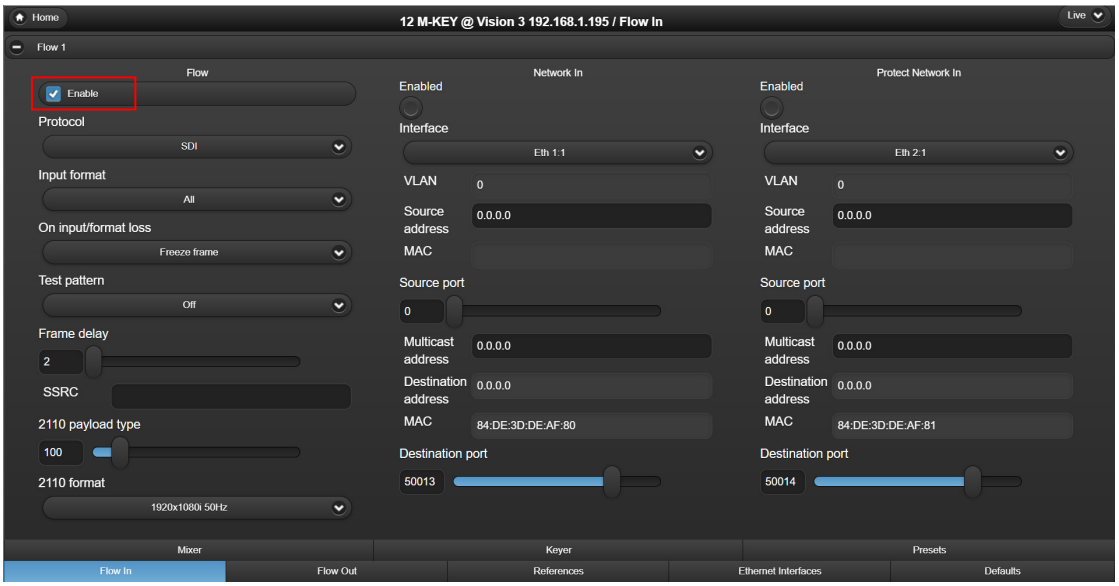
Alternatively if using the VR04, the IP Flow Outputs can be separated onto Eth 3 and 4.



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

4.2 Enabling Input and Output Flow

By default M-KEY input and output flows are disabled. Use the Enable control within the Flow In and Flow Out menus to enable the input and output flows.

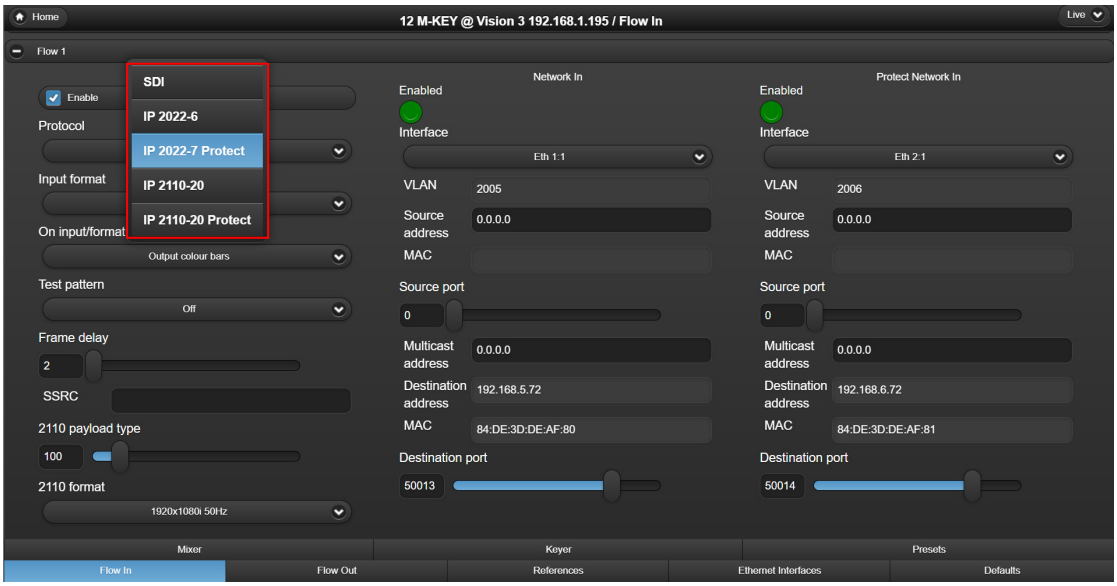


M-KEY Flow In 1 Enable

4.3 Select Flow Protocol

M-KEY supports SDI and uncompressed video over IP protocols ST 2022 and ST 2110-20. It is possible to mix protocols between input and outputs. For example, an ST 2022 input can be output as SDI on Flow Out 1 and ST 2110 on Flow Out 2.

Once the input and output flows have been enabled, the required Protocol can be selected using the drop down menus within the Flow In and Flow Out control tabs. The protocol type will need selecting for the input flow and each output flow.



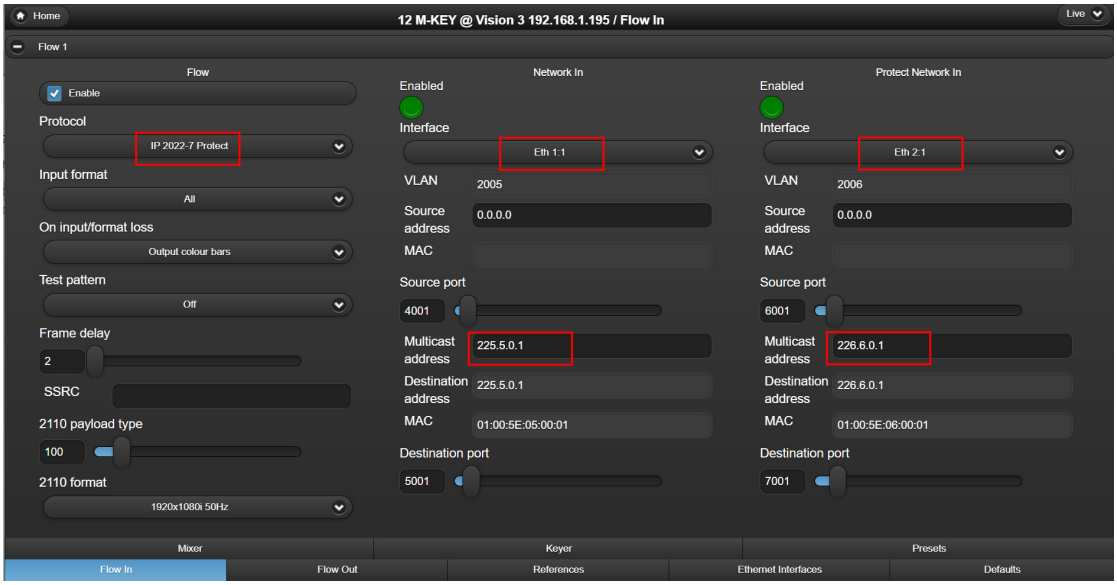
M-KEY Flow Protocol Selection

Flow Out 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-KEY receives ST 2022 or ST 2110-20 video over IP flows using the 10GbE network interfaces on the VR04 or VR06 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-KEY configured to receive Flow 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-KEY Flow In 1

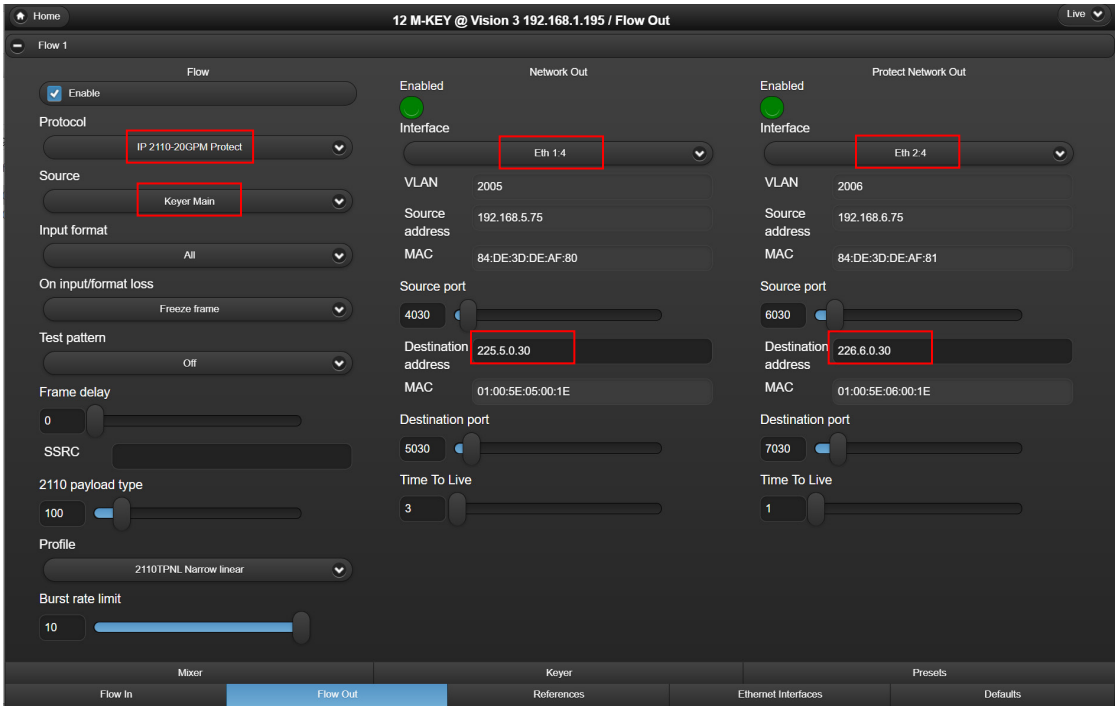
The controls highlighted in the above configuration show Flow 1 of the M-KEY set to receive the 'main' flow packets on Ethernet Interface 1:1 and 'protect' packets of the ST 2022-7 protocol on 2:1. In this example multicast IP addresses are in use.

To successfully receive a 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-KEY transmits ST 2022 or ST 2110-20 video over IP flows using the 10GbE network interfaces on the VR04 or VR06 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-KEY configured to transmit Flow 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-KEY Flow Out 1

The controls highlighted in the above configuration show Flow Out 1 of the M-KEY routing the Keyer Main processing block to Ethernet Interface 1:4 and 2:4 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 Flow Video and Audio status

Flow In video and audio status

Video Status

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

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

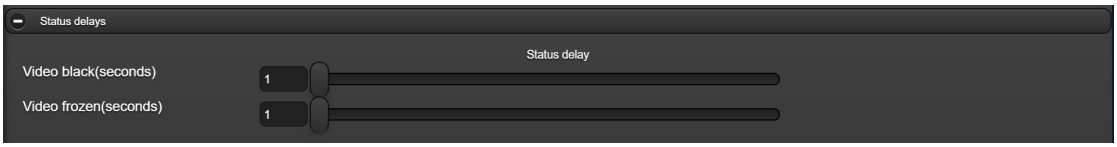
Audio Status

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

The equivalent Flow Out status is also provided for present, format, video black and video frozen.

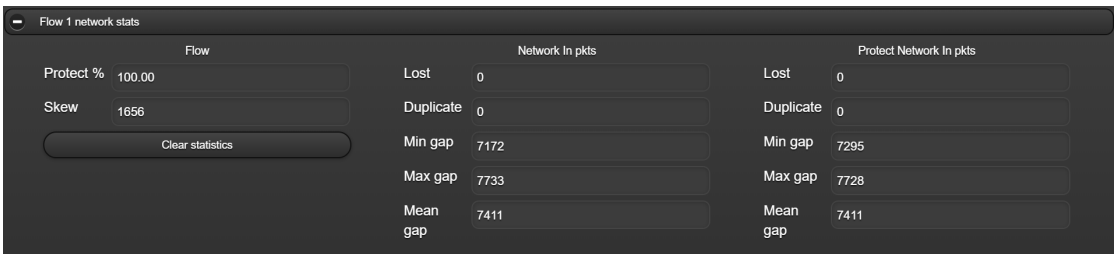
Status Delay

Black and Frozen can be prevented from triggering until a user selectable delayed period between 1 to 120 seconds has expired. These controls are located on the ‘Defaults’ tab.



Status delay

5.2 Network Statistics



Flow In 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)

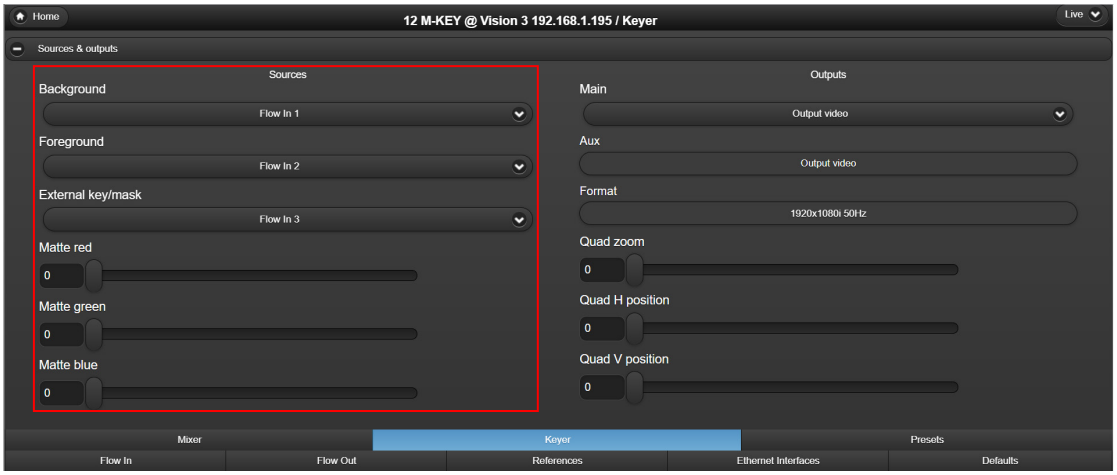
6 Keyer and Mixer

M-KEY is an uncompressed SDI and IP linear keying software app designed to key a foreground (fill) input onto a background (programme). An external key input can be used to force the areas of keying or masking. Alternatively the luminosity of the foreground signal can be used to 'self' key over the background.

6.1 Keyer

Keyer Sources

Select which of the flow inputs are to be used for the background programme video, the foreground keyed graphics video and, if used, the external key/mask input. Background video can be set to matte, with the matte colour configurable using the matte RGB sliders.

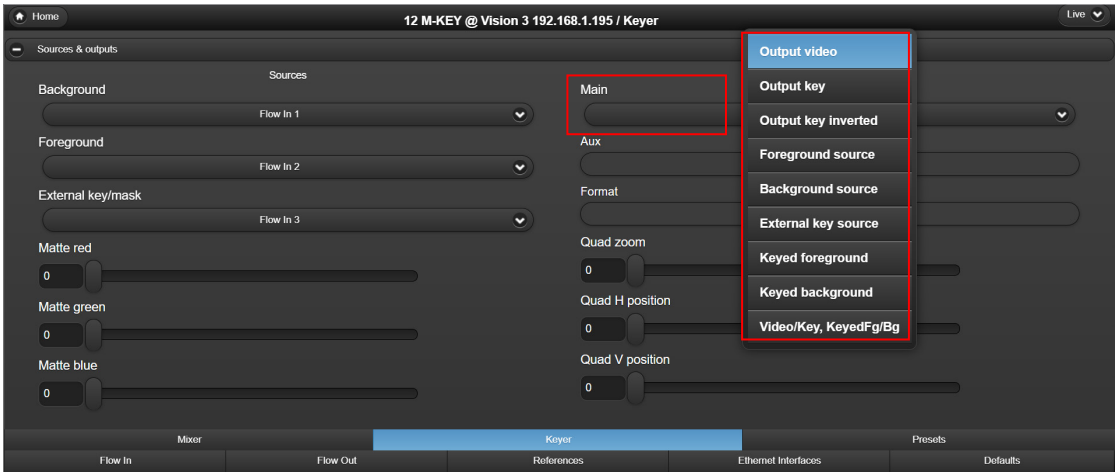


Keyer source selection

Keyer Outputs

The keyer processing provides both a ‘Main’ and ‘Aux’ output. The Aux output is fixed to display the final processed output from the keyer. The Main output, however, can be routed to display keyer source signals* or keyed signals at various stages of the key processing.

To aid setup, selecting 'Video/Key, Keyed FG/BG' displays a quad split output for each of these signals. The quad zoom and position controls provide the ability to zoom into each quad for close inspection of the adjustments to the key across the picture.



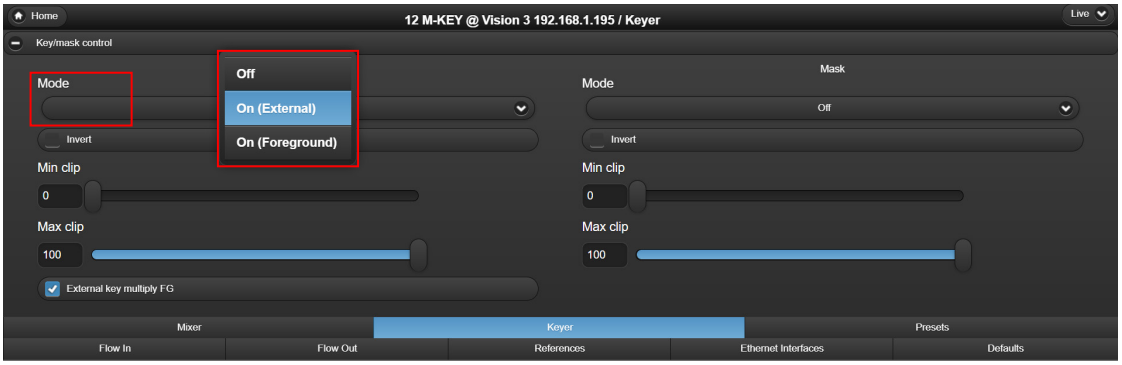
Keyer Main Output signal processing selection

* Keyer source signals ‘Foreground source’ and ‘External key source’ will show black if key mode is set to off.

Key/mask Control

Use the Key/mask control menu to enable the keyer. If ‘foreground’ keying is being used (keying from the luminosity of the foreground input graphics), an external input mask can be used to mask areas of the keyed signal.

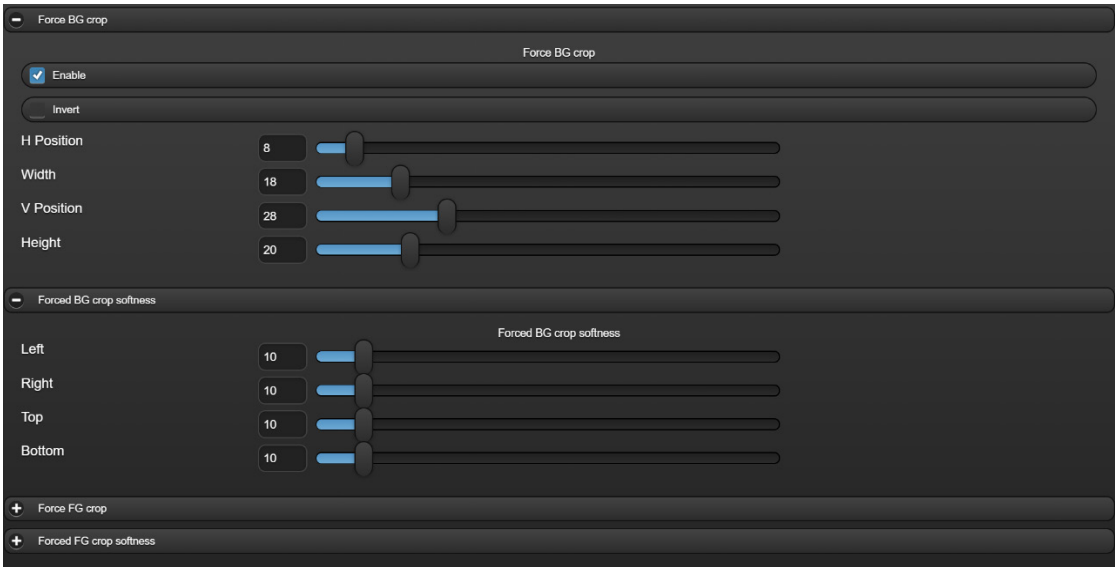
When ‘foreground’ keying, reducing the max clip forces a stronger key with less transparency, with min clip performing the opposite. Likewise if external key or mask inputs are not peak white, max and min clip can be used to decrease/increase transparently of the key.



Key on/off control

Force areas of background or foreground

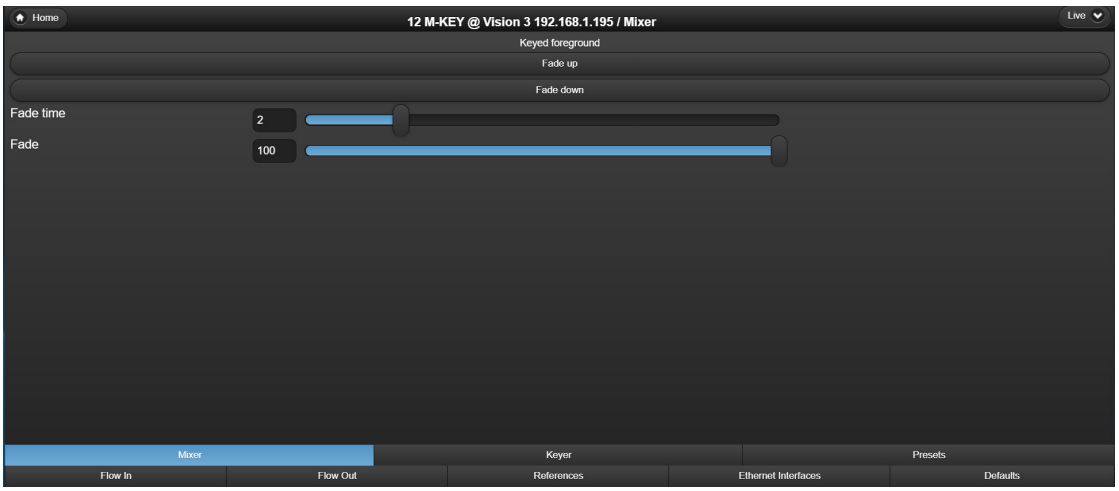
Using the Force BG and Force FG controls it is possible to force areas of the foreground or background input sources. Use the crop controls to determine the size and position of the forced area. Use the softness controls to apply a soft edge to the forced area.



Force Background and Foreground

6.2 Mixer

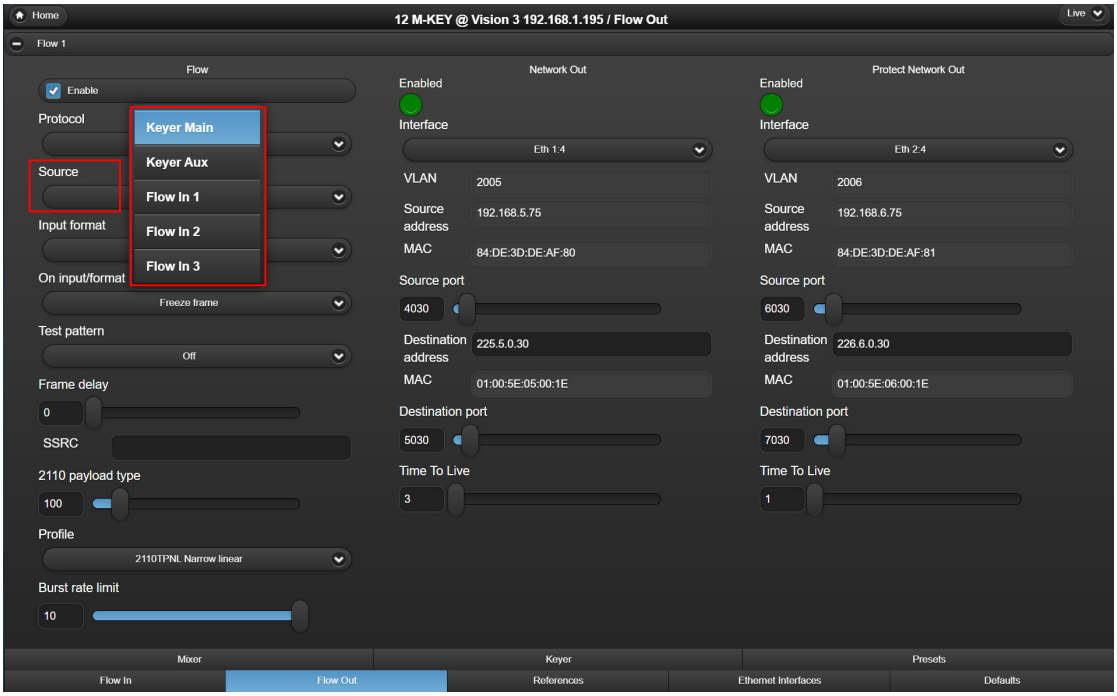
The keyed foreground can be faded up and down using the fade buttons on the Mixer control tab. Fade time from 0 to 10 seconds can be set.



Mixer Fade Key

6.3 Flow Output Routing

The Flow 1 and Flow 2 outputs can be independently routed to either the Main or Aux source from the keyer processing block, or they can be routed directly to the output after the input frame delay processing.



7 References and Output Timing

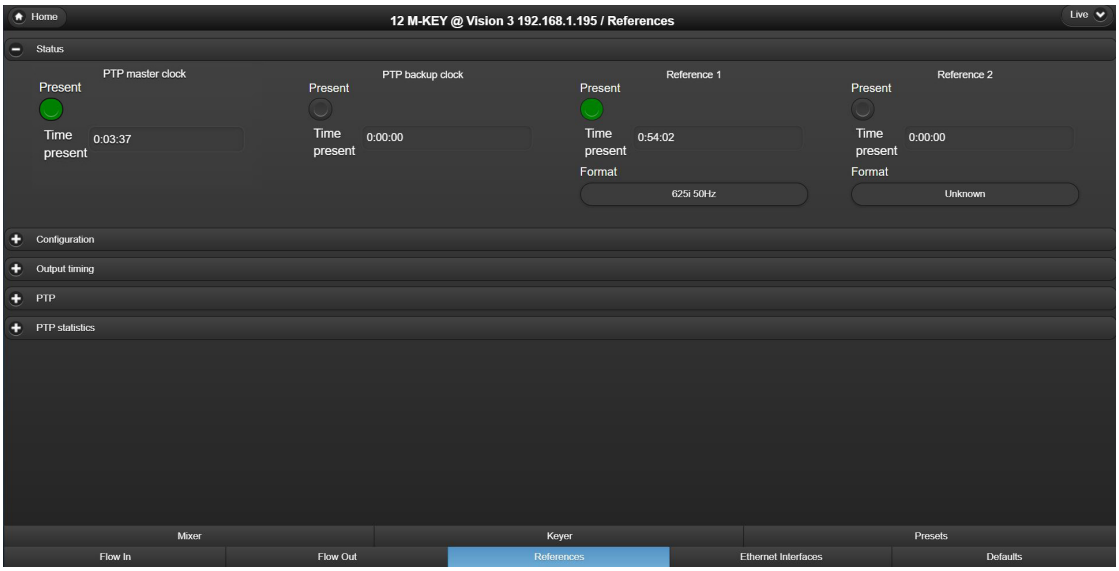
7.1 References

The M-KEY flow output 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 flow in protocol. If the chosen reference sources are absent at power up, the outputs will freerun to an internally generated clock.

Both flow 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



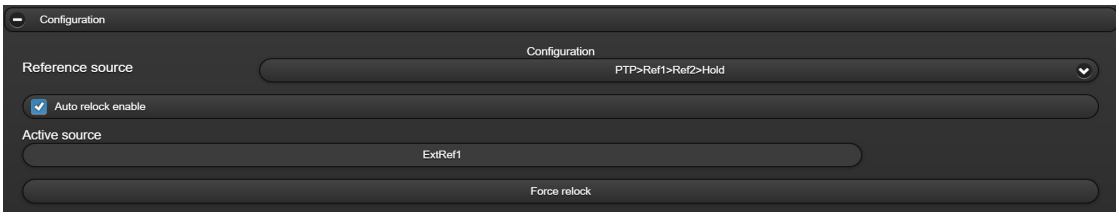
Reference Status

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

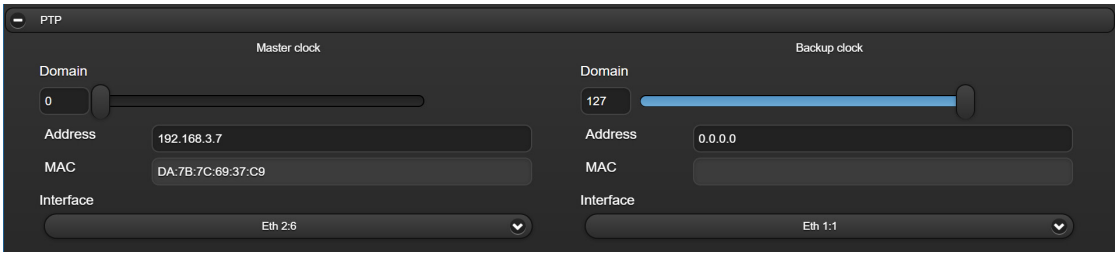
Reference source: Select priority order of reference source. Will automatically fail-over to next source in list if priority source missing

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

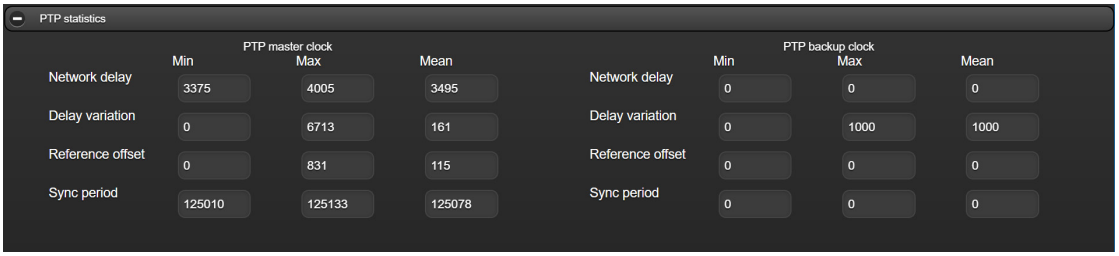
Domain: Domain number of the PTP clock

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

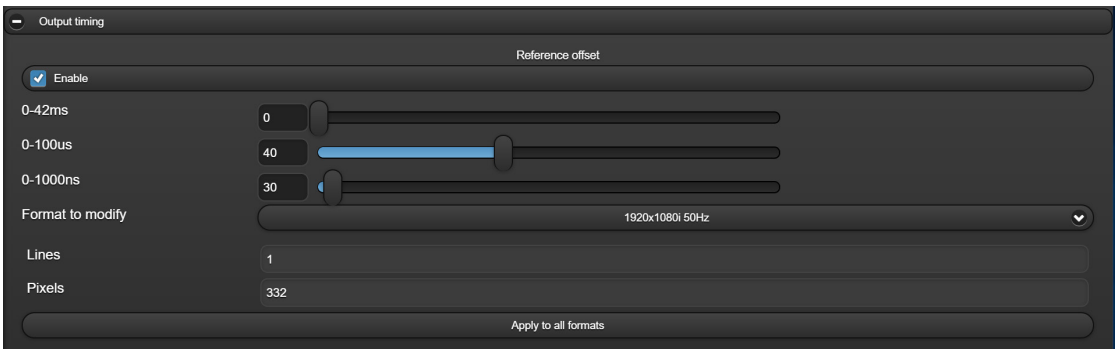
Delay variation: Indicates system noise and how accurately MARBLE-V1 can lock. For example, to lock within 500ns, the delay variation should be less than 500ns

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

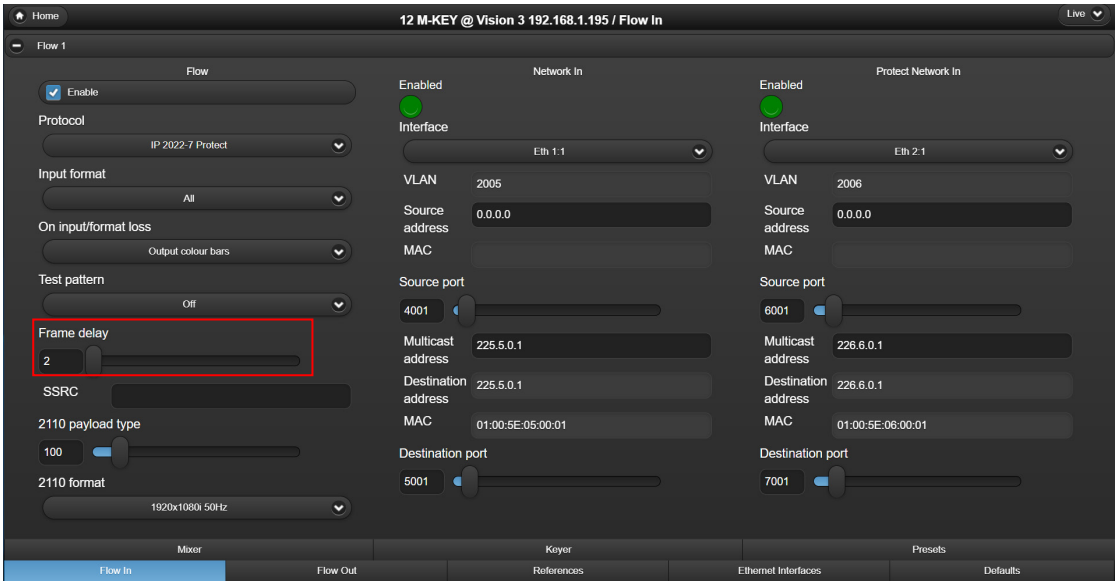
Format to modify: Independently adjust output timing for each video format

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

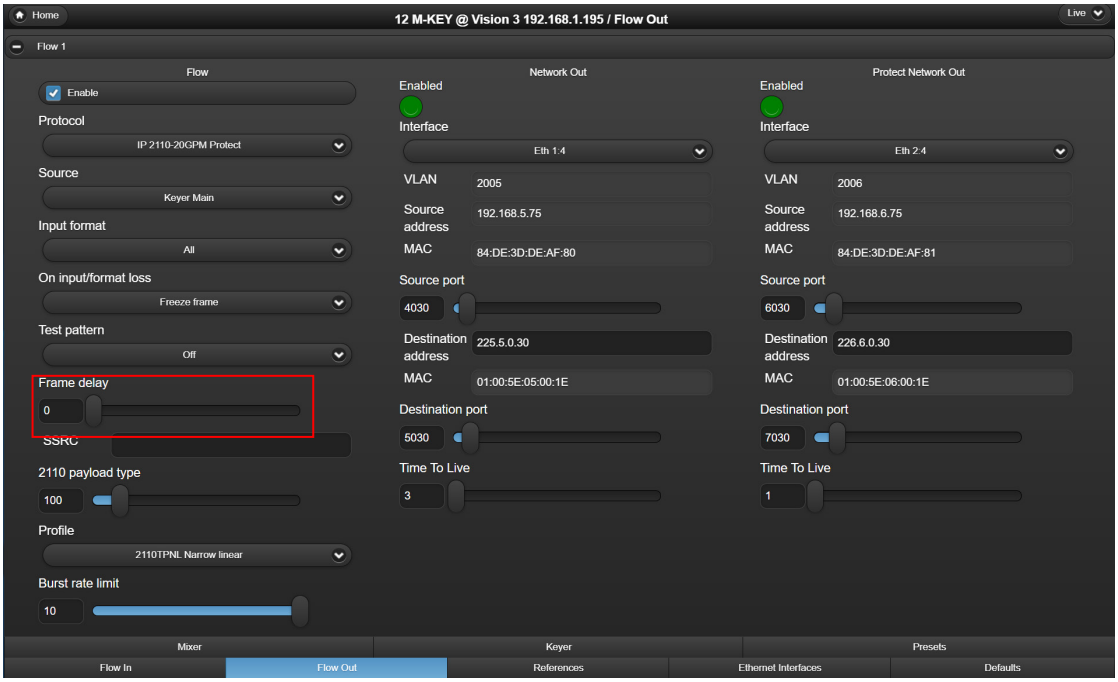
Lines/Pixel: Read only status of the output timing in equivalent lines and pixels

7.3 Frame delay

Up to ten frames of delay adjustable in one frame steps can be applied to each input and output flow. The minimum processing delay through M-KEY is two frames, therefore the input flow frame delays cannot be set lower than this.



Flow In Frame Delay



Flow Out Frame Delay

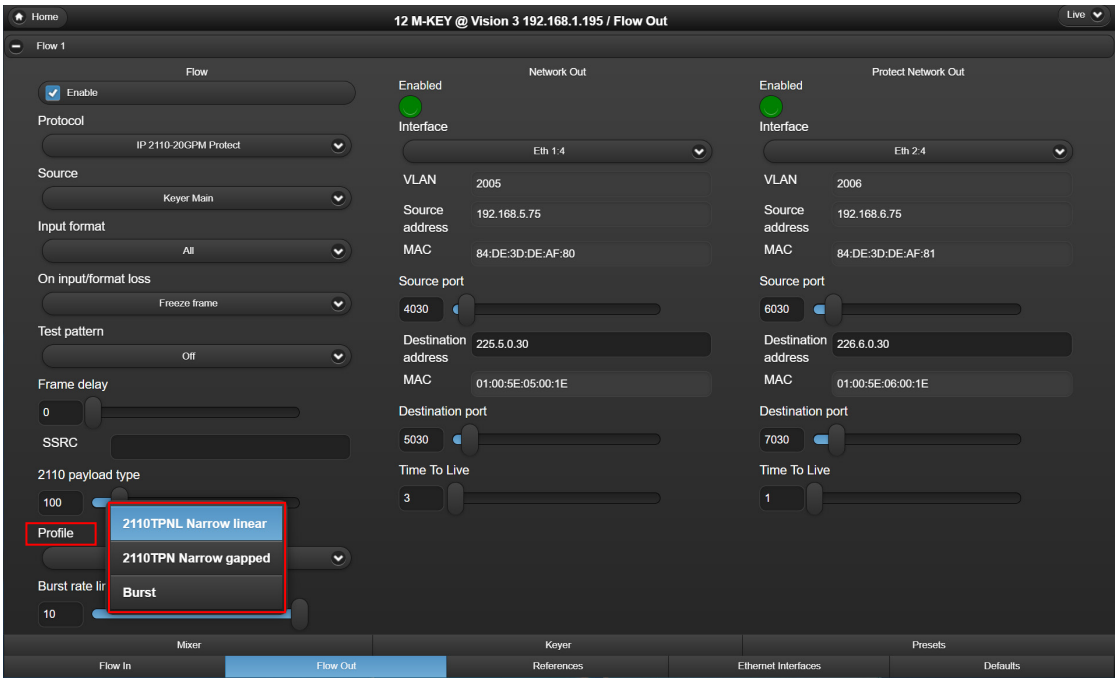
8 Traffic Shaping Profile

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.



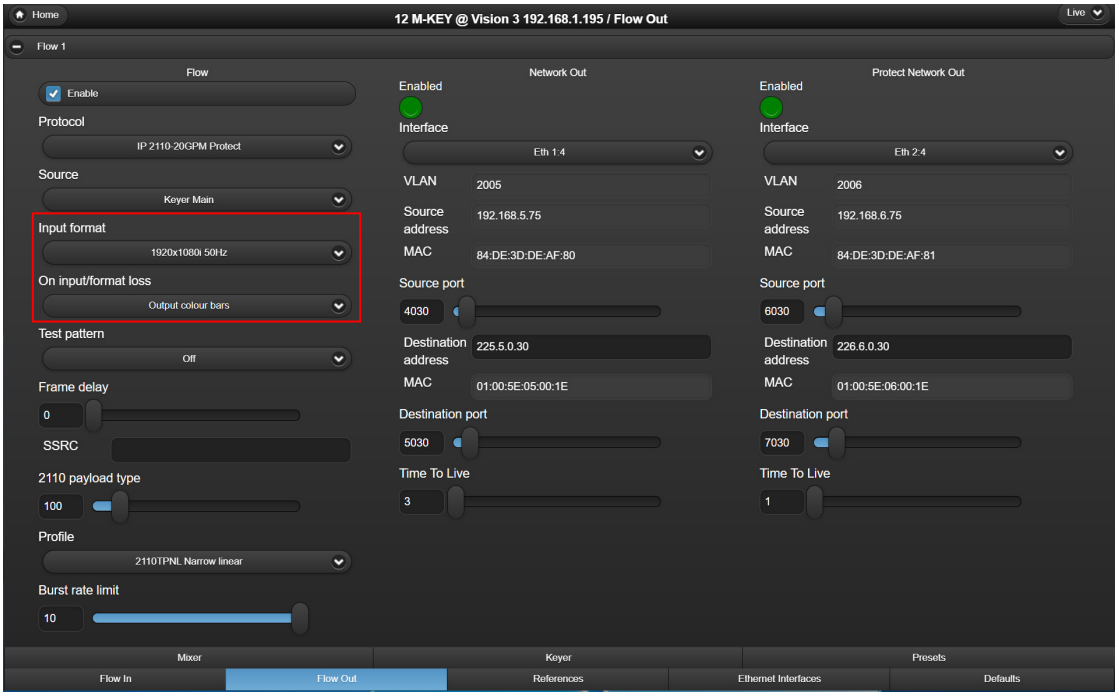
Traffic Shaping Profile

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 input/format loss’ function is triggered.

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



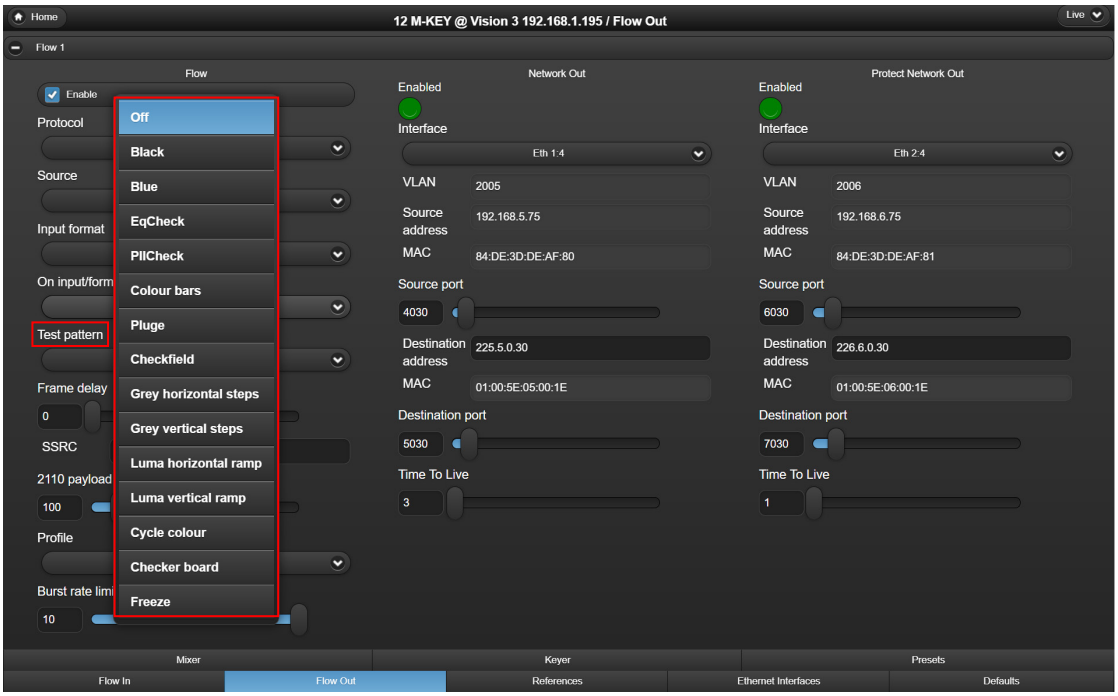
Input Format and On Loss Options

Apps which combine multiple input flows to produce an output, such as picture-in-picture and keying apps, feature ‘On input/format loss’ functions at both the Flow In and Flow Out stage. Enabling at the Flow In stage provides protection prior to the the app specific video processing block. For example, if Flow In 1 is the background programme source for M-KEY, this could be replaced with colour bars if the signal is lost or the incorrect format.

If the flow inputs are set to ‘No output’ upon input/format loss, this could result in no output from the app specific video processing block. Should this occur the Flow Out input/format loss options can be used to provide an output failover option e.g. colour bars.

9.2 Internal Test Patterns

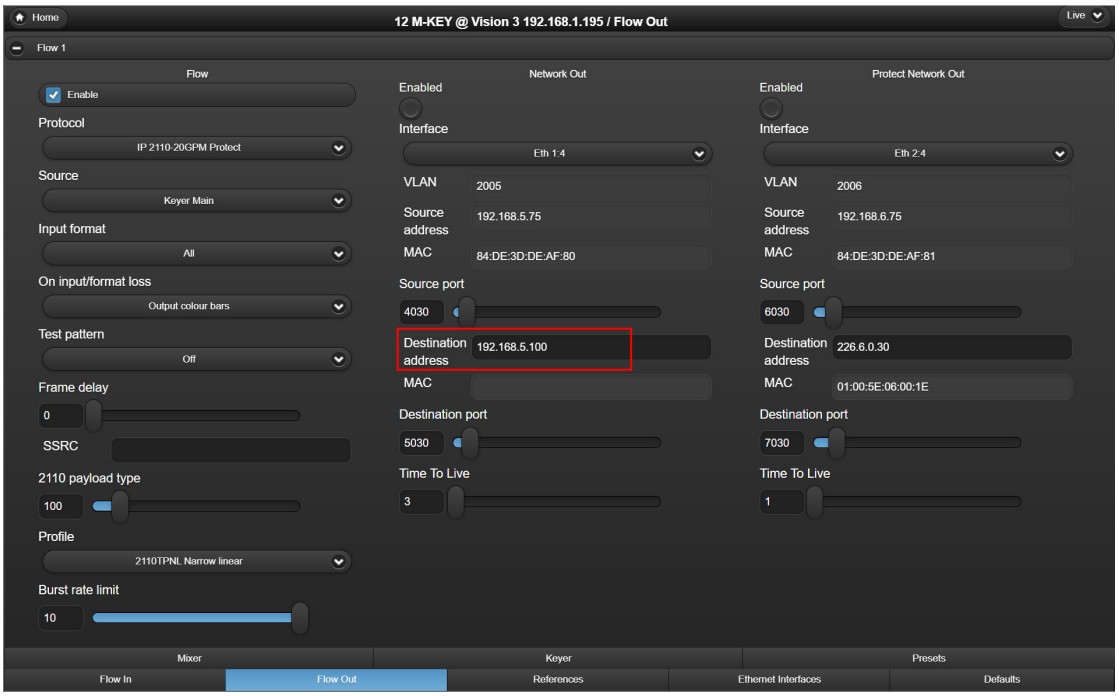
The following internal test patterns are provided for all input and output flows which, when enabled, replace the flow video content with the selected test pattern.



Internal Test Pattern options

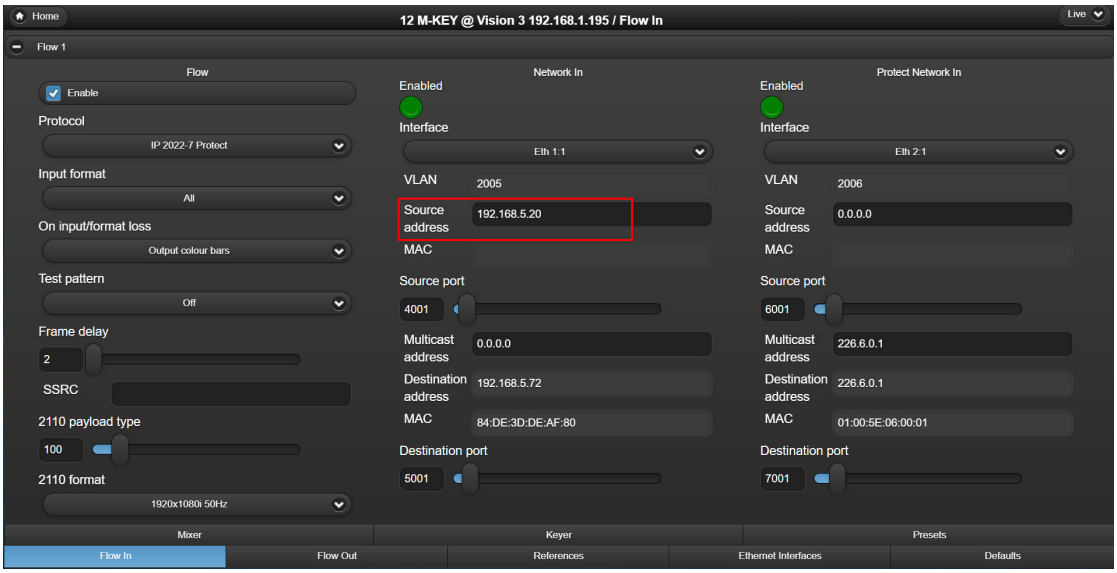
10 Unicast Flow Configuration

To transmit a unicast flow, the Flow Out ‘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 1:4 on the M-KEY is now set to transmit the flow to a downstream device with IP address 192.168.5.100



Unicast IP Address transmit

When receiving a unicast flow, the Flow In ‘Multicast address’ should be set to 0.0.0.0. The Flow In ‘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 flow inputs are enabled (off by default)
- Check flow outputs are enabled (off by default)
- Check correct flow protocol has been selected
- Check 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
- Check network switch ports are configured for trunk mode and not access mode (access mode sends untagged packets which MARBLE-V1 will ignore)

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 flow in 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-KEY APP 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
Five BNCs for SDI 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. Use one SFP+ to put all signals together, use two SFP+ to have main and protect or multicast and unicast on separate network interfaces and use three or four SFP+ to further separate flows
Uses VR04 or VR06 frame rear modules. VR04 must be used when more than two SFP+ are fitted

SDI VIDEO INPUTS

(NB. Some or all of the inputs can be IP instead)
Up to three 3Gb/s or HD or SD SDI inputs
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 FLOW INPUTS

(NB. Some or all of the inputs can be SDI instead)
Up to three 3Gb/s or HD or SD video over IP inputs
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 stream from lost packets by creating two streams of the same data using different routing to the destination. Flow analyser handles the analysis and reconstruction of the protected stream. 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)
Up to two 3Gb/s or 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

IP FLOW OUTPUTS

(NB. Some or all of the outputs can be SDI instead)
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

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)
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 (compulsory in ST 2110 and optional in ST 2022) is selectable per flow 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 flow protection facilitates the dual stream output

ROUTING

The keyer processing block provides a main and aux output. The aux output shows the final result of the keyer processing (output video), whereas the main output can show different stages of processing (see KEYER section)
The flow output routing allows selection between Keyer Main and Keyer Aux for each of the two flow outputs. For example, Flow Out 1 could be set to Keyer Aux and therefore display the final output video of the keyer processing, whereas setting Flow Out 2 to Keyer Main allows this output to be used to preview different stages of the keyer processing. Additionally the Flow Out routing can be set to any of the three input flows

KEYING MODES

Keying mode can be set to Off, On (External) or On (Foreground)

External Key mode ("External") uses luminance of a key signal to key graphic over the Background, while Self Key mode ("Foreground") uses luminance value in the Foreground graphic
Key processing is multiplicative by default. For additive keying, untick the External key multiply FG box
External mask can be set to Off or On (External)
The key and mask can be inverted
The Min Clip and Max Clip controls can be used to increase or reduce transparency in the key or mask

KEYER SOURCES AND OUTPUTS

Background source can be set to Flow in 1 or Flow in 2 or Flow in 3 or Matte
Foreground source can be set to Flow in 1 or Flow in 2 or Flow in 3
External key/mask source can be set to Flow in 1 or Flow in 2 or Flow in 3
Keyer Aux Output shows processed Output video only
Keyer Main Output can be set to show processed Output video, Output key, Output key inverted, Foreground source, Background source, External key source, Keyed foreground, Keyed background or Output video/Output key/Keyed foreground/Keyed background quad split
The quad split option is useful for checking details during configuration. Controls are Quad zoom (0-100%), Quad H position and Quad V position. The single set of controls are applied to all four quads. Zoom of 0% shows the entire images in the quads and zoom of 100% expands a single pixel to fill each quad. When the image is expanded, the position controls define the area of the image to be displayed

INTERNAL MATTE GENERATOR

The keyer background source can be replaced with a colour produced by an internal matte generator

INTERNAL FORCE FOREGROUND AND FORCE BACKGROUND CROPS

Two internal crops can be turned on or off to force areas of foreground and background. They can be inverted and adjusted in position and size
Edge softness controls prevent hard edge on crop, with each edge individually selectable

MIXER

Key can be faded up or down as a timed transition, with fade time set from 0-10 seconds
Fade level can be manually adjusted between 0% and 100%

VIDEO LOSS CONTROLS

The video loss/format mismatch controls – available at both the input and output stages – allow the user to select what will happen to a flow in the event that the video 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 flow

TEST PATTERNS

The test pattern controls allow the user to override each individual input or force the output flow 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 Pass Through, or to freeze the picture. This is independently adjustable on each output flow

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

Ten frames of flow input video delay (adjustable in one frames steps) allows delay compensation between the background source and the two foreground sources
Ten frames of flow output video delay (adjustable in one frame steps) allows compensation for any big system delays

ANCILLARY DATA
All ancillary data (including audio) 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

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

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 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 monitoring using a standard web browser on a PC or tablet

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