Crystal Vision

M-SAFESWITCH-2L

SOFTWARE APP

IP/SDI dual channel 2 x 1 fail-safe switch and legaliser

The dual channel M-SAFESWITCH-2L provides two independent 2 x 1 clean switches, along with an EBU R 103 legaliser on each output. It can be switched either manually or automatically – making it ideal for planned maintenance switches to manually re-route a good signal around broken equipment, or for use as a very sophisticated auto changeover switch, with the option of selecting from ten different fault conditions to automatically trigger the switch.

The M-SAFESWITCH-2L is a software app that runs on the MARBLE-V1 media processor – purpose-built GPU/CPU hardware that fits in the Vision frame. It can be used with IP, with SDI or with both IP and SDI at the same time. Its support for multiple signal formats gives the easiest possible SDI to IP upgrade, while also making it perfect for mixed SDI and IP installations as well as fully IP or fully SDI environments. It supports both SMPTE ST 2022 and ST 2110 video over 10GbE IP networks, including ST 2022-7 redundant streaming and the protect equivalent for ST 2110. 31 video formats are supported. When used with SDI or SMPTE ST 2022, the M-SAFESWITCH-2L passes all ancillary data including embedded audio without modification. If ST 2110 is used, only the video content is output.

The fault conditions that can be selected to automatically trigger a switch are input missing, input video standard incorrect, active video black, active video frozen, video error and network error, with four additional fault conditions available for SDI and ST 2022: audio all selected missing, audio any selected missing, audio all selected silent and audio any selected silent. Different parameters can be chosen for each switch. The M-SAFESWITCH-2L uses source A as its primary input and source B as its secondary input, and will only auto switch to source B if any of the user-defined faults occur on the primary source A. After switching away from a faulty input, the M-SAFESWITCH-2L can be set to switch back automatically or by user intervention. The app's helpful status monitoring will indicate which errors are present for each signal, allowing them to be fixed before switching back.

The M-SAFESWITCH-2L will guarantee a clean switch and is ideal for use on the final output stage of a transmission system, before the signal gets to the MPEG encoder. Typically the backup signal going into the switch will have gone a simplified route compared to the main programme, resulting in a time difference between the two feeds which can upset the MPEG encoder on a switch to backup. The M-SAFESWITCH-2L can correct for any timing difference between the two inputs – resulting in no disruption to the output picture when a switch takes place. As well as a framestore synchroniser on each stream, it can delay the earliest arriving input by up to ten frames – while Source B can also be delayed by an additional 60 frames for when Source A is subjected to a long delay, such as from a graphics system. Further protection comes from the user-defined timing source priority for redundancy, with the option of selecting from the two analogue references on the Vision 3 frame as well as PTP master and backup signals. Should the main syncs become invalid, it will automatically switch to the specified backup syncs.

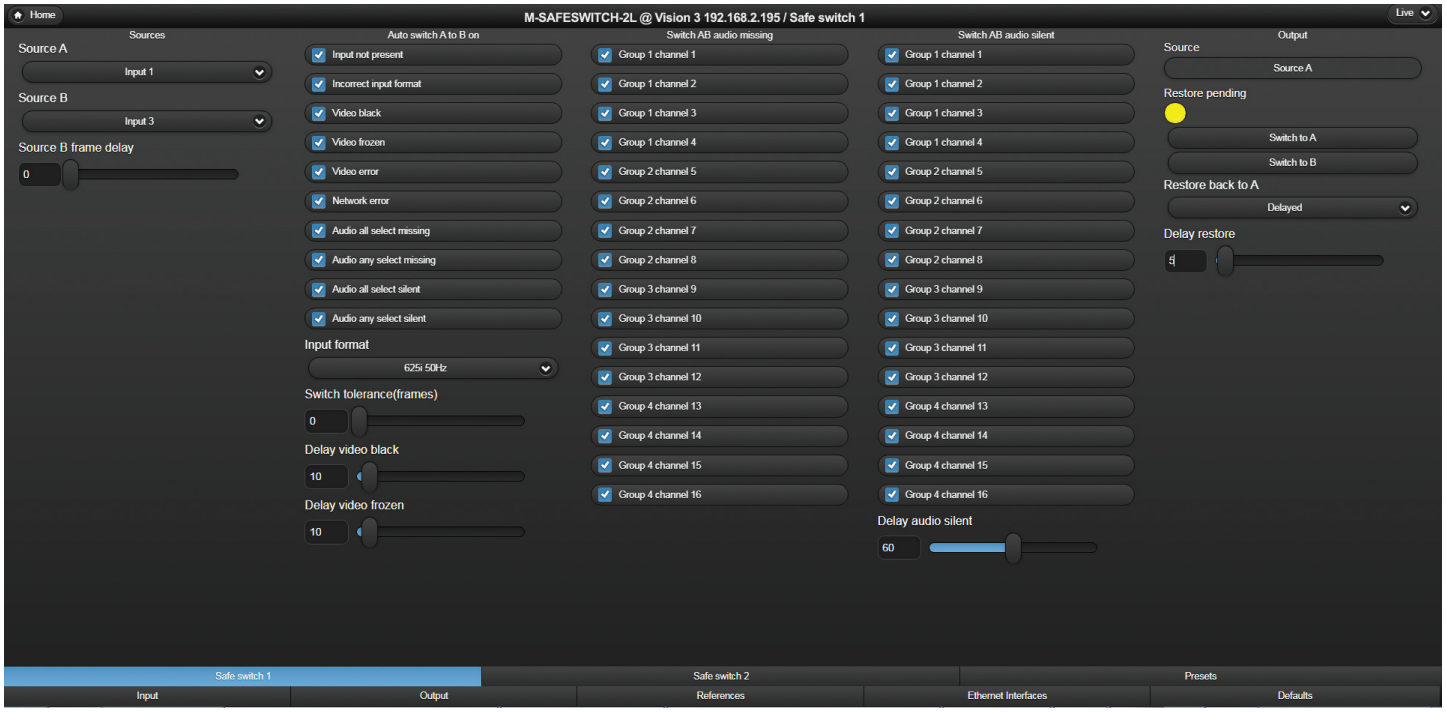
The M-SAFESWITCH-2L is equipped with RGB legalisers for each of the outputs. If enabled, any illegal RGB signals will be clipped to be within the limits as given by the EBU R 103 recommendation. The available RGB clip modes are hard, medium, soft, desaturation and constant hue.

The M-SAFESWITCH-2L's gateway functionality can be used to integrate SDI into an IP environment or IP into an SDI environment. Its IP to IP translation functionality can be used for network address translation, protocol conversion (between any of the input formats and any of the output formats), unicast to multicast address conversion and the creation of media firewalls. The IP flows can be separated and protected across up to four bi-directional 10GbE SFP+ network interfaces. Other features include full VLAN support and traffic shaping.

Should you want to change the functionality of your product completely, you just need to buy a new app to run on your MARBLE-V1 hardware.

- Software app that runs on the MARBLE-V1 media processor
- Dual channel clean and intelligent 2 x 1 switch and legaliser
- Use it with SDI, IP or both at the same time: supports 31 video formats, SMPTE ST 2022-6 and ST 2022-7 protocols and video within ST 2110 (ST 2110-10, -20 and -21 standards)
- Switch it manually: ideal for planned maintenance switches to manually re-route good signal around broken equipment
- Use it as an emergency transmission switch: select from ten fault conditions to automatically trigger a switch
- Per channel audio monitoring and switching makes it easy to detect and react to any audio problems
- Get no disruption to the output picture when a switch takes place: correct for any timing difference between the two inputs
- Get a legal output: clip RGB to be within the limits specified by the EBU R 103 recommendation
- Can be used as a simple 4 x 2 clean switch
- Choice of multiple timing sources with fail-over (PTP, two analogue Black and Burst or tri-level syncs references via Vision frame, or video input)
- Supports SMPTE ST 2022-7 redundant streaming and ST 2110 protect
- Fitting up to four bi-directional 10GbE network interfaces allows you to separate your IP flows as required
- Includes gateway functionality for hybrid systems, encapsulating SDI to IP and de-encapsulating SDI from IP
- Includes IP to IP translation functionality, such as network address translation, unicast to multicast address translation, setting firewall restrictions and protocol translation between any of the input formats and any of the output formats
- Tolerant of any input packet distribution, and includes output traffic shaping
- Protect your SDI programme output with dual relay bypass protection option
- Know your signal is present and valid, with SDI and IP flow signal monitoring
- Flexible remote control and monitoring using frame integrated control panel, remote control panels, ASCII and JSON protocols, SNMP and the web browser-based VisionWeb Control
- Save rack space: MARBLE-V1 media processor is a 'double slot' 96mm x 325mm card, with up to ten MARBLE-V1 fitting in 3U

THE CONTROLS



Example of a VisionWeb Control GUI

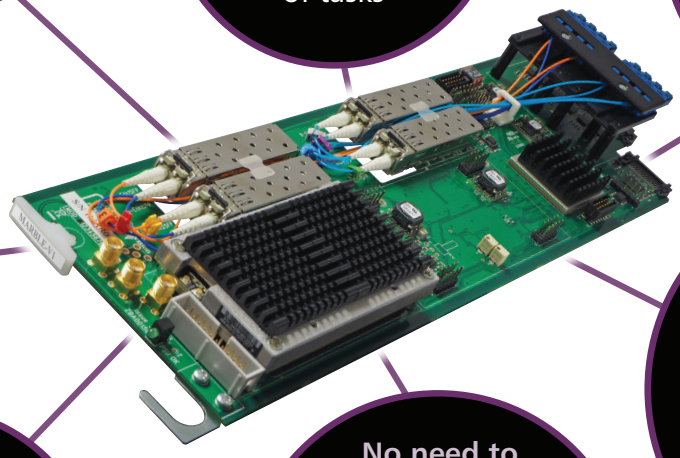
THE MARBLE-V1 MEDIA PROCESSOR

Shared hardware platform = many tasks

Powerful CPU/GPU processor = perform any task or combinations of tasks

I/O flexibility = six bi-directional SDI, four 10GbE SFP+ network interface and eight bi-directional discrete AES

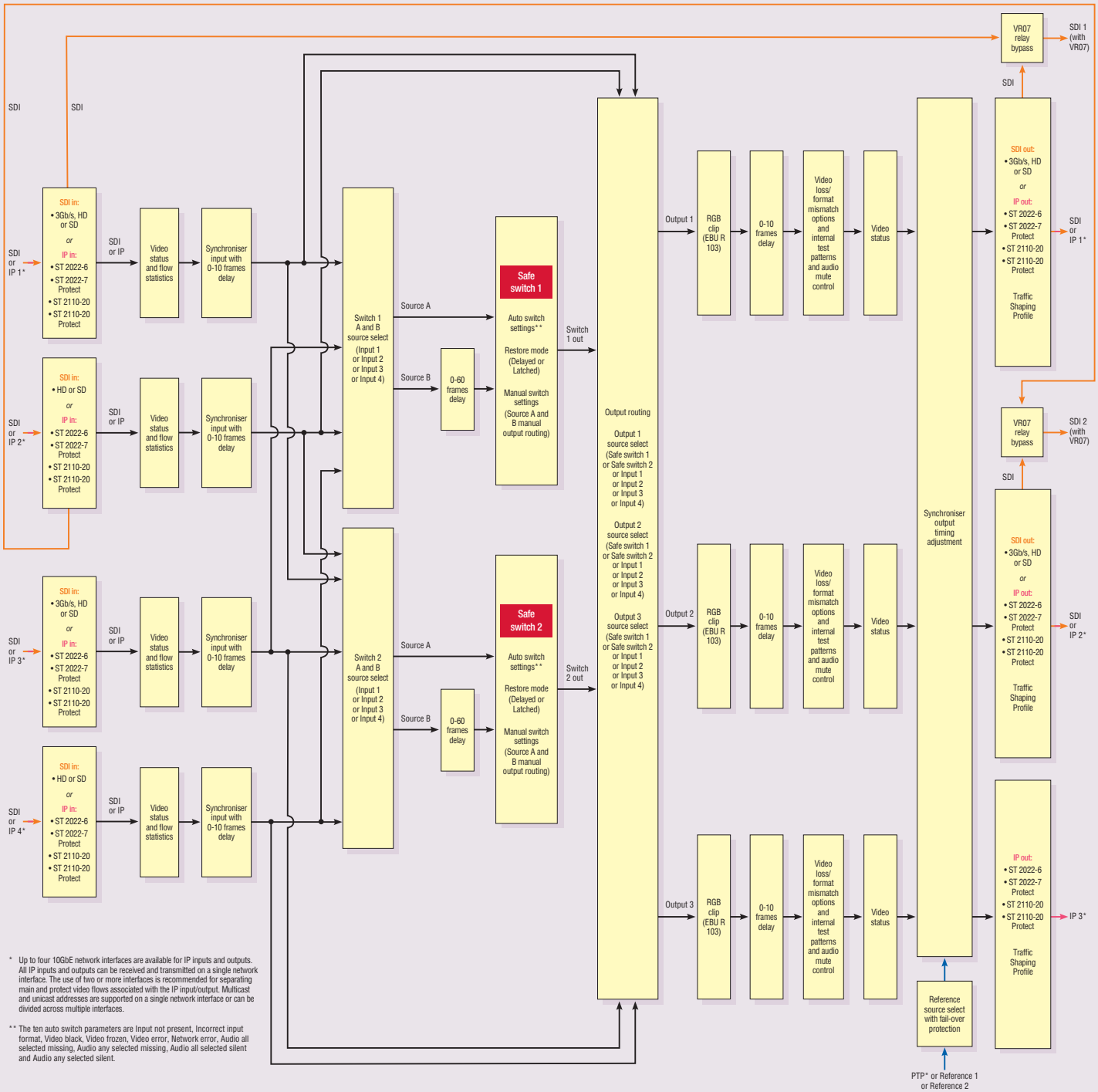
Change the functionality completely = install a different app



Features to help your systems work = signal monitoring, test patterns, traffic shaping, synchronisation, video delay and more

Software-based platform = easy to create custom products or add features

No need to choose between IP and SDI = apps can work with IP, SDI or both – and include IP gateway and translation functionality

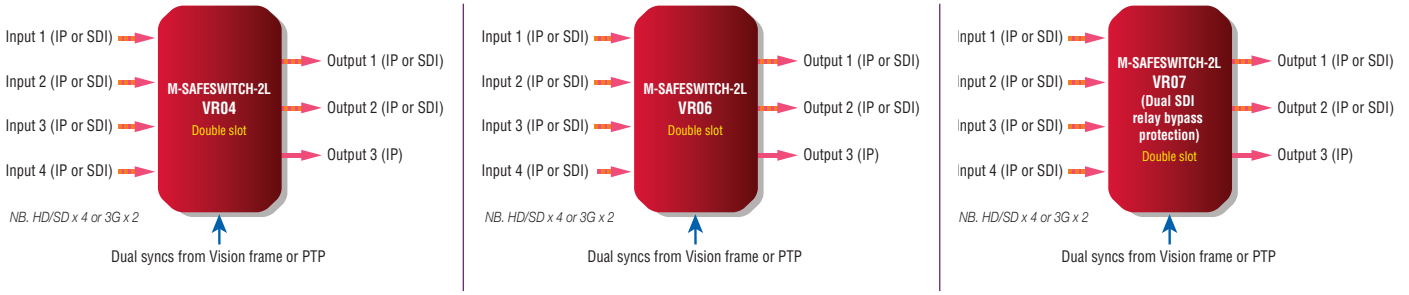


* Up to four 10GbE network interfaces are available for IP inputs and outputs. All IP inputs and outputs can be received and transmitted on a single network interface. The use of two or more interfaces is recommended for separating main and protect video flows associated with the IP input/output. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces.

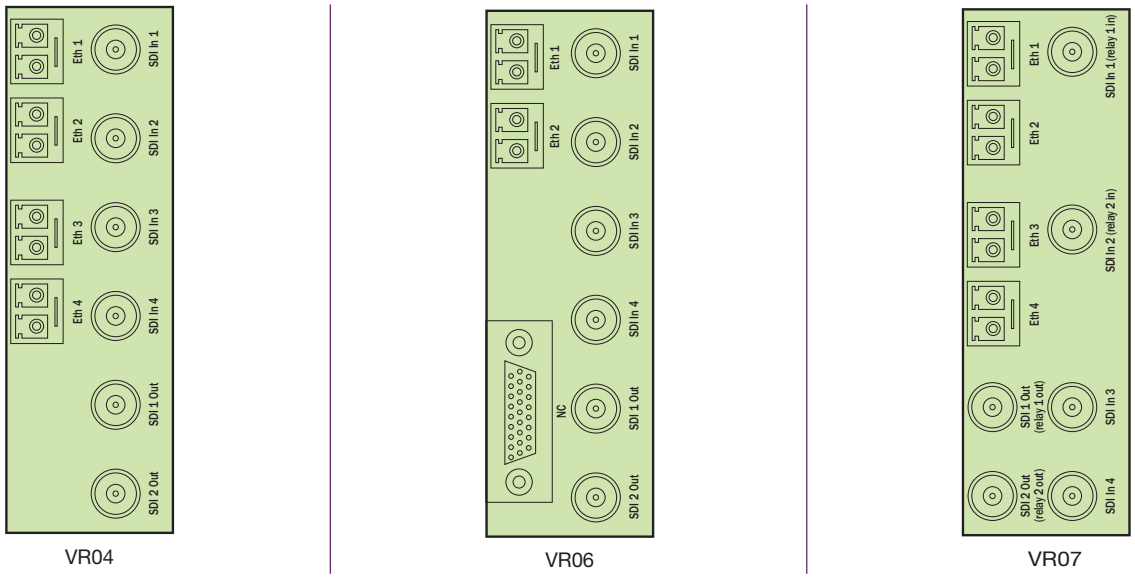
** The ten auto switch parameters are Input not present, Incorrect input format, Video black, Video frozen, Video error, Network error, Audio all selected missing, Audio any selected missing, Audio all selected silent and Audio any selected silent.

REAR MODULE CONNECTIONS

NB. A generic label will be supplied with purchase of the VR04, VR06 and VR07 rear modules. The labels shown below are provided to help you understand the signal connections, such as for wiring purposes.



NB. Any of the inputs can be routed to the two independent switches



VR04 VR06 VR07

SPECIFICATION

M-SAFESWITCH-2L 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

Six 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. All IP inputs and outputs can be received and transmitted on a single network interface. The use of two or more interfaces is recommended for separating main and protect video flows associated with the IP input/output. Multicast and unicast addresses are supported on a single network interface or can be divided across multiple interfaces

SDI only applications do not require any SFP+

Uses VR04, VR06 or VR07 frame rear modules. VR04 or VR07 must be used when more than two SFP+ are fitted

SDI VIDEO INPUTS

(NB. Some or all of the inputs can be IP instead)

Up to two 3Gb/s SDI inputs or four HD or SD SDI inputs. If the input is 3Gb/s then Input 1 and Input 3 should be used

270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A

3Gb/s cable equalisation up to 100m using Belden 1694A. HD cable equalisation up to 140m with Belden 1694A or equivalent (approx. 100m with Belden 8281). SD cable equalisation >250m Belden 8281 or equivalent

IP INPUTS

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

Up to two 3Gb/s video over IP inputs or four HD or SD video over IP inputs. If the input is 3Gb/s then Input 1 and Input 3 should be used

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

continued overleaf...

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 (NB. Two 3Gb/s outputs available when both are routed to the switch with 3Gb/s inputs)

270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A

IP OUTPUTS

(NB. Up to two of the outputs can be SDI instead)

Up to three 3Gb/s or HD or SD video over IP outputs (NB. Three 3Gb/s video over IP outputs available when all are routed to the switch with 3Gb/s inputs)

Any of the 10GbE IP network interfaces can be used to provide a protected output for SMPTE ST 2022-7 or ST 2110 seamless protection switching, which protects the stream from lost packets by creating two streams of the same data using different routing to the destination

Alternatively it is possible to have a unicast on some network interfaces and a multicast on others

RELAY BYPASS PROTECTION (SDI ONLY)

The VR07 frame rear module provides dual relay bypass protection when M-SAFESWITCH-2L is used with both SDI inputs and SDI outputs

The relay bypass protection protects the video output on frame power failure or if the MARBLE-V1 card loses power or is removed

An electromechanical relay switch on the VR07 needs power to hold the switch in one state and will revert to the other state (card bypass) on loss of power. It prevents signal loss by mechanically connecting an SDI input to an SDI output: SDI In 1 is connected to SDI 1 Out and SDI In 2 is connected to SDI 2 Out

NB. Use of the VR07 requires issue 5 or later of MARBLE-V1

VIDEO FORMATS SUPPORTED

The video formats supported are 625i, 525i, 720p50, 720p59.94, 720p60, 1080i50, 1080i59.94, 1080i60, 1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60, 1080PsF23.98, 1080PsF24, 1080PsF25, 1080PsF29.97, 1080PsF30, 2048x1080p23.98*, 2048x1080p24*, 2048x1080p25*, 2048x1080p29.97*, 2048x1080p30*, 2048x1080PsF23.98*, 2048x1080PsF24*, 2048x1080PsF25*, 2048x1080PsF29.97*, 2048x1080PsF30* (*= YUV 4:2:2 10 bit)

IP PROTOCOLS

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

Packing options of the ST 2110-20 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

MANUAL AND AUTOMATIC SWITCHING

M-SAFESWITCH-2L provides two 2 x 1 clean switches

These can be switched either manually (using the Switch to A and Switch to B buttons) or automatically

In auto mode M-SAFESWITCH-2L will always want to be on its primary input (Source A), only switching to secondary input B if there are user-defined faults on the primary input. It is possible to select from ten different parameters to automatically trigger the switch (see AUTO SWITCH PARAMETERS)

After switching away from a faulty input, M-SAFESWITCH-2L can be set to switch back automatically or by user intervention

When the Restore to A mode is set to "Delayed", M-SAFESWITCH-2L will automatically return to Source A once it has been clear of the monitored faults for the time set on the Restore delay slider, with the time programmable between two and 60 seconds

When the Restore to A mode is set to "Latched", M-SAFESWITCH-2L will stay switched to Source B until the user manually restores it to Source A

The framestore synchroniser in each input stream will ensure that both inputs to the switch are correctly timed to the reference so that there is no disruption during a switch

M-SAFESWITCH-2L can cope with signal path delays of ten frames between the inputs. Additional delay of up to 60 frames can be applied to Source B of each switch, should the Source A delay be greater than the ten frames adjustment provided at the input stage

AUTO SWITCH PARAMETERS

M-SAFESWITCH-2L performs checks on the following ten parameters which can trigger an automatic switch, with the user able to select a number of parameters in any combination. Different parameters can be chosen for each switch. Switch tolerance can be applied which allows the error to exist for up to ten frames before the auto switch will occur

- Input not present
- Incorrect input format
- Video black
- Video frozen
- Video error
- Network error
- Audio all selected missing
- Audio any selected missing
- Audio all selected silent
- Audio any selected silent

In addition to the ten frames switch tolerance, detection delay can be applied to the video black and video frozen auto switch parameters which allows the picture to remain black or frozen between 1 and 120 seconds before the auto switch will occur. Black and frozen delays can be individually set, but each is common to both switches

Black is detected when all pixels are black – a single non-black pixel resets the detection delay period

Frozen is detected by splitting each video frame into a grid of image tiles where the sum of pixel values within each tile is computed and compared against the previous frame. If the difference between sums is greater than the in-built frozen detection threshold, the image is detected as not frozen and this resets the detection delay period. This allows frozen video to be detected even in the presence of noise or 'bad' pixels

The four audio parameters are applicable to SDI and ST 2022. Individual audio channels can be selected and a switch can be triggered if any or all of the audio channels are missing or are silent. In addition to the ten frames switch tolerance, detection delay can be applied to the audio silence switch parameters which allows the audio to remain silent between 1 and 120 seconds before the auto switch will occur

LEGALISING

Each channel has its own legaliser with RGB clipping. The RGB Enable control can be set to "Off" (disables RGB clip functions) or to "EBU 103" (any illegal RGB signals will be clipped to be within the limits as given by the EBU R 103 recommendation)

The RGB clip can be set to hard, medium, soft, desaturation or constant hue mode

To avoid affecting hue, two modes are available: desaturation and constant hue. With desaturation mode, clip applied to one channel will cause a proportional reduction to the other channels. With constant hue mode, RGB is transformed into saturation intensity colour space and saturation is then reduced

Hard, medium and soft are sloped controls with a hard, medium or soft filter added

ROUTING

The two clean switches can each select between the four inputs for their Source A and Source B

The default setting – which gives a dual channel 2 x 1 safe switch – is Switch 1 to Output 1 and Output 3 and Switch 2 to Output 2. The default inputs to Switch 1 are Input 1 and Input 3. The default inputs to Switch 2 are Input 2 and Input 4

It is also possible to configure the product to give two or three outputs of Switch 1 or Switch 2 instead, if required. (NB. Third output only available in IP)

continued overleaf...

VIDEO LOSS CONTROLS

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

TEST PATTERNS

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

AUDIO MUTE CONTROL

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

SYNCHRONISER AND TIMING ADJUSTMENTS

Video sources are synchronised to common reference timing source

Choice of timing options:

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

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

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

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

("PTP" means PTP Master>PTP Backup. "SDI" means SDI1>SDI2>SDI3>SDI4>SDI5>SDI6, depending 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 input video delay (adjustable in one frame steps) allows delay compensation between the two input sources to each switch

Additional 60 frames of delay (adjustable in one frame steps) is available to further delay Source B on each switch. This is useful for input timing alignment when there are long Source A delays, such as those created by a graphics system

Ten frames of output video delay (adjustable in one frame steps) allows compensation for any big system delays

ANCILLARY DATA

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

LED INDICATION OF:

Power okay

PRESETS

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

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

SIGNAL MONITORING

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

Checks are performed on the inputs and outputs for the following video and audio parameters:

- Video present and time present
- Video format
- Video black
- Video frozen
- Video error (inputs only)
- 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

continued overleaf...

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

ORDERING INFORMATION

M-SAFESWITCH-2L	IP/SDI dual channel 2 x 1 fail-safe switch and EBU R 103 legaliser. Supports 3G/HD/SD and ST 2022-6, ST 2022-7 and ST 2110-20 protocols. Software app which runs on the MARBLE-V1 media processor
MARBLE-V1	Media processor hardware which runs Crystal Vision's software apps. Housed in the Vision frames, with up to ten MARBLE-V1 in 3U. Requires between one and four 850nm or 1310nm SFP+ transceiver modules when used with M-SAFESWITCH-2L app and IP signals
SFP+10G-850MM	Multi-mode 850nm 10GbE SFP+ transceiver module for MARBLE-V1 media processor – fit between one and four SFP+10G-850MM (or SFP+10G-1310SM) when M-SAFESWITCH-2L app used with IP signals
SFP+10G-1310SM	Single-mode 1310nm 10GbE SFP+ transceiver module for MARBLE-V1 media processor – fit between one and four SFP+10G-1310SM (or SFP+10G-850MM) when M-SAFESWITCH-2L app used with IP signals
App support	Purchase with M-SAFESWITCH-2L app to get software upgrades for changes in standards, new features and bug fixes plus telephone and e-mail operational support (with support for the first year included for free)
Vision 3	3U frame with integrated control panel and smart CPU for up to 20 Crystal Vision cards from the Vision range
VR04	Two slot frame rear module. Allows ten M-SAFESWITCH-2L in 3U. Inputs and outputs can be mixture of SDI via BNCs and IP via up to four 10GbE network interfaces on dual LC. Gives access to four HD/SD (two 3Gb/s) SDI or IP inputs, two SDI or IP outputs and one fixed IP output
VR06	Two slot frame rear module. Allows ten M-SAFESWITCH-2L in 3U. Inputs and outputs can be mixture of SDI via BNCs and IP via up to two 10GbE network interfaces on dual LC. Gives access to four HD/SD (two 3Gb/s) SDI or IP inputs, two SDI or IP outputs and one fixed IP output
VR07	Two slot frame rear module. Allows ten M-SAFESWITCH-2L in 3U. Inputs and outputs can be mixture of SDI via BNCs and IP via up to four 10GbE network interfaces on dual LC. Provides dual relay bypass protection for up to two inputs when used with SDI inputs and outputs. Gives access to four HD/SD (two 3Gb/s) SDI or IP inputs, two SDI or IP outputs and one fixed IP output. NB. Use of the VR07 requires issue 5 or later of MARBLE-V1
VisionPanel	3U Ethernet remote control panel with touch screen
SBB-4	Smart button box with four programmable LCD switches. It is powered by PoE (Power over Ethernet) and therefore needs to be connected to a PoE enabled switch
VisionWeb Control	VisionWeb web browser control included within frame software
SNMP	SNMP monitoring and control included in frame

Performance and features are subject to change. Figures given are typical measured values. M-SAFESWITCH-2L0722

Crystal Vision

Crystal Vision Ltd. Lion Technology Park, Station Road East, Whittlesford, Cambridge CB22 4WL, England.
Tel: +44 (0)1223 497049 E-mail: sales@crystalvision.tv @crystalvisionuk www.crystalvision.tv