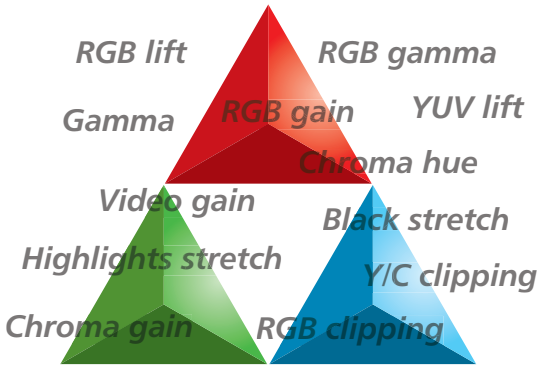
Crystal Vision

M-COCO-2

SOFTWARE APP

IP/SDI colour corrector



The dual channel M-COCO-2 has been designed for whole picture IP or SDI colour correction or for ensuring that the broadcast colour gamut is always legal. Ideal for dealing with camera or lighting problems or to standardise pictures shot at different times, popular applications include adjusting the colours on in-shot monitors, being placed before an encoder to set the range of colours to be transmitted and the correction of computer-generated or post production outputs.

The M-COCO-2 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-COCO-2 passes all ancillary data including embedded audio without modification. If ST 2110 is used, only the video content is output.

The numerous colour correction tools include RGB gain, RGB lift, YUV gain, YUV lift, Video gain, Chroma gain, Chroma hue and both overall and individual RGB Gamma adjustment. Black Stretch and Highlight Stretch are particularly useful for correcting the contrast on brightly lit on-set monitors where the studio lighting has been set to suit the people in shot. These Y Stretches allow the signal to be stretched or compressed for a limited range of the signal, without affecting any other luminance levels outside of this range. The Black Stretch allows levels close to black to be more visible and brings the low level detail back into the final picture, while the Highlights Stretch allows useful changes to the bright areas.

The M-COCO-2 includes an excellent legaliser, with both RGB and Y/C clipping available to create a legal and natural-looking picture. The RGB clipping can be set to either Custom or to meet the EBU R 103 standard. The available RGB clip modes are hard, medium, soft, desaturation and constant hue. Constant hue mode is a newly-developed method which transforms RGB to hue saturation intensity colour space and reduces saturation while ensuring that hue does not change. Being able to highlight pixels containing illegal signal values makes it easier to locate the problem.

Horizontal and vertical wipes allow the user to view the incoming signal on one side of the wipe and the processed signal on the other. The M-COCO-2 can be configured as a single channel device with two outputs, allowing the wipes (as well as any highlighted illegal pixels) to be viewed on the second 'preview output'. 14 internal test patterns can be selected as an alternative to the video input. Test patterns are inserted before the colour corrector to aid getting the best settings, which is especially useful when sending pre-distorted images to on-set monitors. Having the test pattern generator in the colour corrector simplifies the workflow. 16 time-saving presets can be used to store the precise adjustments for future use – ideal for those who need to continually correct a feed from the same camera.

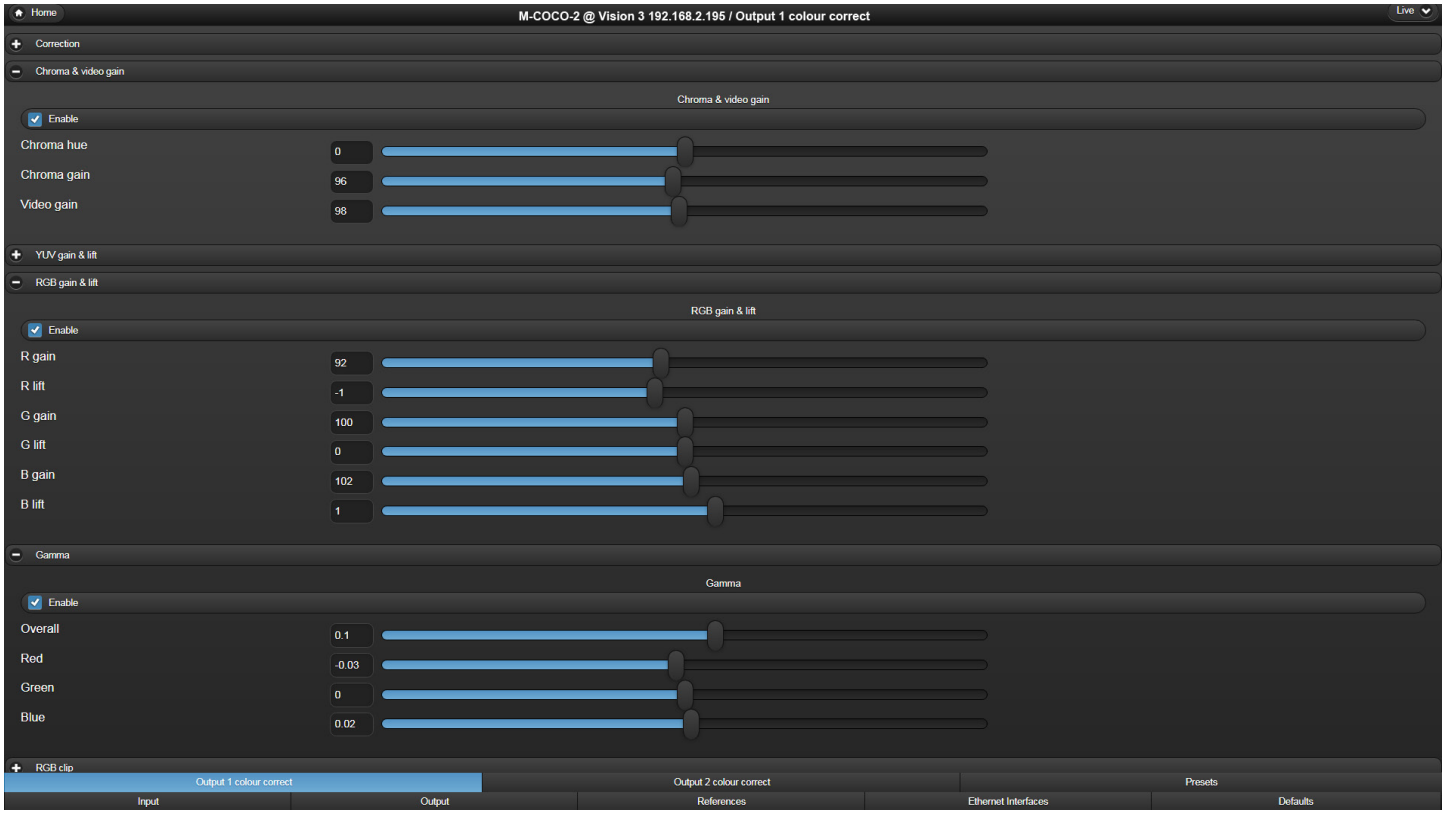
The M-COCO-2's gateway functionality can be used to integrate SDI into an IP environment or IP into an SDI environment – and makes it ideal for on-set monitor correction, when SDI output is needed for the monitors but the studio infrastructure is based on IP signals. The M-COCO-2's IP to IP translation 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.

The M-COCO-2 includes a framestore synchroniser timed to an external Black and Burst or tri-level syncs analogue reference or PTP, with user configurable options for timing source priority and redundancy. Other features include full VLAN support, traffic shaping and signal status monitoring.

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.

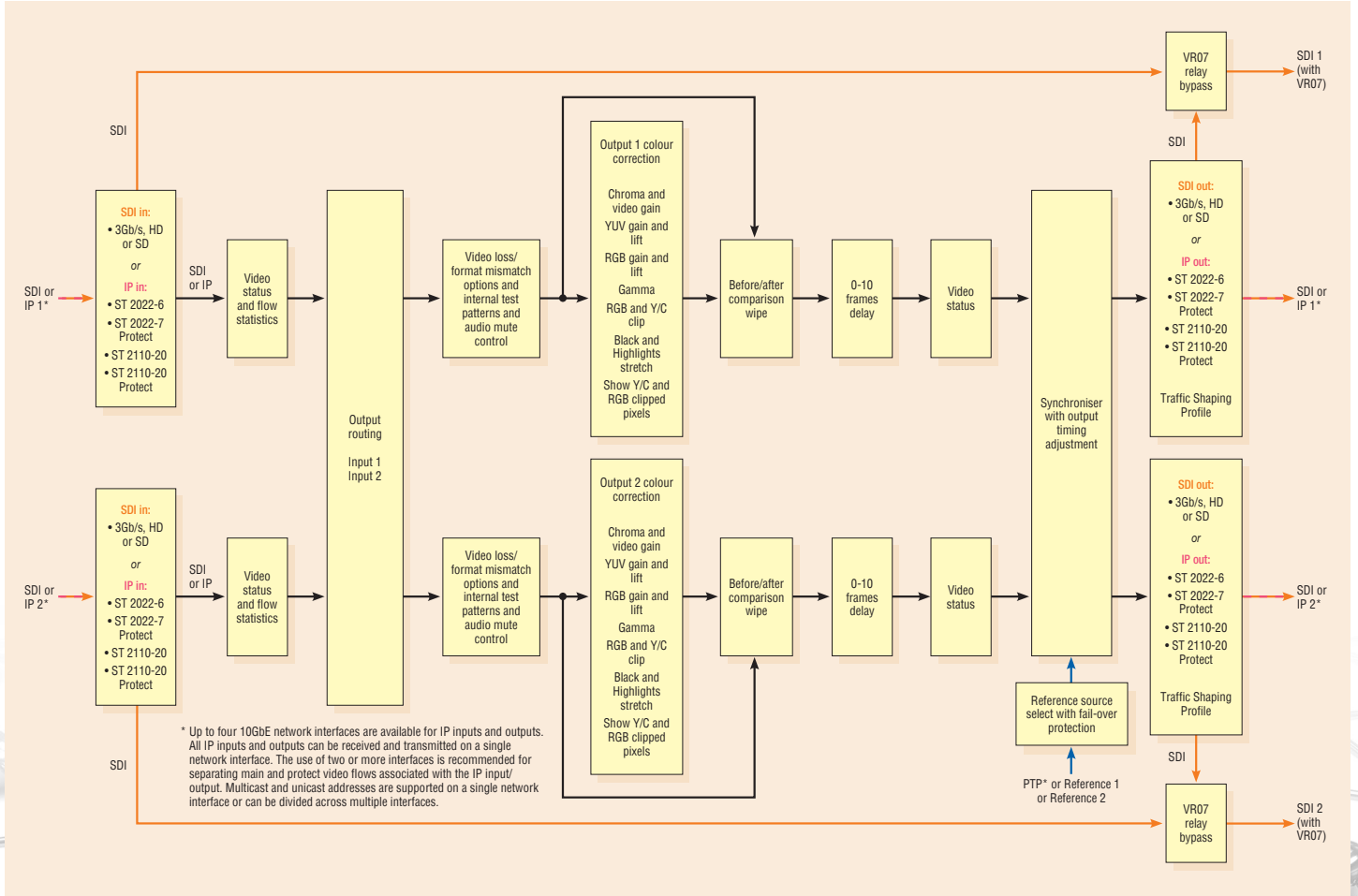
- Software app that runs on the MARBLE-V1 media processor
- Dual channel colour corrector and legaliser for whole picture adjustments in IP and SDI systems
- Use it with SDI, IP or both at the same time: supports 31 video formats, SMPTE ST 2022-6 and ST 2022-7 protocols and video within ST 2110 (ST 2110-10, -20 and -21 standards)
- Wide range of colour correction tools, including RGB gain, RGB lift, YUV gain, YUV lift, video gain, chroma gain, chroma hue, overall and individual RGB gamma adjustment, Black Stretch and Highlights Stretch
- Excellent legaliser: use the RGB and Y/C clipping to create a legal and natural-looking picture
- Illegal signal highlighting, with option to show Y/C and RGB clipped pixels in pink
- Wipe between the processed and unprocessed signal for a 'before' and 'after' comparison
- No need for external test pattern generator when correcting on-set monitors, thanks to 14 built-in test patterns
- Includes synchroniser and 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)
- Flexible assignment of the flows allows you to get the configuration you need (such as two outputs of one input to get a 'preview output')
- 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

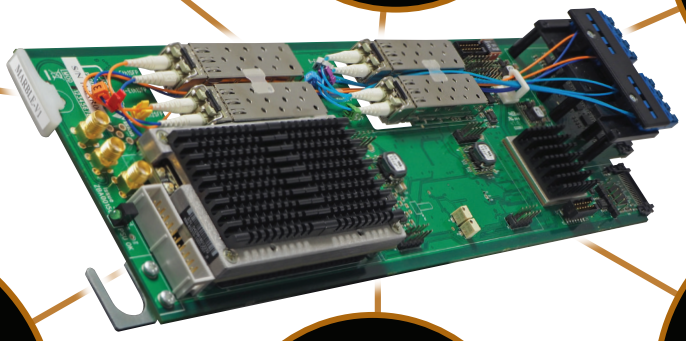


Example of a VisionWeb Control GUI

THE INPUTS AND OUTPUTS



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

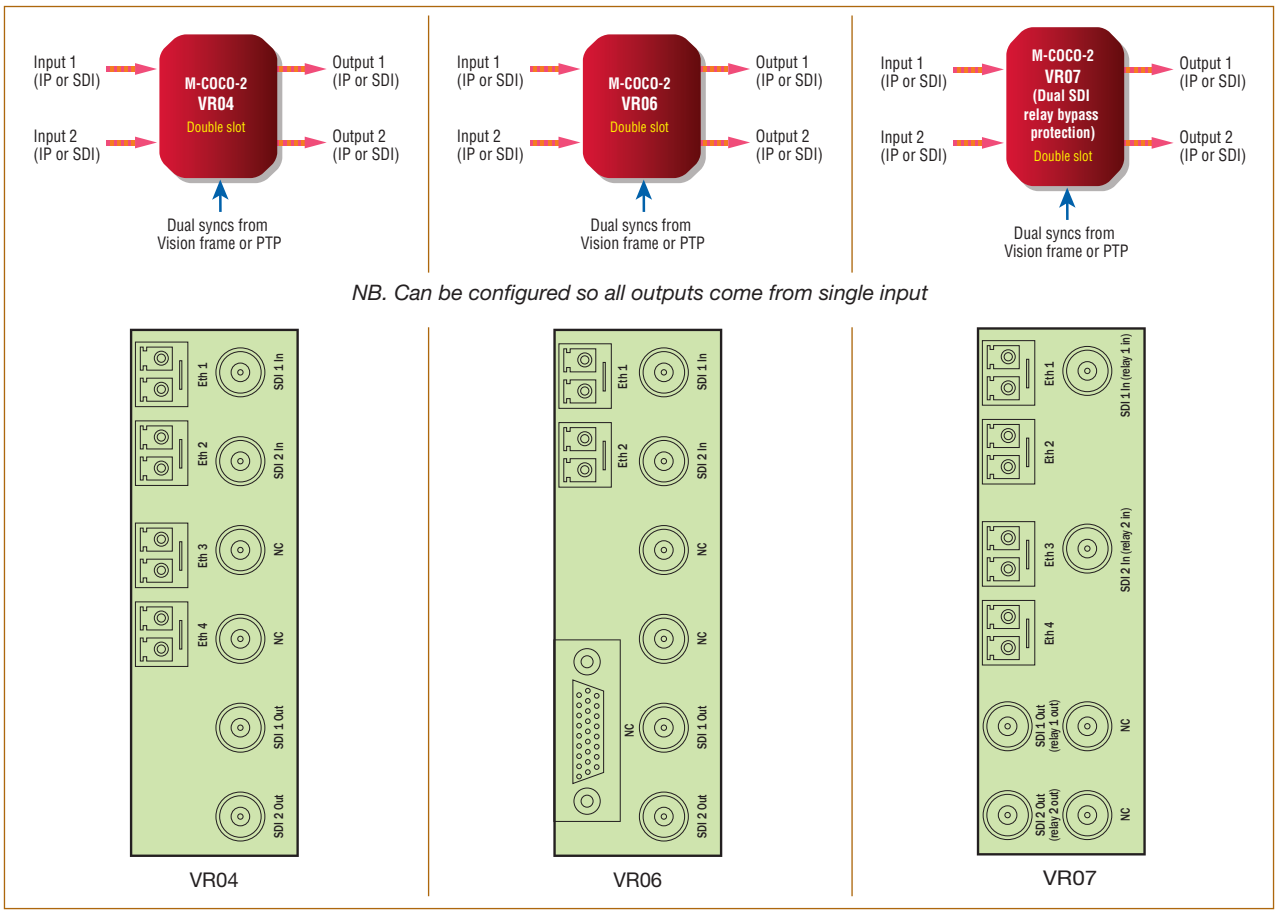
No need to choose between IP and SDI = apps can work with IP, SDI or both – and include IP gateway and translation functionality

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

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

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.



M-COCO-2 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
Four 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 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 INPUTS

(NB. Some or all of the inputs can be SDI instead)
Up to two 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 video flow from lost packets by creating two streams of the same data using different routing to the destination. IP packet analyser handles the analysis and reconstruction of the protected video flow. Any IP input can come from any of the 10GbE IP network interfaces and can either be multicast or unicast

SDI VIDEO OUTPUTS

(NB. Some or all of the outputs can be IP instead)
Up to two 3Gb/s or HD or SD SDI outputs, one per channel (or two outputs if M-COCO-2 configured as single channel device)
270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A

IP OUTPUTS

(NB. Some or all of the outputs can be SDI instead)
Up to two 3Gb/s or HD or SD video over IP outputs, one per channel (or two outputs if M-COCO-2 configured as single channel device)
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-COCO-2 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 1 In is connected to SDI 1 Out and SDI 2 In 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

ROUTING

There are two clean switches that can select between the two inputs for each of the output colour corrector function blocks
The default setting – which gives a dual channel colour corrector – is Input 1 to Output 1 and Input 2 to Output 2
It is also possible to give both colour corrector function blocks the same input to get a 'preview output'. The setting for this – which gives a single channel colour corrector with two outputs – would be Input 1 to both Output 1 and Output 2
An alternative application is to cleanly live switch the input of a single channel colour corrector without any output signal disturbance. The setting for this would be Input 1 to Output 1 cleanly followed by Input 2 to Output 1. The second colour corrector function block can be used, but it is limited to using the inputs already reserved for the first colour corrector function block. If the second colour corrector function block was being used as a preview, the setting would be Input 1 to Output 1 and Output 2 cleanly followed by Input 2 to Output 1 and Output 2

COLOUR CORRECTIONS

Each channel has its own colour corrector function block
The Enable tick box is used to enable/disable the colour corrector function
Increase/decrease overall lift and gain
Increase/decrease overall chroma gain
Increase/decrease Y channel lift and gain
Increase/decrease U channel lift and gain
Increase/decrease V channel lift and gain
Chroma hue adjustment
Increase/decrease R channel lift and gain
Increase/decrease G channel lift and gain
Increase/decrease B channel lift and gain
Increase/decrease overall gamma
Increase/decrease R gamma
Increase/decrease G gamma
Increase/decrease B gamma
Black Stretch: Lifts or suppresses luminance close to black, with the range affected specified by the Threshold lo and Threshold hi controls. The Stretch variable controls the amount of adjustment
Highlights Stretch: Lifts or suppresses the luminance wherever required, with the range affected specified by the Threshold lo and Threshold hi controls. The Stretch variable controls the amount of adjustment

LEGALISING

Each channel has its own legaliser with RGB and Y/C clipping
RGB clip:
Set and limit R, G, B channel positive and negative excursions
The Enable control can be set to Off, Custom or EBU 103. "Off" disables RGB clip functions. "Custom" uses the values in the Custom threshold hi and Custom threshold lo settings. "EBU 103" legalises to the EBU R 103 standard
With "Custom" and "EBU 103", the RGB clip can be set to hard, medium, soft, desaturation or constant hue mode

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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

Y/C clip:

Set and limit luma (Y) positive and negative excursions independently

Set and limit chroma (C) positive and negative excursions symmetrically

The Enable tick box is used to enable/disable the Y/C clipping

The Y threshold hi, Y threshold lo and C threshold can be set, with hard, medium and soft modes available for each

GAMUT ERROR HIGHLIGHTING

The Show Y/C and RGB clipped pixels settings will highlight any pixels containing illegal signal values, making it easier to locate the problem and make any adjustments to equipment in the system. If wipes are set, the highlighted pixels will only be shown in the wiped areas

If M-COCO-2 is configured as the default two channel device, the highlighted pixels can be viewed on the main output before going on air

If M-COCO-2 is configured as a single channel device with Output 2 used as a 'preview output', the highlighted pixels can be viewed on the 'preview output' at any time. Here the second colour corrector can be adjusted to make the picture legal without affecting the first colour corrector and main output, with these good set of adjustments able to be manually copied over to the first colour corrector

WIPES

The H wipe and V wipe can be used to wipe horizontally or vertically between the processed and unprocessed signal for a split-screen 'before' and 'after' comparison

If M-COCO-2 is configured as the default two channel device, the wipes can be viewed on the main output before going on air

If M-COCO-2 is configured as a single channel device with Output 2 used as a 'preview output', the wipes can be viewed on the 'preview output' at any time

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

Test patterns are inserted before the colour corrector to aid getting the best settings, which is especially useful when sending pre-distorted images to on-set monitors

AUDIO MUTE CONTROL

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

SYNCHRONISER AND TIMING ADJUSTMENTS

Video sources are synchronised to common reference timing source

Choice of timing options:

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

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

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

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

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

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

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

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

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

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

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 or IP output

ANCILLARY DATA

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

LED INDICATION OF:

Power okay

PRESETS

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

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

SIGNAL MONITORING

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

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

- Video present and time present
- Video format
- Video black
- Video frozen
- Video error
- Audio group 1 present
- Audio group 2 present
- Audio group 3 present
- Audio group 4 present
- Audio present on group 1 channel 1
- Audio present on group 1 channel 2
- Audio present on group 1 channel 3
- Audio present on group 1 channel 4
- Audio present on group 2 channel 5
- Audio present on group 2 channel 6
- Audio present on group 2 channel 7
- Audio present on group 2 channel 8
- Audio present on group 3 channel 9
- Audio present on group 3 channel 10
- Audio present on group 3 channel 11
- Audio present on group 3 channel 12
- Audio present on group 4 channel 13
- Audio present on group 4 channel 14
- Audio present on group 4 channel 15
- Audio present on group 4 channel 16
- Silence group 1 channel 1
- Silence group 1 channel 2
- Silence group 1 channel 3
- Silence group 1 channel 4
- Silence group 2 channel 5
- Silence group 2 channel 6
- Silence group 2 channel 7
- Silence group 2 channel 8
- Silence group 3 channel 9
- Silence group 3 channel 10
- Silence group 3 channel 11

continued overleaf...

- 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

VisionPanel

ORDERING INFORMATION

M-COCO-2	Dual channel IP/SDI colour corrector and 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-COCO-2 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-COCO-2 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-COCO-2 app used with IP signals
App support	Purchase with M-COCO-2 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-COCO-2 in 3U. Inputs and outputs can be any mixture of SDI via BNCs and IP via up to four 10GbE network interfaces on dual LC and can be changed from the default I/O configuration if required. Gives access to two SDI (3G/HD/SD) or IP inputs and one SDI or IP output per channel
VR06	Two slot frame rear module. Allows ten M-COCO-2 in 3U. Inputs and outputs can be any mixture of SDI via BNCs and IP via up to two 10GbE network interfaces on dual LC and can be changed from the default I/O configuration if required. Gives access to two SDI (3G/HD/SD) or IP inputs and one SDI or IP output per channel
VR07	Two slot frame rear module. Allows ten M-COCO-2 in 3U. Inputs and outputs can be any mixture of SDI via BNCs and IP via up to four 10GbE network interfaces on dual LC and can be changed from the default I/O configuration if required. Provides dual relay bypass protection for up to two inputs when used with SDI inputs and outputs. Gives access to two SDI (3G/HD/SD) or IP inputs and one SDI or IP output per channel. 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

Crystal Vision

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