Crystal Vision

M-COCO-2

SOFTWARE APP

IP/SDI colour corrector

RGB lift · RGB gamma · Gamma · RGB gain · YUV lift · Chroma hue · Video gain · Black stretch · Highlights stretch · Y/C clipping · Chroma gain · RGB clipping

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 clip can be set to hard, medium, soft or desaturation mode. 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'. 13 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.
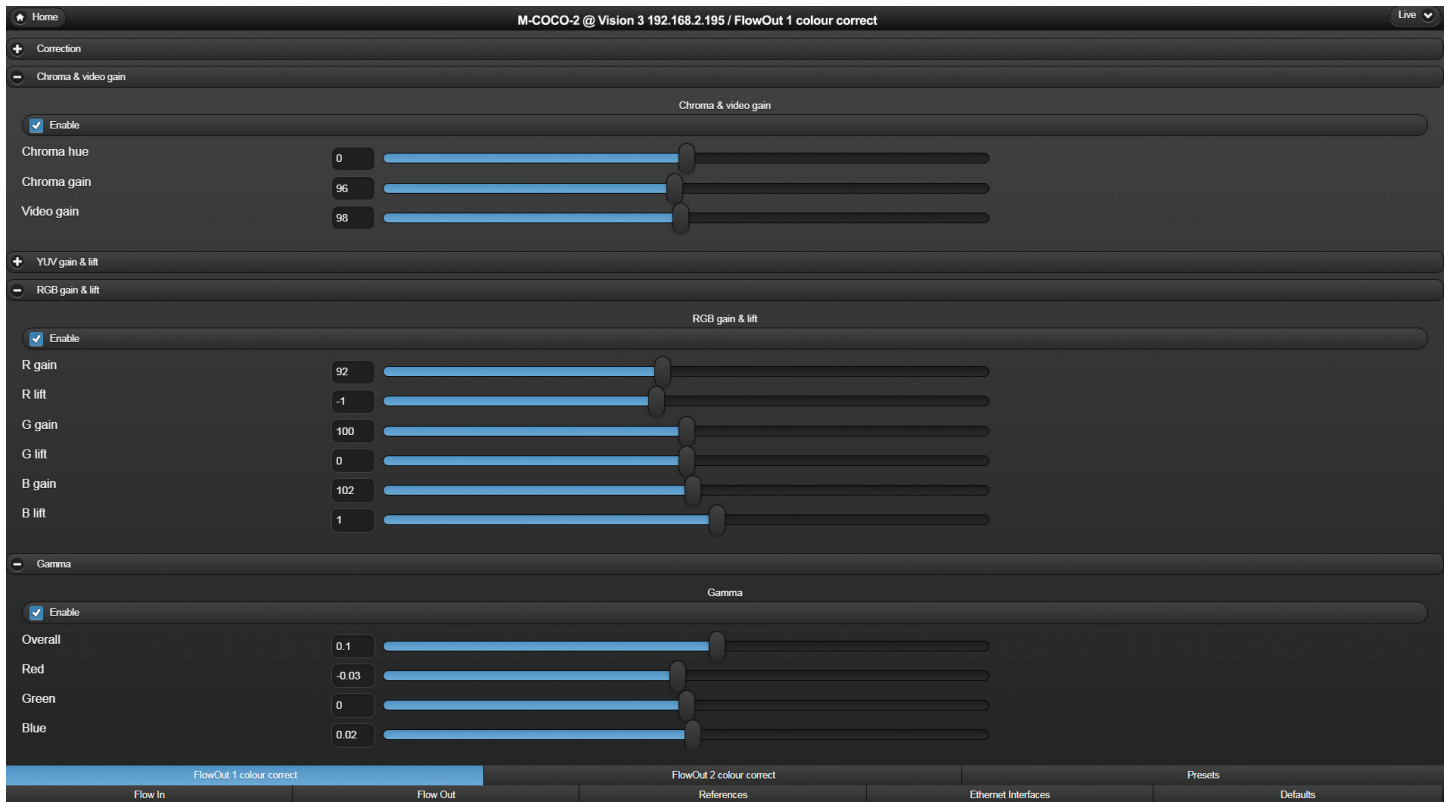
The M-COCO-2's gateway functionality can be used to integrate SDI into an IP environment or IP into an SDI environment – and makes it ideal for on-set monitor correction, when SDI output is needed for the monitors but the studio infrastructure is based on IP signals. The M-COCO-2's IP to IP translation 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.
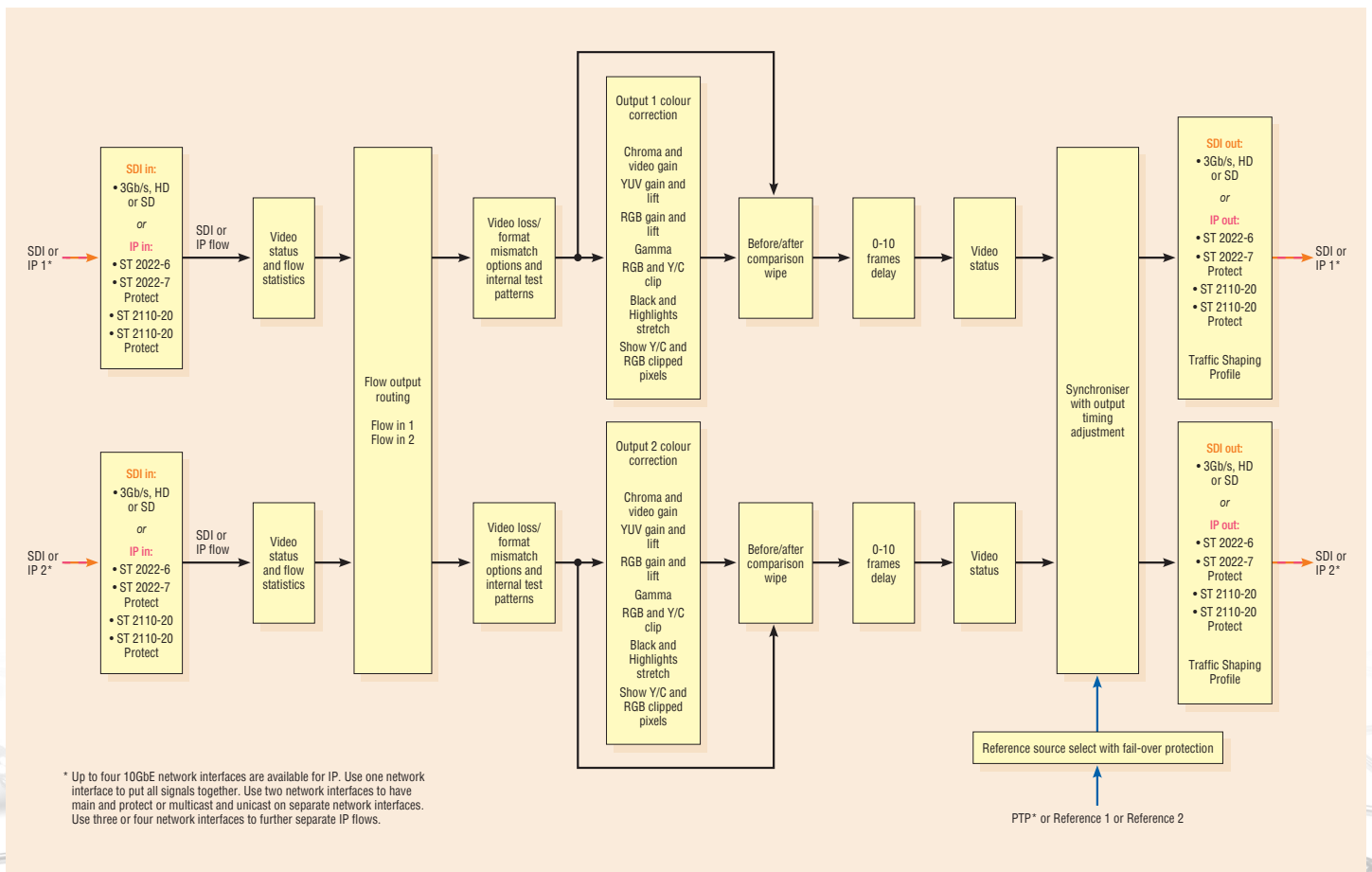
- Software app that runs on the MARBLE-V1 media processor
- Dual channel colour corrector and legaliser for whole picture adjustments in IP and SDI systems
- Use it with SDI, IP or both at the same time: supports 31 video formats, SMPTE ST 2022-6 and ST 2022-7 protocols and video within ST 2110 (ST 2110-10, -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: RGB and Y/C clipping with choice of four modes to create a legal and natural-looking picture, as well as illegal signal highlighting
- 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 13 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
- 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
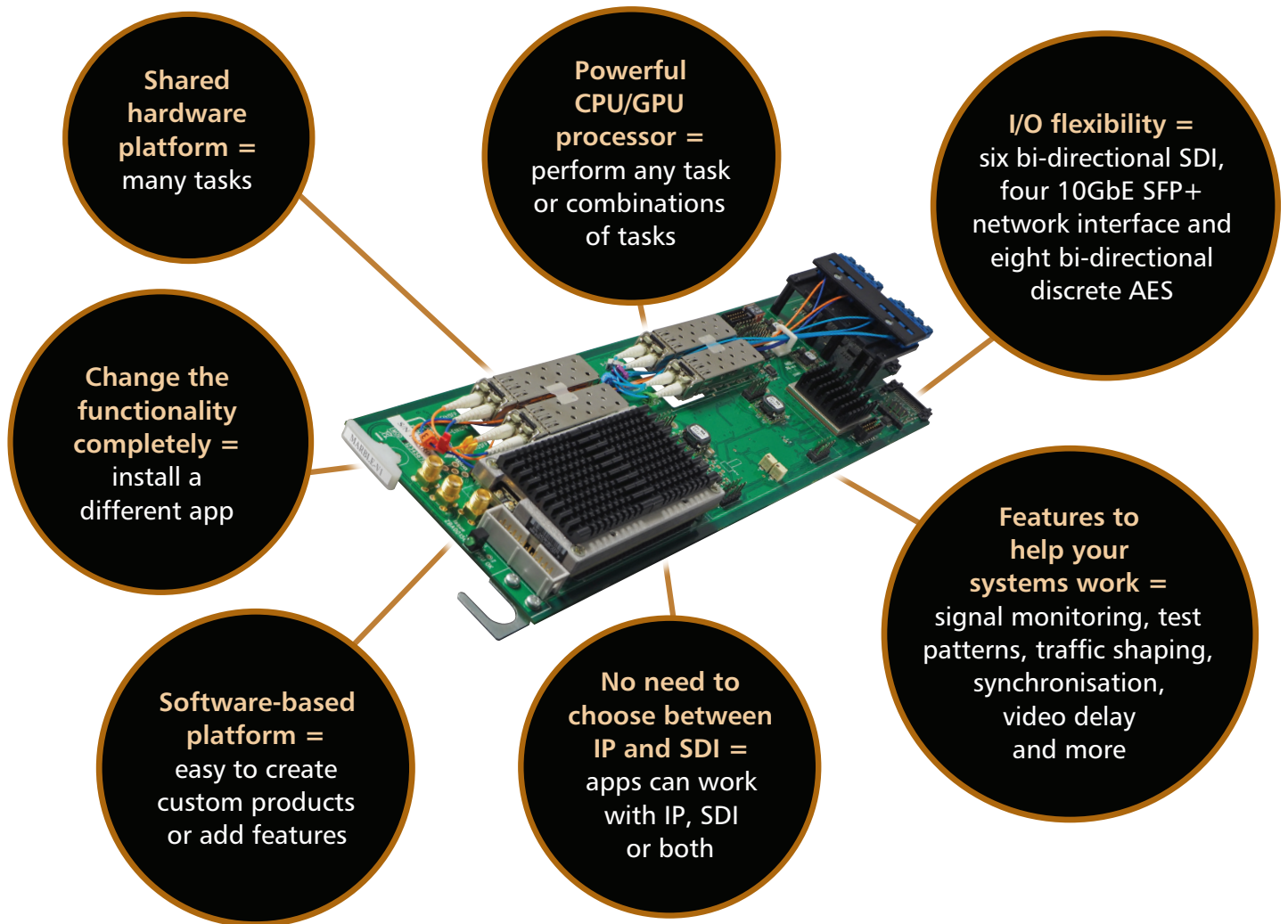
THE CONTROLS

♠ Home	M-COCO-2 @ Vision 3 192.168.2.195 / FlowOut 1 colour correct	Live ⌄

＋ Correction

－ Chroma & video gain

Chroma & video gain

☑ Enable

Chroma hue	0	
Chroma gain	96	
Video gain	98	

＋ YUV gain & lift

－ RGB gain & lift

RGB gain & lift

☑ Enable

R gain	92
R lift	-1
G gain	100
G lift	0
B gain	102
B lift	1

－ Gamma

Gamma

☑ Enable

Overall	0.1
Red	-0.03
Green	0
Blue	0.02

FlowOut 1 colour correct	FlowOut 2 colour correct	Presets

Flow In	Flow Out	References	Ethernet Interfaces	Defaults

Example of a VisionWeb Control GUI

THE INPUTS AND OUTPUTS

SDI or IP 1*

SDI in:
• 3Gb/s, HD or SD

or

IP in:
• ST 2022-6
• ST 2022-7 Protect
• ST 2110-20
• ST 2110-20 Protect

SDI or IP flow → Video status and flow statistics

Flow output routing

Flow in 1
Flow in 2

Video loss/format mismatch options and internal test patterns

Output 1 colour correction

Chroma and video gain
YUV gain and lift
RGB gain and lift
Gamma
RGB and Y/C clip
Black and Highlights stretch
Show Y/C and RGB clipped pixels

Before/after comparison wipe

0-10 frames delay

Video status

Synchroniser with output timing adjustment

SDI out:
• 3Gb/s, HD or SD

or

IP out:
• ST 2022-6
• ST 2022-7 Protect
• ST 2110-20
• ST 2110-20 Protect

Traffic Shaping Profile

→ SDI or IP 1*

SDI or IP 2*

SDI in:
• 3Gb/s, HD or SD

or

IP in:
• ST 2022-6
• ST 2022-7 Protect
• ST 2110-20
• ST 2110-20 Protect

SDI or IP flow → Video status and flow statistics

Video loss/format mismatch options and internal test patterns

Output 2 colour correction

Chroma and video gain
YUV gain and lift
RGB gain and lift
Gamma
RGB and Y/C clip
Black and Highlights stretch
Show Y/C and RGB clipped pixels

Before/after comparison wipe

0-10 frames delay

Video status

SDI out:
• 3Gb/s, HD or SD

or

IP out:
• ST 2022-6
• ST 2022-7 Protect
• ST 2110-20
• ST 2110-20 Protect

Traffic Shaping Profile

→ SDI or IP 2*

Reference source select with fail-over protection

PTP* or Reference 1 or Reference 2

* Up to four 10GbE network interfaces are available for IP. Use one network interface to put all signals together. Use two network interfaces to have main and protect or multicast and unicast on separate network interfaces. Use three or four network interfaces to further separate IP flows.

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

SPECIFICATION

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. 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

SDI only applications do not require any SFP+

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 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 FLOW 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 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, 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 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, 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

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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

There are two clean switches that can select between the two input flows for each of the output colour corrector function blocks

The default setting – which gives a dual channel colour corrector – is Flow 1 input to Flow 1 output and Flow 2 input to Flow 2 output

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 Flow 1 input to both Flow 1 and Flow 2 outputs

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 Flow 1 input to Flow 1 output cleanly followed by Flow 2 input to Flow 1 output. 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 Flow 1 input to Flow 1 and Flow 2 outputs cleanly followed by Flow 2 input to Flow 1 and Flow 2 outputs

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

The Enable tick box is used to enable/disable the legaliser function (RGB and Y/C clipping)

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

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

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

Set and limit R, G, B channel positive and negative excursions. To avoid affecting hue, select desaturation mode where a clip applied to one channel will cause a proportional reduction to the other channels

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 the Flow 2 output 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 the Flow 2 output 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 flow 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 flow

TEST PATTERNS

The test pattern controls allow the user to override an input and 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 or Checker Board, or to freeze the picture. This is independently adjustable on each flow

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

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 output or IP output flow

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:

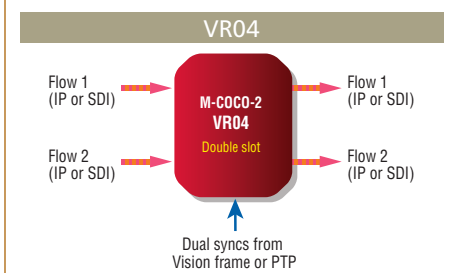Control from integrated control panel on Vision 3 frame

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
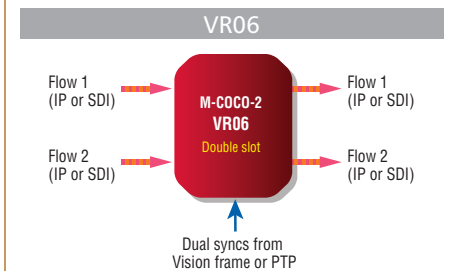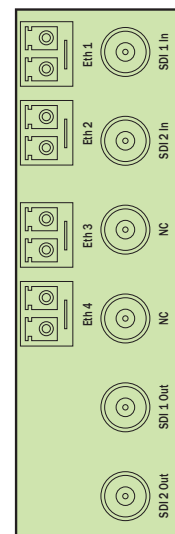

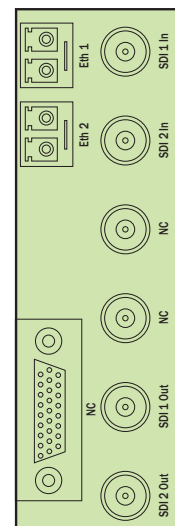
VisionPanel

REAR MODULE CONNECTIONS

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

VR04

Flow 1 (IP or SDI)   M-COCO-2 VR04 Double slot   Flow 1 (IP or SDI)
Flow 2 (IP or SDI)   Flow 2 (IP or SDI)

Dual syncs from Vision frame or PTP

NB. Can be configured so all outputs come from single input

Eth 1 · SDI 1 In
Eth 2 · SDI 2 In
Eth 3 · NC
Eth 4 · NC
SDI 1 Out
SDI 2 Out

VR06

Flow 1 (IP or SDI)   M-COCO-2 VR06 Double slot   Flow 1 (IP or SDI)
Flow 2 (IP or SDI)   Flow 2 (IP or SDI)

Dual syncs from Vision frame or PTP

NB. Can be configured so all outputs come from single input

Eth 1 · SDI 1 In
Eth 2 · SDI 2 In
NC
NC
NC · SDI 1 Out
SDI 2 Out

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 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 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 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 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
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