C2-8000 Series

Universal Input Seamless Switcher

Key Features C2-8000 Series

- Up ▲, Down ▼, Cross ✖ Conversion
- High quality seamless switching
- DVI-U inputs (HDMI/CV/YC/RGB/YPbPr): up to 12
- SDI inputs: up to 2 SD/HD/3G-SDI + re-clocked out
- DVI-U outputs: 2 (HDMI/CV/YC/RGB/YPbPr)
- SDI outputs: up to 2 (SD/HD/3G)
- Genlock inputs: 1x Tri/Bi with loop-through
- Analog: PC to 2048x2048, HDTV to 1080p/60
- DVI: PC to 1920x1200, HDTV to 1080p/60
- Supports: NTSC, PAL, PAL-M, PAL-N, SECAM
- HDMI-compatible input & output with HDCP
- Motion Compensation & 3:2 Pull-down
- Diagonal Interpolation
- Noise Reduction - PAL / NTSC / 1080i inputs
- Automatic Incoming Resolution Detection
- AutoSet - Auto picture sizing of PC inputs
- 4:4:4 Full bandwidth sampling
- Variable Zoom to 10X & Shrink to 10%
- Chroma and Luma keying
- Fade, Wipe, Push, Cut transitions
- Video signal parameter adjustments
- Audio de-embed / embed for SDI and HDMI
- Closed-caption de-embed / embed for SDI
- Closed-caption de-embed CV
- Integral Audio Routing
- User-defined Logo insertion
- Still image store
- Borders with variable size and color
- IP Interface
- RS-232/422/485 interface
- Optional Audio Module with AES break-out and adjustable delay
- Optional Tally Module (C2-8110 & C2-8120)
- Optional Redundant Power Supplies
- Optional Rear Rack mount supports

C2-8000 Universal Input Seamless Switcher is based on TV One's exclusive CORIO®2 technology and provides high quality video switching with two-channel bi-directional conversion between a variety of analog and digital video formats. The standard system features multiple DVI-U input modules (allowing any of HDMI, DVI, Composite Video, YC, YUV, YPbPr or RGB) that can be scaled and switched between, along with two independent processing channels. The system can also have 3G-SDI input/output modules fitted, as well as audio I/O.

The high resolution DVI-U (HDMI, DVI, CV, YC, YUV, YPbPr or RGB) outputs are selectable as virtually any PC or HDTV resolution (or SDI with the 3G-SDI I/O module). Our exclusive AutoSet feature takes the hassle out of setup by automatically sizing and positioning the computer image to fit exactly on the video screen. NTSC, PAL, PAL-M, PAL-N, SECAM standards are supported.

In Switcher mode, transitions include Cross-fade, Push, Wipe and Cut. Independent mode gives two channels of video conversion. Dual PIP mode allows two windows to appear together on the same output. All modes allow Background sources to be used along with Keying and Logo insertion.

Signal parameters of the incoming video may be adjusted. All settings are stored in non-volatile memory and are retained even when power is switched off. User defined presets are also available to customize settings for various applications.

All the functions can be controlled via the front panel Push Buttons, an RS-232/422/485 or IP connection. Windows Control Panel software is provided and most third party control systems interface directly with the entire C2 range of products. A front panel LCD makes setup easy. The unit is housed in a standard 1U rack mount case and features an optional redundant internal PSU and power inlet.

Variable Zoom to 10X enlarges any part of the computer screen to fill the entire video screen and position controls allow movement to any area desired. Variable Shrink to as little as 10% allows fitting the image onto most displays. The advanced Digital Flicker Elimination circuitry and high sampling rate ensures crisp, clear images, while full bandwidth chroma sampling ensures faithfully reproduced, high resolution colors. Pixel Level Motion Adaptive Diagonal Interpolation and Noise Reduction ensures high quality de-interlacing of PAL, NTSC and 1080i signals. 3:2 Pull-down ensures proper 24 fps film extraction from NTSC and 1080i sources.

Advanced Features - The Key Mode allows one input to be keyed over another. The keyed image may be faded in and out. Due to the 4:4:4 RGB/DVI sampling format, precise keying at the pixel level can be achieved. The Mix Mode permits Seamless Cut, Fade or Wipe transitions between input sources whilst a background is in use. The Genlock reference input is SD and HD compatible and ensures precise synchronization of the incoming signals by providing a wide Subcarrier lock range with Subcarrier phase adjust.

Integral Audio switching is provided to route audio from the (HDMI-compatible) DVI input or SDI input to the DVI and SDI outputs. An optional Audio Module can provide AES I/O abilities and audio delay and can link to our A2-7300 range of audio break-out units.

DVI-U The Universal I/O

Large Venue Presentation Switchers

C2-8000 Series Specifications

Video Inputs

Television Standards	NTSC, PAL, PAL-M/N, SECAM
Composite Video	Up to 12x via DVI-U
YC (S-Video)	Up to 12x via DVI-U
YUV/YPbPr	Up to 12x via DVI-U
SD/HD/3G-SDI	Up to 2x via BNC + re-clocked out

Computer Inputs

Digital DVI	Upto 12x via DVI-U (HDMI & HDCP compatible)
Analog	Upto 12x via DVI-U
Analog Format	RGBHV, RGBS, RGsB, YPbPr
Analog Sync	TTL Level, 10K , Pos or Neg
RGB Level Range	0.5-2.0 Vp-p
Scan Rate Detection	Automatic
Analog Signals	PC to 2048x2048, HD to 1080p60
DVI Signals	PC to 1920x1200, HD to 1080p60
Max Horiz Scan Rate	150kHz
Computer Compatibility	PC, Macintosh, Workstations

Video Outputs

Television Standards	NTSC, PAL, PAL-M/N, SECAM
Composite Video	2x via DVI-U
YC (S-Video)	2x via DVI-U
YUV/YPbPr	2x via DVI-U
SD/HD/3G-SDI	Up to 2x via BNC

Computer Outputs

DVI Signals	2x via DVI-U (HDMI & HDCP compatible)
Analog	2x via DVI-U
Analog format	RGBHV, RGBS, RGsB, YPbPr
R-G-B Level	0.7 Vp-p
DVI Signals	PC to 1920x1200, HD to 1080p60
Analog Signals	PC to 2048x2048, HD to 1080p60
Vertical Refresh Rate	Any to 250Hz
Size and Position	Automatic via AutoSet or Manual
Image Size	User-Definable
Image Freeze	One Video Frame
Settings Memory	Non-Volatile
Zoom Range	Variable to 10X Zoom
Shrink Range	Variable to 10%
Image Mirroring	Horizontal and/or Vertical
Conversion Technology	Proprietary – CORIO®2
Frame-rate Conversion	Temporal
Color	RGB 24 -bit 4:4:4, YPbPr 20-bit 4:2:2
Max. Sampling Rate	162MHz
Firmware Memory	Flash, Upgradeable via RS-232
De-Interlacing	Pixel-level Motion Adaptive,
(NTSC, PAL, 1080i)	Diagonal Interpolation, Noise Reduction.
Video Comb Filter	Adaptive
Film (NTSC, 1080i)	3:2 Pull-down
Video Adjustments	CV/YC: Contrast, Brightness, Saturation, Hue (NTSC). Analog RGB/YPbPr levels

Audio support

De-embed / embed	SDI & HDMI-I/O via DVI
Delay	Via optional module

Closed Captions

De-embed / embed	SDI (608 & 608 in 708)

Genlock Adjustments

Subcarrier Lock Range	+/- 200Hz for NTSC Operation (+/- 250Hz for PAL Operation)
Subcarrier Phase	+/- 180 Adjustment

3G/HD/SD-SDI

SMPTE259M-C	270Mbps < 0.1UI jitter
(SD-SDI)	525/625Line
SMPTE292M	1.485/1.4835Gbps < 0.2 UI jitter
(HD-SDI)	720p, 1035i, 1080i, 1080p
SMPTE424M	2.97/2.967Gbps < 0.3 UI jitter
(3G-SDI)	1080p 60/59.94

HD Resolutions supported (DVI, YPbPr, SDI)

720p (1280x720) 23.98, 24, 25, 29.97, 30, 50, 59.94, 60Hz
1035i (1920x1035) 59.94, 60Hz
1080i (1920x1080) 50, 59.94, 60Hz
1080p (1920x1080) 23.98, 24, 25, 29.97, 30Hz
1080p (1920x1080) 50, 59.94, 60Hz

Control Methods

Local	via Front Panel Buttons & LCD
RS-232/422/485	via D9 Female Connector
IP Interface	RJ45 Connector

Warranty

Limited Warranty	5 Years Parts and Labour

Regulatory Compliance

Main unit	FCC, CE, RoHS, (UL PSU)

Mechanical

Size (H x W x D)	1.73" x 17.0" x 13.1" (44 x 431 x 334mm)
Weight (Net)	Approx. 5Kg (with redundant PSU option)

Environmental

Operating Temperature	0º to +50ºC (+32º to +122ºF)
Operating Humidity	10% to 85%, Non-condensing
Storage Temperature	-10º to +70ºC (+14º to +158ºF)
Storage Humidity	10% to 85%, Non-condensing
MTBF	Approx. 35,000 hours

Power Requirement

External Power Supply	110v to 240v auto-detecting
Redundancy	Optional redundant internal PSU

Accessories Included

1x Operations Manual
1x Front Rack Ears

1x Power cable	US, UK, Euro or AU

Product Item Number

C2-8110	6x DVI-U In, 2x DVI-U Out
C2-8120	8x DVI-U In, 2x DVI-U Out
C2-8130	12x DVI-U In, 2x DVI-U Out
C2-8160	10x DVI-U In, 2x DVI-U Out, + Audio Interface
C2-8210	8x DVI-U, 2x 3G/HD/SD-SDI In 2x DVI-U Out, 2x 3G/HD/SD-SDI Out
C2-8260	6x DVI-U, 2x 3G/HD/SD-SDI In, + Audio Interface 2x DVI-U Out, 3G/HD/SD-SDI Out

Optional Accessories

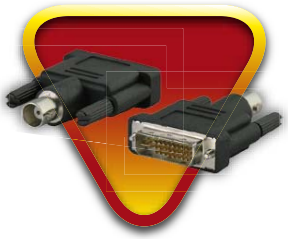
CM-AUD-8IN-8OUT	Audio delay module (2)
CM-1RPS	Redundant PSU (2)
RM-120	Rack Support Rails(24")
RM-130	Rack Support Rails(32")
Control Software	Downloadable from Website

Notes

(1) Each of these uses a module slot and will reduce inputs.
(2) These are Factory or TV One Tech Center Fitted only.

DVI-U - The Universal I/O

The DVI-U universal interface utilizes a single DVI-I connector to provide an incredible degree of flexibility. The DVI input module of the C2-8000 series provides two single link full bandwidth DVI-U inputs, which support analog (CV/YC/YUV/RGBHV) and digital inputs but not simultaneously. A series of adaptors for HDMI, RGBHV, RGBS, RGsB, YUV, YPbPr, Y/C and CV enable connection to the C2-8000. DVI, RGB, YUV & CV are auto detected, but YC must be user selected. Audio for HDMI inputs is de-embedded and passed to the Video Processor for routing.



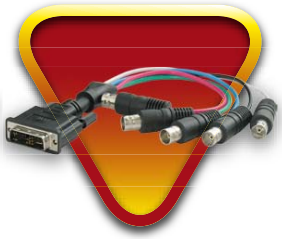
ZDH2050 Composite Video adapter DVI Male to BNC Female

CMD1939 HDMI adapter DVI Male to HDMI Female

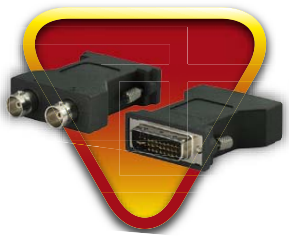
ZDH2040 Analog PC adapter DVI Male to HD-15 Female

ZDB2042 YPbPr/YUV adapter DVI Male to 3RCA Female

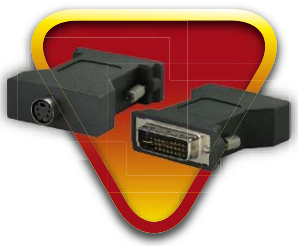
ZDB2044 YPbPr/YUV adapter cable DVI male to 3-BNC Female - 1.5' (0.5m)



ZDB2038 Analog RGBHV adapter cable DVI-I Male to 5-BNC Female - 1.5' (0.5m)



ZDB2048 YC (S-Video) adapter DVI Male to 2-BNC Female



ZDS2046 YC (S-Video) adapter DVI Male to 4-Pin Mini-Din Female

Large Venue Presentation Switchers

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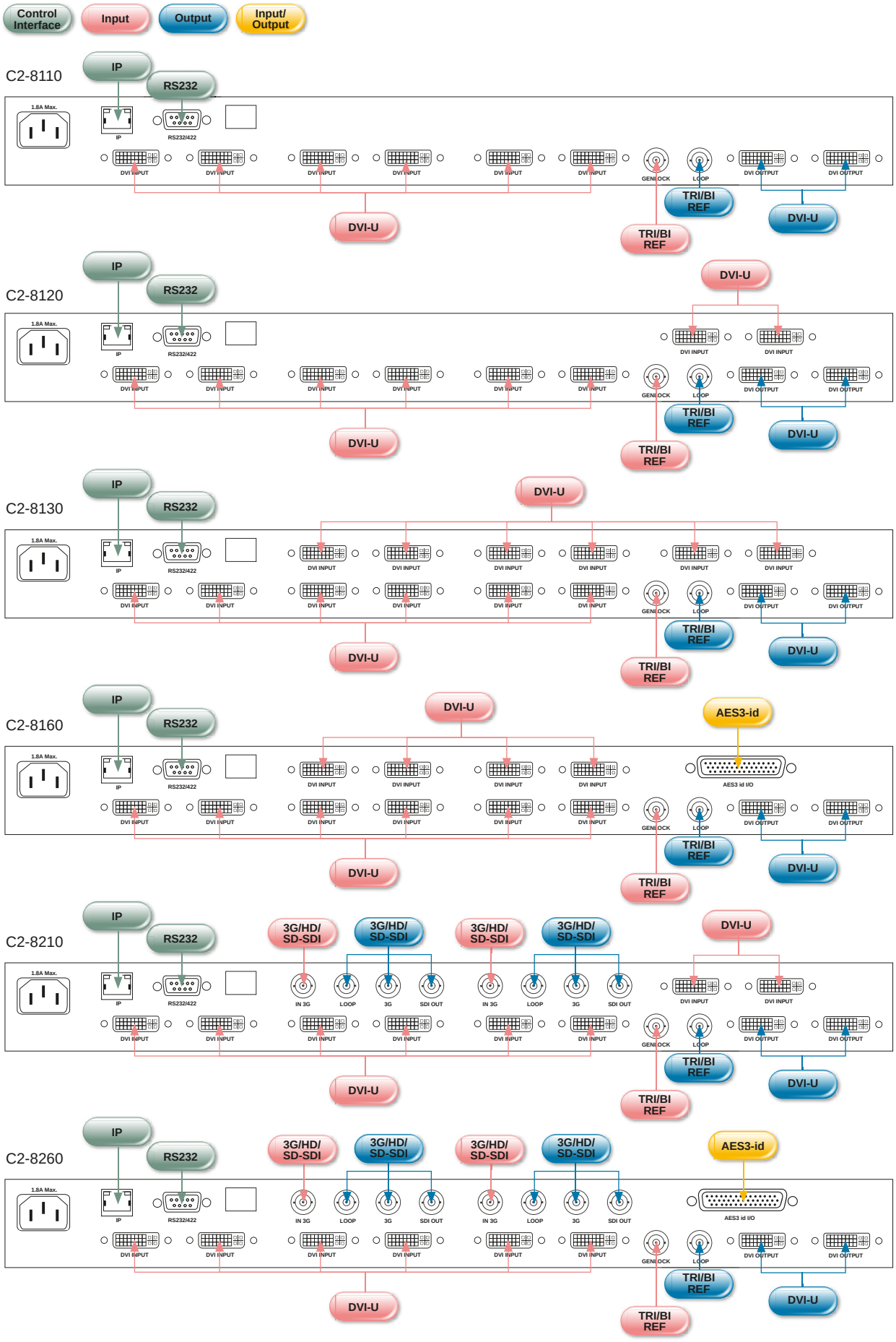

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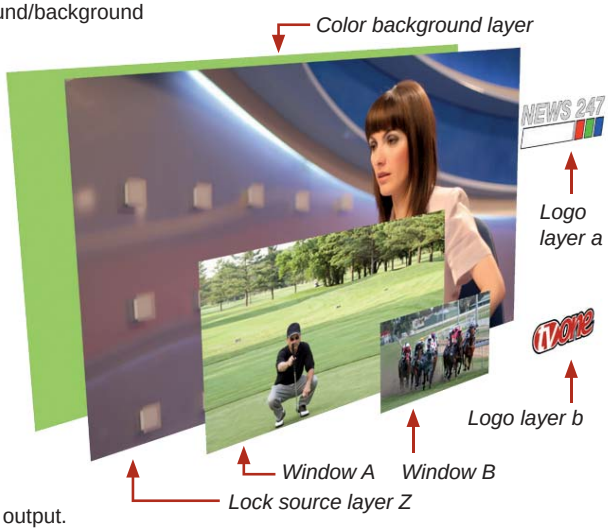
Powerful advanced image processing

The C2-8000 & C2-7000 Series Video Processors are extremely flexible units and address a wide range of requirements. All products in these families are in reality multiple products in a single box and are at home in broadcast, display and live event environments.

Image Layer Processing

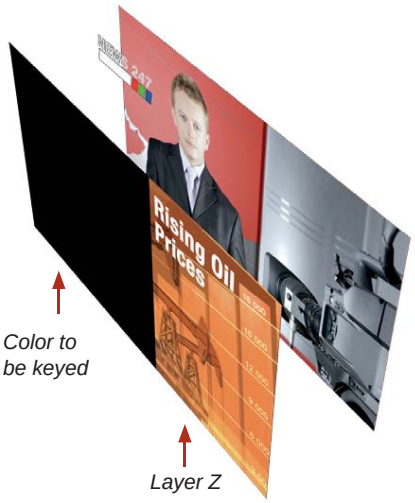
The C2-8000 & C2-7000 Series utilizes a multiple layer video display system allowing the stacking order of layers to be altered. For example, in the C2-7000 Series Dual PIP mode there are two image windows (A & B) that can be resized and positioned as desired, a lock source layer* (Z) which can be an active video source, two logo layers (a & b) and a color background. The foreground/background priority of each layer is user assignable over the color background layer. Windows A & B and layer Z can all be utilized as either a key source or background, and have fully adjustable levels of transparency through to opaque. In Independent Mode each scaler may use a different Z layer video source as a background or as a foreground key. In Switcher Mode video may be seamlessly transitioned over the Z layer video or under [behind] a Z layer key. In Dual PIP Mode the video layer priority and keying may be assigned independently for each output. The C2-8000 Series can have three PIPs in Multi PIP mode.



*(C2-7000 Series) only 2 x SDI inputs can be used at a time

Image Keying

The Lock & Mix mode found on select CORIO® processors extends the capabilities of the Z layer to become an unscaled video source or a luminance/chroma key source. As a key source, the Z layer background information can be keyed out and utilizing the image layer processing capability, keyed over one or both windows depending on the mode. The transparency of the keyed Z layer video is fully adjustable. In Independent Mode, each scaler may use a different Z layer video source, in Switcher Mode, video may be seamlessly transitioned under a Z layer key and in PIP Mode the video layer priority may be assigned independently for each output.



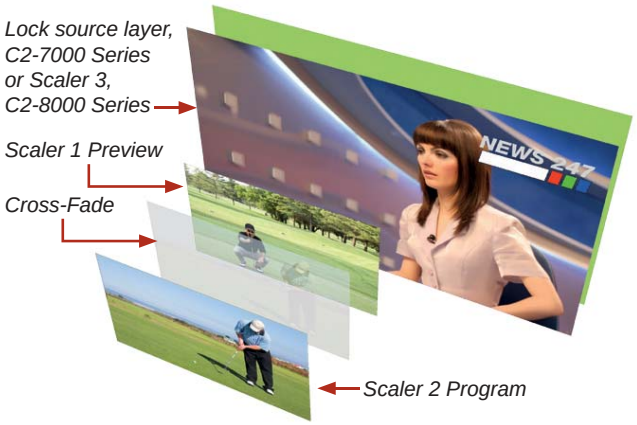
Keyed Output

Operational Modes

The C2-8000 & C2-7000 Series Video Processors can be operated in three different modes:

Switcher Mode

Provides equally powerful Program and Preview channels for live event switching. To achieve seamless switching, one scaler is reserved for Preview and a second for Program, enabling a true cross fade, cut, push or wipe transition between the two. In addition to previewing inputs before selection, complex functions, such as Chromakeys and Picture-In-Picture, can be previewed for setup totally independent of the Program channel output. Any signal format can be freely mixed with any other.



Below, a simulation of a cross fade from Program (left), through transition (center), to the Preview source (right)

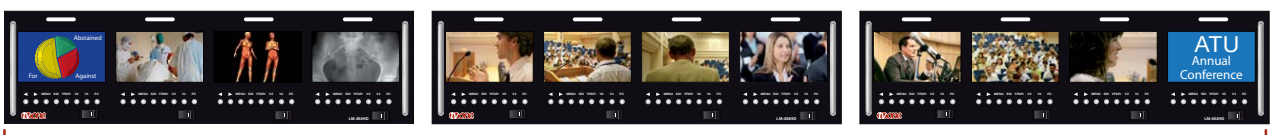
Switching using the Still Image Store

The Still Image Store (SIS) can be used to store graphic elements that are used on a regular basis and can quickly be retrieved as a source. The SIS images can be positioned in Preview and a seamless transition to Program applied.

The C2-8000, the ideal Seamless Switcher for live events

The C2-8000's potential to have up to twelve universal inputs, makes it the ideal Seamless Switcher for live events, such as conferences for example. Due to the DVI-U connectors a multitude of different source formats (HD Video, SD Video, PC, DVD …) can be plugged directly into the C2-8000 Series unit, scaled and output to devices that have the same resolutions, i.e. a HD monitor, at 720p and a 720p projector.

Preview



Sources

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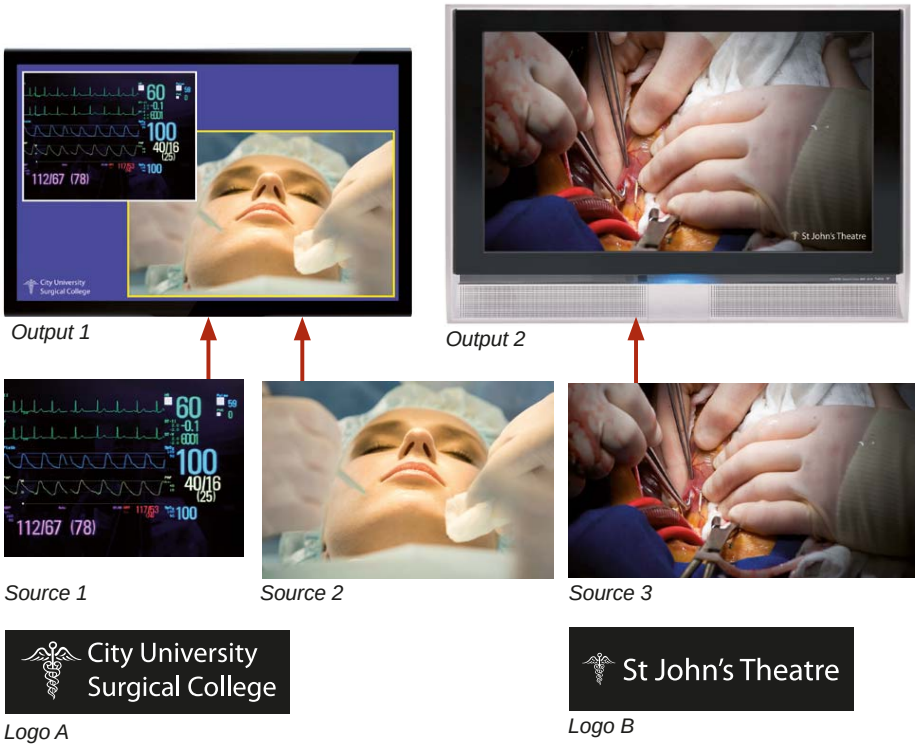
Independent Mode

Provides the power of two independently functioning products, performing different tasks in one box. Each output can deliver different formats and resolutions simultaneously. For example, a presentation being fed to a high resolution display on Output 1 via DVI can also be fed to a VCR for recording on Output 2 via Composite Video. Used for channel branding or digital signage applications user defined stored logos can be imposed on the outputs. Independent Mode in a Broadcast environment provides two completely independent Analog to HD-SDI Converters, each genlocked to a different reference and each with a different logo or ID keyed in.

The C2-8000, in Independent Mode, can seamlessly switch between any input (SD/HD/3G-SDI, HDMI, CV, YC, RGB, YPbPr) and output 2 different videos signals (SD/HD/3G, HDMI, CV, YC, RGB, YPbPr) of independent resolutions and frame-rate. One of the outputs may also have a PIP. Transitions available in Independent mode are Fade thru black, Push, Wipe and Cut.



PIP Mode - Dual PIP (C2-7000 Series)

Any video input* can be placed into either of two windows of any size and positioned anywhere on the screen, even overlapping each other with user defined layer priority control. The windows can be placed over any other input as the background. The image in the window can then be switched to another input or a static image from the unit's memory and even zoomed in or out. Keying can be added independently to each window and the background.

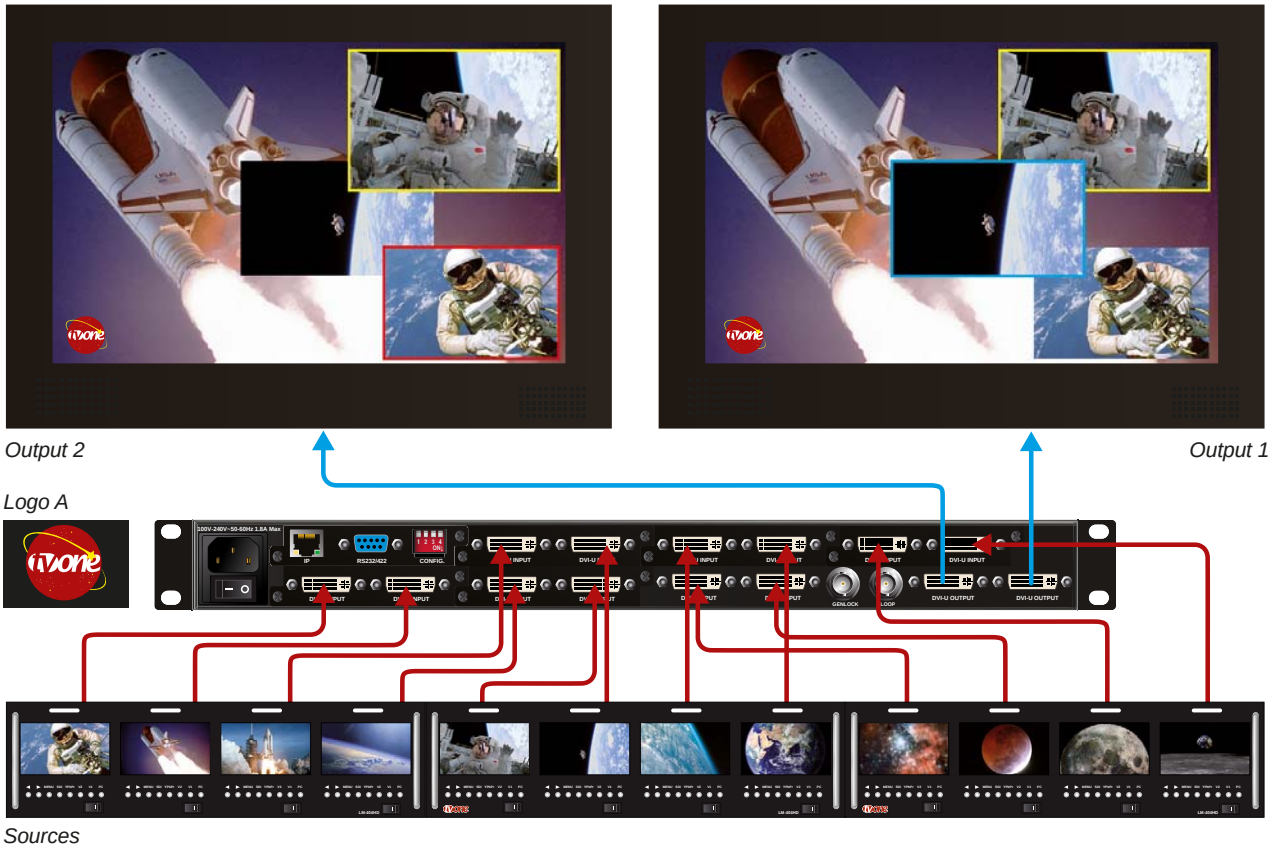
*only 2 x SDI inputs can be used at a time

PIP 1 : Keyed computer generated animation

PIP 2 : Video with border added

Multi PIP (C2-8000 Series)

In Multi PIP mode both outputs have the same resolution or are referenced to a house source. Three PIPs can be layered on an unscaled lock source which determines the output resolution. Both Outputs 1 & 2 have identical sources, PIP size and positioning, but the layer order and borders of the PIPs can be different. Transitions available in Multi PIP mode are Fade thru black, Push, Wipe and Cut. A user defined logo can be overlayed.

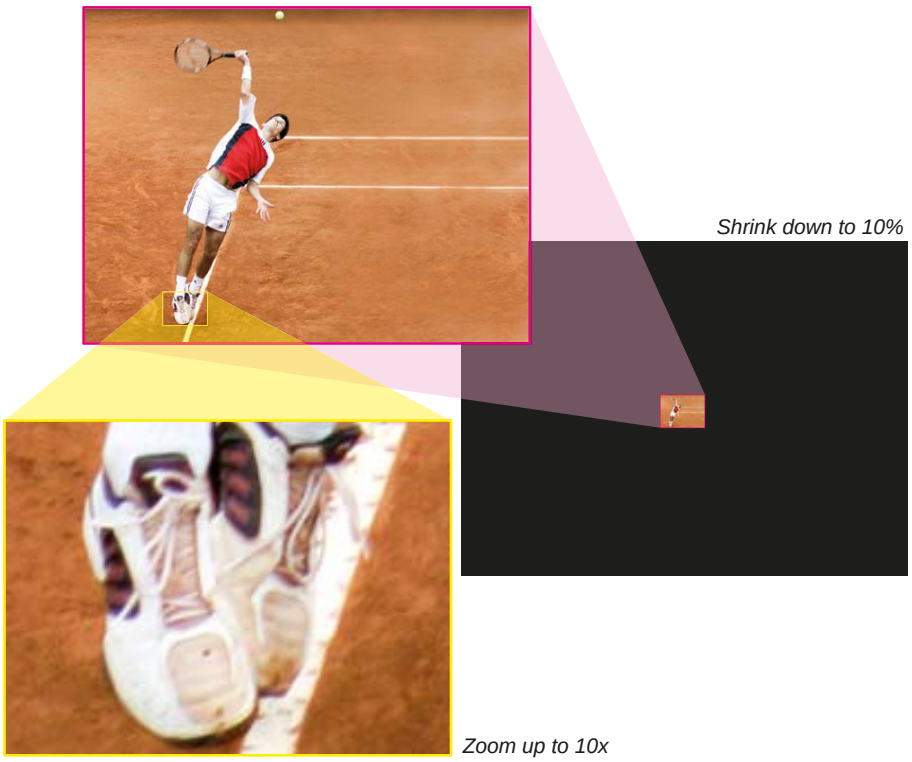


Automatic 3:2 Pulldown

Our exclusive CORIO®2 conversion technology employs advanced proprietary pixel adaptive motion compensation to smooth out fast moving images. The automatic 3:2 Pull-down efficiently de-interlaces NTSC video originating from 24 fps film. This enables original film footage to be incorporated into video without any loss in image quality.

Zoom and Shrink

Zooming into any area of the image, while maintaining high quality, is possible because of the unique CORIO®2 video sampling technology. Variable zoom can go up to 10x while Variable Shrink can go down to 10%, both adjustable in one pixel steps. Pixel level position controls allow accurate movement around any desired area and can be controlled from the front panel or the Windows Control Panel. Zooming can be independently applied to the images in the windows.



Shrink down to 10%

Zoom up to 10x

EDID Manager

An innovative new feature for CORIO®2 firmware is an EDID Manager. The EDID Manager allows the user to copy the EDID data from a display attached to the TV One unit's output and simulate its presence to a PC that is attached to its input, effectively giving transparent EDID operation. EDID is an information packet retrieved by a PC graphic card over a DVI link from a monitor which informs the graphic card the resolutions compatible with the display. The EDID manager on a CORIO®2 unit works by holding multiple copies of EDID data in non-volatile memory and allowing the user to select which one is shown to a PC on the DVI input.
As well as having pre-defined EDID data, this remarkable feature also allows the user to capture EDID information from any display attached to the DVI output of a CORIO®2 unit and store this in its non-volatile memory for recall at a later time. Up to six custom EDID settings can be stored in the CORIO®2 unit and will be retained even when power is switched off.
Designed to address commonplace problems that can occur as a result of EDID information transfer, the EDID Manager is now available on all new CORIO®2 video switcher/scalers, and can be added to existing units in the field by performing a free firmware upgrade from our website.

Frame Lock

The Frame Lock feature in CORIO®2 Technology is a useful tool that can be used to aid in the synchronization of an HD-SDI output to a composite video source, or for scaling one resolution to another whilst avoiding any potential frame-rate conversion artifacts. Available on all new CORIO®2 Video Switcher/Scalers, frame lock capability can also be added to existing units in the field by performing a free firmware upgrade from the TV One website.

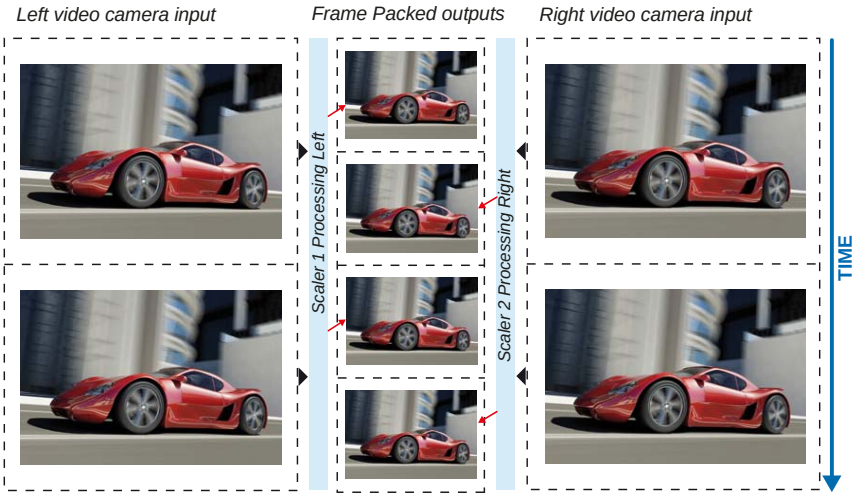
Developed in response to the demand from the Broadcast Industry, this new frame lock feature enables the user to lock an output resolution frame rate to an input resolution frame rate (providing that both frame rates are identical) thus ensuring that the signals will remain aligned and not drift apart. For example, a 1280x720p @ 59.94Hz output could be frame-locked to a composite video NTSC @ 59.94Hz source, or a 1920x1080i @ 50Hz output could be frame-locked to a composite video PAL @ 50Hz source. In the C2-7000 Series, the non-scalable Z layer acts as a synchronization source.The C2-8000 Series differs by having a separate Genlock input with loop-through enabling inputs to be synchronized.

The image above simulates effect without Frame Lock, the image left, with Frame Lock

3D solutions

Due to the flexibility of CORIO® technology, TV One have been able to 3D Video support to the latest version of firmware, which will extend the ability of compatible products; for example the C2-8000 Series, C2-6204, C2-6104A and 1T-C2-750.

The firmware allows the EDID data for the source to be read and adds information to the HDMI signal sent to the display so that it recognizes the 3D signal. It also adds the extra 3D resolutions that supports the necessary Frame Packing. The processing of the left & right 3D images is handled by different scaling engines, allowing them to be either split from a single frame or merged into a single frame.



Frame packed 3D video resolutions

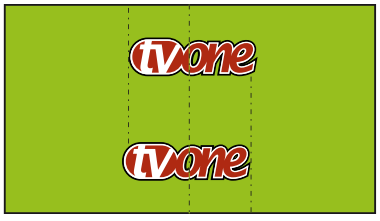
Frame packing is the simplest form of putting two images (left & right) into a single video resolution; effectively, the left image is sent first followed by the right image. Video bandwidth is doubled, which then means that the pixel rate is also doubled – and hence both left and right are sent together at the same individual frame rate. Because the video pixel rate has to be doubled in order to fit twice as many frames in during the same amount of time, only resolutions that are of low enough pixel rate can be doubled and still be within the DVI / HDMI pixel rate limit: 50, 59.94 & 60Hz for 720p, and 23.98, 24 & 25Hz for 1080p. As well as Frame Packing, left & right images can be transmitted 'Top-Bottom' or 'Side-by-Side'.

2x Camera inputs to 3D resolutions using two CORIO®2 scalers

By using 2 cameras and 2 scalers, the individual camera sources can be fed into each scaler, with the resulting windows output to a single 3D resolution – as per Frame packing mode. This then allows real-time conversion of camera sources to a 3D video signal. The same setup could be used to convert the 2 camera signals into a standard video resolution and sent over fiber, SDI, or recorded to Blu-ray. A separate unit could then scale that signal back to a standard 3D resolution for display.

3D Picture-in-Picture

A PIP can be added to a 3D resolution, with the PIP made to appear 'floating' out in front of the background video. This requires a unit with 2x scalers (and at least two inputs, one for Frame packed 3D, and one for the PC/Video PIP source), both taking the same PIP source and placing the PIP slightly offset in each Left & Right frame.



Off-setting a graphic (left & right Frame Pack) and keying the background produces a PIP that appears to be 'floating' in front of the video. Reversing the offset causes the PIP to appear to 'sink back' in the frame, however this is not recommended as it can break the 3D effect if an object in the background tries to go in front of it.