



The absolute opposite of ordinary

M800Ex Digital Mapping Processor Datasheet

M801Ex (1 CH), M802Ex (2 CH), M803Ex (3 CH), M804Ex (4 CH)

Input: up to 7680*1200 @30Hz, 4096*2160 @60Hz

4:4:4 full color sampling

Output: 2048*1080 @60Hz

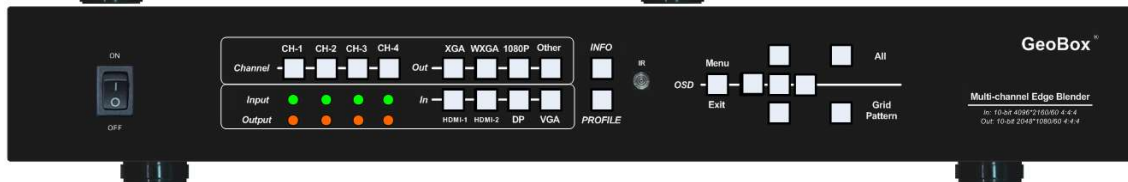


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Introduction

M800Ex is curved screen edge blending and digital mapping processor with the ability to provide multiple processing modules to control from 1 to 4 projectors based on user's requirements. M801EX is designed with one processing module to control one projector, M802EX for 2 projectors, M803EX for 3 projectors and M804EX for 4 projectors. It was designed for sophisticated edge blending as well as image warping, stacking and projection mapping...etc. One M804EX can execute 4 projector edge blending without any additional equipment or splitter. Two M804EX can control up to 8 projectors. More M800EX can be cascaded for large scale display.

4 input ports (2x HDMI, 1x DP, 1x VGA) and 1x HDMI outputs are designed in each processing module. Digital input supports up to 7680*1200 @30Hz / 4096*2160 @60Hz with 4:4:4 full color sampling. Output supports up to 2048*1080 @60Hz. It is integrated with 10-bit high end processor, motion adaptive de-interlace, low angle smooth algorithm, 3:2/2:2 pull-down and supports non-VESA standard input timing. Programmable EDID can optimize input timing to get the best video result.

Advanced warp technology is embedded in M800EX. User can use IR controller, USB, WebGui and Ethernet to perform edge blending and sophisticated geometry alignment up to 17x17 control points. Linearity Grid Line Adjustment and Corner Wall image adjustment for mapping image at 90 degrees corner is a new function in geometry alignment. Separate R, G, B gamma correction for edge blending region color fine-tune, individual color correction for each output and 9 regions non-edge blending area black level uplift are also standard functions in M800EX. Users can see real time geometry and color adjustment to get optimized result. It is designed with Digital Mapping function and no need to mask source image for easy to prepare video content for projection mapping.

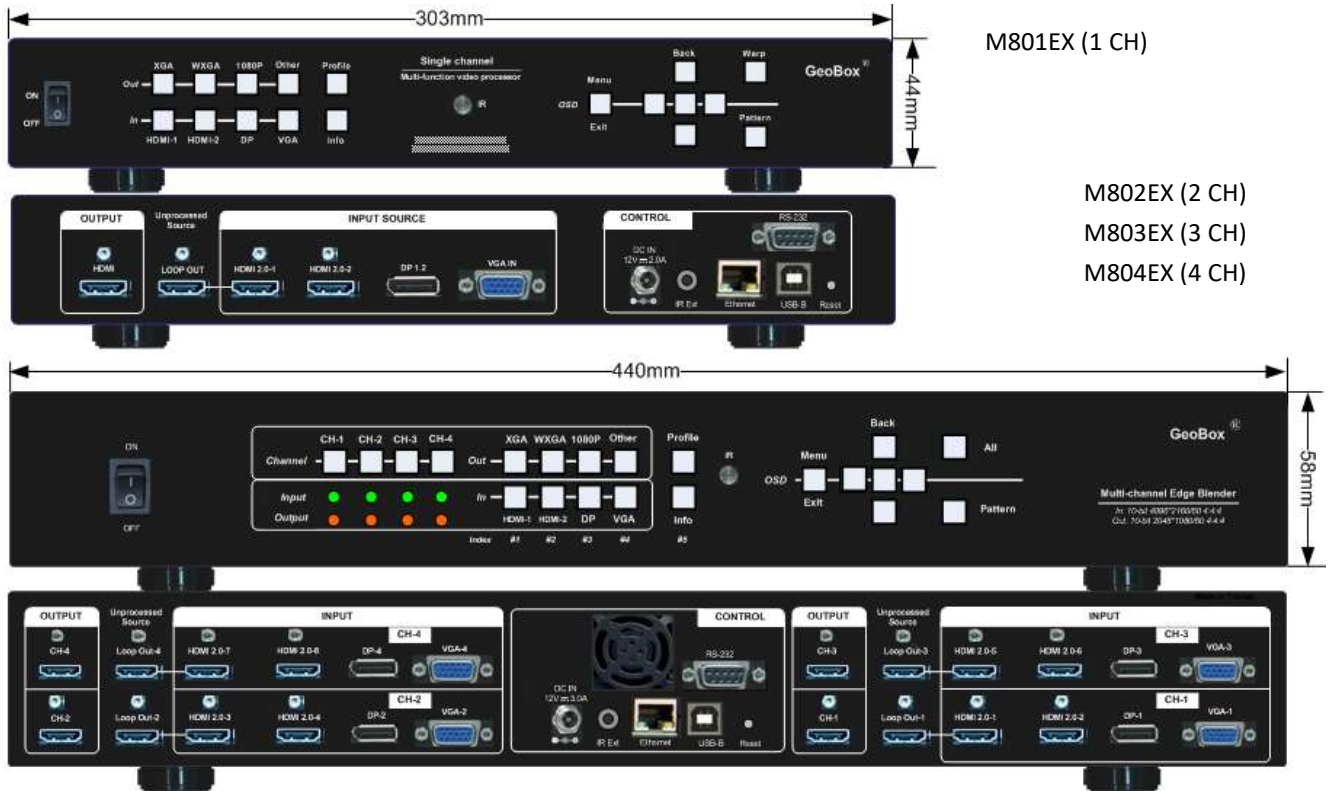
Image 90/180/270 degrees rotation and flip with 4k/60 input from various input sources are embedded in M800EX. It provides more flexible system configuration.

HDMI loop out supports daisy chain connection up to 7680*1200 @30Hz / 4096x2160 @60Hz and allows large display with multiple M800EX cascaded. Video wall function in M800EX is to crop and allocate source image for each projector and set overlap pixels for edge blending. Complete curved edge blending can be achieved through remote controller and Ethernet without PC software, video distributor and splitter.

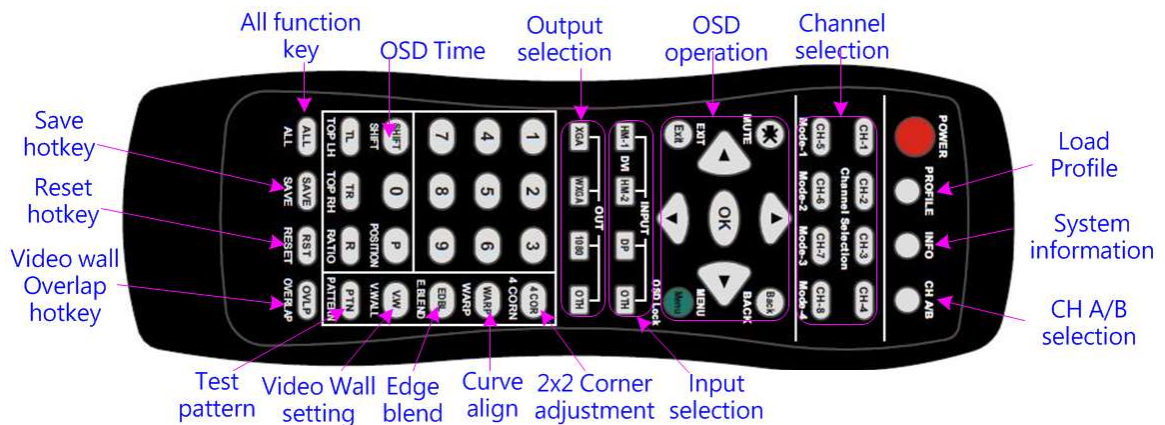
PIP (picture in picture) and POP (side by side) are standard functions in M800EX. PIP image size is from 320*180 up to 1920*1200. In one M804EX, user can display up to 8 different input contents on the screen.

M800EX is an ideal solution for simulation. It can connect with inputs from multiple PCs and combine them into one seamless image. It also provides flexible displays in edge blending system. For a 3x projector edge blending system, user can configure as 1+1+1 independent display, 1+2 (two projectors blended) and all-in-one (three projectors blended). User can also execute edge blending with projector at portrait position without rotating source image to increase image height. It is a good fit with laser projector without the limitation in installation angle.

Using M800EX, users can replace high end projector with low cost projector without lens shift, warp, digital mapping and edge blending. It provides easy configuration, low entry barrier, cost effective, reliable and flexible solution.



(This back panel shows 4 CH model—M804Ex)



Specification

- ✧ Each box has 1-4 processing modules.
 - M801EX: Single module processor
 - M802EX: Dual module processor
 - M803EX: Triple module processor
 - M804Ex: Quad module processor
- ✧ Each processing module includes:
 - Input: 2x HDMI 2.0b, 1x DP1.2a and 1x VGA
 - Output: 1x HDMI
 - Loop output: 1x HDMI 2.0 for cascade.
- ✧ HDCP: HDMI V2.2/V1.4, DP: HDCP: V1.3
- ✧ Max. input resolution: 7680*1200 30fps, 4096x2160 60fps
- ✧ Output: HDMI up to 2048x1080/60. Output signal is RGB 4:4:4 progressive.
- ✧ New generation warp engine for geometry alignment up to 17x17 grid control points.
- ✧ Maximum geometry adjustment up to 1200 pixels in both H&V directions.
- ✧ Edge blending at 4 edges up to H=1920 pixels, V=1200 pixels with independent R, G, B gamma correction.
- ✧ 9 regions black level uplift to compensate light leakage from projector optical system.
- ✧ Support Corner Wall adjustment in H&V at flexible location.
- ✧ Support Linearity Grid Line adjustment for quick H&V line position alignment.
- ✧ Embedded video wall function for image split, cropping and edge blend overlap pixel setting.
- ✧ Support non-VESA standard input timings for easy connection with various signal sources.
- ✧ Selectable output up to 2048*1080 60Hz.
- ✧ Selectable grid pattern size from 8-120 pixels in H&V direction. Default is 32*32 pixels.
- ✧ Selectable grid pattern color with optional transparency to see background image.
- ✧ Flexible aspect ratio adjustment in each edge up to +_ 1800 pixels position shift.
- ✧ M800Ex is designed with digital mapping function. User can upload pattern into M800Ex and implement projection mapping. Each channel can store up to 10 different patterns.
- ✧ Frame lock function to get perfect synchronized outputs in all channels.
- ✧ Frame rate conversion and 50Hz in/out function to eliminate image frame repeat.
- ✧ Three synchronization method: phase lock, frame lock & free-run modes.
- ✧ Free-run mode provides continuous signal to projector, no source searching required when timing change.
- ✧ 10-bit processor, 3:2/2:2 cadence, low angle smooth algorithm, high quality scaling engine.
- ✧ 4:4:4 Chroma sampling, 30 Color bits, 12-bit RGB gamma CLUT.
- ✧ Support sRGB & xvYCC color processing & 8/10/12-bit deep color.
- ✧ 3D motion adaptive de-interlace.
- ✧ High Dynamic Range (HDR) support: SMPTE ST-2084, SMPTE ST-2086
- ✧ Individual color and white balance adjustment in each processing channel.
- ✧ Individual 90/180/270 rotation, flip, cropping, scaling & color adjustment in each channel up to 4k/60 input.
- ✧ PIP/POP function with PIP image size from 320*180 up to 1920*1200 resolution with flexible position and selectable aspect ratio. This function is not available when the main image is 90/270 degrees rotation.
- ✧ Embedded HDMI audio outputs.
- ✧ Selectable and programmable EDID.
- ✧ ESD Protection: ±8kV (Air-gap discharge), ±4kV (Contact discharge)
- ✧ Power supply: DC: 12V 3.3A
- ✧ Max. Power consumption:
 - max. 13.2W (M801EX), 28w (M804)
- ✧ Working environment: 45 ° C, 10-90% RH
- ✧ Control: keypads, IR, RS232, USB, Ethernet
- ✧ System settings can be stored and backup.
- ✧ Dimensions:
 - M801EX: 303mm*180mm*45mm, weight: 1.55kg
 - M802EX-M804Ex: 440mm*180mm*55mm
 - Weight: 2.4kg-2.8kg
- ✧ CE/FCC/RoHS/Reach Certified
- ✧ 2 Year Warranty, paid extension available up to 5 years.

Function and features:

A. Structure

Each M800EX consists of 1-4 processing modules. Each processing module can control one projector and multiple processing modules can be cascaded to control big scale display system.

B. Each processing module includes below input and output ports

1. Input: 2x HDMI, 1xVGA, 1x DisplayPort °
 - HDMI & DisplayPort support 7680*1200 @30Hz / 4096*2160 @60Hz with 4:4:4 chroma sampling without compression. VGA supports up to WUXGA or 205MHz analog input signal.
 - Connect with various video sources and support none VESA standard input resolution up to 120Hz.
2. Output: 1x HDMI. Selectable output resolutions: 720x480 、XGA 、WXGA 、1280x1024 、1366x768 、1400x1050 、1600x1200 、1920x1080 (24/30/50/60Hz) 、1920*1200/60 、2048x1080/60 °. All outputs are RGB 4:4:4 progressive signals.
3. Loop out port: 1x HDMI, same as source signal up to 7680*1200@30Hz / 4096*2160@60Hz.

C. Image warp, geometry alignment and edge blending

1. Selectable grid pattern size for geometry alignment from 8-120 pixels in H&V. Default is 32*32 pixels.
2. With full functions for quick 4 corner alignment, vertical and horizontal keystone correction, Pincushion & Barrel adjustment, image warp and image 90/180/270 degrees rotation and flip.
3. Each module controls one projector and can be cascaded to control unlimited number of projectors.
4. Integrated with full function front panel keypads & IR remote controller for manual geometry alignment through OSD up to 9*5 grid patterns with +_ 1200 pixels adjustment range at each corner. 3x3 edge center geometry alignment range is limited to +_600 pixels in full HD output in top edge and both side edges. Bottom edge is limited to 300 pixels. In most of curved screen edge blending system, the projector will be installed at ceiling position, the lower position of the image has more distortion and will be at top edge of GeoBox. It can match +_600 pixels adjustment range without problem.
5. Gwarp3 PC tool is available for warp and geometry alignment up to 17x17 grid patterns through USB or Ethernet. The geometry alignment range is the same as manual adjustment. After finishing geometry alignment, the parameters will be stored inside GeoBox and no more PC tool is needed.
6. Corner wall geometry alignment at 90 degrees corner wall up to 900 pixels adjustment range in H&V directions. The adjustment point can be changed up to 900 pixels in H&V directions.
7. 4 directions edge blending up to H=1920, V=1200 overlapped pixels for flat, dual curved & cylindrical screens.
8. Independent R, G, B gamma correction for edge blending color fine.
9. Precise black level uplift at multiple areas (up to 9) to compensate light leakage in the projector optical system in dark environment.
10. White balance and individual color correction for each projector.

D. High end 10-bit video processor

1. 10-bit high end processor with 3D motion adaptive de-interlace, low angle smooth algorithm and 3:2/2:2 film mode detect and recovery function.
2. Complete color adjustment function, including brightness, contrast, hue, saturation, preset color mode, independent RGB color adjustment and white balance correction.

E. Edge mask

Image [Shift] to execute edge mask up to 500 pixels following the image profile after geometry adjustment and [Edge Mask] with 8 adjustment points to provide irregular shape edge mask with random edge position up to 900 pixels in each control point. These two functions can be executed at the same time.

F. PIP/POP

1. PIP (picture in picture): with flexible PIP size (320*180 to 1920*1200), location and aspect ratio.
2. POP (Picture outside picture): side by side images with full screen or maintain source signal aspect ratio.
3. PIP sub-image size, cropping area, position and aspect ratio can be further adjusted through Overlap function.
4. Limitation:
 - When implement PIP/POP function, the main signal source can't be rotated at 90/270 degrees
 - Source: only one HDMI source can be displayed on PIP/POP screen. Another source shall be DP or VGA.
 - PIP Overlap function is only available up to 4k/30 input resolution.

G. Video wall function

1. Image cropping and location assignment for each projector.
2. Image pixel cropping range is up to 1800 pixels for image position shift, aspect ratio adjustment, bezel compensation and creating overlap region for edge blending.
3. Connect with 8k/1k / 4k/2k input signal and split the image for display devices without additional PC, image splitter or other devices.
4. Serve as video wall controller for irregular video wall display up to 15x15 matrix display from single signal source.

H. Image rotation and flip

1. Image 90/180/270 degrees rotation, flip and mirror up to 4k/60Hz input resolution.
2. Image flip in Front/Rear, Left/Right and Top/Bottom directions.
3. When execute PIP/POP function, no 90/270 degrees image rotation is available.
4. No 3D motion adaptive de-interlace function while the image is 90/270 degrees rotated. We propose to apply progressive signal source to get the best video quality.

I. Digital Mapping (M800Ex)

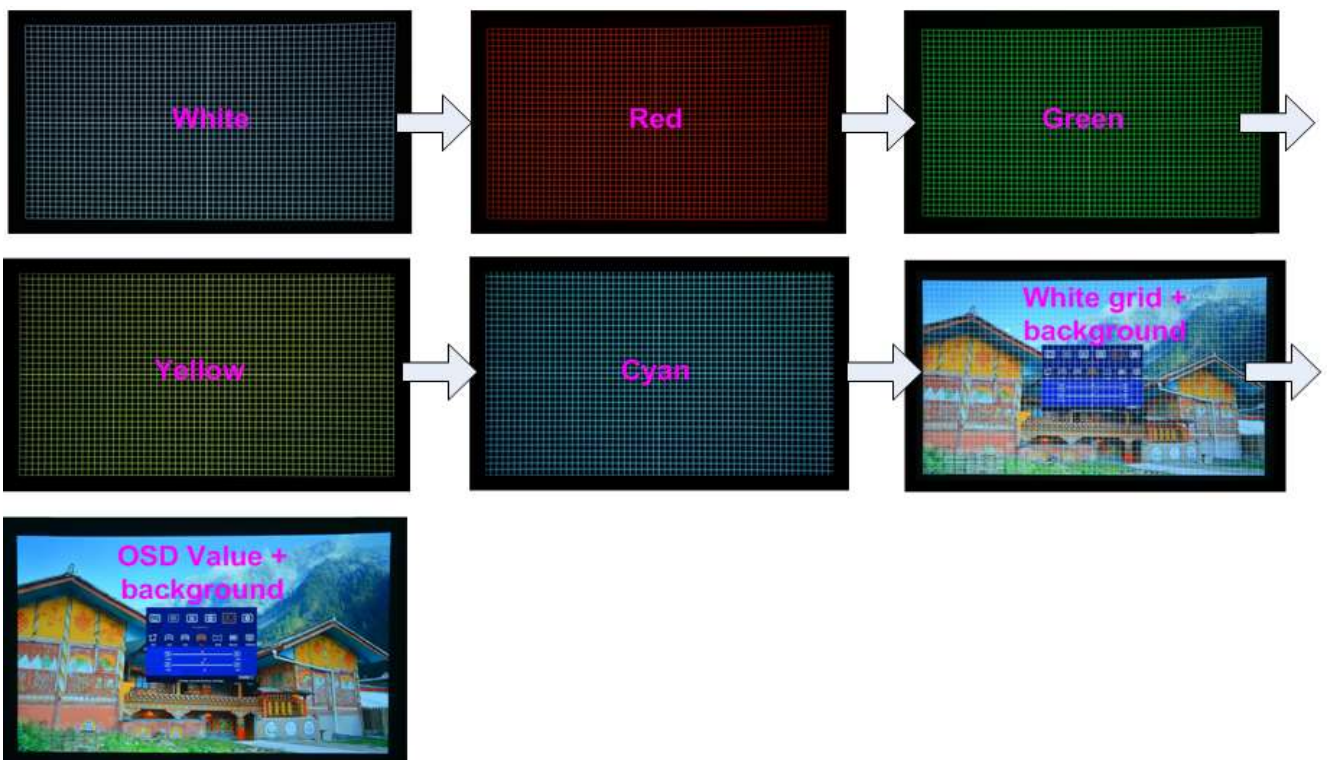
Projection mapping function is embedded in M800Ex models. User can input up to 10 patterns (images) to M800Ex in each channel, then implement projection mapping. The pattern needs to be 2-bit monochrome with BMP file format. User can use any signal source and select up to 4 display styles in each pattern. User can use any signal source and content and no need to pre-mask in signal source.

J. System control and other features

1. Professional design and reliable for 7/24 working condition.
2. Operation temperature: 0-45 ° C. Relative humidity: 10%-90% non-condensing.
3. Full function OSD by front panel keypad, WebGui, IR and Ethernet (Including through WiFi by PC, Mobile or iPad).
4. Firmware update via USB or Ethernet.
5. Gwarp3 PC tool can control multiple processors simultaneously through USB or Ethernet.
6. Internal grid pattern with selectable color and grid size for easy geometry alignment.
7. RS232 & Ethernet system control compatible with most of control system.
8. User can select blue or black background color when no input signal is detected.
9. Programmable EDID in the range at H=1024~3840, V=720~2400.
10. BOX ID and programmable IP address for convenient multiple unit control at the same time.
11. User can save up to 5 settings and can be recalled by remote controller, RS232, USB or network.
12. System settings can be backup in PC, USB device and copied to another unit.
13. Automatic power ON/OFF through input signal control. While no input signal is detected, it will shut down output automatically. User can power ON/OFF the system through the control in signal source.

Features illustration

Selectable Grid Pattern for geometry alignment

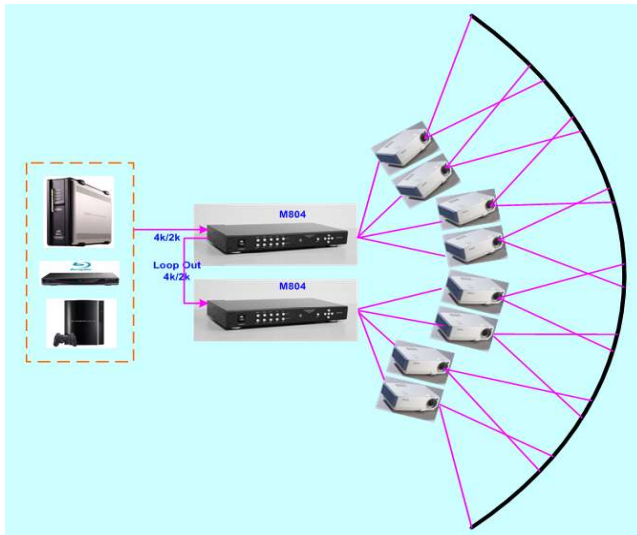


Selectable grid pattern size for geometry alignment

The pixel size in grid pattern for geometry alignment is selectable to meet high end simulation system geometry alignment requirements. The grid size in both horizontal and vertical directions is from 8 to 120 pixels with 1-pixel increase. H&V grid size will be the same. User can select grid size under [Edge Blend] menu.



8k/1k, 4K/60 daisy chain connection



No additional device is required.

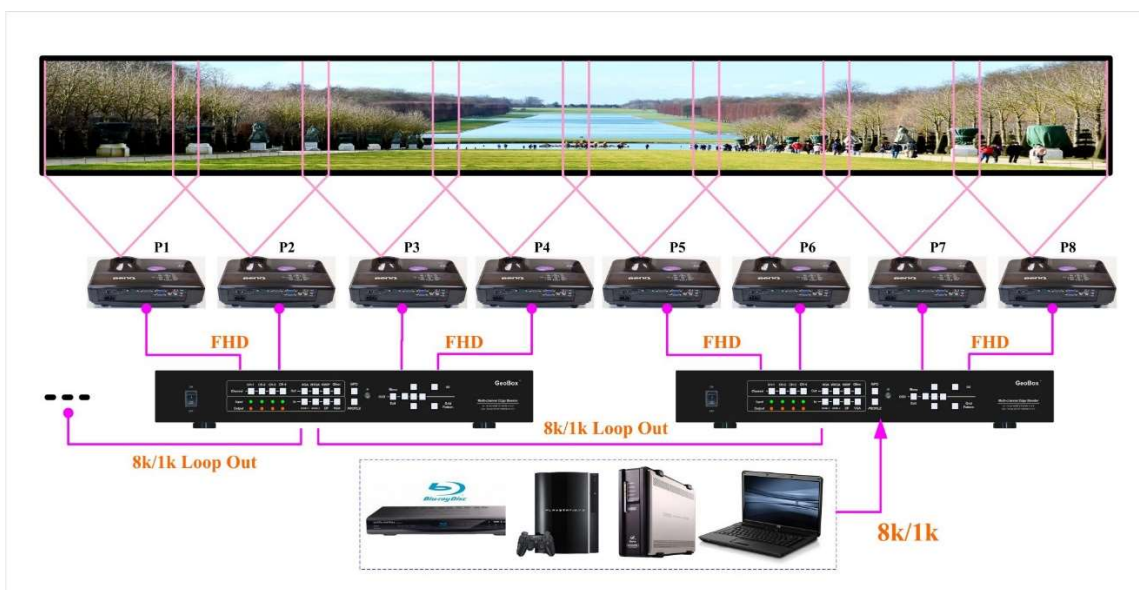
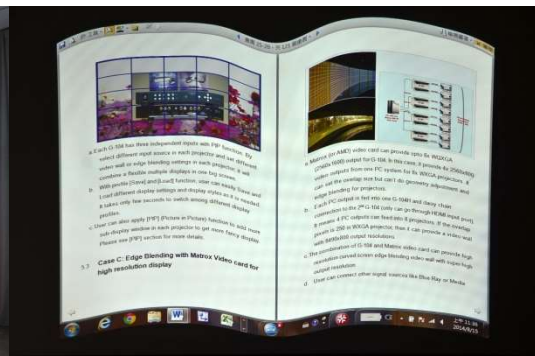
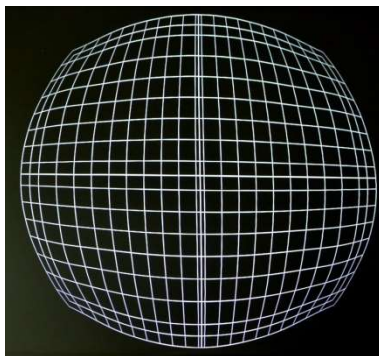
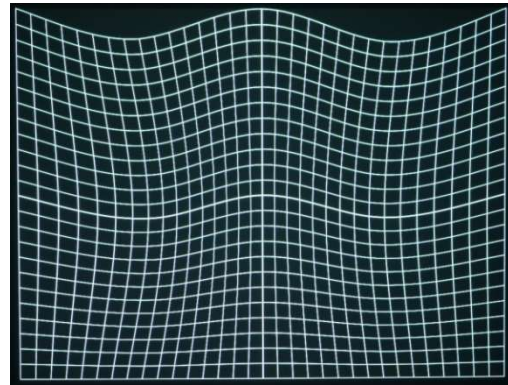
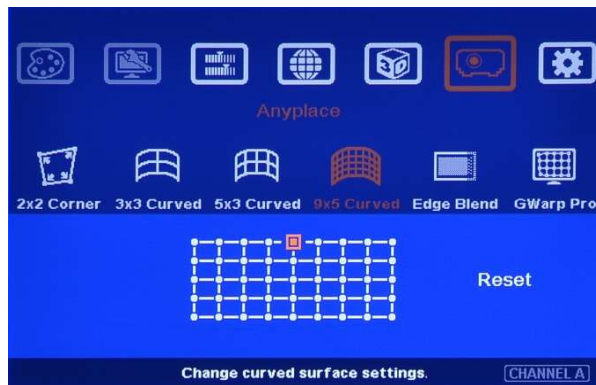
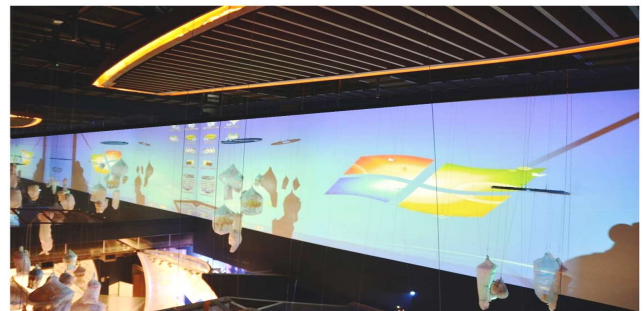


Image geometry alignment and warp



Edge blending on flat and curved screen





Corner wall Alignment & Display

Corner wall alignment function is functional in both horizontal and vertical direction at any location but not only in the center. The image scaling factor in two split sections will keep the same. The adjustment range is up to 900 pixels. 2x2 Corner position alignment and Edge Blend function are still available with Corner Wall adjustment simultaneously for easy image mapping and system setup.

In Horizontal and Vertical directions

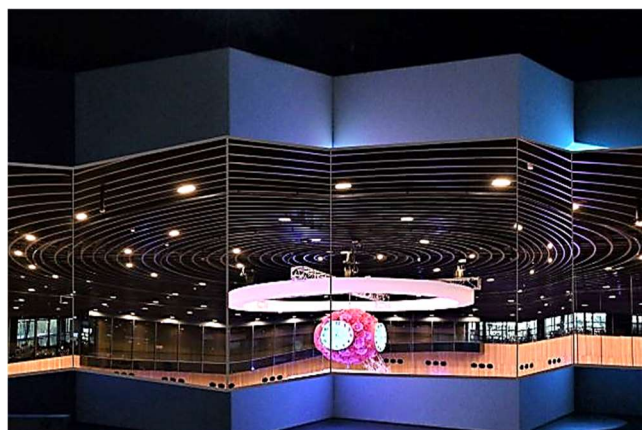
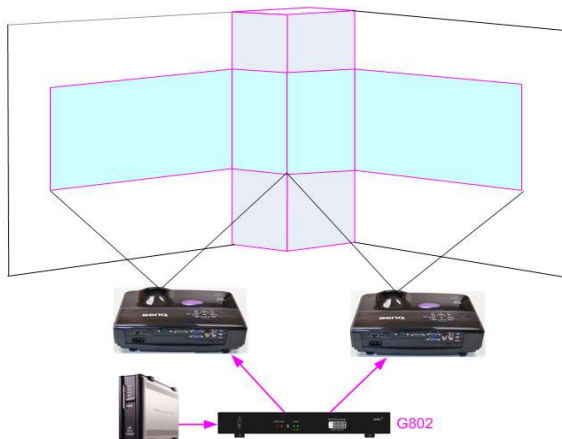


At any location but not only at center

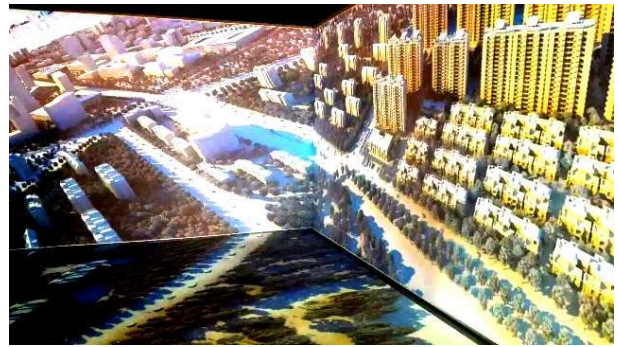


Two projector corner wall application

Three projector corner wall application



Another corner wall application examples



Single projector application

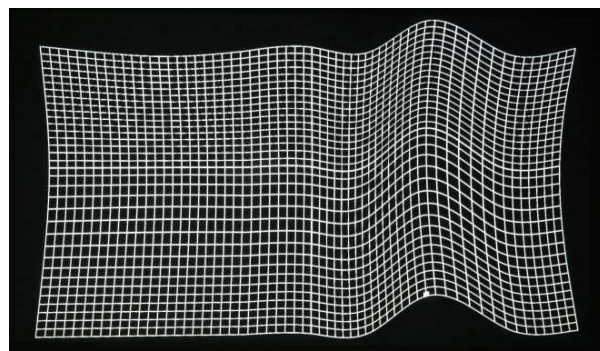
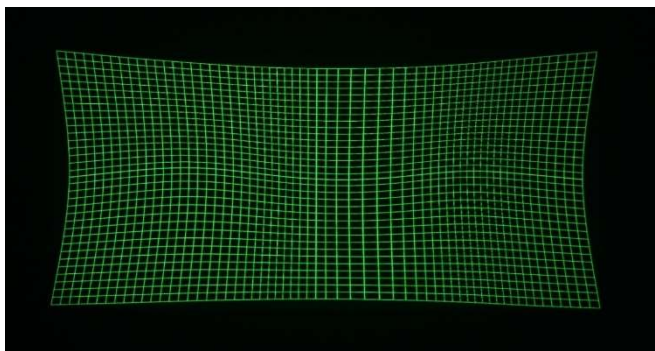


Portrait & Landscape Corner wall

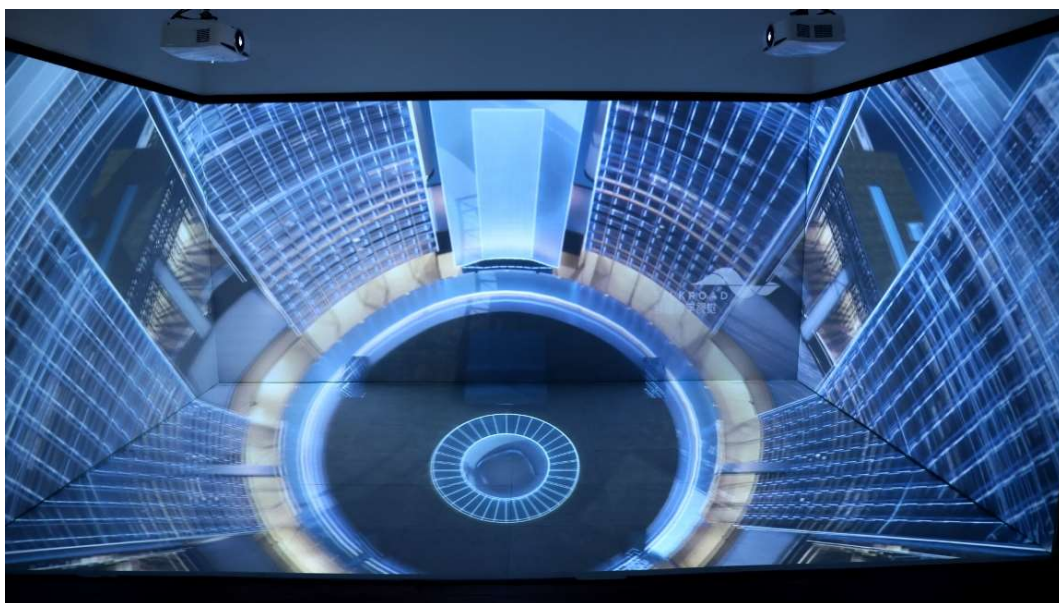
Linearity grid line adjustment

When projector projects image on curved screen, the image will change the grid size gradually and cause different scaling factor on the center and both sides. Linearity grid line adjustment is to compensate this kind of effect and enable complete image with the same scaling factor.

1. This function can be executed through remote controller and Gwarp3 PC tool and applied to both horizontal and vertical directions.
2. The maximum adjusting points are 17 in both horizontal & vertical directions.
3. Linearity line adjustment can be executed together with warp alignment & edge blending at the same time.

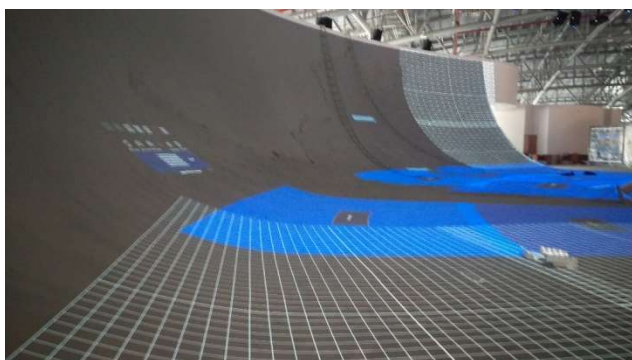


Immersive display



Immersive system with 4 walls + one floor

Big scale display



24 units of Christie projectors together with GeoBox for 35mx18m screen

Flexible display

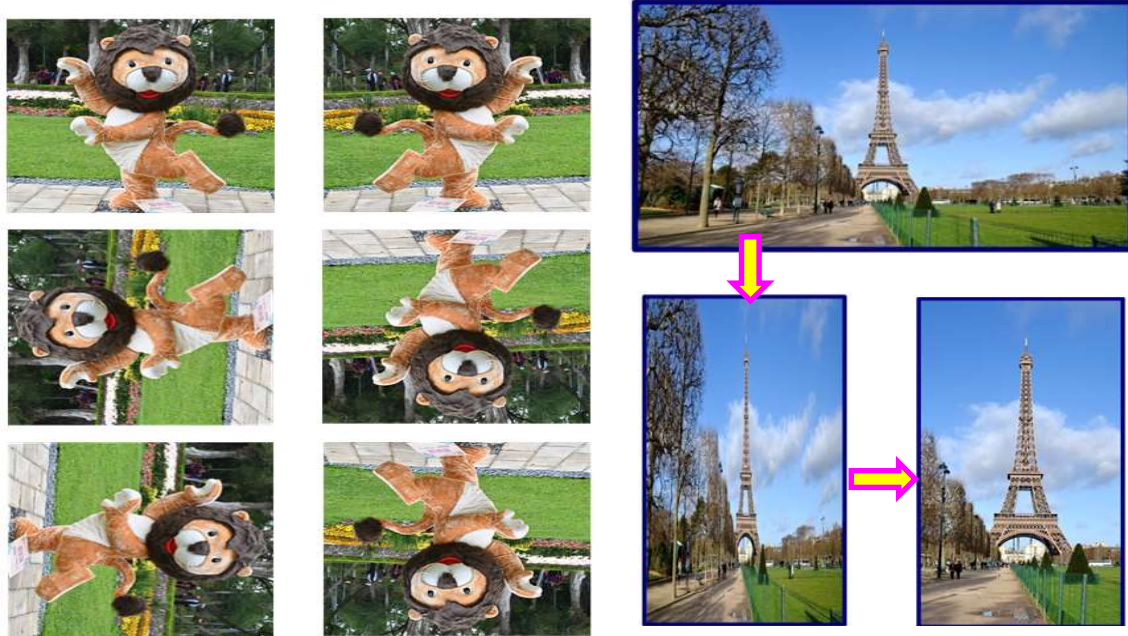
One M800EX has below flexible display functions:

1. One big content edge blending.
2. Independent content display from each projector.
3. 16:9 / 16:10 image at the center.
4. Edge Blending with projector at portrait to increase image height.
5. PIP/POP in each projector.



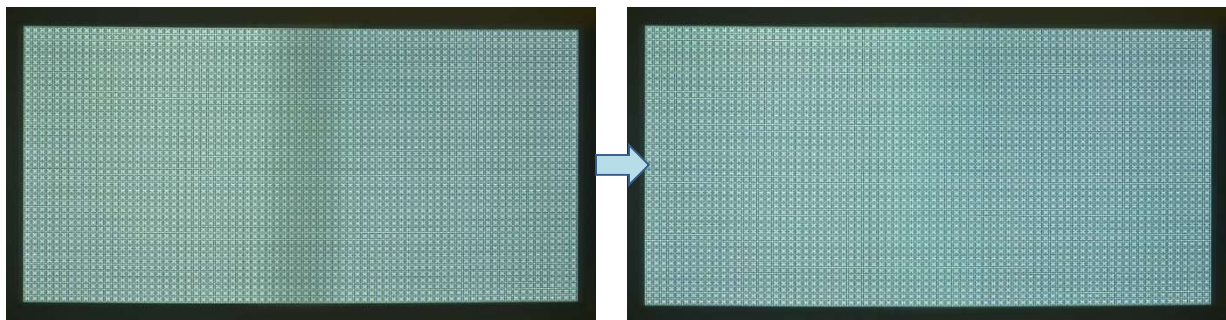
Image Flip & Rotation

Image 90/180/270 degrees rotation and flip up to 4k/60Hz resolution. After image rotation or flip, user can also adjust the aspect ratio.

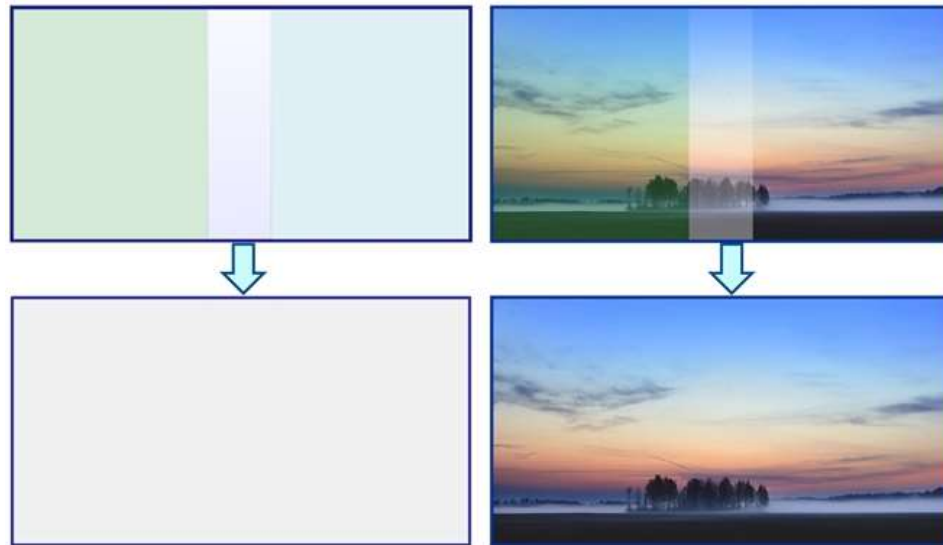


Independent RGB gamma correction

Independent RGB gamma value adjustment in Overlapped region allows more capability to compensate color banding in overlapped region.



White balance & Color correction



Nine region Black level uplift

It can compensate the light leakage in the projectors, especially in low contrast ratio projector under dark working environment. The native contrast ratio is related to projector light leakage and can't be reduced through signal processing. Higher native contrast ratio will have less light leakage. Laser projector will have high contrast ratio and is the best choice for edge blending system. Separate RGB precise black level uplift can be executed in multiple regions (up to 9) in each output channel at selectable position.





Nine regions black level uplift. Each region can set different RGB gain and offset.

Edge Mask

There are two edge mask functions in M800EX. One is image [Shift] and another one is Edge [Mask] under Edge blending menu.

1. [Shift]: Able to do edge mask with black background in each edge up to 500 pixels. The image mask location will follow the image position after geometry alignment.
2. [Edge Mask]: There are 8 control points for edge mask. When user moves the position for each control point it will result many kinds of edge mask pattern. The maximum position adjustment for each control point is +_ 900 pixels.
3. The adjusting range in [Shift] is based on the image position after geometry alignment and the range in [Mask] is calculated from original edge position before geometry or [Shift] adjustment. Both functions can be implemented at the same time.



Original Image after geometry alignment

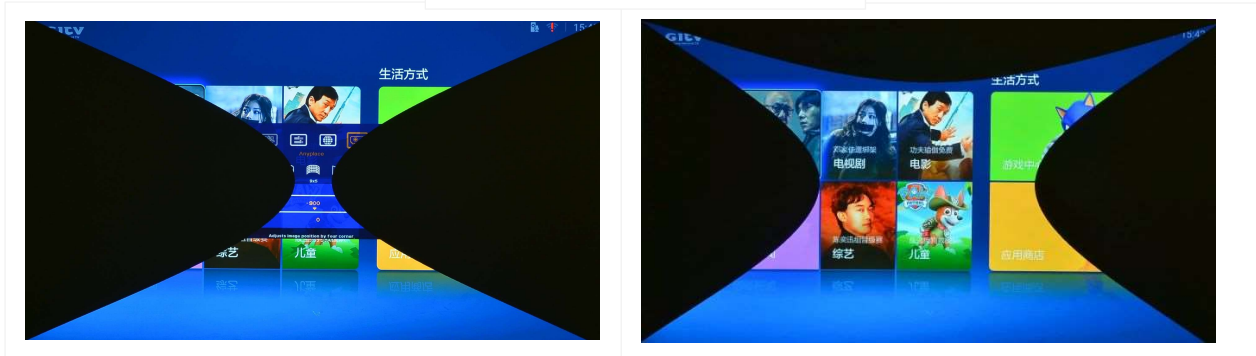


Image [Shift] (Follow geometry curve)



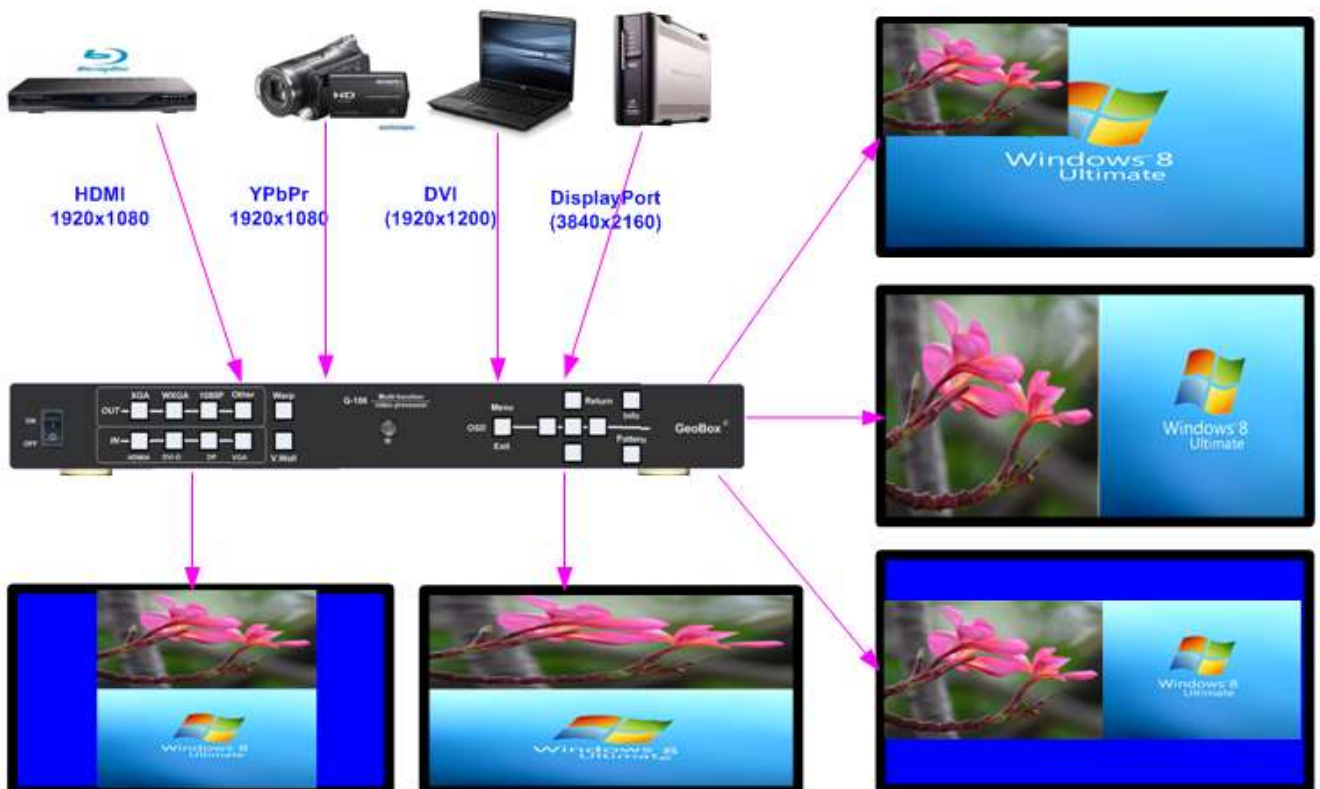
Image [Mask] (executed by 8 control points)

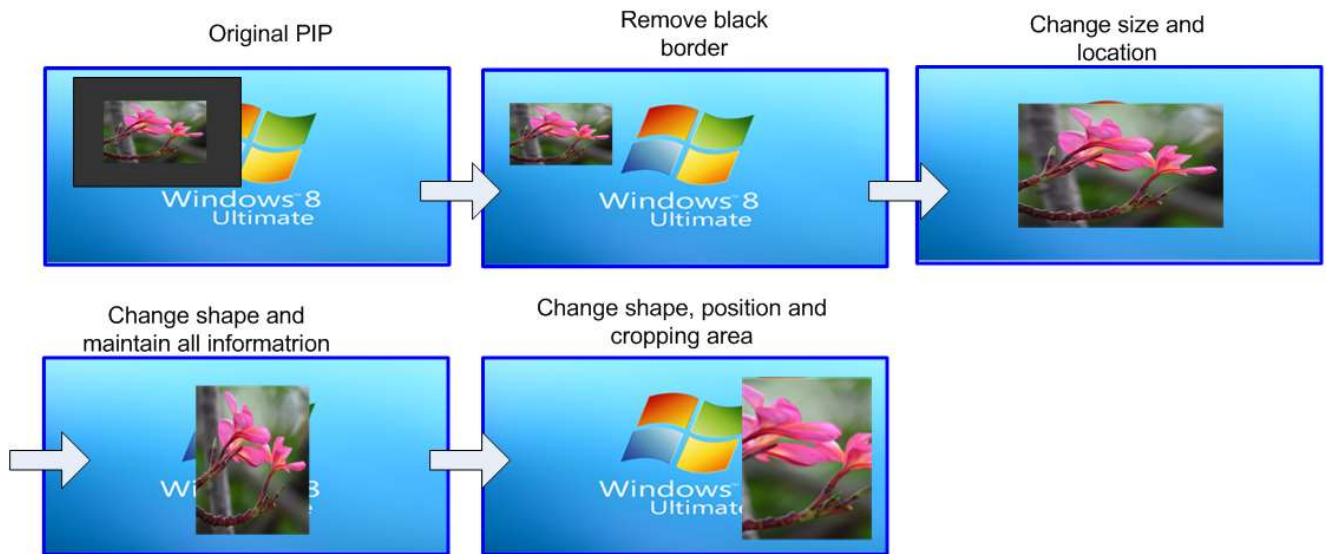
Another Image [Mask] example



PIP/POP function

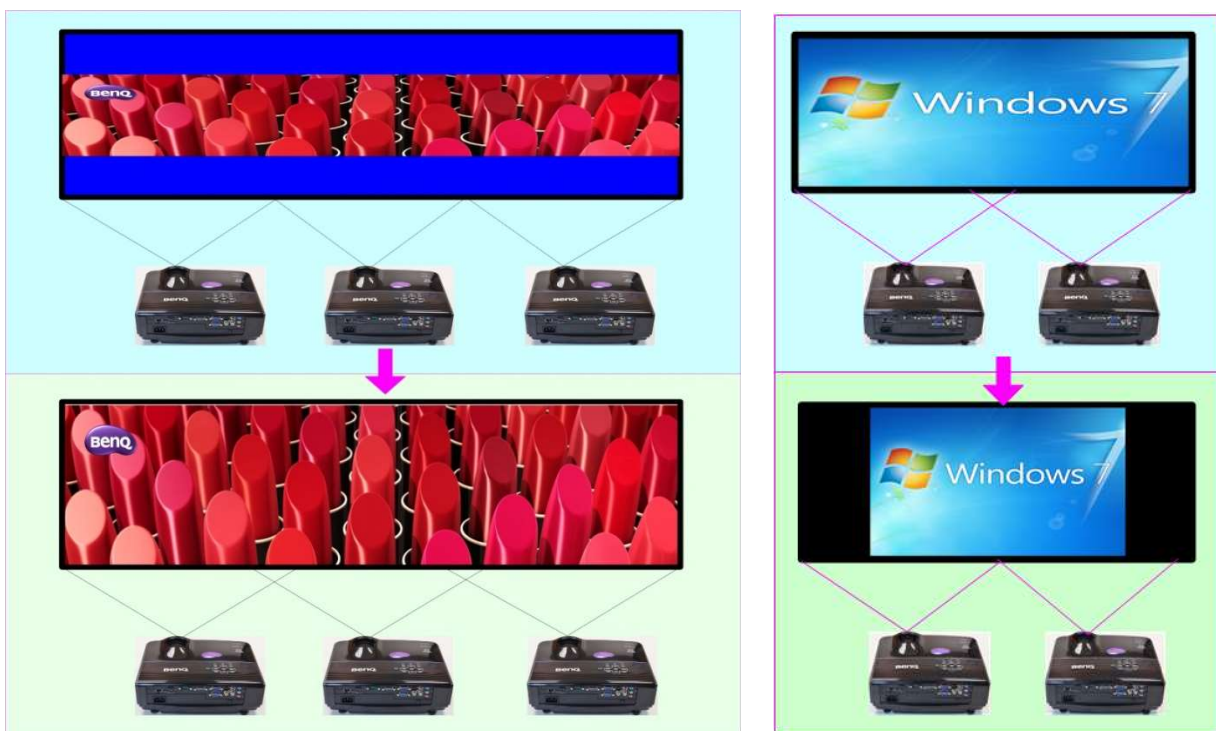
M800EX is designed with PIP/POP function in each processing module. Each processing module can display two contents with PIP (Picture in Picture) or POP (Picture outside picture). User can select two contents among HDMI, DP & VGA for PIP/POP display but can't select two HDMI input signals at the same time. The PIP image can be with variable size from 320*180 to 1920*1200 resolution. The location is flexible around entire display zone in each projector. The POP images can be full screen or keep original aspect ratio.





Stretch image and change aspect ratio

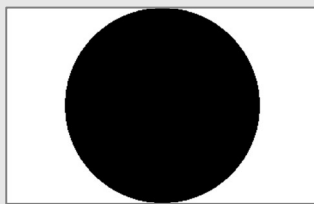
Geometry adjustment and Video wall cropping function can compensate image size or change aspect ratio. The adjusting range is up to 1800 pixels in each edge based on signal source.



Digital mapping (M800Ex)

Projection mapping function is embedded in M800Ex models. User can input up to 10 patterns (images) to M800Ex in each channel, then implement projection mapping. The pattern needs to be 2-bit monochrome with BMP file format. User can use any signal source and select up to 4 display styles in each pattern. User can use any signal source and content and no need to pre-mask in signal source.

Pattern: 1280*800



Type 1



Type 2



Type 3



Type 4

