



The absolute opposite of ordinary

UD101 Lite UHD Warping Box Datasheet

(Warping Box + MultiViewer)

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

4:4:4 full color sampling

*Output: up to 4096*2160 @60Hz*

- *Image warp & geometry alignment*
 - *Edge mask*
 - *PIP/POP*
- *MultiViewer function*
- *Quick seamless input swap*



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Introduction

UD101 Lite (UD101L) is multi-purpose warping box with multiple functions for LED, LCD and projectors. Multi-units can be cascaded for large scale display.

4 input ports (3x HDMI 2.0, 1x DP 1.4) and 1x HDMI outputs are designed in UD101L. Digital input supports up to 7680*2160 @30hz and 7680*1200 / 4096*2160 @60Hz with 4:4:4 full color sampling. Output supports up to 4096*2160 @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.

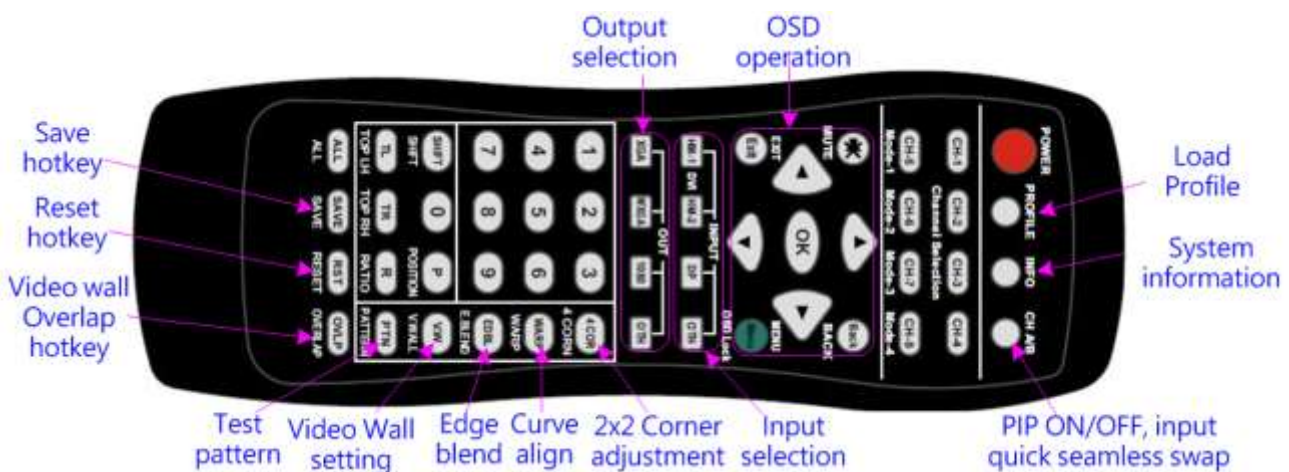
Advanced warp technology is embedded in UD101L. User can use IR controller, USB, WebGui and Ethernet for the operation. Geometry alignment is up to 17x9 control points and 128x68 grid pixel position fine-tune is embedded. Linearity Grid Line Adjustment and Corner Wall image adjustment for mapping image at 90 degrees corner are integrated in UD101L. Users can see real time geometry and color adjustment to get optimized result.

Video wall function is to split and allocate source image. Overlap function is to crop image at desired location, shift image position and change aspect ratio.

HDMI loop out is designed for signal source monitoring and multi-unit daisy chain connection.

PIP (picture in picture) and POP (Picture outside Picture) are standard functions in UD101L. PIP image size is from 320*180 up to 1920*1200 with flexible position and aspect ratio adjustment. Quick seamless main/sub images swap. Overlap function allows further image size, aspect ratio and cropping area adjustment in PIP window.

UD101L is an ideal front end processor for image stacking, geometry alignment, PIP, POP, image format conversion, de-interlacing, image rotation and mobile mirror image displayed on portrait TV. It provides easy configuration, low entry barrier, cost effective, reliable and flexible solution.



Specification

- Input: 3x HDMI 2.0b, 1x DP1.4, Output: 1x HDMI 2.0, input seamless switcher function can be selected.
- Loop output: 1x HDMI 2.0b for audio and daisy chain connection.
- HDCP compliance: Input: HDMI: HDCP V2.2/V1.4, DP: HDCP: V1.3, Output: HDCP V2.0/V1.4.
- Max. input resolution: DisplayPort: 7680*4320 @30Hz, HDMI: 7680*2160 @30Hz, 7680*1200 @60Hz, 4096*2400 @50Hz, 4096*2160 @60Hz. Max. pixel clock: 600 MHz.
- Input supports progressive and interlaced RGB/YUV signal, 4:4:4 Chroma sampling, up to 30 Color bits.
- Support non-VESA standard input timings for easy connection with various signal sources.
- 16 preset Outputs: up to 4096*2160 @60Hz, progressive 4:4:4 RGB. Max. pixel clock: 600 MHz.
- 1:1 pixel to pixel native image display with original quality.
- 2 frames system latency: 33ms (@V=60Hz)
- Warp engine for geometry alignment up to 17x9 control points.
- 120x68 grid pixel position fine-tune is embedded. Each control point can be adjusted with 1/4 pixel/step and moved up to 12.5 pixels adjustment range. Maximum adjusting points are 100 points.
- Maximum geometry adjustment up to 1200 pixels in both H&V directions for each corner.
- Support W shape Corner Wall adjustment in H&V at flexible location.
- Support Linearity Grid Line adjustment for quick H&V line position alignment. It is good for the line gap adjustment on curved screen display.
- Edge Mask with 8 control points up to 900 pixels at each control point in H&V directions.
- Embedded video wall function for image split, cropping and aspect ratio adjustment.
- Selectable geometry alignment grid size from 8-120 pixels in H&V direction. Default is 32*32 pixels.
- Selectable grid pattern color with optional transparency to allow user to apply external test pattern.
- Flexible aspect ratio adjustment in each edge up to +_ 1800 pixels position shift.
- 3D format conversion: Convert 3D input signal into Side by Side, Top/Bottom and frame sequential output format for passive 3D and active 3D displays.
- OSD menu location is adjustable.
- 10-bit processor, 3:2/2:2 cadence, low angle smooth algorithm, high quality scaling engine.
- 3D motion adaptive de-interlace.
- Frame lock function to get perfect synchronized outputs in multi-unit application.
- Frame rate conversion and 50Hz in/out function to eliminate image frame drop or repeat.
- Support xvYCC & 8/10/12-bit deep color processing.
- Automatically support HDR 10 input signal processing with SDR full color RGB 4:4:4 output.
- 90/180/270 rotation, flip, cropping, scaling & color adjustment up to 4k/2k 60Hz input signal. User can do more rotation angle fine-tune through geometry alignment.
- PIP/POP function with PIP image size from 320*180 up to 1920*1200 resolution with flexible position and adjustable aspect ratio. 2/3/4 split view POP is integrated.
- Quick seamless swap between two input signals.
- Selectable and programmable EDID in the range: H=1024-4080, V=720-3840.
- User can save up to 10 settings that can be stored and backup in PC and recalled at any time.
- ESD Protection: ±15kV (Air-gap discharge), ±8kV (Contact discharge)
- Working environment: 45° C, 10-90% RH
- Control: IR, RS232, USB, Ethernet
- CE/FCC/RoHS Certified
- Power supply: DC 12V 2A, Power consumption: DC 12V/1.1A (13.2W)
- Dimension and weight (Body Only): 303mm*190mm*40mm, 1.2Kg
- 2 Year Warranty, paid extension available up to 5 years.

Functions and features

A. Input / Output (the spec may be changed)

- Input: 3x HDMI 2.0b (600 MHz), 1x DisplayPort 1.4 (1080 MHz).
 - Support 7680*2160 @30Hz, 7680*1200 @60Hz/4096*2160 @60Hz with 4:4:4 chroma sampling without compression.
 - DisplayPort input supports up to 7680x4320 @30Hz input resolution.
 - Connect with various video sources and support none VESA standard input resolution.
 - Support progressive and interleaved input signals.
 - Seamless switching function can be selected.
- Output ports: 1x HDMI2.0b. Selectable output resolutions: UHD60, UHD50, UHD30, 4096x2160 (60/50), FHD60, 1920x1200, 720P60, XGA60, 1280x800, 1360x768, SXGA, 1400x1050, UXGA, FHD50, 1920x1200/30, FHD24, FHD30, FHD120, UHD24, FHD240, 1152x576/60, 1152x1152 1536x1536, 2304x1152/60, 2304x1182/30, 10-bit deep color.
 - Loop out port: 1x HDMI 2.0b, same as source signal from nearby HDMI input port up to 8k/2k (2k/8k) @30Hz / 4096*2160 @60Hz.
 - All outputs are RGB 4:4:4 progressive signals.
 - Selectable 8-bit/10-bit Deep Color mode for each output port.
 - Automatically detect HDR BT. 2020 input signal and processing with SDR full color 4:4:4 RGB output.

B. Image warp and geometry alignment

- Test pattern grid size for geometry alignment is from 8-120 pixels in H&V. Default is 32*32 pixels.
- 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.
- Each box controls one projector and can be cascaded to support unlimited number of projectors.
- Integrated with full function IR remote controller. Manual geometry alignment via Remote controller up to 17x9 control points.
- 120x68 grid pixel position fine-tune is embedded. Each control point can be adjusted with 1/4 pixel/step and moved up to 12.5 pixels adjustment range. Maximum adjusting points are 100 points.
- GCT PC tool is available for geometry alignment up to 17x9 control points through USB or Ethernet. After finishing geometry alignment, the parameters can be stored inside PC or GeoBox and no more PC tool is needed.
- Geometry alignment range:
 - Geometry alignment range is based on keystone angle in horizontal and vertical direction. The maximum geometry alignment range is about 40° horizontal keystone and 35° vertical keystone in combination of all geometry alignment, including 2x2 and warp alignment.
 - 2x2: each control point (4 corners) can be moved up to H=+_ 600 pixels and V=+_ 600 pixels. It is about H=600/3840 and V= 600/2160 position shift when the output is 4k/2k output resolution. If the

output resolution is 1920*1080, it will have bigger keystone angle. The adjustment range will be still about H=+_600 pixels and V=+_600 pixels before image crush. It is about H=600/1920 and V=600/1080 position shift.

- 3x3: each control point (total 9 control points) can be moved up to H=+_600, V=+_600 pixels. If user applies both H&V adjustment, the range will be lower.
- 2x2 and 3x3 can be executed at the same time but the combination of the geometry alignment will be limited to H=+_1200 pixels and V=+_1200 pixels for each control point.
- When user applies both H&V direction geometry alignment, the adjustment range may be reduced. User will see abnormal display (some noise or image crush). While the image is crushed, user can return the adjustment value or adjust adjacent control points to let the image back to normal.
- The major geometry alignment should be done through 2x2 and 3x3. Other warp function such as 5x3, 9x5, 17x9 and 120x68 alignments are for position fine-tune purpose only. Geometry alignment shall follow 2x2→3x3→5x3→9x5→17x9→120x68 sequence. If user executes 120x68 and back to 9x5, only 9x5 warping data will be kept.
- 2x2 is independent and it can combine warp result in 3x3, 5x3, 9x5, 17x9. However, it will reset 120x68 grid point warp result and only keep up to 17x9 warp result.
- If user executes geometry alignment to some extent with 2160P output resolution and switch back to 1080p output resolution, the image may crush due to bigger geometry alignment angle. If switch from low output resolution to high input resolution, the image will not crush.
- W shape Corner Wall geometry alignment: up to 1200 pixels adjustment range in 12 control positions at H/V directions. The image distortion range at wall corner depends on the throw ratio of the projector. Longer throw ratio will have less image distortion and easier for Corner Wall alignment. W shape corner adjustment can correct the image in both sides of the pillar at wall corner.
- Linearity grid line adjustment: User can use this function to move the position of a group of vertical lines or horizontal lines simultaneously. The major purpose is to move complete line position or smooth the gaps in image horizontal or vertical lines in curved screen display. Usually, user will see smaller grid line size at both sides of the curved screen. User can use this function to let all grid lines with the same gap quickly.
- Embedded test pattern grid size is editable from 8-120 pixels in both H&V directions.
- User can select different color in the test pattern and can also apply external test pattern from signal source.

C. High end 10-bit video processing

- 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.
- Complete color adjustment function, including brightness, contrast, hue, saturation, preset color temperature and independent RGB gain adjustment.

D. PIP/POP, MultiViewer

- [PIP]: Picture in Picture display with any two inputs.
- [SBS]: Side by Side display.
- [Top/Bottom]: Top/Bottom display.
- [SBS 2/1]: 2/3:1/3 side by side display with monitor at landscape position
- [POP3]: One image at LH side and two top/bottom images at RH side in landscape monitor.
- [POP4]: One image at Top and two images at bottom in landscape monitor.
- [3X SBS]: Three split views at landscape with the flexibility to adjust center image size from 1/6 to 5/6 of horizontal size.
- [3X T/B]: Three split views at portrait with full screen or original aspect ratio selection.
- [4x Split]: Four split view multi-viewer. (Monitor at landscape only)
- [4x T/B]: Four split view with one image at top and three small images at bottom.
- PIP (picture in picture): with flexible PIP size (320*180 to 1920*1200), location and aspect ratio.
- Except [4x split] & [4x T/B] functions, all the other PIP/POP functions can support monitor at portrait and landscape position. Sub- images also support rotation and flip up to 4k/2k 60Hz.
- Cropping function is available in PIP and POP image for further location, size and aspect ratio adjustment as well as creating image borders with black or blue color.
- Main and sub-image color can be further adjusted to get optimized video quality.
- All the inputs for main and sub-images can be up to 4k/2k 60Hz 4:4:4 signals.

E. Quick PIP ON/OFF and two input seamless swap

- User can use remote controller [CH A/B] hotkey to turn ON/OFF PIP image.
- If the output resolution is set to FHD or 1920x1200, user can assign one input signal to main and another signal to PIP channel and execute quick input seamless swap through this function.

F. Video wall function

- Image split, cropping and location assignment for each projector.
- Video Wall overlap functions up to +_1800 pixels in H&V direction in each edge:
 - Image position adjustment
 - Image cropping area adjustment.
 - Irregular video wall application
 - Aspect ratio adjustment.

G. Native 1:1 image display mode

When single content is displayed on the screen, user has below choices for the display:

- [Full screen]: to display the content with full screen. The image will be scaled to full screen no matter the input is with what kind of aspect ratio.
- [Original AR]: to display content with original aspect ratio. If 4:3 input content is displayed on 16:9 monitor, it will keep 4:3 image aspect ratio with vertical full screen on the monitor.
- [1:1]: to display native pixel to pixel image at the center of the screen. When XGA image is displayed

on 16:9 monitor, it will show up pixel to pixel XGA image at the center of the monitor without scaling to keep original image quality.

- Further image cropping and aspect ratio adjustment is still available.

H. Image rotation and flip

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

I. Edge Mask

8 control points to define the area for edge mask up to 900 pixels in each point. It can work together with geometry alignment to get various edge mask effect. Edge mask will not change the image aspect ratio.

J. 3D function

- Passive 3D: Decode 3D input signal into RH/LH eye frame output for passive 3D display.
- 3D format conversion: Convert Frame packed, Frame Sequential, Top/Bottom, Side by Side, Line interleaved input signal into RH/LH, Side by Side, Top/Bottom and frame sequential output signal for passive 3D and active 3D displays.

K. Various color adjustment

- Independent R.G.B color gain adjustment.
- Preset color temperature: Standard, Reddish, Bluish
- Brightness, contrast, Hue, saturation and sharpness adjustment.

L. System control and other features

- Full function OSD through WebGui or IR.
- Firmware update via USB or Ethernet.
- GCT PC tool can control multiple processors simultaneously through USB or Ethernet.
- Internal grid pattern with selectable color and grid size for easy geometry alignment.
- Standard RS232 & Ethernet control protocol compatible with most of control system.
- User can select blue or black background color when no input signal is detected.
- Programmable EDID in the range at H=1024-4080, V=720-3840.
- BOX ID and programmable IP address for convenient multiple unit control at the same time.
- User can save up to 10 settings and can be recalled by remote controller, RS232, USB or network.
- System settings can be backup in PC and copied to another unit.
- Automatic power ON/OFF through input signal control. While no input signal is detected, it will shut down output automatically. If it detects input signal again, it will automatically output signal to display devices. User can power ON/OFF the system through the control in signal source.

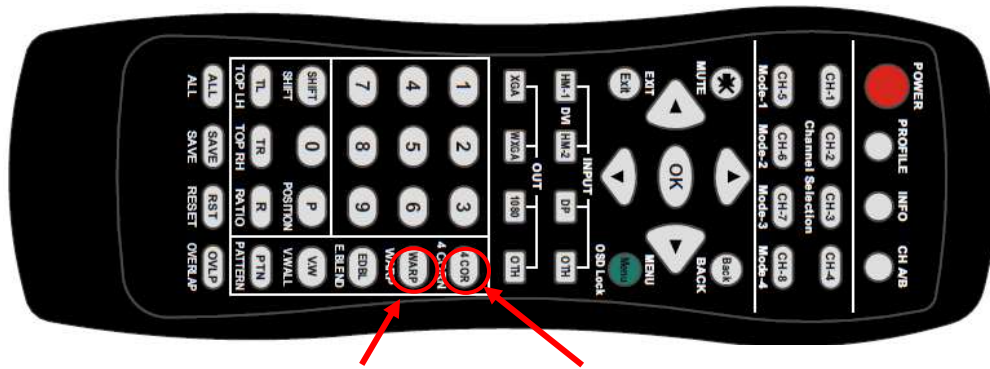
Application

- 4K Projector display on curved screen. It is good for golf simulation and big screen game application.
- Change aspect ratio of the screen to meet required screen size.
- Display mirror image of mobile phone or iPad on 4k portrait monitor for game or commercial application.
- PIP/POP to add second video content on the screen with flexible image size, aspect ratio and position adjustment.
- Quad split view multi-viewer to display 3/4 split view content in one 4k display.
- Crop any size and location of the image for the display.
- Image rotation for portrait display without rotating image source.
- Correct image distortion in ultra-short throw ratio projector application.
- Edge mask to remove unnecessary image at the edge.
- Smooth display projection image on 90 degrees wall corner. ("V" type corner wall adjustment)
- Display image on 90 degrees wall corner with square pillar on it. ("W" type corner wall adjustment)
- Stacking multiple projectors to increase the brightness of the image.

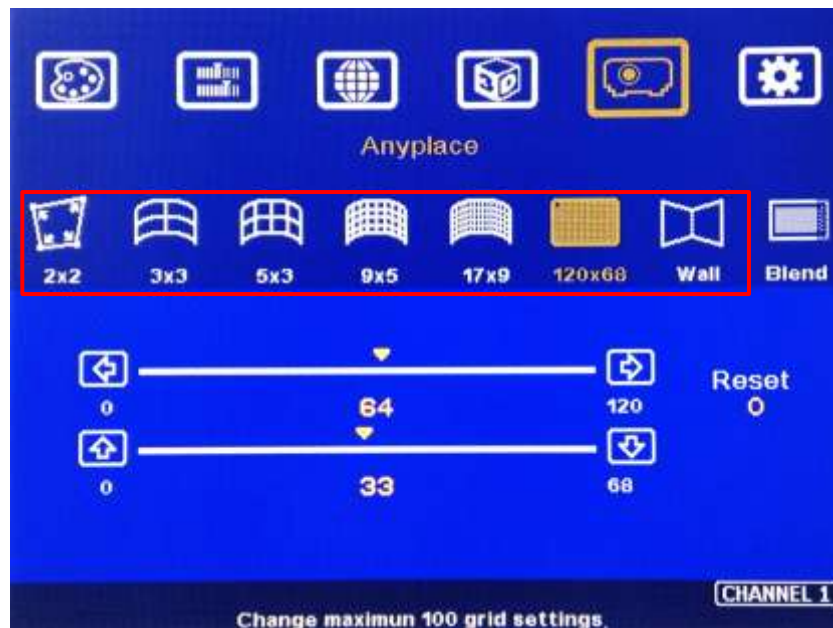
Feature illustration

A. Geometry alignment menu

- User can execute geometry alignment through remote controller, OSD, WebGui or PC tool.
- The control point is 17x9 with remote controller & PC Tool.

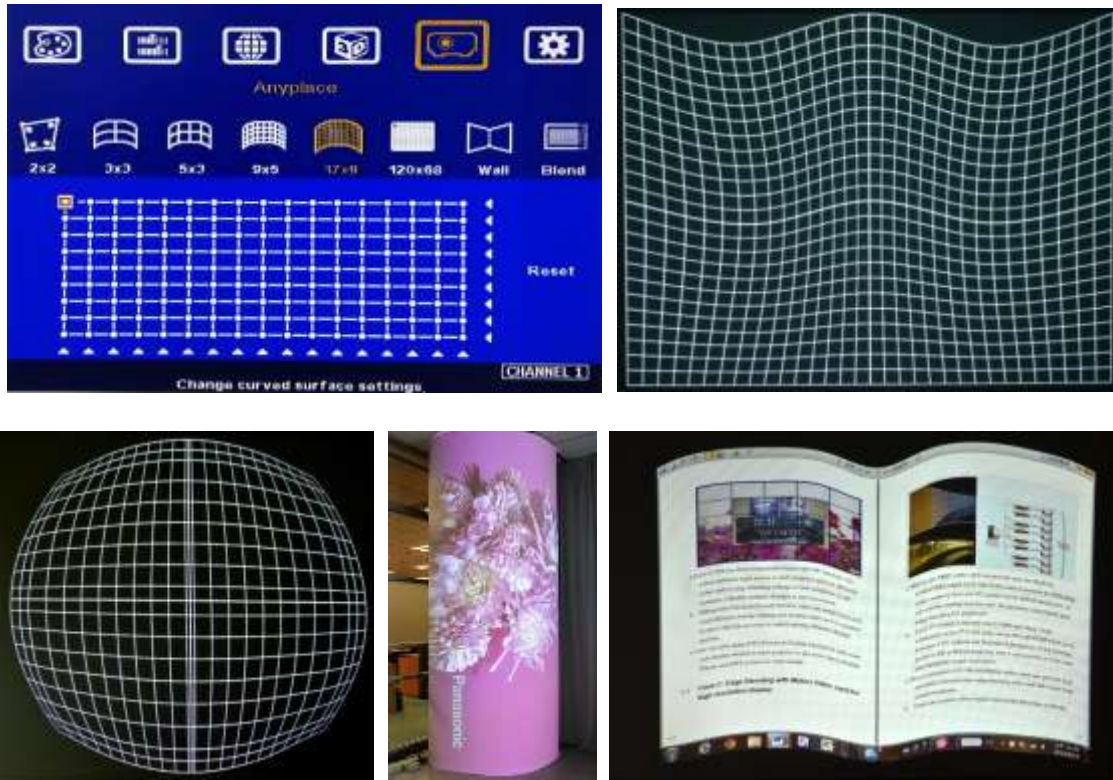


[3x3], [5x3], [9x5], [17x9] Warp [2x2] 4 Corner alignment hotkey



B. Image geometry alignment and warp

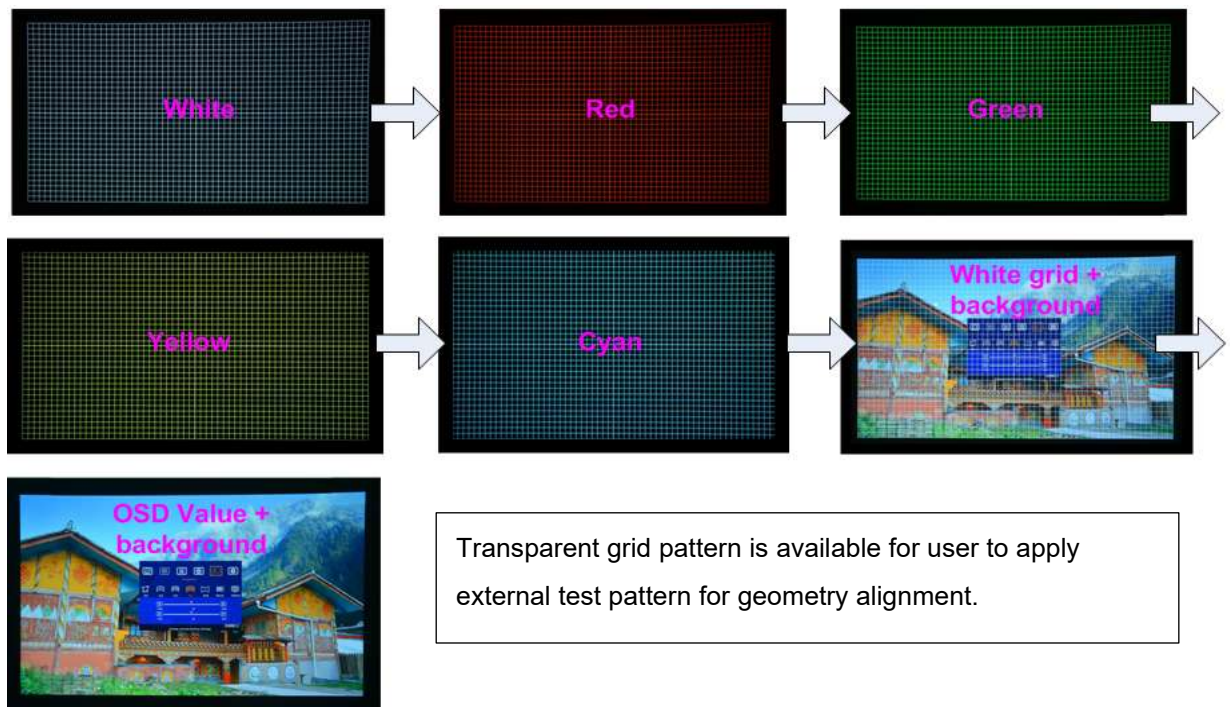
User should follow [2x2]→ [3x3]→ [5x3]→ [9x5]→ [17x9]→ [120x68] sequence to do geometry alignment to get smooth scaling factor in the image in all regions.



C. Variable Grid Patterns for geometry alignment

Grid pattern is required for geometry alignment. User can activate test pattern through [Pattern] hotkey in remote controller or through WebGui and GCT PC tool.

- The default grid size is 32*32 pixels. User can select different grid size from 8-120 pixels. Each channel can be set separately.
- There are 6 pattern styles for user to select. When user presses [Pattern] key, it will circulate from [White]→ [Red]→ [Green]→ [Yellow]→ [Cyan]→ [White grid + background]→ [OSD menu + Background]
- If user wants to apply his own test pattern, please select the last transparent pattern mode to show up user pattern.
- User can select different pattern color for each projector while doing image geometry alignment.
- User can see geometry adjusting value when select [Background + OSD] display style.



D. Selectable grid pattern size for geometry alignment

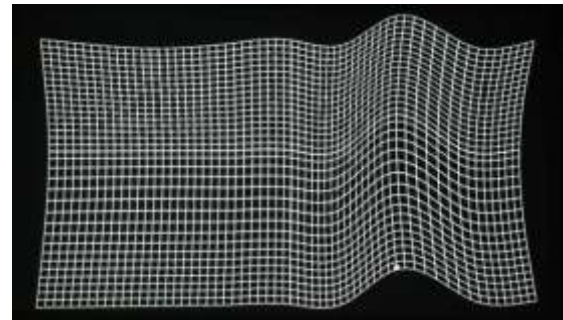
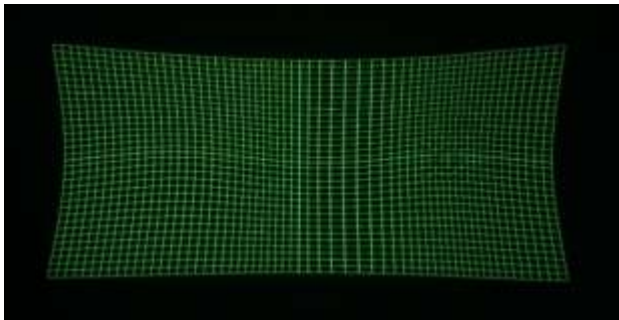
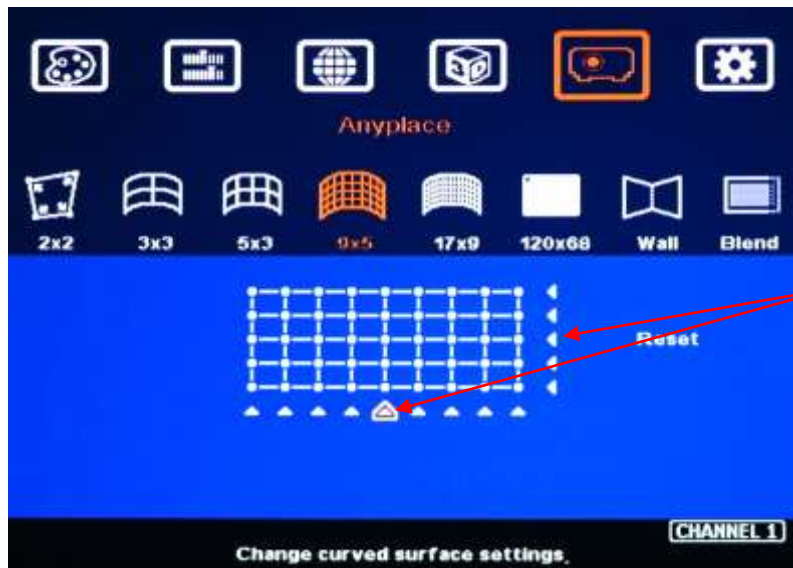
- The grid size in both horizontal and vertical directions is from 8 to 120 pixels with 1-pixel increasement. H&V grid size will be the same.
- Default grid size for both H&V directions are 32x32.



E. Linearity grid line adjustment

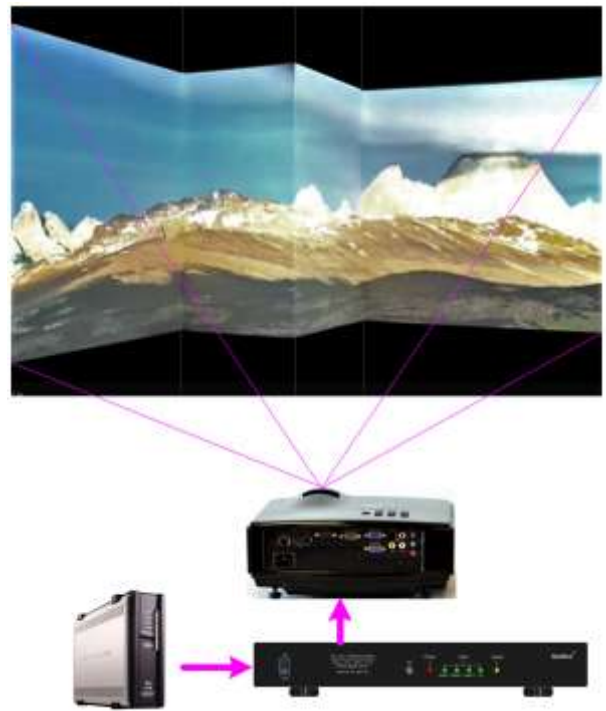
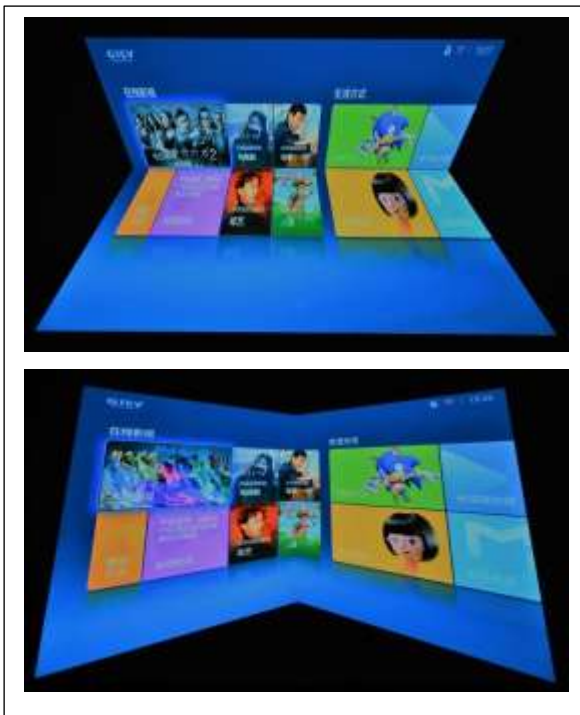
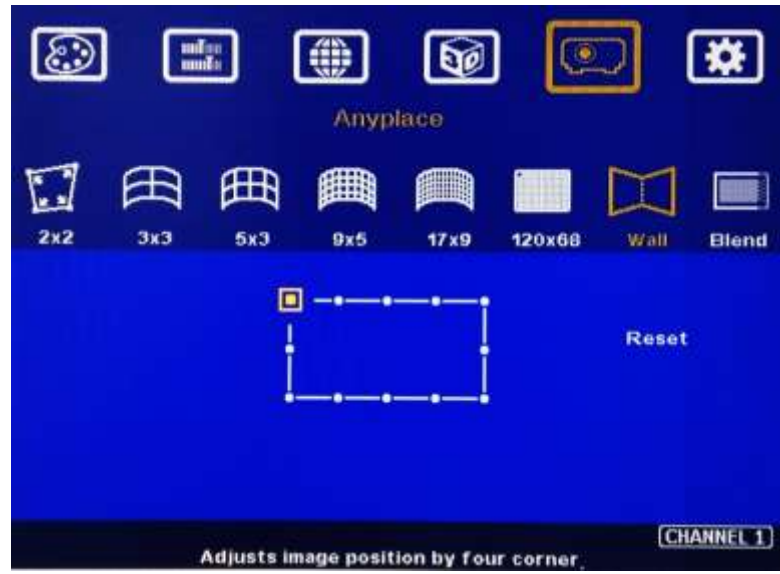
When projector projects image on curved screen, the image will change the grid size gradually and cause different scaling factor on the center and both sides. Linearity grid line adjustment is to compensate this kind of effect and make complete image with the same scaling factor. This function can be executed only through OSD menu operation.

1. It can be applied to both horizontal and vertical directions.
2. The operation OSD menu is under 3x3, 5x3, 9x5 & 17x9 warp alignment menu. The result can be further adjusted by PC tool for image position fine tune.
3. Linearity grid line adjustment can be executed together with warp alignment at the same time.



F. “W” shape Corner wall Alignment

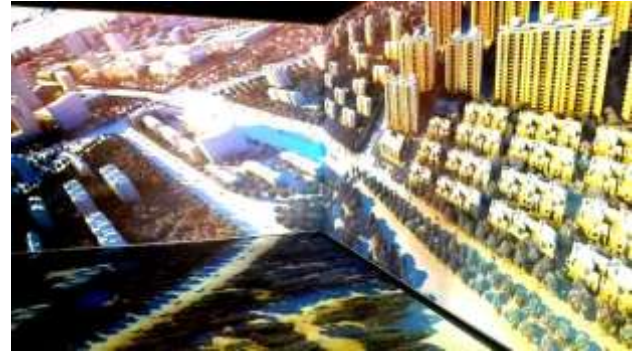
- Corner Wall alignment function is functional either in horizontal or vertical direction. 12 control points across entire edges are integrated. Corner Wall geometry alignment range up to ± 1200 pixels in each control point in H&V directions. 4 Corner position alignment is integrated in these 12 control points. The function is similar to 4 corner geometry alignment to let complete image shift position with the same scaling factor. The other 8 control points are for geometry alignment for the corner wall image. Edge Blend function are still available when user implements Corner Wall adjustment. Other geometry alignment and Warp function will be disabled when Corner Wall alignment is enabled.
- W shape Corner Wall alignment can correct the image on both sides of the pillar at wall corner.



Three projector Corner Wall application



Another Corner Wall application examples



G. Edge Mask

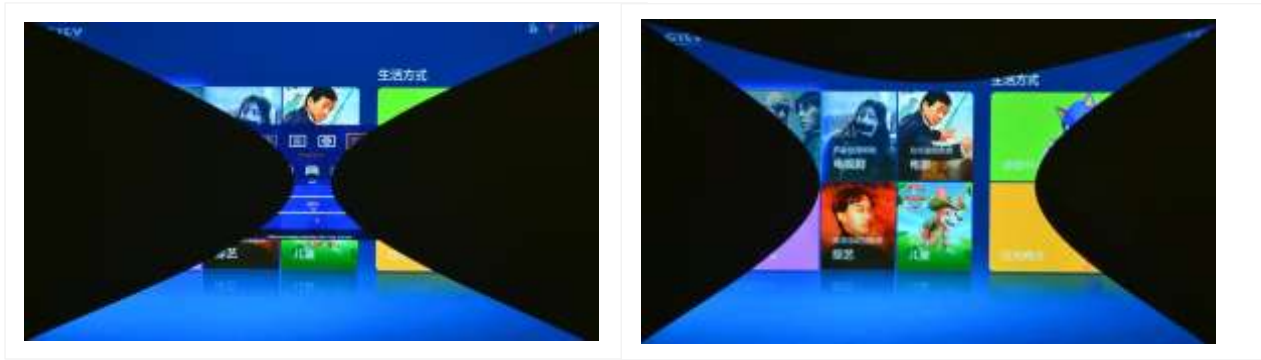
Edge mask function is integrated in UD101 Lite.

- [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.
- The adjusting range in [Mask] is calculated from original edge position before geometry. User can execute both geometry alignment and Edge Mask to get various mask effect.





Example: Another Image [Mask]



H. PIP/POP function

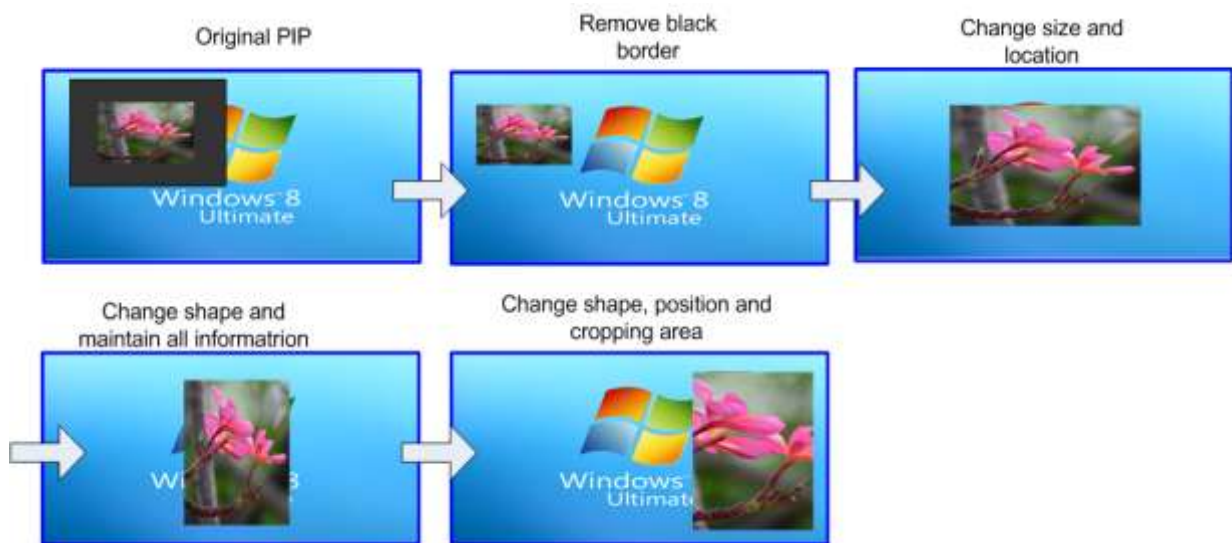
- [PIP]: Picture in Picture display with any two inputs in each channel.
- [SBS]: Side by Side display.
- [Top/Bottom]: Top/Bottom display.
- [SBS 2/1]: 2/3:1/3 side by side display with monitor at landscape position
- [POP3]: One image at LH side and two top/bottom images at RH side in landscape monitor.
- [POP4]: One image at Top and two images at bottom in landscape monitor.
- [3X SBS]: Three split views at landscape with the flexibility to adjust center image size. Center image size can be up to 5/6 of the screen.
- [3X T/B]: Three split views at portrait with full screen or original aspect ratio selection.
- [4x Split]: Four split view multi-viewer. (Monitor at landscape only)
- [4x T/B]: Four split view with one image at top and three small images at bottom.
- PIP (picture in picture): with flexible PIP size (320*180 to 1920*1200), location and aspect ratio.
- Except [4x split] & [4x T/B] functions, all the other PIP/POP functions can support monitor at portrait and landscape position. Sub- images also support rotation and flip up to 4k/2k 60Hz.
- Cropping function is available in PIP and POP image for further location, size and aspect ratio adjustment as well as creating image borders with black or blue color.
- All the inputs for main and sub-images can be up to 4k/2k 60Hz 4:4:4 signals.



All PIP/POP functions

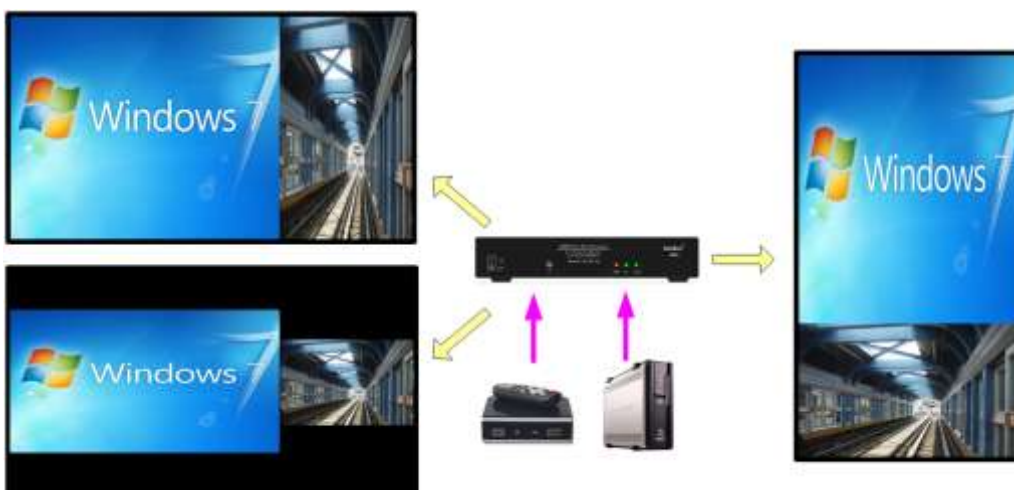


Cropping function through Overlap adjustment

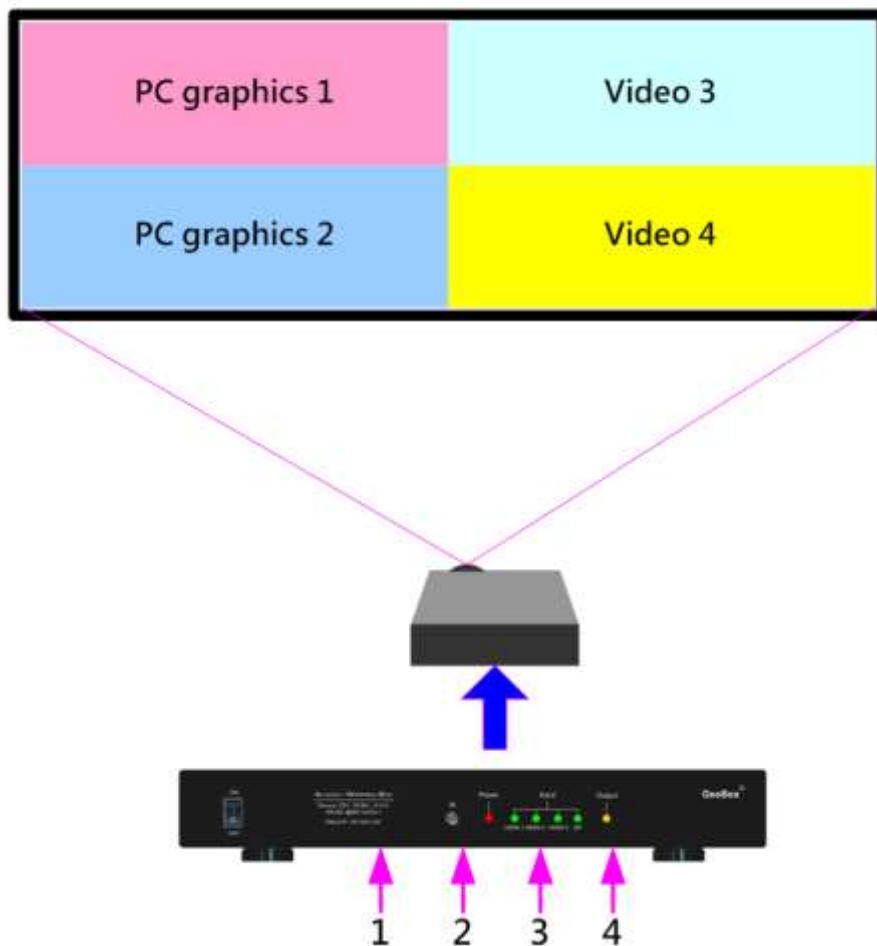


I. MultiViewer function

3 split views

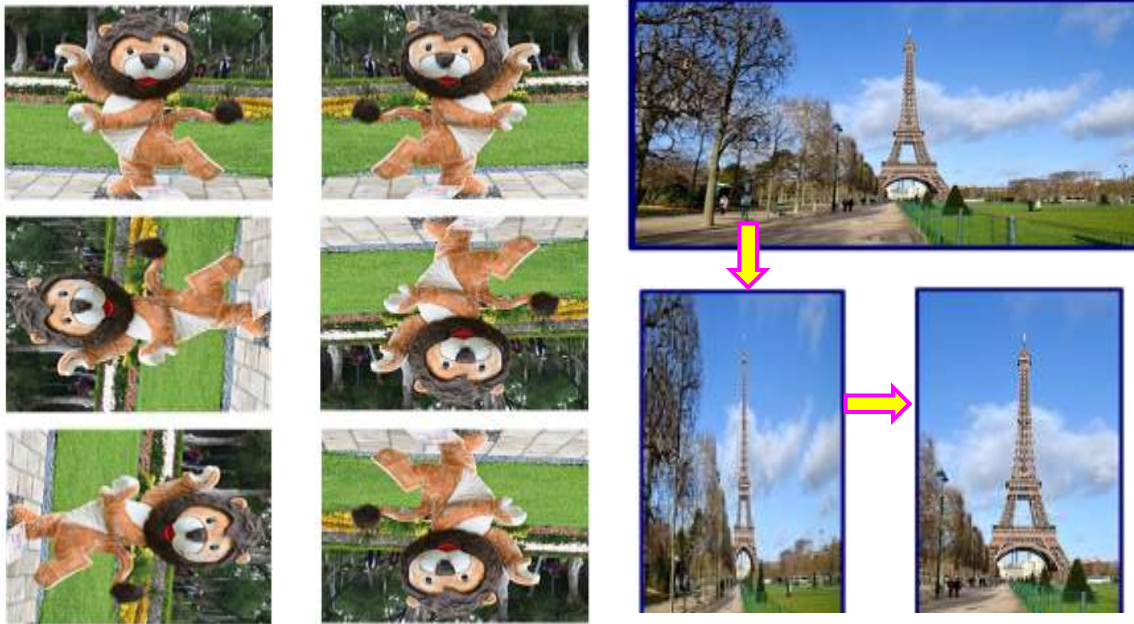


4 split views (One signal shall come from DisplayPort)



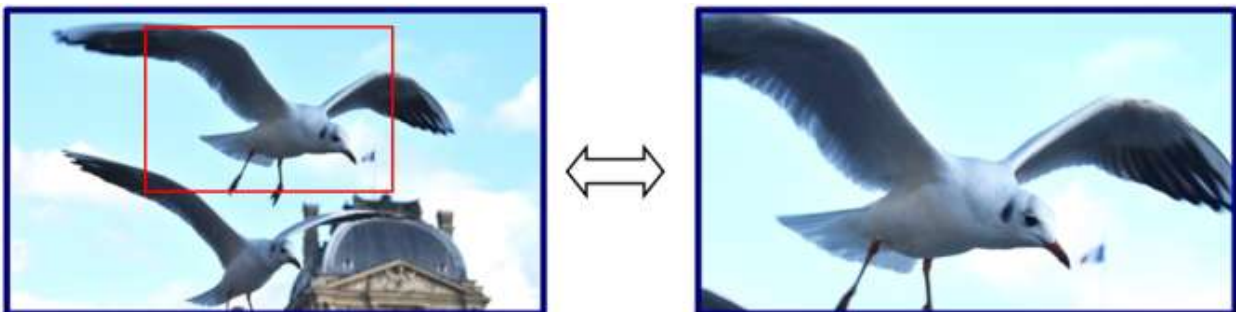
J. Image Flip & Rotation in main and PIP/POP (Sub-images)

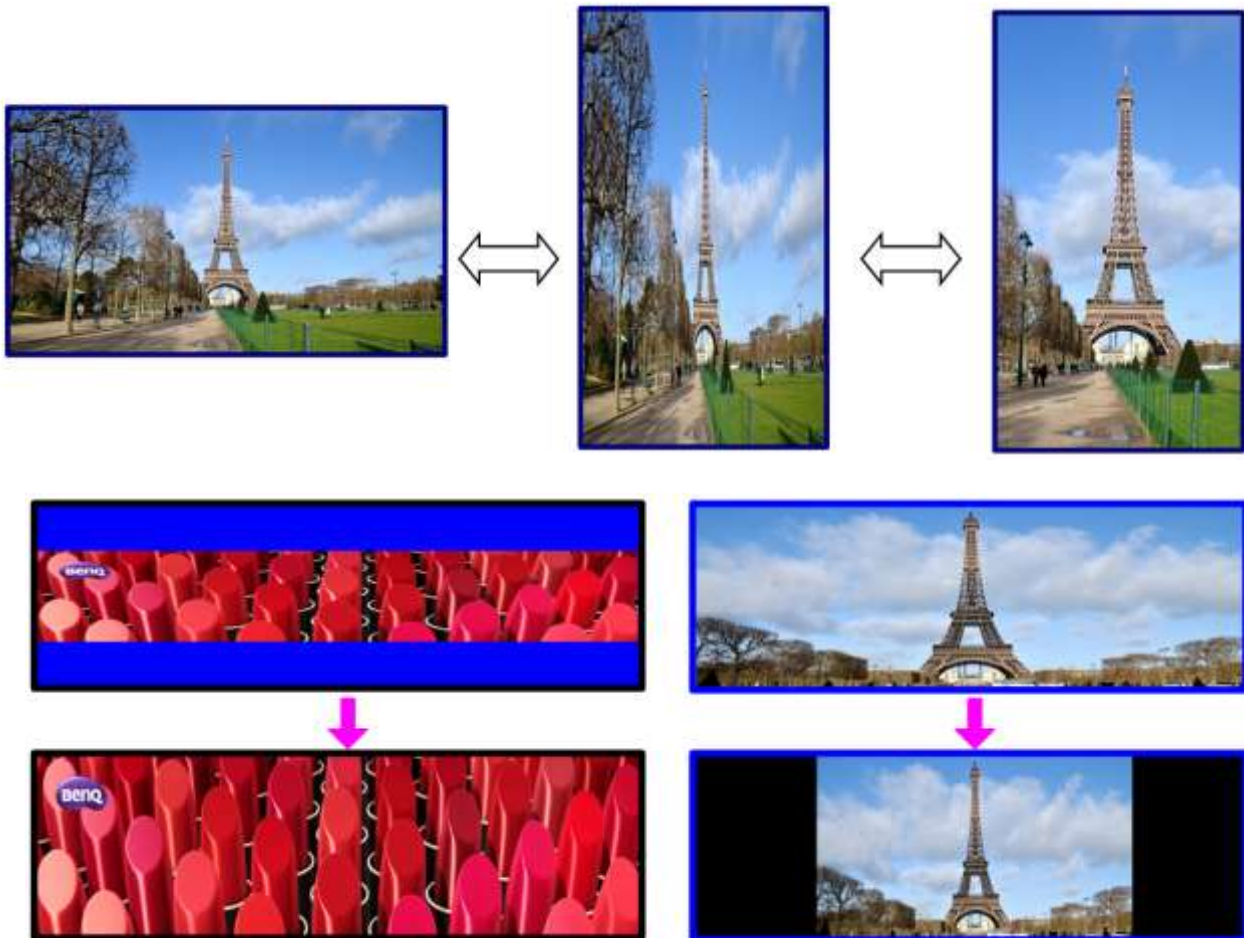
Image 90/180/270 degrees rotation and flip up to 4k/60Hz resolution in both main and sub-image independently. After image rotation or flip, user can also adjust the aspect ratio and cropping area.



K. Stretch image, shift position and change aspect ratio

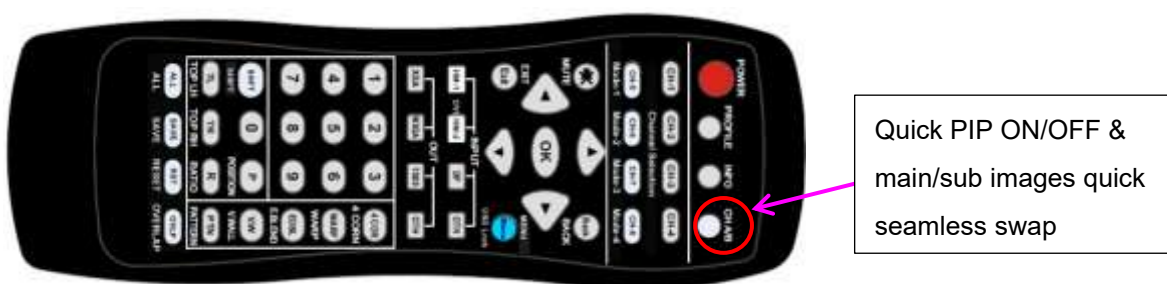
Geometry adjustment and Video wall cropping function can compensate image size, position shift or change aspect ratio. The adjusting range is up to 1800 pixels in each edge based on signal source.





L. Quick PIP ON/OFF and two inputs quick seamless swap

- CH A/B key in remote controller can execute quick PIP image on/off.



- When the output resolution is set to 1920x1200 or 1920x1080, user can add full screen PIP image on top of main image. User can click [CH A/B] key to turn on/off PIP image to swap main/sub-images seamlessly.
- This image swap can be applied to any two inputs. Please assign one input to main image and another input to PIP image, then click [CH A/B] key to execute seamless quick swap between these two inputs.



M. 3D format conversion and Active 3D application

UD100 can convert Line interleaved and frame packed 3D from Blue Ray DVD player into Side by Side, Top/Bottom or Frame Sequential 3D format output signal for 3D display devices, including FHD 120Hz for 4K UHD projector active 3D display. When connected with two UD101L, user can decode 3D signal into RH/LH discrete outputs for passive 3D display.

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