



The absolute opposite of ordinary

G112 Mini Edge Blending Processor User Guide

Input: up to HDMI 1.4, 3840*2160 @30Hz

4:4:4 full color sampling

Output: Up to WUXGA @60Hz, 2048*1080/60Hz

Warping up to 17x9 control points

Flat and curved Edge Blending



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This device is designed and tested to the highest standards and backed by two years' parts and labor warranty. Warranties are effective upon the first delivery date to the end customer and are non-transferable. Warranty related repairs include parts and labor, but do not include repair of faults resulting from user negligence, special modifications, abuse (mechanical damage), shipping damage, and/or other unusual damages. The customer shall pay shipping charges when the unit is returned for repair. Manufacturer will pay shipping charges for return shipments to customers.

Manufacturer does not assume responsibility for consequential damages, expenses or loss of revenue, inconvenience or interruption in operation experienced by the customer. Warranty service shall not automatically extend the warranty period.

User can pay extension fee to extend the warranty period. Please contact us for more details. In the event that a product needs to be returned for repair, inform manufacturer and ask for a Return Material Authorization number.

FCC/CE statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice:

- (1) An Unshielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to the nearby radio and television reception. It is essential that only the supplied power cord be used.
- (2) Use only shielded cables to connect I/O devices to this equipment.
- (3) Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Introduction

G112 is mini curved screen edge blending processor. It was designed for edge blending as well as image warping, rotation and stacking. Multiple units of G112 can execute big scale edge blending system.

One HDMI 1.4 input port and 1x HDMI1.4 output port are designed in each box. Max. input resolution is up to 3840*2160 @30Hz with 4:4:4 full color sampling. Output supports up to 1920*1200 @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 G112. User can use IR controller, front panel keypad or RS232 to perform edge blending and sophisticated geometry alignment up to 17x9 control points. Linearity Grid Line Adjustment and Corner Wall image adjustment for mapping image at 90 degrees corner is embedded in geometry alignment. Separate R, G, B gamma correction for edge blending region color fine-tune is also standard functions in G112.

Video wall function is to crop and allocate source image for each projector and set overlap pixels for edge blending. User can add one HDMI splitter and multiple units of G112 to implement flat and curved screen edge blending through remote controller and IR controller.

Edge mask function is for user to execute further image edge mask to cut off unnecessary image without change the image scaling factor.

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.

G112 provides easy configuration, low entry barrier, cost effective, reliable and flexible edge blending solution.



Difference between M801 & G112		
Function	M801	G112
Input port	2x HDMI 2.0, 1x DP, 1x VGA	1x HDMI 1.4
Max. input resolution	4096 x 2160 @60 fps, 4:4:4, 600MHz, HDCP 2.2 °	3840*2160 @30 fps, 4:4:4, 300MHz, HDCP 1.4
Output port	1x HDMI 1.4, up to WUXGA/2048x1080/60Hz	Same
Loop out port	1x 4k/60 HDMI 2.0 loop out	NO
Black level uplift	Black level update in 9 regions	NO
8 points Edge Mask	Yes	NO
System control	IR/Keypad/RS232/USB/Ethernet	IR/Keypad/RS232
PC Tool	Gwarp3 and WebGui	No PC Tool
FW update	Using PC Tool	End user can't update FW
FW backup and copy	Using PC Tool	NO
Geometry alignment	Remote controller up to 9x5, PC Tool up to 17x17	Remote controller up to 17x9
Corner Wall adjustment	V type	W type
Setting storage	5 settings	10 settings
Dimension & weight	303*164*44mm, 1.51kg	169*116*31mm, 0.53kg

Function and features

A. Each box includes below input and output port

1. Input: 1x HDMI 1.4.
 - Support up to 384*2160 @30Hz with 4:4:4 chroma sampling without compression.
 - Connect with various video sources and support none VESA standard input resolution.
2. Output port: 1x HDMI 1.4. Selectable output resolutions: XGA, WXGA, 1280x720, 1280x1024, 1366x768, 1920x1080 (24/30/50/60Hz), 1920x1200 (30/60Hz), 2048x1080/60, 1024x768 @120Hz, 1280x720 @120Hz, 1280x800 @120Hz.

B. Image warp, geometry alignment and edge blending

1. Selectable grid pattern size for geometry alignment from 8-120 pixels in H&V. Default size 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 box controls one projector and can be cascaded to support up to 225 projectors.
4. Integrated with full function IR remote controller. Manual geometry alignment via Remote controller up to 17*9 control points with H=+_1200 pixels and V=+_1200 adjustment range in full HD output (4 corners + warp adjustment).
5. W type 12 control point Corner Wall geometry alignment up to 900 pixels adjustment range in each control point.
6. Four direction edge blending up to H=1920, V=1200 overlapped pixels for flat, curved & cylindrical screens.
7. Independent RGB gamma selection for edge blending color fine.
8. Linearity grid line adjustment for quick image alignment on curved screen.

C. 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 gain adjustment and white balance correction.

D. Edge mask

OSD [Shift] to execute edge mask up to 500 pixels following the image profile after geometry adjustment.

E. 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,

video wall bezel compensation and creating overlap region for edge blending.

F. Image rotation and flip

1. Image 90/180/270 degrees rotation, flip and mirror up to 4k/30Hz input resolution.
2. Image flip in Front/Rear, Left/Right and Top/Bottom directions.
3. Able to display mobile/iPad image on portrait monitor with flexible aspect ratio adjustment.
4. No 3D motion adaptive de-interlace function while the image is 90/270 degrees rotated.

G. System control and other features

1. Professional design and reliable for 7/24 working condition.
2. Full function OSD by front panel keypad and IR controller.
3. Firmware update should be done in the factory.
4. Internal grid pattern with selectable color and grid size for easy geometry alignment.
5. RS232 control system compatible with most of control system.
6. User can select blue or black background color when no input signal is detected.
7. Programmable EDID in the range at H=1024~3840, V=720~2400.
8. BOX ID for convenient multiple unit control at the same time.
9. User can save up to 10 settings and can be recalled by IR controller, RS232 and keypad.
10. 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.

H. Main applications

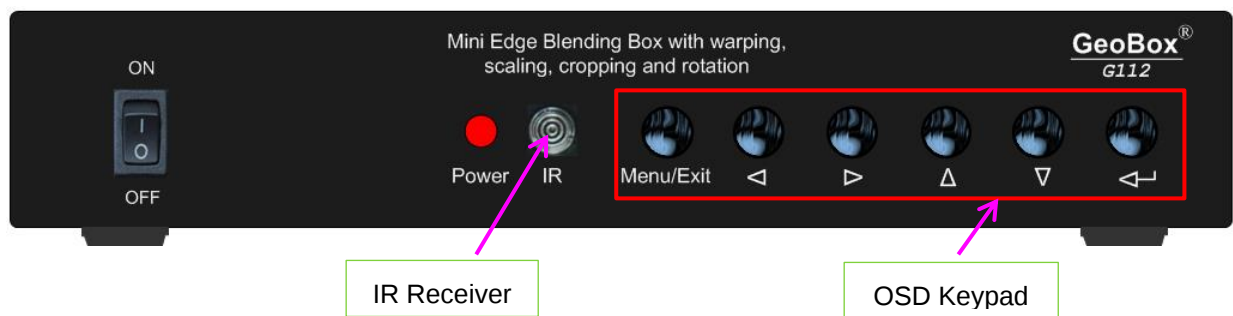
1. Multiple projector edge blending.
2. Image distortion correction for ultra-short throw ratio projector.
3. Projector curved screen display.
4. Image rotation.
5. Mobile/iPad native image display on portrait monitor with aspect ratio correction.
6. Image aspect ratio adjustment.
7. Image scaler: Resolution scaling up and down.
8. Crop specific image area for LED, projector and monitor.

1. Content in the packing box

- The G112 mini edge blending processor.
- 1x RC-400 IR Remote Controller (without battery)
- 1x IR Extending Receiver with 1.8m cable
- 1x Wall mount DC Power supply unit, In: AC 100V-240V. Out: DC 12V 1A
- Curved screen edge blending Tutorial Video is available at <https://youtu.be/pn6XQiNpdLc>

2. asic operation & setting

2.1. Front panel

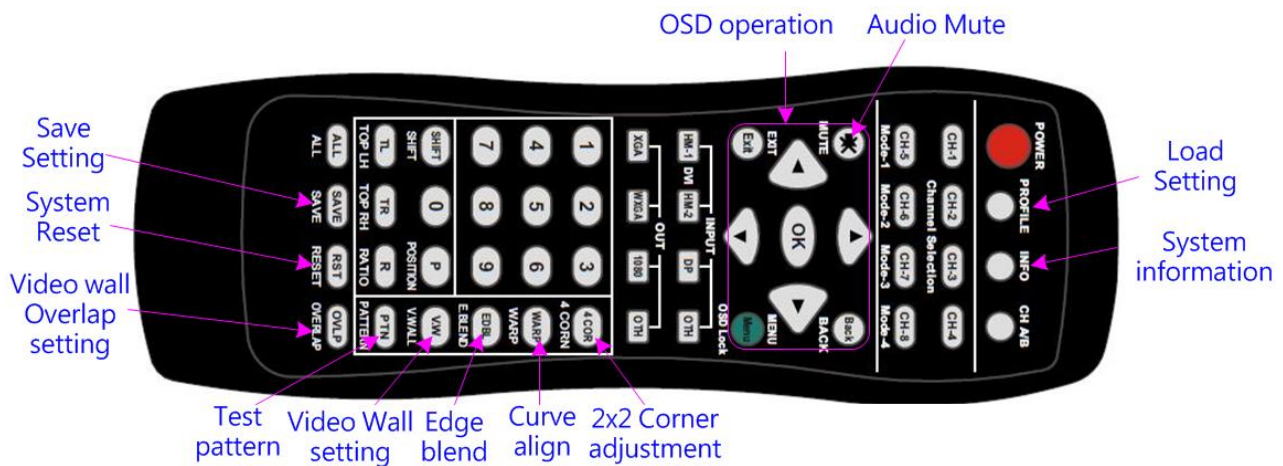


2.2. Back panel



- Maximum input resolution: 3840*2160 @30Hz
- Maximum output resolution: WUXGA, 2048*1080 @60Hz

2.3. IR Remote controller



2.4. System connection

Below is system connection for 2 projectors with one G914 & two G112.

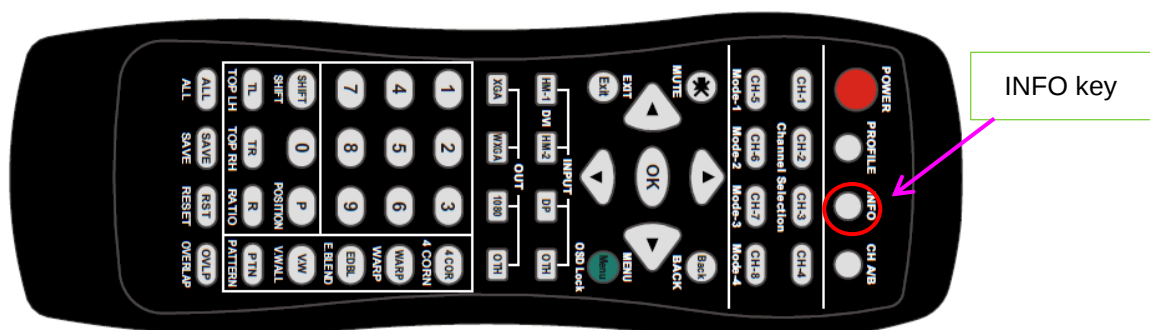


2.5. System Information

User can press [INFO] key on remote controller to get system information:

- Input signal status: input resolution, color bit and type
- Output status: output resolution, color bit, HDCP status and input/output synchronization status
- Model Name
- Firmware version

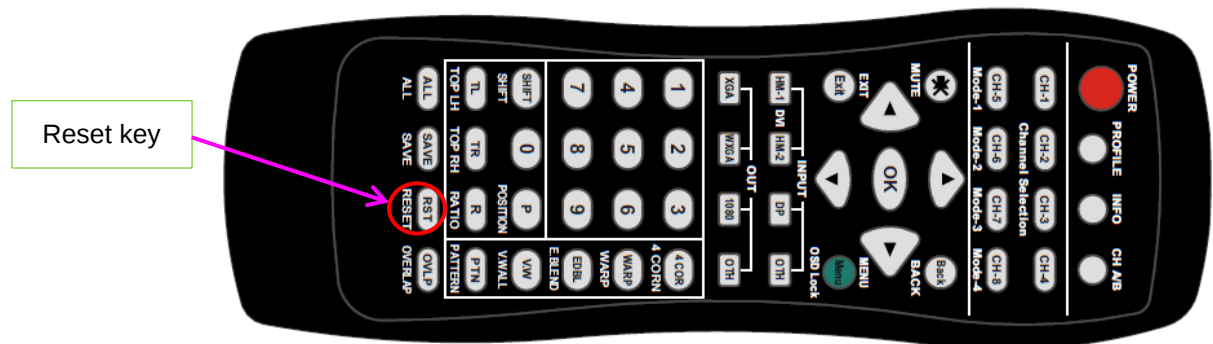
OSD menu under [Options] is also available to get system information.



2.6. System Reset

User can reset system through below method:

- Use small pin to insert RESET hole at back panel for 5 seconds, user will see [Reset to Default] message. It will reset the system to factory default including all settings in Profile Index.
- Open OSD menu; [Options]→ [Reset]. User can select reset items from
 - Reset All
 - Video Wall
 - Anyplace (geometry alignment and edge blending)
- User [Reset] hotkey on remote controller will get into Reset OSD menu. The function is the same as reset from OSD. It will still keep customer settings in Profile Index without change.
- **Reset from OSD or remote controller will not delete Profile Index data. RESET from RESET Hole on back panel will delete Profile Index data.**



2.7. System settings: Box ID, RS232

When multiple units are used at the same time, user can set different Box ID for RS232 and remote controller executing independent control.

2.7.1. Box ID

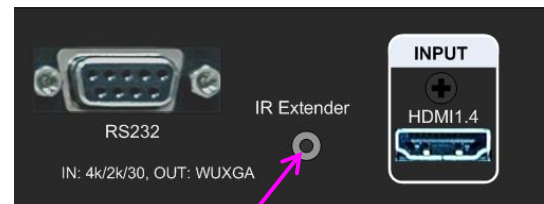
- OSD Menu [Options]→ [Setting]→[Box ID]
- The range of Box ID is 0 ~ 99 for RS232 command.
- If user uses remote controller to execute system operation, the Box ID range is 0 ~ 9.

2.7.2. RS232 settings

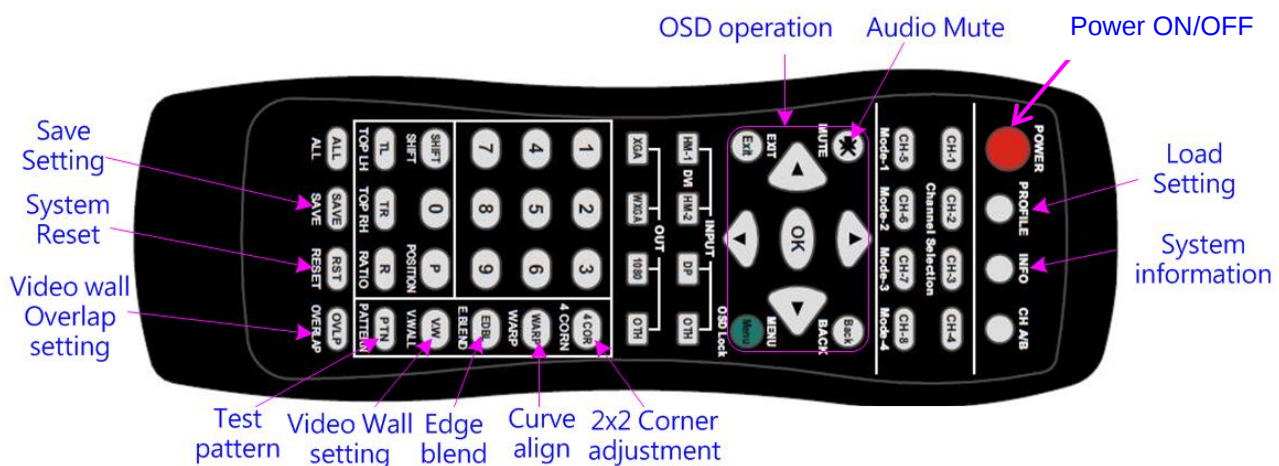
- RS232 is designed with DB-9 connector. User can select baud rate between 11520 and 9600.
- UART protocol for the control from RS-232 is available in the website.

2.8. How to use IR Remote Controller

- IR receiver is on Front Panel. One 3.5mm audio connector for IR extender is located at Back Panel. 1.8m IR extension cable is equipped in the packing. User can add audio cable to extend the distance up to more than 20 meters.
- IR remote control system is possible to be interfered and cause abnormal or discontinuous operation.



Audio connector for IR extender



- If power off by remote controller, user need to power on by remote controller.
- Remote controller can execute full function of the box.

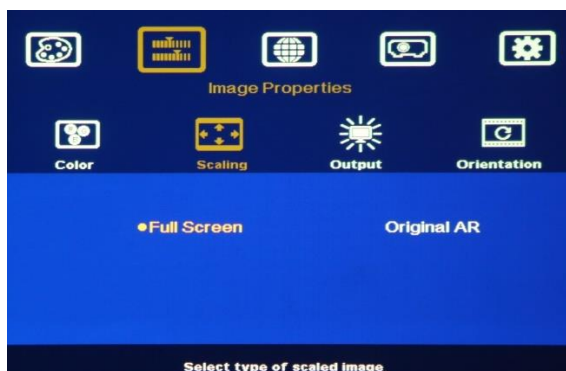
2.9. OSD Lock and unlock in multi-unit application

- In order to avoid interference among multiple GeoBox during setup, user can set ID number for each GeoBox under [Options] Menu. Press number keys in Remote Controller to determine which GeoBox will be controlled.
 - 851: control GeoBox ID No. 1
 - 853: control GeoBox ID No. 3
 - 850: to unlock all units and user can control all GeoBox.
 - User will see flashing Green LED on front panel after press 85x number keys. It means the OSD menu in the box with flash Green LED is locked and cannot be controlled.

- OSD Lock / Unlock: When continuously press [Menu] key in IR Remote Control for 5 seconds, the OSD function will be locked to prevent from setting change by negligence. User will see flashing orange LED. To press [MENU] key for 5 seconds again, it will unlock OSD and user can manipulate the OSD again.

2.10. Full screen and native aspect ratio

- [Scaling] under [Image Properties] menu is to select the display mode either following signal source original aspect ratio or full screen display
- For edge blending application, set to [Full Screen] mode is required. Otherwise, there will be abnormal display in some input timing.



- [Full Screen]: to display full screen image no matter the input source is in what kind of aspect ratio.
- [Original AR]: the output display will keep the same display aspect ratio as signal source. If the input is 4:3, then the output display will keep the same 4:3 aspect ratio with black borders at both sides.

2.11. Image rotation and flip

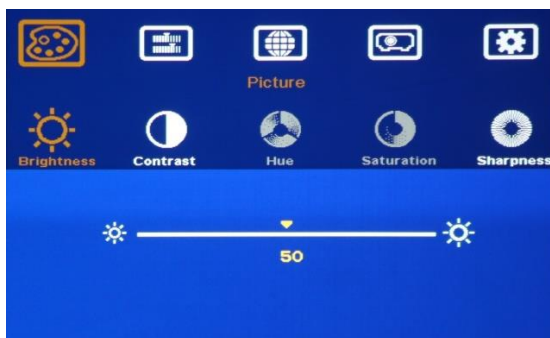
- This function can support up to 4k/30Hz input signal.
- Image 90/270 degrees rotation is for edge blending with projectors at portrait position to increase image height. There is no need to rotation signal source.
- Image flip is for projector to project image from rear or top position.
- When the image is rotated or flipped, the OSD will still keep at original direction without change. Geometry alignment direction will follow OSD direction. The direction for [Video Wall] settings will follow the image direction after rotated or flipped.
- User can see the direction of the TEXT "R" to do image flip and rotation.



2.12. Color Adjustment

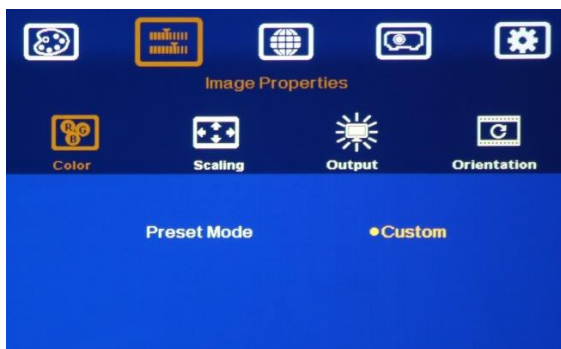
In edge blending application, color adjustment is important due to multiple units of projector images are combined together.

2.12.1. Global color adjustment: [Picture]



- [Picture] can execute below color adjustment for each processing channel.
- When input is YUV video: [Brightness], [Contrast], [Hue], [Saturation] & [Sharpness]
- When input is RGB 4:4:4: [Brightness], [Contrast] & [Sharpness]

2.12.2. Preset Color Temperature and independent RGB color adjustment



- [Color] under [Image Properties] menu can change preset color temperature and discrete [RGB] color in each channel.
- [Preset Mode]: [Neutral], [Reddish], [Bluish]
- [Custom]: discrete RGB color adjustment

2.12.3. Color adjustment function under [Edge Blend] menu

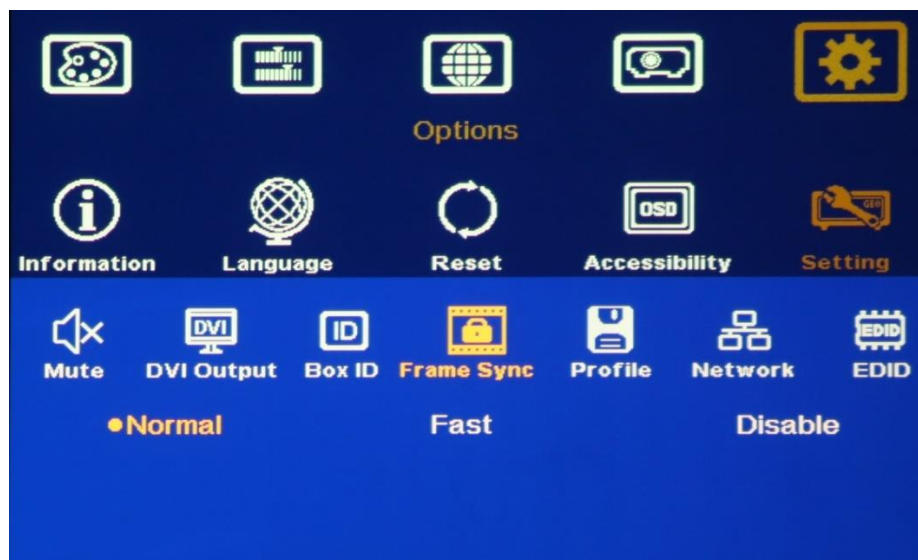
The color adjustment range under [Edge Blend] has small adjustment range. The major purpose is to adjust white balance in the background of the projector image.



2.13. System synchronization

When the system uses multiple projectors, the image should be synchronized together. GeoBox uses [Frame Sync] to synchronize all outputs based on the input signal vertical sync. When [Frame Sync] is applied, it is possible to lose sync during system setup and cause the projector to re-search the signal source. In order to provide smoother setup, GeoBox provides OSD for user to select different synchronization methods for easy setup.

- [Normal] (Frame Locked): We propose to set at [Normal] in most of the applications. When user reset system or adjust video wall settings, user will see projector re-searching the input source.
- [Fast]: time to catch the input source will be fast than [Normal].
- [Disable] (Free-Run mode): when GeoBox changes input source or timing, the output will still send out continuous output signal. The projector has lowest chance to re-search the input signal while system setup. It is recommended to set at [Disable] when execute setup in GeoBox.
- If multiple unit application is required, please set it at [Normal] to let all output channels have synchronized image without frame tear or synchronization issue.
- If the output refresh rate is not the same as input refresh rate. The frame lock function will be disabled and it may lose synchronization among output channels. If the input is 4k/30 with FHD/60 output, it will have no synchronization problem. If the input is 50Hz, please select 1080p 50 Hz output to avoid frame repeat and system synchronization issues.



3. **Example for 3 projector edge blending procedures**

A Curved Screen Edge Blending tutorial video is available in the website at <https://youtu.be/pn6XQINpdLc>.

Please also see more detailed description in the following chapters.

3.1. **Get detailed edge blending information through VNS Excel Spread Sheet**

3.1.1. Assumption

- Required image size (screen size): 6.5m*1.5m
- Watch distance: 2m (pixel pitch should be less than 2mm)
- Input signal resolution:
 - Horizontal resolution: $6.5\text{m} / 2\text{mm} = 3250$. It means minimum input resolution shall be $H > 3250$. 3250 is not VESA standard resolution. Therefore, we select 3840 as horizontal resolution. The ideal vertical resolution is based on screen aspect ratio: $6.5/1.5 = 4.33:1$. $3840/4.33 = 886$. It means 3840*886 is the resolution without image distortion.
 - In actual application, user can select 3840*886 from PC signal source. The media player and other display playback devices may have no 3840*886 output. User can select 3840*800 (same as projector vertical resolution) or 3840*1080 (or 3840*2160). Once user set a full screen display in the complete system, user still can see no distortion image.
 - User needs to prepare a content with 4.33:1 aspect ratio to avoid image distortion.
- Number of projectors: 3 projectors at 3x1 horizontal position
- Projector resolution and lumens. 1280*800 (native resolution), 3200 Lum. GeoBox output resolution shall be the same as projector native resolution to get the best video quality.
- Overlap pixels and dimension. $8\text{ grids} = 8 * 32 = 256$ pixels
- Projector throw ratio: 1.2-1.7 (based on projector spec)

3.1.2. Excel calculation

- Please download Excel Spread Sheet from VNS website and check the password from factory.
- Input the data in yellow column. User will get calculation result.
- Final image size for each projector: 2.500m*1.563m
- We reserve 6 cm image height for geometry alignment and after service. User can use geometry alignment to draw the vertical height to the required dimension 1.5m.
- Optimized content resolution: 3328*800 (This is the ideal resolution for the content and EDID).
- Installation distance: 3m-4.25m (based on throw ratio 1.2-1.7).

- The value in video wall Overlap setting:
 - #1 Projector: RH edge: +197
 - #2 Projector: LH edge=+98, RH edge=+98
 - #3 Projector: LH edge: +197
- The final luminance is 819 Lux. It will be enough for indoor environment.

Project basic data

Source resolution (H)	3840	Screen width	6.50 (m)
Source resolution (V)	800	Screen height	1.50 (m)
Projector resolu. (H)	1280	Projector lumen	3200 (Lum)
Projector resolu. (V)	800	Screen Aspect ratio	4.33 (required)

Overlap pixels (32 pixels per grid)	Overlap %	Recommended
Overlap pixel (H)	256	20.0%
Overlap pixel (V)	0	25%~40%

Recommended overlap region: Min. 50 cm width

Qty of projector (H)	3	Throw ratio (Min)	1.20
Qty of projector (V)	1	Throw ratio (Max)	1.70

Final output resolution

Horizontal resolution	3328
Vertical resolution	768
Extended pixel (H)	98
Extended pixel (V)	0

Video wall setting value

Position of projector (H)	1	2	3	4	5	6	7	8	9	10
LH edge overlap value	0	98	197	x	x	x	x	x	x	x
RH edge overlap value	197	98	0	x	x	x	x	x	x	x

Position of projector (V)	1	2	3	4	5	6	7	8	9	10
Top edge overlap value	0	x	x	x	x	x	x	x	x	x
BTM edge overlap value	0	x	x	x	x	x	x	x	x	x

Final result checking list (PJT: Projector)

Final Image size (meter)	Final Illuminance Lux (Lum/m2)	Image size for each PJT
Width	6.50	Width (m)
Height	1.56	Height (m)

Overlap region size	Original aspect ratio	Projector throw distance
Horiz. (m)	0.500	Min (m)
Vertic. (m)	0.000	Max (m)

* Final image height should be equal or larger than screen. User can shrink image to have the same image height as screen by GeoBox geometry adjustment.

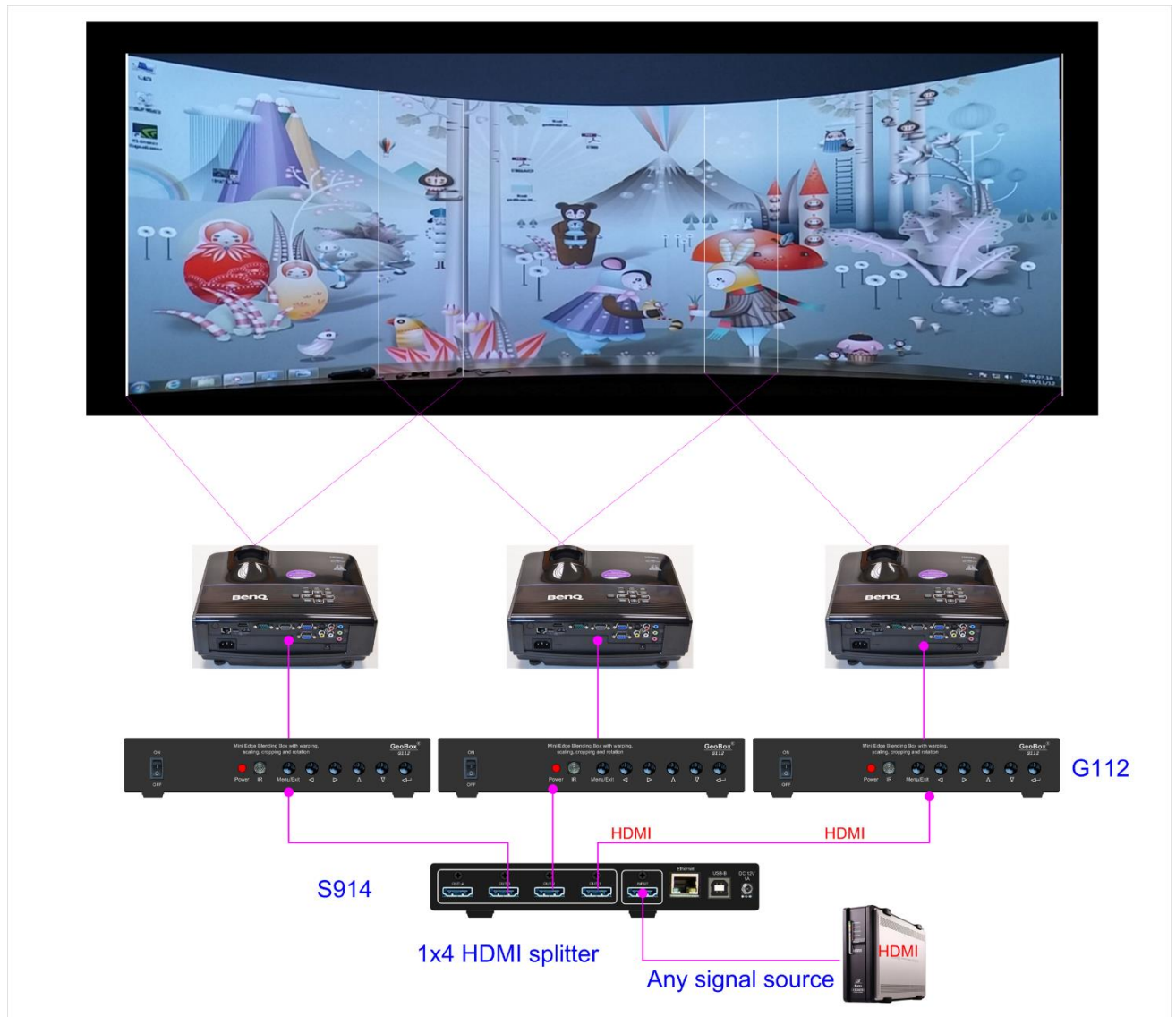
* Standard luminance is 400-800 Lux for restaurant and big conference room, 1000-1500 Lux for trade show. 3D: 500 Lux (single projector)

3.2. Mark image location and install the projectors

- After Excel Spread Sheet calculation, user can understand the final image position for each projector based on the image size for each projector and the overlap region dimension. Please mark image position by paper adhesive tape on the screen. The positions should include 4 corners of the image for each projector and horizontal center line of the screen. Laser level is an ideal tool for marking center line, horizontal and vertical image positions.
- Please install the projector just enough to cover the required area with minimum keystone in both sides.

3.3. System connection

- User can setup by IR remote controller or front panel keypad. If setup by IR remote controller, please install IR extender near screen for easy access by remote controller. The maximum adjusting points is 17x9.
- Connect input port and set GeoBox output resolution to be the same as projector native resolution.



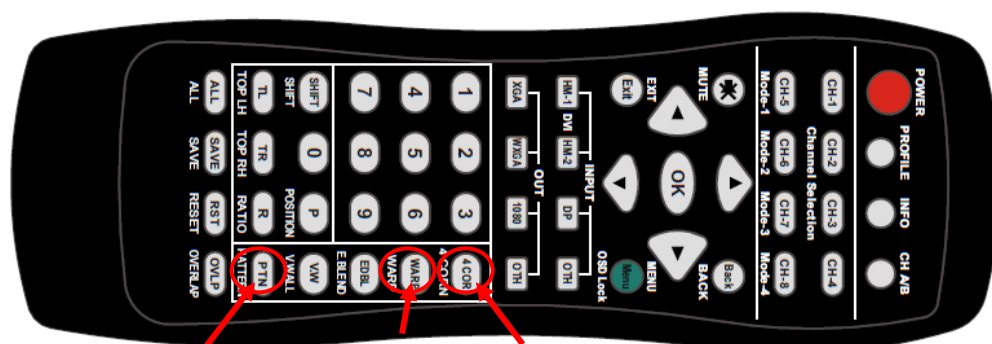
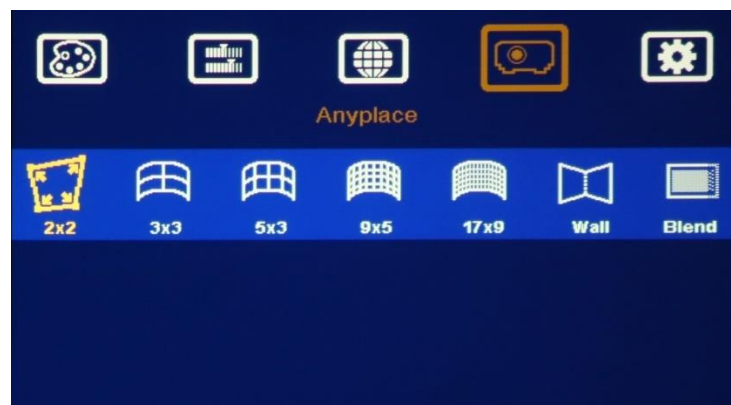
3.4. Projector settings

- Please reset projector to default setting.
- Disable dynamic color adjustment.
- Disable Auto Keystone function.
- To select a Display Mode with 2.2 gamma curve will reduce the color difference in overlap area. If necessary, please choose a Display Mode with the best result.
- Use projector internal color adjusting function to adjustment the color variation among projectors before implement edge blending.
- Install projectors at a place with image size that can cover required image area and with minimized keystone to get the best video quality.

3.5. GeoBox Settings

- Reset GeoBox to default setting. If it is new machine, it is not necessary.
- Select output resolution to be the same as projector native display resolution.
- Check input/output LED indicators and make sure to have correction system connection.
- Disable [Frame Sync] function to reduce Source re-search in the projector while executing GeoBox system setup through [Options]→[Setting]→[Frame Sync]→[Disable]. Please return to [Normal] setting after edge blending.

3.6. Geometry alignment



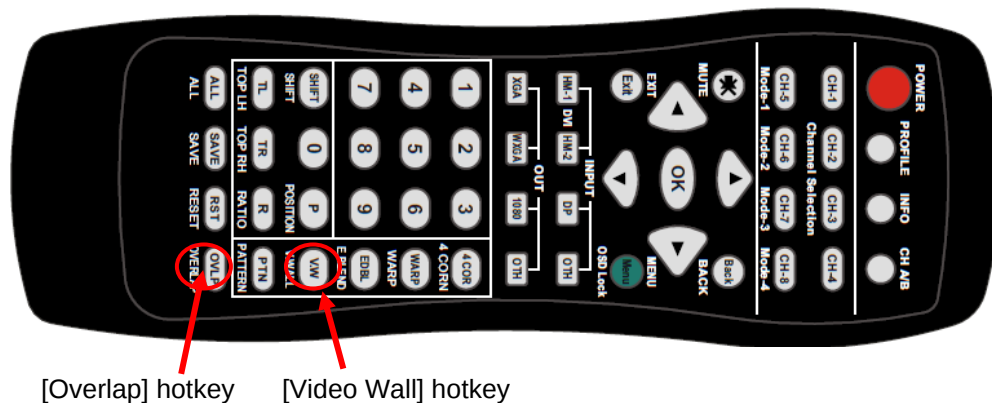
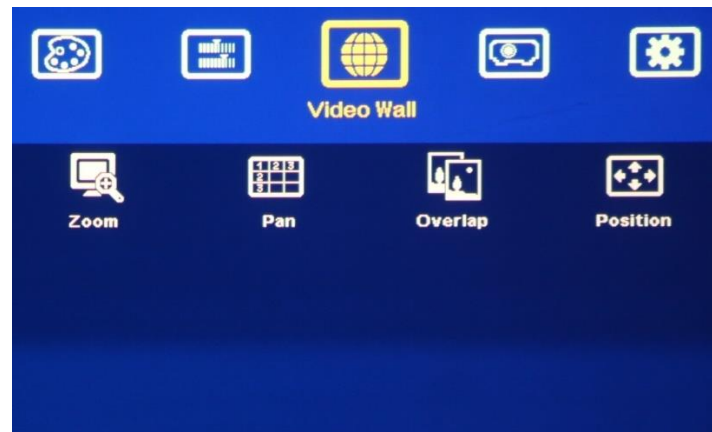
Grid pattern Warp ([3x3], [5x3], [9x5] & [17x9] alignment) [2x2] (4 corner alignment)

- User can install IR extender receiver near screen for easy GeoBox operation. IR receiver extender can be extended through audio cable.
- Click channel selection key and [Pattern] key to show grid patterns in all projectors. Press [Pattern] key again will change grid color. To set different pattern colors in adjacent projectors will be more convenient for geometry alignment.
- Please follow the sequence [2x2]→[3x3]→[5x3]→[9x5]→[17x9] to do geometry alignment to ensure entire image will have uniform scaling factor.

- Apply [2X2 Corner] geometry alignment and draw the corners to expected locations. It doesn't matter to have some image inside the screen once it covers entire screen before 4 corner adjustment. [Warp] alignment will adjust the image position back to the required position.
- If user doesn't execute VNS Excel Spread Sheet calculation, please use [2x2] alignment and try to let all projectors have similar image size with the overlap area having the same grid number.
- Apply [3x3 Curved] geometry alignment to let 9 adjusting points be located at the required position including four corners, edge center points and center line position in each projector.
- Please use [5X3], [9x5] & [17x9] for further geometry alignment and fine-tune. Linearity Grid Line adjustment function is convenient for complete grid line movement in curved screen application.
- After finish the alignment, user can use [2x2] for complete image position fine tune. If user executes [3x3] alignment again after [17x9] alignment, [17x9] grid position will be reset and only keep [3x3] grid point information.
- In ideal condition, all grids in edge blending area between two adjacent projectors should be aligned together.
- After the above processes, if the grid pattern in edge blending area still can't stack together, user can reduce or increase overlapped grids to change the control point positions in adjacent projectors and get more accurate geometry alignment result.
- After finish geometry alignment, all grids should be matched together.



3.7. Video Wall settings



- Click [INFO] key to check if correct input and output timing is in the system. User needs to apply the same input/output timing as VNS Excel Spread Sheet calculation.
- Example for [Video wall] settings for 3 projectors horizontal edge blending with 3x G112.
 - [Zoom]: set to H=3, V=1 in all channels. Each Box should be set separately.
 - [Pan]: LH projector (1st): H=1, Center projector (2nd): H=2, RH projector (3rd): H=3. All projector Vertical PAN is the same: V=1.
 - [Overlap]: select the correct edge and apply the value calculated from VNS Excel Spread Sheet: LH projector: RH edge, Center projector: both RH/LH edges, RH projector: LH edge
 - Below is overlap value calculated from VNS Excel under below condition:
 - Input: 3840*800, Output: 1280*800, Overlap pixels: 256, Projectors: 3
Horizontal Overlap value: Projector 1 RH edge= 197, Projector 2 RH edge= 98, LH edge= 98, Projector 3 LH edge=197
Vertical values in all projectors are set with the same "V=0".

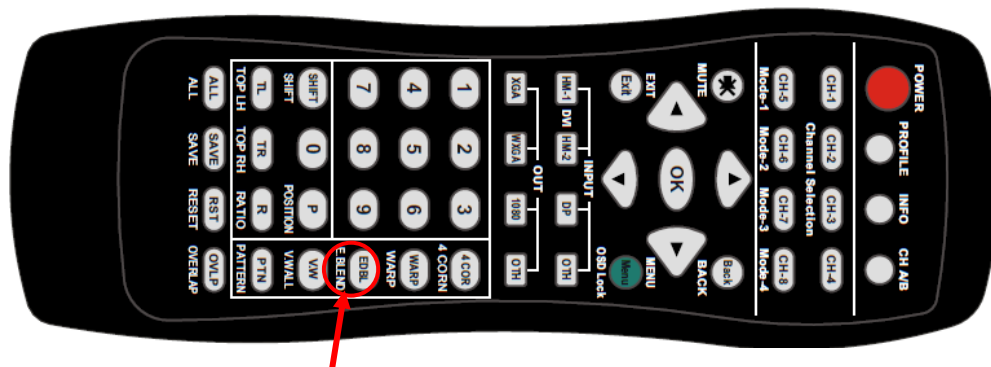
Video wall setting value

Position of projector (H)	1	2	3	4
LH edge overlap value	0.0	98	197	x
RH edge overlap value	197	98	0.0	x

Position of projector (V)	1	2	3	4
Top edge overlap value	0.0	x	x	x
BTM edge overlap value	0.0	x	x	x

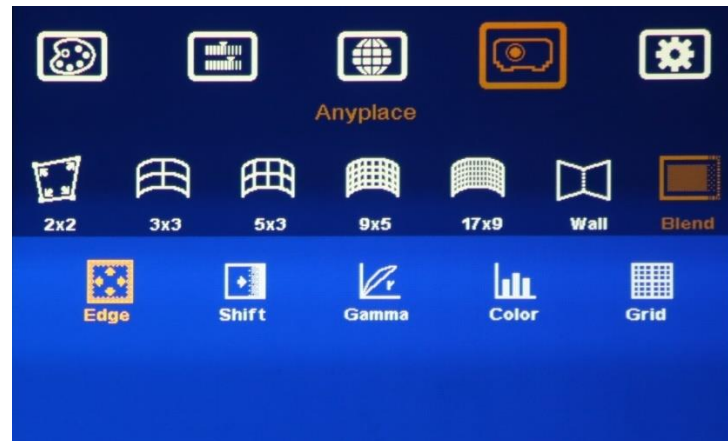
- For dual projector edge blending, user can apply still image, select correct edges and adjust [Overlap] value simultaneously and let the image in edge blending area comes closer till without double image. Two projectors shall have the same value (same cropping range). The difference shall not be over 2 pixels.
- If no Excel is available for overlap calculation, user can apply VNS Video Wall test pattern on the screen, then adjust the complete pattern to let entire pattern match together by overlap adjustment.
- If user still sees some blurred image in edge blending area, please increase or decrease [Overlap] value in [Video Wall] setting to improve video quality.
- Please note that projector has Thermal Drift issue (position shift due to different temperature). The image position in power ON stage may be different from the position after 15-20 minutes when the position is stable. Don't fine-tune image position during this period until it is stable.

3.8. [Edge Blend] setting



[Edge Blend] hotkey

- Select correct Edge for the edge blending:
LH projector: RH edge, Center projector: RH & LH edge, RH projector: LH edge
- RED and GREEN indicating lines will appear when increase edge blending pixels. The final overlap setting value will be the same as Overlap pixels (256) in this example case.
- User needs to adjust the color indicating lines to match together (green to green, red to red) and will see a smooth image.



3.9. Final Image quality fine-tune

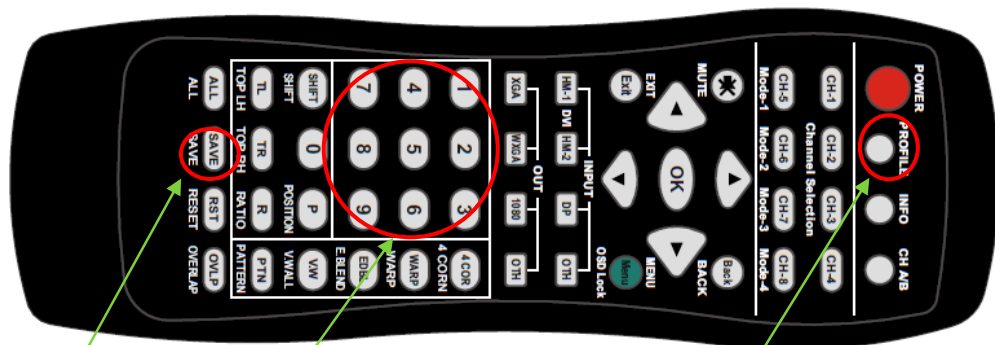
- If banding effect is visible in overlap area, please try below method:
 - GeoBox [Gamma]: Please try to adjust Gamma value in [Transition] & [Gain] menu and adjust [Shift] value to “ - “ to do color uplift in the edge of overlap region.
 - Projector: please try to change projector settings
 - All projector should have the same setting.
 - To select color profile with gamma 2.2 will get the best result.
 - Check Display Mode: Usually Standard, sRGB modes will get better result.
 - Disable projector Brilliant color or Dynamic color adjustment.
- The video quality in overlap region is related to many factors. Please see more details in other section related to [Final Image quality fine-tune] in this user guide.
- No black level uplift function in G112. If user requires this function, please use other models to implement it.

3.10. Save/Load System Settings



- After finishing system settings, user can save the setting via OSD menu through [Menu]→ [Options]→ [Setting]→ [Profile]→ [Save]→ [Index 1-10]. It will take effect for one channel only. User needs to save each channel separately.

- User can save the settings through [Save] hotkey on remote controller. User needs number keys 0-9 to save the settings. "0" is served as [Index 10] for the storage.
- Please save all boxes into the same Profile Index for easy Load back at the same time.
- Ten different display settings can be saved to [Profile]. The data stored in Profile include EDID setting, input source, output resolution, color settings and all user customized settings.
- User can [Load] the settings through below methods:
 - OSD menu: [Menu]→ [Options]→ [Setting]→ [Profile]→ [Load]→ [Index 1-10]. It will take effect for one channel only.
 - Remote controller [Profile] hotkey: Press [Profile] hotkey, then select number keys on the remote control (not through OSD direction keys) to [Load] user settings. It will Load the settings for all channels at the same time.
- When user power off the system, GeoBox will save user setting without loss even the setting is not saved into Profile Index, unless someone to change it.
- Under below conditions, the settings data inside Profile Index will be kept without missing:
 - When system has been reset from OSD menu, the Profile data will not be deleted.
 - Remote controller [Reset] hotkey will keep Profile data without delete.
 - Only Reset from reset hole on back panel will erase Profile Data.
- Hotkeys for Profile [Save] and [Load]



Press [Save], then select number key to save settings.

Number keys (0-9) for Profile [Save] & [Load]

Press [Profile] hotkey, then select number keys (not through OSD direction keys) to [Load] user settings

4. Detailed description for Edge Blending

4.1. Edge blending application guide

- Edge blending is good for multimedia display and Power Point presentation without single pixel text in the content.
- If the application is for single pixel text like Excel file, it is easy to see blurred text even the stacking image in overlap area has less than one pixel position difference between two projectors.
- The position shift in the projector may be enlarged up to more than 10x on the screen. The projector also has thermal drift issue to cause image shift.

4.2. Determine source signal resolution

- The image size and watching distance are two major factors to determine source signal resolution and number of the projectors.
- If the screen size is 20m and the watching distance is 5m, the signal pixel pitch should be around 5mm (around 1mm for 1 meter watching distance). The system resolution is about $20\text{m}/5\text{mm}=4000$. It means the system resolution should be around 4000 pixels in width and the vertical resolution should follow the projector native resolution. If WUXGA projector is used, the ideal system vertical resolution is 1200.
- After determine the system resolution, please make sure all the equipment in the signal pipe line should be able to support this resolution or higher. It includes signal source output, edge blending processor and the total resolution of the projectors after edge blending.
- If user uses 8x XGA projector with 250 overlapped pixels, the total projector resolution after edge blending will be $1024*8-250*7=6442$ pixels. It means it is enough to use XGA resolution projectors in this 20m screen case. If user uses FHD or WUXGA high end projectors with watching distance at 5m, the final video quality will be very similar as XGA projector under 4k signal source at 5m watching distance but will be better at less than 5m watching distance.
- We can provide free service to help customers to make project plan, including system configuration, type of projector, signal source and installation data.

4.3. Determine overlap region size and pixels

- VNS provides an Excel Spread Sheet in the website for user to do edge blending plan.
- During Excel Spread Sheet calculation, user has some flexibility to determine the overlap region size by different projector resolution, lumens, image size and number of projectors.
- The most common overlap region is about 20% to 40% based on single projector native resolution. For 1024*768 projector, the overlap range is $1024*20\%\sim 1024*40\%=205\sim 409$ pixels. GeoBox test

pattern default size is 32x32 pixels. Therefore, the final result will be around 7 grids (224 pixels) to 13 grids (416 pixels) for XGA projector and 12 grids (384 pixels) ~ 24 grids (768 pixels) for 1080p & WUXGA projectors. If the projector has accurate color and gamma curve, the overlapped pixel can be lower to 5 grids (160 pixels) in XGA projector. The actual pixel number should be determined based on the required screen size and the projector model used. Under the same screen width, if higher image is required, then the overlap region will be also increased.

- If the overlap pixels are increased, the image height will be also bigger. User can simulate with different overlap pixels (multiples of 32) to get a result that the image height is bigger than required image height with reasonable overlap region dimension between 50cm to 120cm in overlap region. Reasonable overlap region will be easier for overlap color control.
- Please note that user can change the grid pattern size from 8 to 120 pixels. Default is 32x32.

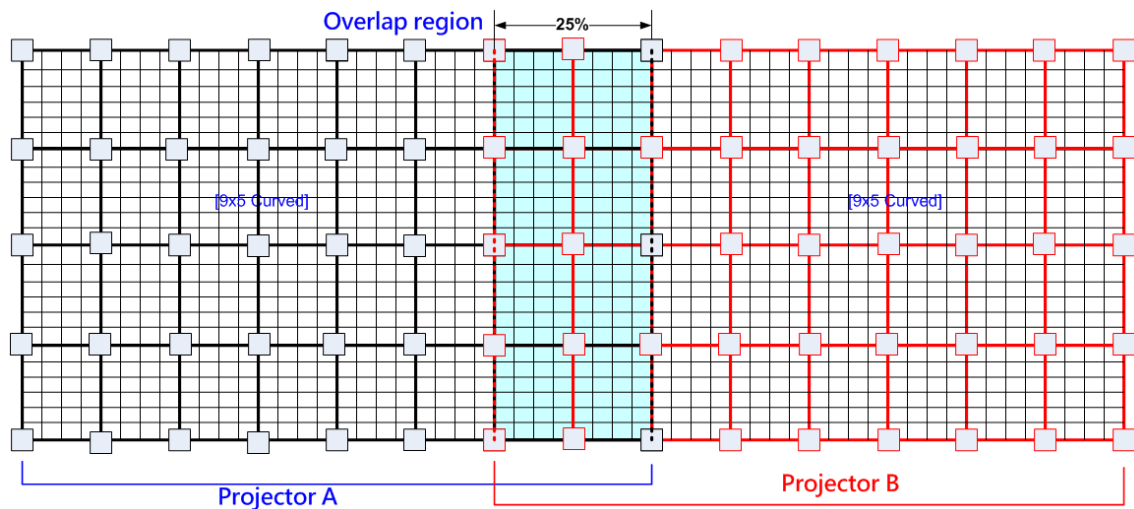
4.4. Relation between Overlap pixels and geometry alignment accuracy

- Proper selection of Overlap pixels will affect the control points in geometry alignment. If the Overlap pixel is 25% of the projector native resolution (or GeoBox output resolution), it will have less geometry alignment points due to control points in adjacent projectors will be at the same location. If the overlap pixel is not 25% of the projector native resolution, the control points will be at different positions. 37.5% overlap pixel will double the control points of the geometry alignment if compared with 25% overlap and have the best geometry alignment accuracy.
- [9x5 Curved] alignment will cut the horizontal image into 8 sections and the image in each section can be independently adjusted. In different output resolutions, there will be different pixel number in each section: XGA: $1024/8=128$, WXGA: $1280/8=160$, 1080p: $1920/8=240$.
- If the overlap area between two adjacent projectors has the same or multiple number as above, the geometry alignment control points in overlap region will be less. User can reduce one or two grids in each projector (32 or 64 pixels) in overlap area to increase the control points in overlap region for more accurate alignment between adjacent projectors.
- Edge blending on flat screen, it will be easier for geometry alignment. User doesn't need to consider the relation between overlap pixels and geometry alignment accuracy.
- Below figure is an example for [9x5 Curved] alignment in 1024 resolution:

- **25% overlap region:**

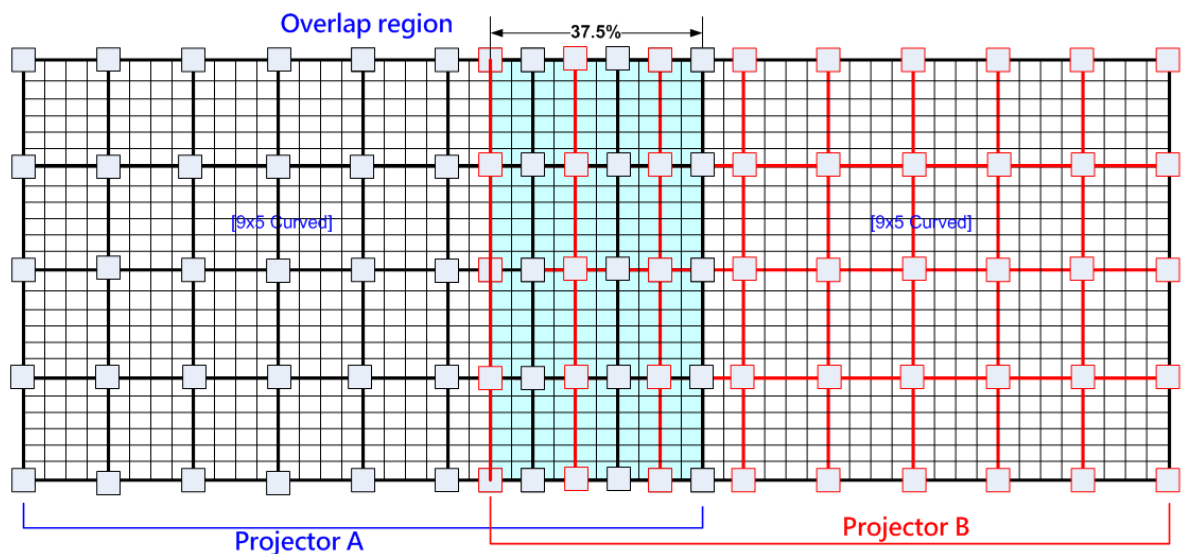
The adjusting points in projector A & B will be at the same position in overlap region

If the overlap is 256 pixels (25%) in XGA resolution, total adjusting points in overlap region are $3*5=15$. The adjusting points in projector A & B will be at the same position in overlap region. User will have less adjustment flexibility. If increasing two grids (64 pixels) to 320 overlap pixels, user can have 30 adjusting points to get more accurate geometry alignment.



▪ **37.5% overlap region**

The adjusting points in projector A & B will be separated in 37.5% overlap region and increase geometry alignment accuracy.



▪ **Recommended overlap pixels in different output resolutions**

Below is the list for the accuracy of geometry adjustment in different overlap pixels:

GeoBox output resolution	1920*1200	1280*800	1024*768
Min. adjusting flexibility	256/480/704	320/480/640	256/384/512
Max. adjusting flexibility	352/608/832	224/256/384/416/544/576	192/320/448/576

4.5. Get installation data from VNS Excel Spread Sheet

- VNS can provide an Excel Spread Sheet for user to calculate necessary installation data for the project. It is important data for installation and setup. User needs to input the data in yellow column based on the projector specification and customer's requirement.

Project basic data

Source resolution (H)	3840	Screen width	6.50	(m)
Source resolution (V)	800	Screen height	1.50	(m)
Projector resolu. (H)	1280	Projector lumen	3200	(Lum)
Projector resolu. (V)	800	Screen Aspect ratio	4.33	(required)

Overlap pixels (32 pixels per grid)

Overlap pixel (H)	256	Overlap %	20.0%	Recommended
Overlap pixel (V)	0	0.0%	25%~40%	

Recommended overlap region: Min. 50 cm width

Qty of projector (H)	3	Throw ratio (Min)	1.20
Qty of projector (V)	1	Throw ratio (Max)	1.70

Final output resolution

Horizontal resolution	3328
Vertical resolution	768
Extended pixel (H)	98
Extended pixel (V)	0

Video wall setting value

Position of projector (H)	1	2	3	4	5	6	7	8	9	10
LH edge overlap value	0	98	197	x	x	x	x	x	x	x
RH edge overlap value	197	98	0	x	x	x	x	x	x	x

Position of projector (V)	1	2	3	4	5	6	7	8	9	10
Top edge overlap value	0	x	x	x	x	x	x	x	x	x
BTM edge overlap value	0	x	x	x	x	x	x	x	x	x

Final result checking list (PJT: Projector)

Final Image size (meter)	Final Illuminance Lux (Lum/m2)	Image size for each PJT
Width	6.50	PJT lumen
Height	1.56	Final Illumin

Overlap region size	Original aspect ratio	Projector throw distance
Horiz. (m)	0.500	Projector
Vertic. (m)	0.000	Final result

* Final image height should be equal or larger than screen. User can shrink image to have the same image height as screen by GeoBox geometry adjustment.

* Standard luminance is 400-800 Lux for restaurant and big conference room, 1000-1500 Lux for trade show. 3D: 500 Lux (single projector)

- Below are assumptions for the above 3x projectors edge blending system Excel calculation.
- **Screen Size: 6.5m*1.5m with watching distance within 2m (pixel pitch less than 2mm)**
 - **Input signal resolution: 3840*800 (Pixel pitch is 6500mm/3840=1.7mm = 1.7m watching distance, optimized vertical resolution is the same as projector native resolution: 800)**
 - **Number of projectors: 3 projectors**
 - **Projector resolution and lumens. 1280*800 (native resolution), 3200 Lum**
 - **Overlap pixels and dimension. 8 grids=8*32= 256 pixels (50cm)**
 - **Projector throw ratio: 1.2-1.7 (based on projector spec)**
- How to use VNS Excel Spread Sheet
- **Input all the data in yellow column, including Source Resolution, GeoBox output resolution (Same as Projector native Resolution), Screen size, Projector throw ratio, Projector Lumens, quantity of projector and Overlap Pixels. User can try different configurations and select the most cost effective one with the image height a little higher than required.**
 - **User will get below data from the Spread Sheet.**
 - Final image size for each projector is 250cm*1.56cm with Overlap region of 50cm in width.
 - The image height should be higher than the required one. User can shrink the vertical height to required dimensions through geometry alignment. The vertical adjustment range in each edge is 600 pixels.

-
- Optimized content resolution: 3328*800 (This is the ideal resolution to set EDID). It is suggested to select the same vertical resolution (800) as projector native resolution to get the best result.
 - Installation distance: 3m-4.25m. It is calculated from throw ratio and image wide for each projector. (2.5m*1.2=3m, 2.5m*1.7=4.25m)
 - The final luminance is 819 Lux. It will be enough for inside room environment.
 - The overlap value in Video Wall setting:
 - ♦ When user sets Video Wall Zoom, it will split the image equally for each projector. The projectors will be installed with some Overlap Pixels for edge blending. Therefore, Overlap Value is to crop more pixels for each image section based on the Overlap size between two adjacent projectors.
 - ♦ LH Projector: select RH edge: +197 (to crop more 197 pixels for LH projector. These 197 pixels are based on source resolution.
 - ♦ Projector (Center): LH edge=+98, RH edge=+99 (total 197)
 - ♦ RH Projector: LH edge: +197
 - ♦ If the input source resolution while video wall setting is different from the calculation, the result will be wrong.
 - ♦ After finish setting, user can check the image, if some overlap area is still blurred, user can increase or decrease Overlap Value with 1-2 pixels and select optimized one.
 - It is allowed to have different overlap pixel among projectors. “Irregular” Spread Sheet is required to calculate the data (under the same Excel File)
 - Please contact dealer or factory to get necessary assistance for the Spread Sheet.

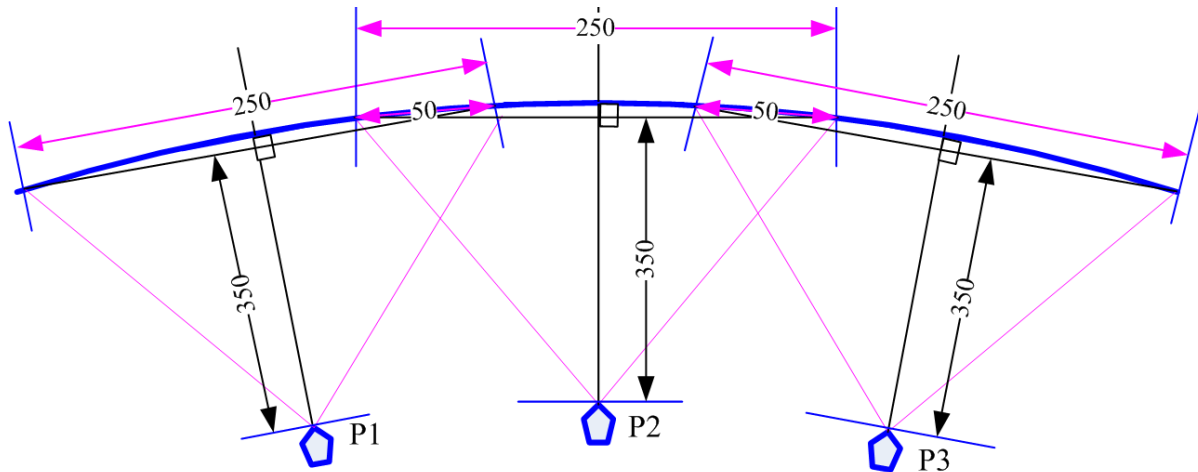
4.6. Apply Spread Sheet data for projector installation and GeoBox setting

4.6.1. Installation data from Spread Sheet from previous section:

- Image size for each projector: 250cm *156cm
- Overlap region: 50cm
- Installation distance based on throw ratio 1.1-1.7: between 300cm-425cm
- Installation height: install the projector at a position with minimum keystone at both vertical edges.

4.6.2. Mark projection region for each projector

- Based on the calculation data, user can easily determine the image location for each projector.
- Using laser Level tool and mark the locations for each projector with paper tape, including 4 Corners and H&V center line of each projector and the screen. The paper tape shall not damage the surface of the screen.



4.6.3. Installation the projector

- To install the projector at a location as showed above with the image just a little over required region at any point. Too large image will lose image resolution and brightness.
- Minimum keystone effect will optimize the image quality with less geometry alignment.
- The image height from the projector can be higher than required and user can draw down the image height through geometry alignment. The adjusting range is up to 1200 pixels in the top and bottom edges.



During the installation, Laser Level is a good tool to get correct horizontal and vertical line and make sure each projector can cover correct display

4.7. Projector settings before edge blending

- Please reset all projectors to factory default settings.
- Set with Ceiling Mount mode if necessary.
- Disable below items if necessary:
Auto keystone, auto aspect ratio, auto color compensation
- Select a display mode with gamma 2.2 or standard display mode. After edge blending, if user still sees some banding in overlap region, please select the best one from different display modes.
- If there is color deviation among projectors, please try to correct color difference through projector color adjusting function to let all color as close as possible.
- Enable [multiple projector display] mode if the projector has this setting.

4.8. **GeoBox settings before edge blending**

- Use small pin to insert into RESET hole on the back panel of GeoBox for 5 seconds to reset GeoBox to default setting.
- Select input port and output resolution in each Box.
- Set output resolution to be the same as projector native display resolution. Each Box shall set output resolution separately.
- When set 1080p output for WUXGA projector, the display image will be only 1080/1200 height.
- Connect the same signal source to each Box through HDMI splitter.
- The signal source for installation should be no less than 1080p.
- Check input/output LED indicators and make sure to have correct system connection.
- User can set [Frame Sync] at [Disable] to eliminate [Source Re-Search] in projector during setup. After finish the setup, user needs set to [Normal] to get synchronization in all outputs.

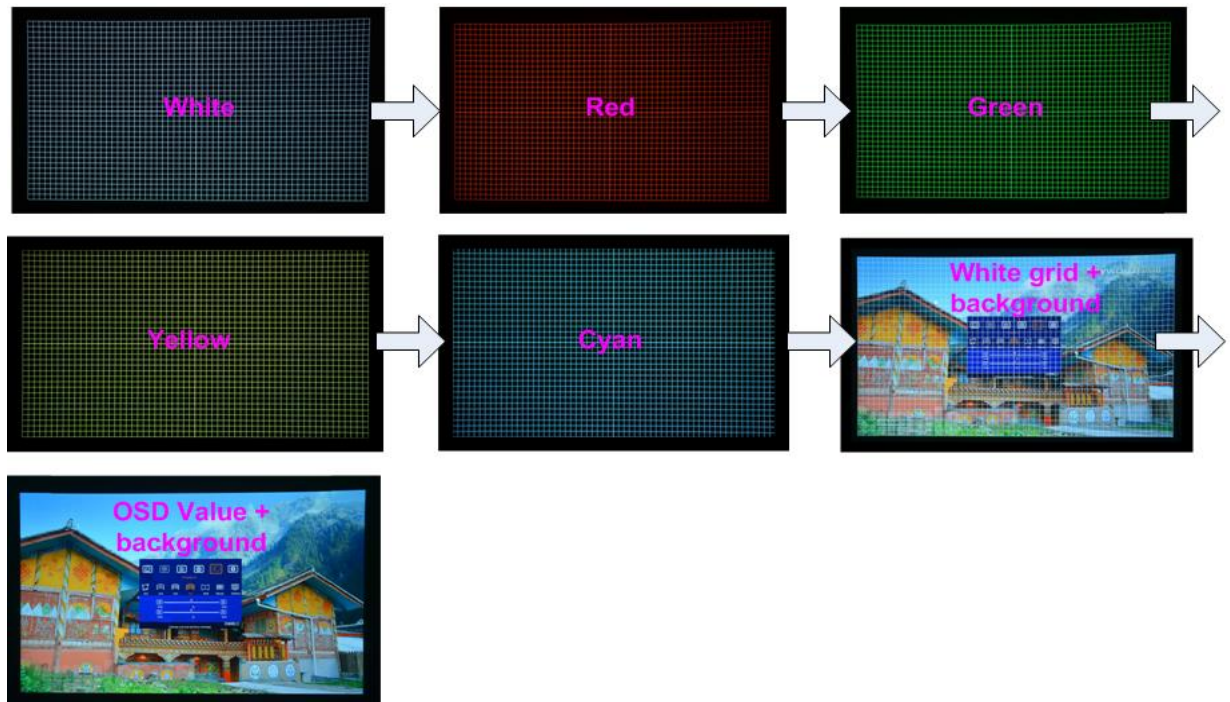
5. **Geometry alignment**

5.1. **Select Appropriate Grid Pattern for geometry alignment**

Grid pattern is required for geometry alignment. User can activate test pattern through [PTN] hotkey in remote controller or through OSD. When user activates OSD geometry alignment menu and press OK, the grid pattern will appear automatically.

- The default grid size is 32*32 pixels. User can select different grid size from 8-120 pixels. Each Box can be set separately. In edge blending, the grid size in all Boxes shall be the same.
- The OSD show-up time can be determined by [Options]→ [Accessibility]→ [Menu Time Out]. If set at "0", the OSD will show up all the time unless input timing is changed or press OSD [Exit].
- If user finds different grid size in different projectors, please check the grid pattern size, output timing setting and the aspect ratio settings in each projector. GeoBox needs to set at [Full Screen] display mode under [Image Properties]→ [Scaling] menu.
- If user executes Geometry alignment, the pattern will appear automatically after select the adjusting point and press Enter.
- 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]
- User can select different pattern color for each projector while doing edge blending setup.
- Note: some projector RGB pixels are not at the same location. It will cause position deviation. Please recheck with White grid pattern for final result.
- User can see geometry adjusting value when select [Background + OSD] display style.

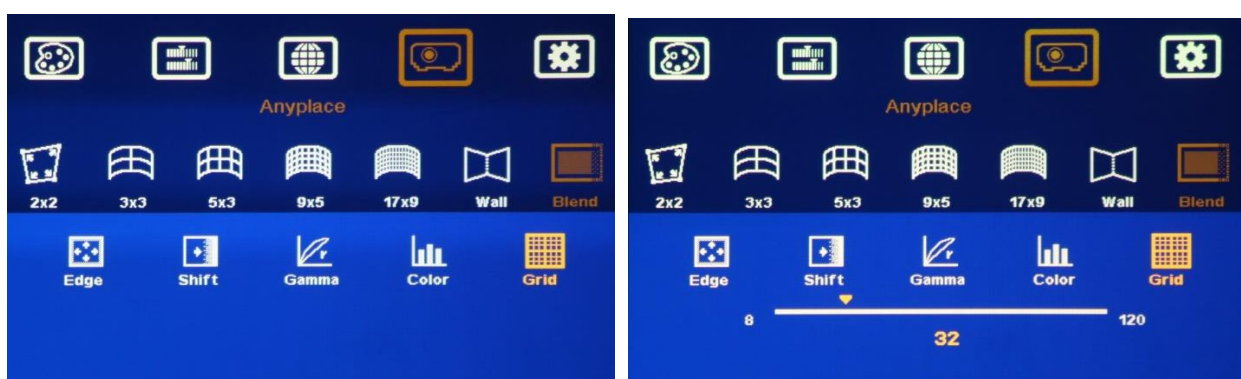
- PS. User can select the last pattern mode [OSD Value + background] and apply external test pattern for geometry alignment.



5.2. Grid Pattern Pixel Size selection

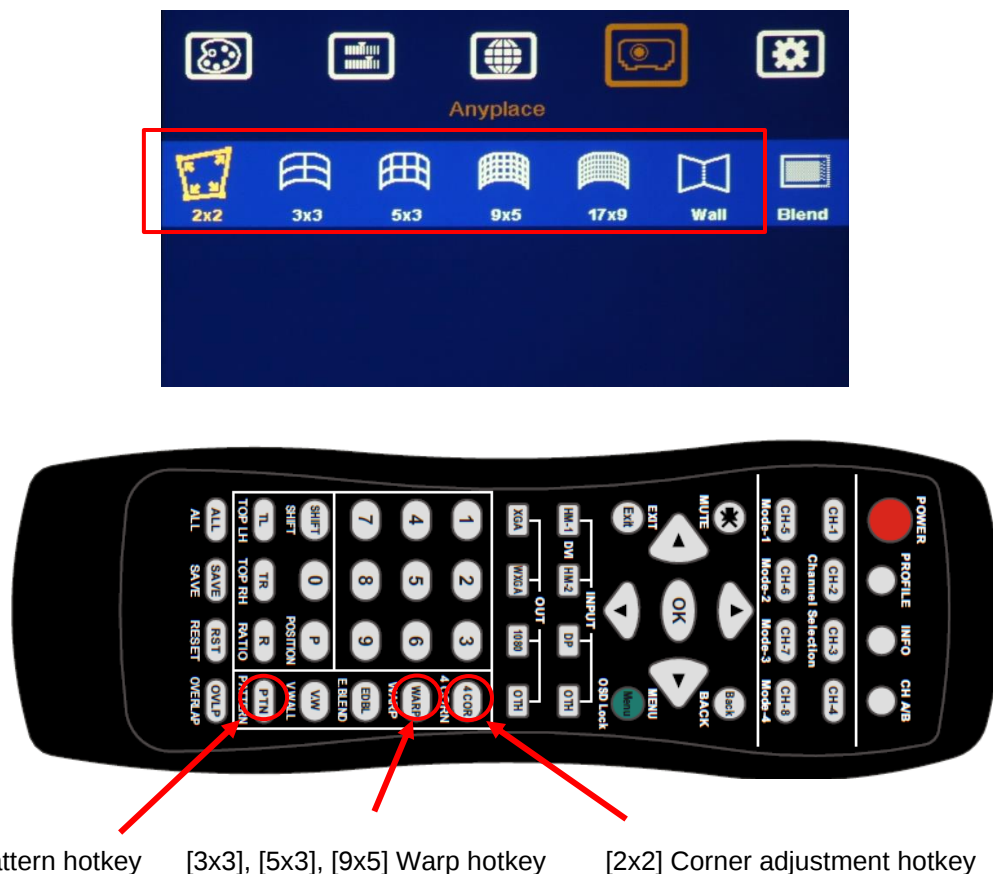
- The pixel size in grid pattern for geometry alignment is selectable to meet high end simulation system geometry alignment requirements. The grid size in both horizontal and vertical directions is from 8 to 100 pixels with 1-pixel increasement. H&V grid size will be the same. User can select grid size under [Edge Blend] menu.

Default grid size for both H&V directions are 32x32. Below is the OSD menu selection of grid size.



5.3. Geometry alignment

Geometry alignment is to align the image position to let the projection image match the screen and also let image grids between two adjacent projectors be matched together. This step will take most of the time for edge blending. User can execute geometry alignment through remote controller or front panel keypad.



5.3.1. Geometry alignment through IR remote controller

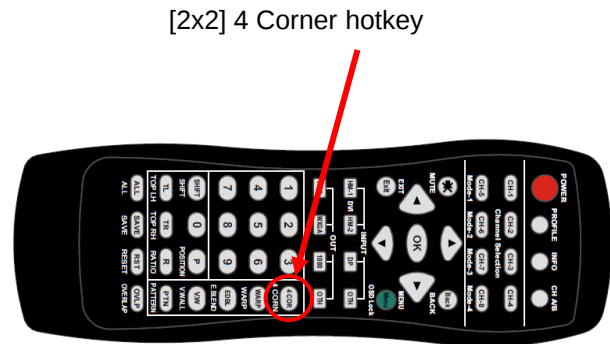
- Please be familiar with OSD operation from remote controller, including activating grid pattern, and hot keys for [4 Corner], [Warp], [Video Wall], [Edge Blend], [Pattern] and [INFO].
- [OSD Time Out] is default to "0". It will ensure the OSD and grid pattern will not be turned off automatically. Input timing change or press [Exit] key will disable OSD and exit from grid pattern.
- User can install IR extender receiver near screen for easy GeoBox operation (Please add audio extending cable to extend the distance up to 20 meters). If multiple units of GeoBox are used and IR receivers are put together, please set [Box ID] for each GeoBox so that user can control each GeoBox separately through [85x] command.
- Each Box should execute geometry, video wall setting and edge blending setting separately.

5.3.2. Activate Grid Pattern

- Use [PTN] key on remote controller to show grid patterns in all projectors. Press [PTN] key again will change grid color. To set two different pattern colors in adjacent projectors will be more convenient during geometry alignment.
- If user finds the grid size between adjacent projectors is different. Some possibilities:
 - The projection image sizes between two projectors are different (Zoom setting or projection distance is different).
 - GeoBox output resolution settings are not the same.
 - Projector aspect ratio setting is different.
 - GeoBox is set at [Original AR]. It shall be [Full Screen].
 - Set different grid pattern size in each channel.
- If user doesn't use VNS Excel Spread Sheet to calculate the image size in each projector, please try to set the same projection height prior to geometry adjustment. In this case, the image width and overlap grid size for all projectors will be similar and is easy for geometry alignment.

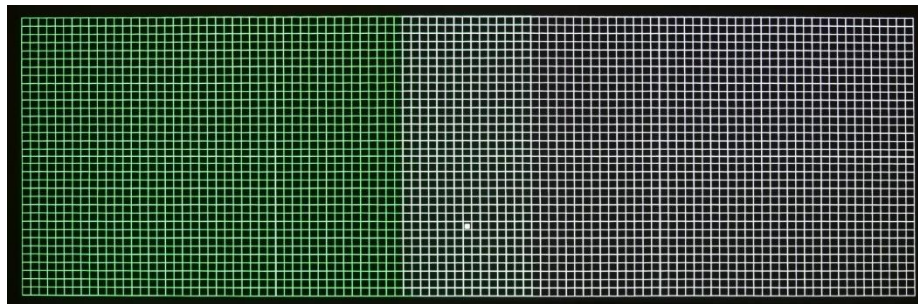
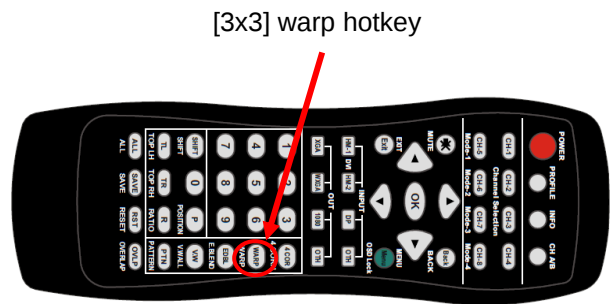
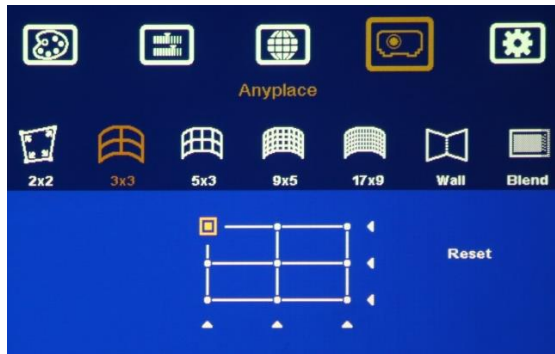
5.3.3. [2x2] 4 corner geometry alignment

- In most of applications, no need to do keystone correction in the projector before geometry alignment unless the image distortion is too much.
- If using short throw ratio projector in curved screen display, the image will have big distortion. Please use projector to do geometry alignment first before GeoBox.
- [2x2] alignment will adjust whole image with the same scaling factor. [Warp] alignment will adjust only some portions of the image.
- Please follow the sequence [2x2]→ [3x3]→ [5x3]→ [9x5]→ [17x17] to do geometry alignment to ensure entire image will have uniform scaling factor.
- Apply [2X2] Corner geometry alignment and draw the corners to pre-marked locations.
- If no pre-marked location, please use [2x2] alignment to let the image in each projector with the same horizontal position and also let the vertical lines without keystone effect.
- Measure the image size in each projector, to reduce the size of the larger image and let adjacent projectors have similar grid size and grid number in overlap area.
- If the screen is curved, it is possible to have some image inside or outside the screen after 2x2 adjustment. However, it doesn't matter once the image covers entire screen before 4 corner adjustment. [Warp] alignment can adjust the image position back to required position.

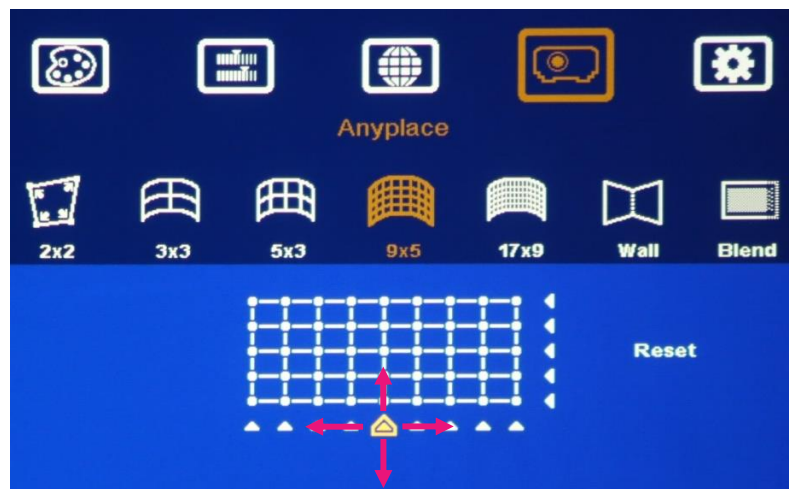


5.3.4. [3x3], [5x3], [9x5], [17x17] Warp alignment

- After finish [2x2] corner alignment, apply [3x3 Curved] geometry alignment to let 9 adjusting points be located at the required position including 4 corners, edge center points and center line position.
- Please use [5x3], [9x5] & [17x9] for further geometry alignment and let all the grids in overlap area with good grid stacking from two projectors.
- For curved screen, there will be some difference in the grid size in adjacent projectors, user can use Linearity Grid Line adjustment (in next section) to adjust the grid size and finish the image position fine tune within shorter time.
- After finish Warp alignment, user can use [2x2] for complete image position fine tune without changing the Warp result. If user executes [5x3] alignment again after [17x9] alignment, [17x9] grid position will be reset and only keep [5x3] grid point information.
- In ideal condition, all grids in edge blending area between two adjacent projectors shall be aligned together. In some special case, the vertical lines in edge blending area have some gap and can't match 100%. Please try to align the grids near center of overlap region with good stacking. It allows small image position variation near side borders of the overlap region because edge blending will reduce the effect of the mis-alignment in side borders. User can also adjust [Overlap] value in video wall settings to compensate this deviation and keep reasonable image quality.
- After the above processes, if the grid pattern in edge blending area still can't stack together, user can reduce one or two overlap grids from adjacent projectors to separate the adjusting points in each projector and get more accurate geometry alignment result.
- Geometry alignment range from remote controller can be up to 600 pixels in [2x2] + 600 pixels more in [3x3] for one corner/edge.
- If over GeoBox geometry adjustment range, the image will be broken. Please adjust projector installation position or use projector geometry alignment function to cover some adjustment.
- Ultra-short throw ratio projector is not suitable for curved screen display due to big image distortion. Once user can execute geometry alignment to required position, the image quality will be reduced, especially in the Text mode.
- After geometry alignment, all the grid patterns in overlap region should be stacked together.



5.3.5. Linearity grid line adjustment

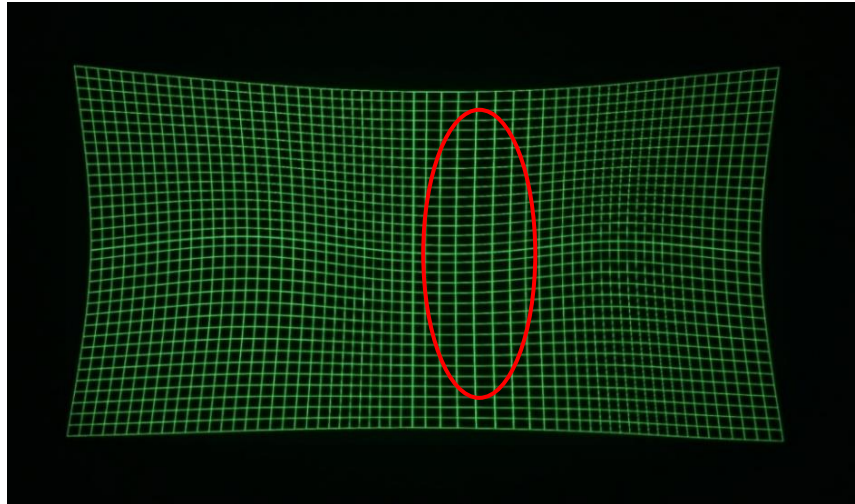


The control point can shift grid lines in both horizontal and vertical directions.

- Linearity grid line adjustment is under [3x3], [5x3], [9x5] & [17x9] warp alignment menu. User can select the control point, then press ENTER to do grid line adjustment. Each control point can shift the image in both horizontal and vertical directions.
- When user projects the image to curved screen, the image grid size will continuously change—the grid size at the center will be bigger than both sides. Ultra-short throw projector will be more serious. Linearity grid line adjustment is designed to correct this kind of grid line gap difference.

- Linearity Grid Line adjustment can shift both horizontal and vertical grid lines. The maximum adjusting points in OSD menu is H=17, V=9. For [3x3], the adjusting range is +_600 pixels in each direction.
- This function can co-work with Warp and Edge Blending function.

Grid line gap adjustment

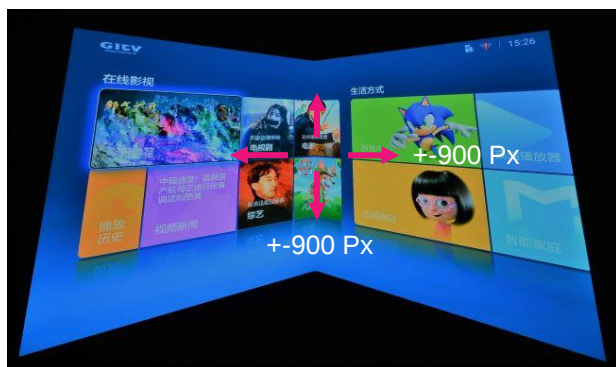
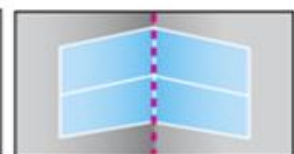
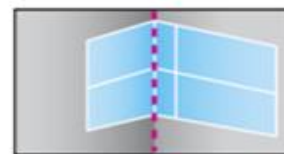
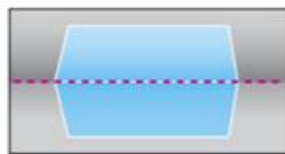
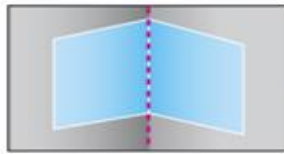


5.3.6. Corner Wall geometry adjustment

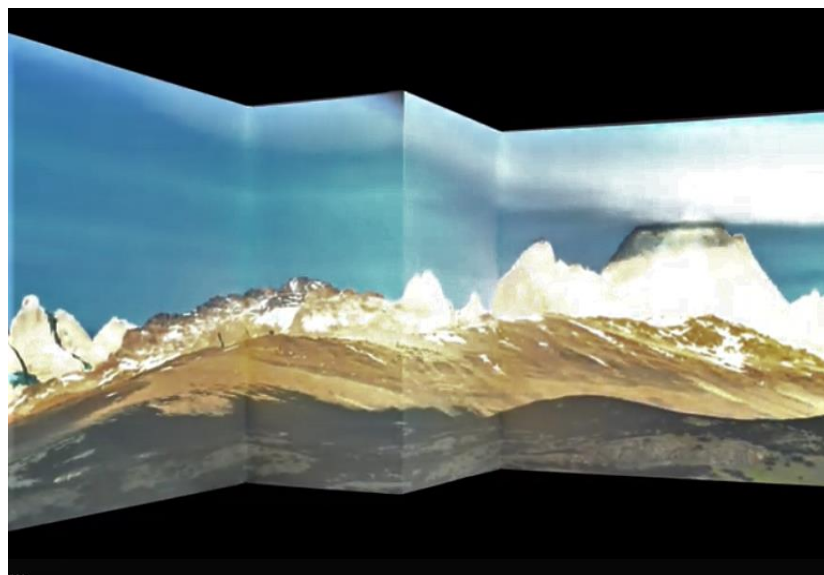
Important note: When apply Corner Wall function, all the other geomtry alignment function will be disabled. User can only execute geometry alignment through 8 points of Corner Wall adjustment. 4 corner control points can execute image 4 corner alignment same as [2x2] geometry alingment function. Edge Blend function will be still available.

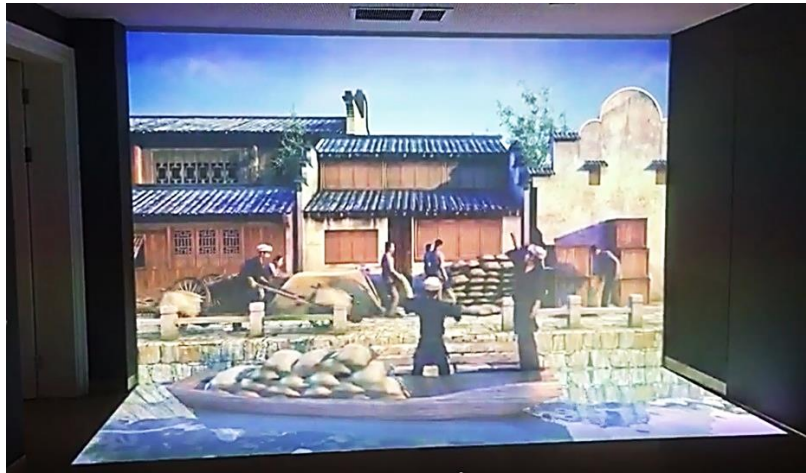
Corner Wall alignment allows user to adjust the image with "W" shape image for corner wall. It can execute horizontal and vertical corner alignment. User can only select either horizontal or vertical alignment at one time. This function can co-exist with edge blending function but not warp function. The image position can be adjusted as below:

- 4 corner image positions
- The transition position of the image in horizontal or vertical direction
- The maximum Corner adjusting range is +_ 900 pixels and the curvature location adjusting range is +_900 pixels.
- User can't use ultra-short throw ratio projector for corner wall application. Otherwise, the image distortion will be too big to be adjusted and may also create focus issue. The ideal projector throw ratio should be larger than 0.8:1.

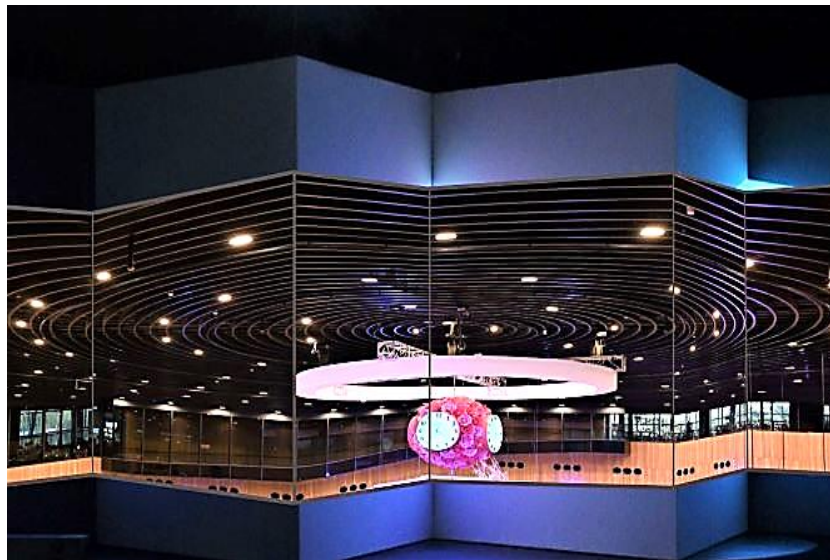


Example A: Single projector application





Example B: Dual projector application



Corner wall application on curved screen

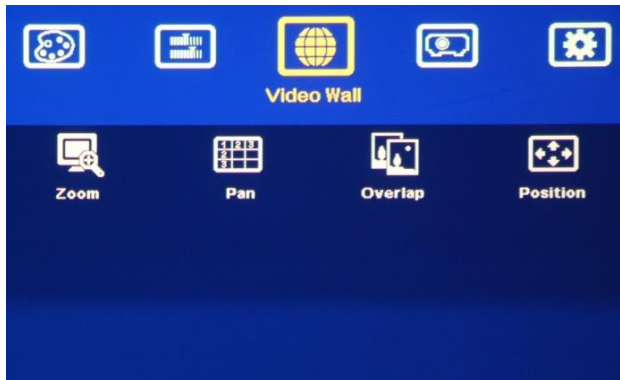
If user wants to implement Corner Wall function on curve screen, user can add one more G111/G112 to do warp alignment, then connect the output to the input port of the Box for Corner Wall alignment. Then user can execute curve alignment and Corner Wall adjustment at the same time. The image latency will be 4 frames in this case.

Important notice on curved screen application

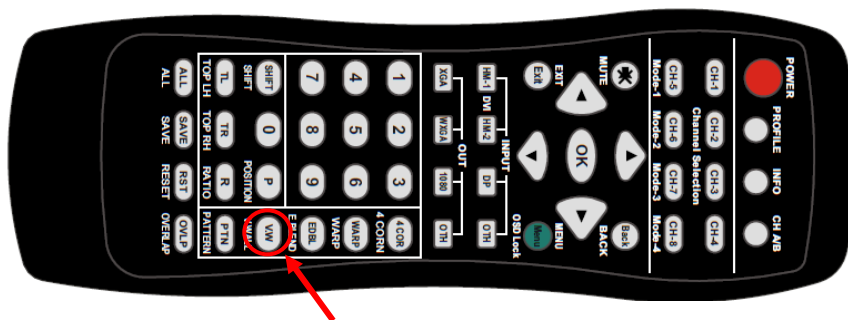
Refer to curve image alignment on wall corner, if the curve radius is larger than 1.5 meters, user can use normal throw ratio (larger than 1.0) projector for the alignment. If the radius is less than 1.5 meters, we propose to change the design with 90 degree corner wall. Then user can apply [Corner Wall] alignment or project the image to separate wall from each projector. We propose to use projector with throw ratio larger than 0.8 for curved screen edge blending. The ideal curvature should be larger than 6m radius.

6. [Video Wall] setting

- The purpose for Video Wall Setting is to split the image and assign specific image to each projector. The overlap pixel setting is to change the cropping area for each projector based on the overlap size. Overlap value shall be accurately adjusted to avoid blurred image in overlap region. All of these functions are under [Video Wall] menu.
- Each Box shall execute [Video Wall] settings separately.

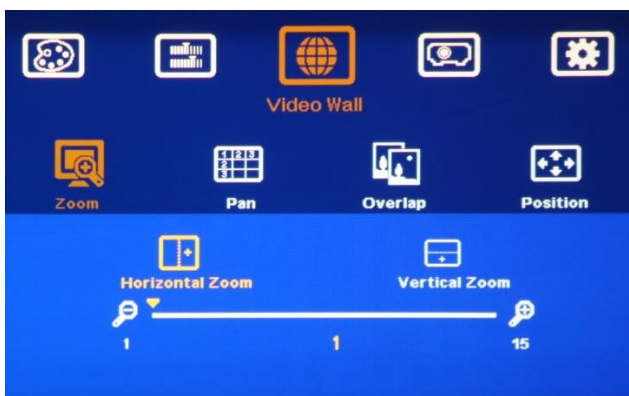


- Press Menu Keypad on Front Panel to enter [Video Wall] OSD menu.
- [V.W] hotkey on the bottom right position of the remote controller is available for quick access.
- Video wall function can crop image for edge blending and assign to projectors.



[Video Wall] menu hotkey

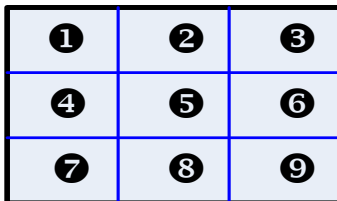
6.1. [Zoom]: split the signal source



Use [Zoom] to split input image in horizontal and vertical directions. Maximum split images are 15x15 in both horizontal and vertical directions from single input source.

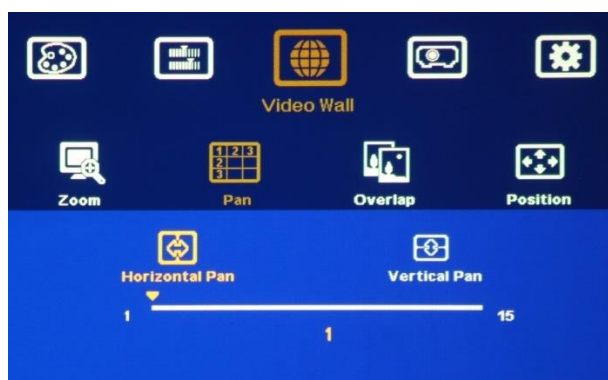


*For 3 projectors at horizontal position, Horizontal Zoom=3,
Vertical zoom=1*

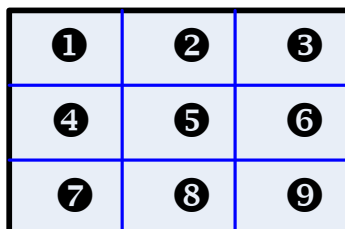


*For 3x3 displays (9 projectors), Horizontal Zoom=3, Vertical
Zoom=3*

6.2. [Pan]: assign image location



- Use [Pan] to determine the location of each split image in both horizontal and vertical directions.
- Default setting:
Horizontal Pan=1
Vertical Pan=1



For No. ③ projector:

Horizontal Pan = 3

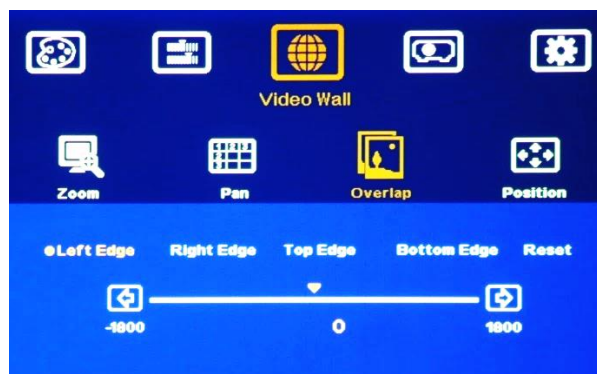
Vertical Pan = 1

For No. ⑥ projector:

Horizontal Pan = 3

Vertical Pan = 2

6.3. [Overlap]: crop the right image for each projector



- Use [Overlap] to adjust overlapped pixels between two adjacent projectors
- It can also change image aspect ratio.
- Max. Overlap range is +_1800 Pixels

- In multiple projector applications, the Overlap value can be determined by VNS Excel Spread Sheet as showed in below chart with RED mark. User can follow this value to get the right overlap settings with clear image.
- This Overlap value will be calculated based on several factors—such as input resolution, projector resolution, quantity and overlap region size.
- If the overlap regions have different size due to installation position limitation, please use Irregular Excel Spread Sheet to calculate overlap value.
- User can use Video Wall overlap setting to fine-tune the image position in overlap region. It can compensate geometry mis-alignment and let image become much clearer.

Project basic data

Source resolution (H)	3840	Screen width	6.50 (m)
Source resolution (V)	800	Screen height	1.50 (m)
Projector resolu. (H)	1280	Projector lumen	3200 (Lum)
Projector resolu. (V)	800	Screen Aspect ratio	4.33 (required)

Overlap pixels (32 pixels per grid)	Overlap %	Recommended
Overlap pixel (H)	256	20.0%
Overlap pixel (V)	0	25%~40%

Recommended overlap region: Min. 50 cm width

Qty of projector (H)	3	Throw ratio (Min)	1.20
Qty of projector (V)	1	Throw ratio (Max)	1.70

Final output resolution

Horizontal resolution	3328
Vertical resolution	768
Extended pixel (H)	98
Extended pixel (V)	0

Video wall setting value

Position of projector (H)	1	2	3	4	5	6	7	8	9	10
LH edge overlap value	0	98	197	x	x	x	x	x	x	x
RH edge overlap value	197	98	0	x	x	x	x	x	x	x
Position of projector (V)	1	2	3	4	5	6	7	8	9	10
Top edge overlap value	0	x	x	x	x	x	x	x	x	x
BTM edge overlap value	0	x	x	x	x	x	x	x	x	x

Final result checking list (PJT: Projector)

Final Image size (meter)	Final Illuminance Lux (Lum/m2)	Image size for each PJT
Width	6.50	PJT lumen
Height	1.56	Final Illumin

Overlap region size	Original aspect ratio	Projector throw distance
Horiz. (m)	0.500	Min (m)
Vertic. (m)	0.000	Max (m)

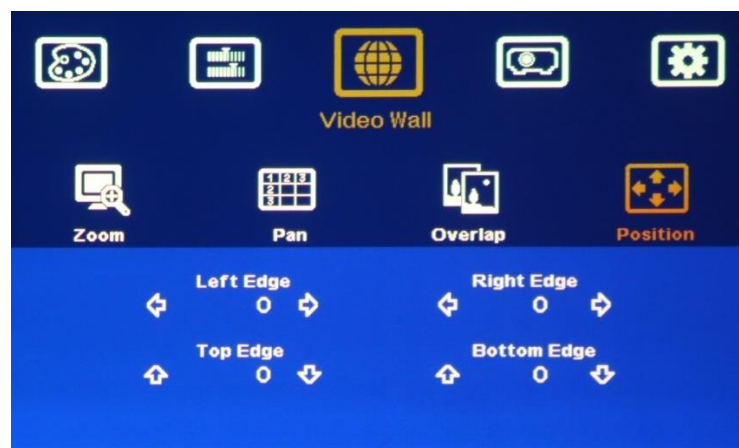
* Final image height should be equal or larger than screen. User can shrink image to have the same image height as screen by GeoBox geometry adjustment.

* Standard luminance is 400-800 Lux for restaurant and big conference room, 1000-1500 Lux for trade show. 3D: 500 Lux (single projector)

- If no Excel spread sheet is available, user can apply video wall test pattern and execute overlap adjustment. Once the pattern can match together, it is done with the right overlap value.

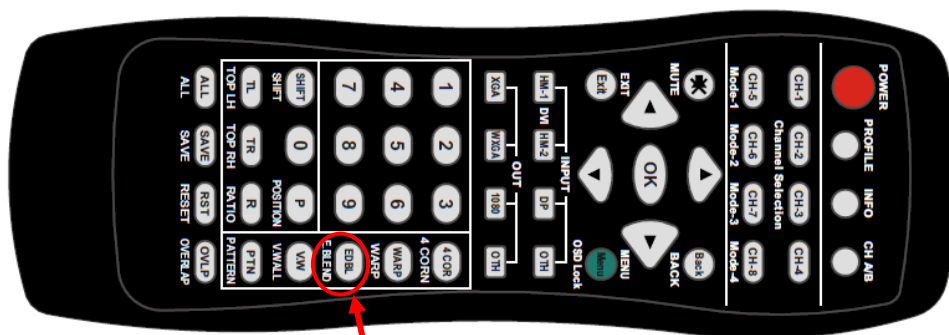
6.4. [Position]: shift image position without changing image size

After cropping, user can shift image position at H&V directions without changing image size. Usually, it is for video wall application to fine tune image position. In projector edge blending application, user only changes Overlap value in one edge but not execute image shift.



7. [Edge Blend] settings

- Edge Blend is to merge the images from multiple projectors to become one seamless image.
- The scaling factor between two adjacent images shall be the same. It means the image size under the same resolution should be the same.
- Geometry alignment is required before edge blending:
 - To let the image has the same grid size (same scaling factor in both horizontal and vertical directions)
 - To let images overlapped together in horizontal lines and vertical lines.
- Sub-menu under [Edge Blend] menu
 - [Edge]: select the right edge and set overlap pixels. The pixel no. is same as the overlap grid size multiple grid number. If overlap is 10 grids, the overlap pixel is 320 in default grid size.
 - [Shift]: to shift image edge blending location and implement [Edge Mask] function for non-overlapped edges with black background.
 - [Gamma]: adjust gamma value in [Transition] and [Gain] in each channel to improve banding effect in overlap region.
 - [Color]: to do White Balance correction for individual projector.
 - [Grid]: set grid pattern size for Horizontal and Vertical directions.



[Edge Blend] hotkey

7.1. [Edge]: select location and set edge blending value

- [Edge] is to select the edge for edge blend and set overlapped pixel number.
- User can execute edge blending at any edge.
- Maximum edge blend pixels are H=1920, V=1200.
- Color indicating lines will appear when set edge blending pixels.
- User needs to adjust the color indicating lines to match together (green to green, red to red). The final overlap value is the same as actual overlap number (grid size * grid number).



For 3 projector edge blending as example:

- To select [Right Edge] for LH projector
- To select both [Right Edge] & [Left Edge] for center projector.
- To select [Left Edge] for RH projector

7.2. [Shift]: shift edge blending position and execute Edge Mask

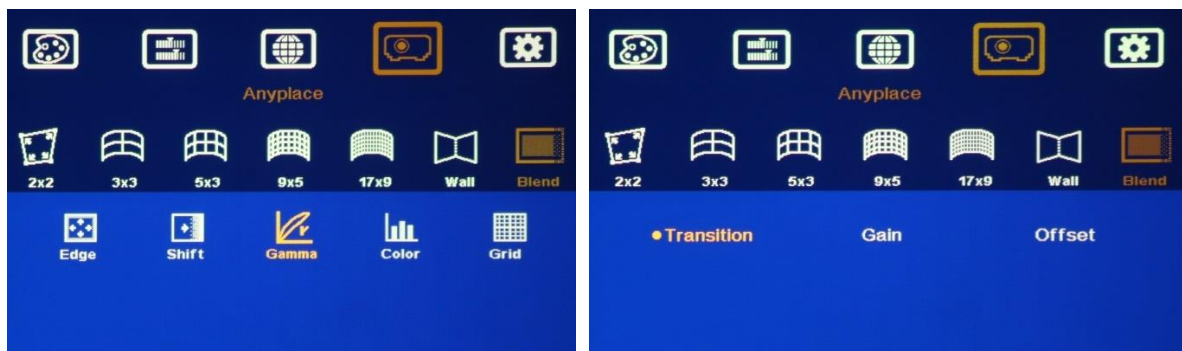
- [Shift] has two functions: one is to shift [Edge Blend] location and another function is to do [Edge Mask] in not [Edge Blend] borders.
- When user selects the edge in Edge Blending area, user can apply "+" value (0 to +500) to shift the whole [Edge Blend] position. If the value is "-" (0 to -10), user can see color uplift in the edge of the Edge Blending area. The purpose is for user to do color fine tune in edge blending area.
- When user selects the edge without [Edge Blend], [Shift] will change image border location with black background without changing image size and location. It implements [Edge Mask] up to 500 pixels following the final result after geometry alignment.



- [Shift] is to shift [Edge Blend] location in [Edge Blend] edge. If the value is set to "-", it will uplift the color in the border of edge blending area.
- It will execute [Edge Mask] on the edges in non-overlapped region.

7.3. **[Gamma]: Color correction in edge blending area**

- Different projectors may have different gamma curves. Different “Display mode” in the same projector will also have different gamma curves. Edge blending default gamma curve is 2.2. These gamma curves will affect the color in edge blending area. The common issue is gray color banding effect. These issues are more significant in pure color or white back ground display.
- [Gamma] function is to adjust the gamma curve in edge blending area for each projector through independent RGB gamma curve adjustment.
- The major reason for banding effect in edge blending area is related to projector color setting and gamma curve. All projectors shall have the same gamma setting and [Display Mode].
 - User needs to select right display mode (gamma curve 2.2 is the best gamma value in the projector setting) and fine tune the color difference among the projectors before edge blending to minimize the possible banding effect in edge blending region.
 - Some projectors have [Multiple unit application] menu for user to choose while executing edge blending function.
 - Please disable [Dynamic] color function in the projectors. These functions may change gamma curve based on the content and affect final edge blending image quality.



Three sub-menus under [Gamma] menu:

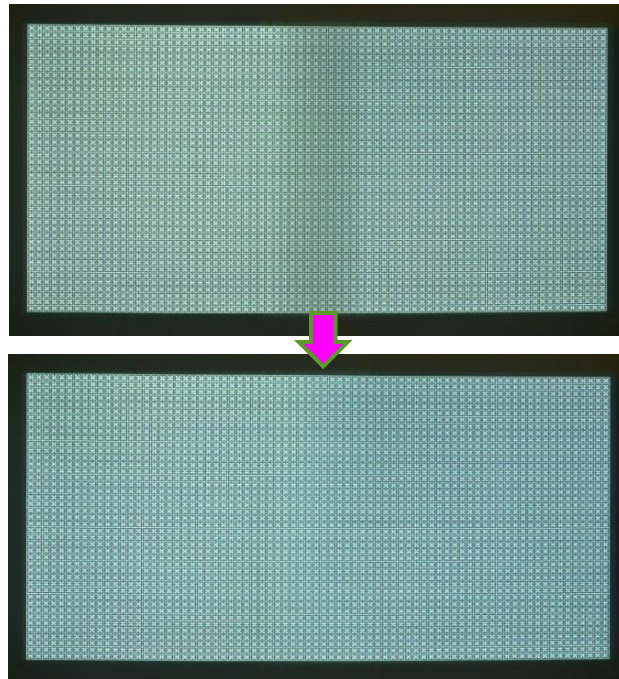
- [Transition] Gamma:
 - To set edge blending area gamma value via discrete RGB gamma curve value adjustment. The gamma value range for each RGB color is from 0.9-3.0.
 - When overlap region is brighter, user can decrease the gamma value and if overlap area is too dark, user can increase the gamma value to improve video quality.
 - User can apply pure color RGB and adjust R.G.B. value separately to see the difference.
 - Transition gamma adjustment may not solve color banding issue once the projectors gamma curves are not the same, smooth or have variation among projectors.

- [Gain] gamma:
 - This function can change the gamma curve in each projector separately.
 - It can further improve edge blending result, especially while two adjacent projectors have different gamma curve.
 - User can start with one projector in one color first and see the color change in overlap area. Then adjust other colors to match required color.
 - Usually, when user adjusts Gain Gamma in the first projector, it will affect the color in one side of the overlap region. User can adjust another projector to compensate another side. The adjusting value for adjacent projector can be different.
 - [Offset] gamma: It will apply to each projector separately and is only available when implement black level Offset adjustment. It determines the percentage of the Black Level [Offset] effect. [Offset] gamma adjustment can be served as a tool to compensate the brightness difference between two projectors. It is only functional when user applies Black Level [Offset] function.
- [Offset] gamma:
 - [Offset] gamma will change RGB gamma at the same time.
 - This function is only available when user implements [Offset] function for black level uplift. After user implements [Offset] setting for black level uplift, user can adjust [Offset] gamma to change the gamma curve for black level uplift.
 - User can use this function to fine-tune the brightness level between overlap region and non-overlap region in edge blending application.

Below picture shows banding effect in edge blending area

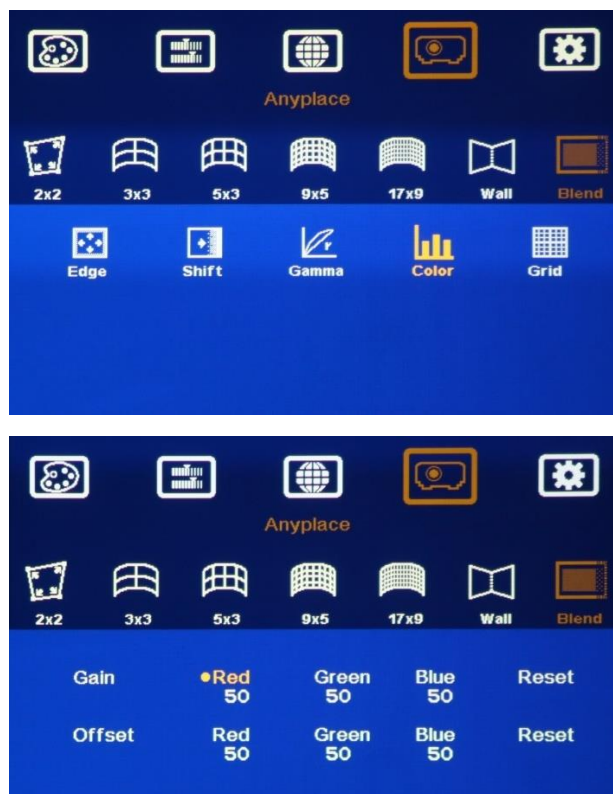
This issue is related to many factors:

- Screen: gain value under 1.0 is recommended
- Projector: shall be the same model with the same gamma and Display Mode settings.
- Usually, Laser projector can get good result due to accurate gamma and color.
- Signal content: to avoid pure color or pure white color content. Multimedia is the best.
- Overlap range: too small overlap range will cause banding effect. 20%-40% with more than 60 cm width is recommended.



7.4. [Color]: Individual projector white balance and color correction

The [Color] function can be applied to individual projector for white balance and color difference correction through separate RGB Gain and Offset adjustment. It will be helpful to compensate projector color difference, lamp brightness decay and lamp replacement issue.



- Under [Color] menu, user can adjust separate RGB [Gain] and [Offset] value to change the color and white balance in each projector.
- [Gain] is to change the color slope and take more effect in brighter region.
- [Offset] is to add value in all level of brightness (0-225) and take more effect in darker region.
- When apply [Color] adjustment, it will affect entire color in the projector. Please check with different video contents and minimize the side effect.

In edge blending procedures, user needs to adjust the color from projector first. If it is still not enough, user can use [Color] function to do further adjustment. Please note that, any color adjustment will reduce the color dynamic range. User needs to check the result with full range color image.

7.5. [Grid] (determine grid pattern size)

The pixel size in grid pattern for geometry alignment is selectable. The grid size is from 8 to 120 pixels with 1-pixel increasement in both horizontal and vertical directions. H&V grid size will be the same. User can select grid size under [Edge Blend] menu. Default grid size for both H&V directions are 32x32.



7.6. Final image quality fine-tune

- The final performance will be a combination of many factors—projector characteristics, projector setting, screen, ambient light and GeoBox setting.
- Banding in overlap area under dark environment is caused by light leakage in the projector optic system. User needs to uplift the black level in none overlap area through [Offset] menu.
- The projector may retain light leakage near the border (about 20 pixels) of the imager (micro display—DMD, LCOS or LCD). It is not possible to be fixed.
- The factors affect final image quality
 - Projector:
 - To select projector display mode near 2.2 gamma setting will get the best result.
 - Ultra-short throw ratio projector is not recommended for edge blending, especially in curved screen edge blending.
 - When using ultra-short throw projectors, the reflection angle in overlap area will be very big. Viewer will see different color banding when watch the image from different viewing angle especially the screen gain value is more than 1.0.

- To reserve enough overlap area—0.6m-1.2m in width or 20%-40% (based on single projector native resolution) is recommended.
- To adjust image position of the projector and reduce keystone angle.
- Increase Overlap region & reduce off axis angle
- To reset projectors with the same settings.
- To select Display Mode. Usually Standard, sRGB/Neutral will get better result.
- To disable projector Brilliant color adjustment or Auto/Dynamic color adjustment.
- Try different color settings in the projectors.
- GeoBox settings:
 - Edge Blending Gamma settings:
 - ♦ To execute [Transition] Gamma adjustment: start from one color in one channel first. After see some difference, then adjust other two colors. Try to do the same in the second channel.
 - ♦ [Gain] Gamma adjustment: if Transition Gamma adjustment still can't fix the issue, try to adjust Gain Gamma. It will change gamma curve in each projector. Starting from one channel in one color first, then to do other two colors adjustment.
 - ♦ [Offset] gamma: When implement black level uplift, [Offset] gamma can change the brightness in overlap region borders if some brightness gap happens between overlap and non-overlap areas.
 - [Shift] adjustment: If user sees dark line at the edge of the overlap region, to adjust few pixels (1-10) at “-“ value will change the color at the border.
 - [Color] under [Blend] menu: If user sees background color difference when apply pure white image, user can adjust [Color] to balance background color difference.
 - Image Properties: To select Preset Mode to Neutral or Bluish may improve banding condition but it will change whole image color temperature.
- Screen: To use lower gain value screen.
 - Low gain value screen will improve banding effect in overlap region but will reduce total image brightness.
 - Short throw projectors with high gain screen may cause banding effect when watch from different viewing angles due to different reflection intensity.
 - User needs to carefully select the transparent screen for projection from rear when using ultra-short throw ratio projector. Due to big reflection angle, the transparent screen should be test before installation.

8. Complete system aspect ratio adjustment

User can change the aspect ratio of the image with black borders or to stretch the image in specific direction to compensate the aspect ratio difference. The Maximum adjustment range is 1800 pixels in each edge. User can adjust [Overlap] value under [Video Wall] menu to change the cropping area and achieve aspect ratio change.



- In multiple projector application, when user adjusts Top or Bottom Overlap value in one projector, user needs to adjust the same Overlap value in other projectors to let all projectors has the same scaling factor.
- In two projector edge blending, when user adjusts horizontal aspect ratio, user needs to change Video wall Overlap value with the same number in both projectors until getting clear overlap image. In VNS Excel Spread Sheet calculation, if user calculates original Overlap value with 3840 input resolution, after increase 500 pixels in both outside edges in projector 1 (RH edge) and projector 2 (LH Edge), user can shrink the image width. However, the overlap region will become blurred. User needs to re-calculate Overlap value by new input resolution $3840+500*2=4840$ to get correct video wall Overlap value. User can also continuously increase overlap value in both projectors to a point that both images can match together.
- The adjustment range of 1800 pixels is calculated according to the signal source resolution.

9. **Miscellaneous settings**

9.1. **Helpful tips for edge blending**

- In the application with short throw ratio projector on curved screen, there will be big image distortion. User needs to apply big geometry alignment and degrade the video quality.
- Image position drift will cause blurred image in overlapped region. For edge blending application, please select one projector with less Thermal drift. It can be judged through comparing image position shift between Power ON and after 20 minutes running time.
- Mark the final image position. Once the position shift in the future, it can be recovered through [2x2] corner adjustment via remote controller easily.
- Native contrast ratio is important in edge blending. The higher contrast ratio will have less light leakage with less banding in overlapped region under dark environment.
- Ultra-short throw projector is for single projector application and is not suitable for edge blending due to big reflection angle and easy to cause color banding effect while watching from different viewing angle, especially under high gain screen. Most of ultra-short throw projector has max. image size limitation.
- Select projector models for edge blending in advance will make sure to get the best final quality.
- DLP Laser projector is good for edge blending under dark environment. LCD projector has good color saturation and is suitable for multimedia application at normal ambient light environment.
- During system settings, the output signal may be temporarily lost and cause projector re-searching input signal and the image disappears shortly. User can disable [Frame Sync] function to avoid this kind of effect. After finishing system setup, user need to set [Frame Sync] at [Normal] position to get perfect synchronization in all output channels.

9.2. Image distortion

- If the content aspect ratio is different from the screen aspect ratio, it will cause image distortion. User has below alternatives:
 - User can adjust aspect ratio through video wall [Overlap] settings.
 - Full screen display but some content will be drawn to outside border and missing.
 - Draw the image into screen and keep some blanking border at some borders.
- If the content aspect ratio is the same as screen aspect ratio, user can take below actions to get no distortion full screen display through below actions:
 - If the signal source is from PC, user can set EDID resolution with the same aspect ratio as the screen.
 - If the signal source output resolution is not the same aspect ratio as the screen, user needs to set signal playback with full screen display but not keep original aspect ratio.
- In PC display card settings, user needs to select [Full screen] display but not [Keep original aspect ratio]. GeoBox will expand the image to full screen automatically.

9.3. EDID Setting

Selective EDID setting for input source resolution is added into GeoBox. The settings will be applied to individual processing module on select input port. Each processing module needs to set EDID separately. Below are some guideline for EDID setting:

- GeoBox can support big range of input signal timing—from XGA up to 4k/2k @30Hz. In order to get the best video performance, user needs to select the best input signal resolution.
- Different source resolution may show different final image aspect ratio. User can utilize different EDID setting to change signal source timing and get different output aspect ratio.
- User can select different EDID directly from OSD list or use [Customize] function to create Non-VESA standard timing. The range is from 1024x768 to 3840x2400.
- If the signal is from PC, user can set customized EDID in GeoBox to let PC output expected resolution. Some PC may not follow GeoBox EDID resolution setting and require customized output setting from display card or re-boot.
- User can create some timings that is outside VESA standard, such as 7680x1200/30Hz.
- PC or laptop may not output required timings due to hardware limitation or driver issue. User may need to do custom setting inside PC and re-boot to get desired output.
- The optimized EDID resolution should be the final resolution after edge blending. For instance, if user uses three WXGA projectors for edge blending with 320 overlapped pixels, then the best signal for this setup will be $1280 \times 3 - 320 \times 2 = 3200$.

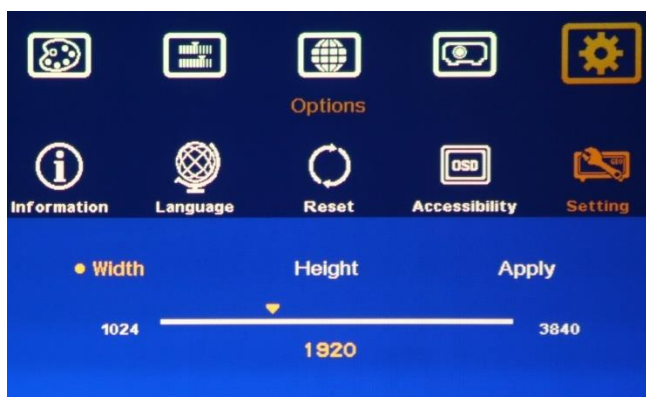
- PC may memory the first EDID when it is connected with GeoBox. Some PC may not follow new EDID setting in GeoBox. Below are some suggestions that may fix this kind of issue.
- Power ON GeoBox first and set EDID before connected with signal source. It will make sure PC can catch correct EDID information.
 - Please use [Customize] EDID setting if PC output doesn't follow the select EDID due to PC OS may memory the EDID in first time connection. This setting is reduced blanking timings. It will re-activate a new EDID for PC.
 - Disconnect signal source while set EDID. It will avoid interference from signal source and get correct EDID settings.



- Activate EDID setting menu:
[Options]→ [Setting]→ [EDID]
- Use IR remote controller to select desired EDID.
- After select EDID, signal source will auto-change the output timing setting.
- Press [INFO] key to check if the input and output timing are set correctly.

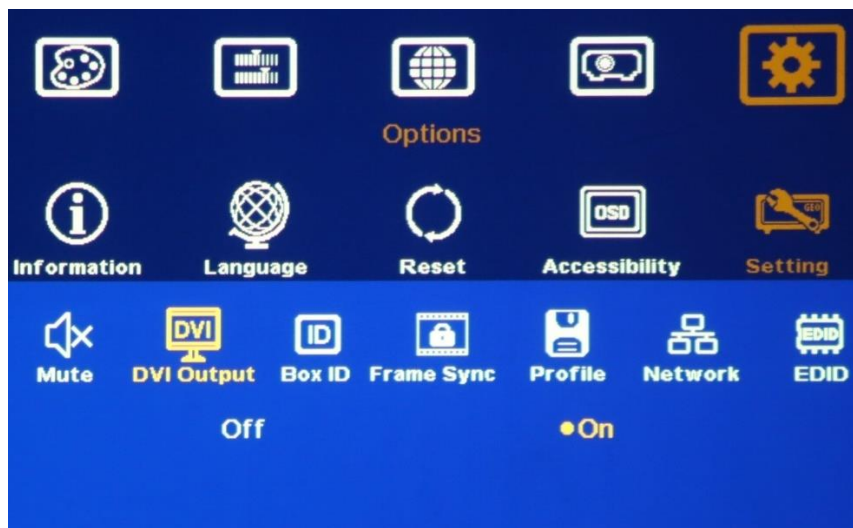


- User can also set EDID manually. The range for customized EDID will be from 1024x768 to 3840x2400.
- Horizontal resolution is in a step of 8 pixels and vertical resolution is in 1-pixel.
- After creating the EDID, PC or laptop may not output required timings due to old EDID has been kept inside PC. User may need to do custom setting in GeoBox or inside PC and re-boot to get desired output.



9.4. HDMI vs. DVI Output Signal

- HDMI digital signal is compatible with DVI signal. Most of display devices can support both digital signals. However, some old equipment may have less flexibility in signal compatibility. In this case, user may need to select DVI output format to get normal display in some devices.
- HDMI signal embeds more signal information, such as audio and HDCP. Once some information is missing, it will also affect the display. It may cause intermittent or loss of image. Under this condition, user can try to set DVI output. The connection doesn't need to change.

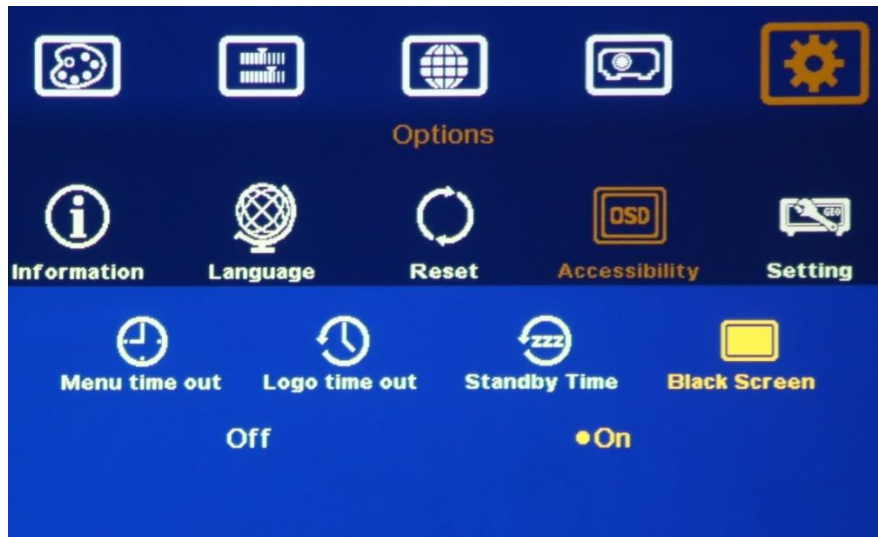


9.5. System Standby and Automatically Turn Off Output Signal

- [Options]→ [Accessibility]→[Standby Time]
- If set [Standby Time] at 60, the system will get into Standby Mode after 60 seconds when no input signal is detected. The output signals from GeoBox will also be terminated at the same time. If GeoBox detects input signal again (hot plug signal), it will automatically turn on the system.
- If the projector can automatically turn off/on by detecting input signal, user can control signal source to execute entire system on/off control.

9.6. Change Background Color

When no signal input, the system will show blue color background with [Power Saving Mode] message on the screen. User can change background color to black on the screen with no text message on it through [Options]→ [Accessibility]→ Black Screen]→ [On]



9.7. Turn off splash screen Logo

- Use can turn off splash screen Logo through [Options]→ [Accessibility]→ [Logo Time Out] and set the value at "0". Default setting is 10 seconds.
- It will reduce the boot up time.

10. **Trouble Shooting**

10.1. **Back Panel LED indicators**

- User should see Input / Output LED lights on back panel. If no light illuminated in specific channel, please check Input / Output connecting cables, signal source & projector in that channel.
- If user sees continuous flashing in some channel LED, it means OSD may be locked. Please press [Menu] key for 5 seconds or press 850 number keys in remote controller to disable [OSD locked].

10.2. **No image in the projector**

- If user can't see the image, please click [Menu] key to activate OSD. If user can see normal OSD, the system should be normal. Please click [INFO] key to check input and output timings.
- If user can't see the OSD, please change signal source, HDMI cable or display device to identify the root cause of the failure.
- HDCP may be the reason for no image. Please make sure display device is HDCP compliant.

10.3. **Intermittent or Loss of Input Signal**

- Check the HDMI cable quality and make sure all cables are fitted correctly. 4k/60 signal requires high speed certified cables.
- Cable length: Connecting cable length should be as short as possible. Replace a short cable to verify the possible root cause.
- HDCP compliant issues: If the input source or the monitors are not HDCP compliant, it is possible to stop GeoBox from negotiating HDCP link and show intermittent, abnormal or no image. Please check HDCP condition in signal source or display device.
- Resolution issues: check if signal source and connecting cables can provide source signal supported by GeoBox.
- DVI/HDMI signal compatibility: some display devices may only support HDMI or DVI video signal and execute wrong signal format detecting. The default output is HDMI. User can change output with DVI format through [Options]→ [Setting]→ [DVI]→ [On].
- Usually, to swap with different cable, output channel, signal source and projector can verify the root cause for the failure.
- It is possible to have signal compatibility issue. User can add one HDMI splitter/switcher in the middle to change signal impedance. It may fix the issue.
- We propose to use signal enhanced cable, HDBaseT or Optical Fiber cable for long distance connection. Conventional 4k/60 HDMI can't support more than 10 meters.

- User can connect a monitor at the end of the Loop out port to check signal source stability.
- During system settings, the output signal may be temporarily lost and cause projector re-searching input signal and the image disappears shortly. User can disable [Frame Sync] function to avoid this kind of effect. After finishing system setup, user need to set [Frame Sync] at [Normal] position to get perfect synchronization in all output channels.

10.4. Video quality issues

- Use the highest resolution and number of color bits (RGB 4:4:4) images allowed by G112. Please click INFO key to verify input/output resolution.
- There are a number of lower-quality AV players, the specification and actual output are difference, or because of the use of lower color sampling bits or poor image compression technology, resulting in lower quality or image is not smooth (LAG).
- If the use of H.264/H.265 compressed files, please select a player with hardware decoding to get smooth video quality.
- If the input signal is interlaced signal (interlaced-1080i), and the image is rotated, then the channel will have no [3D Motion adaptive de-interlaced] processing function. If user applies static image source, the output video will have a slight jitter phenomenon. The processing channel quality will be reduced. Use a progressive signal source setting (1080p/2160p) whenever possible.
- Please press [INFO] shortcut key to check the input/output signal settings.

10.5. Image position shift after installation

The position shift in the projector will be enlarged to more than 10x due to projection distance. One mm image shift inside projector may appear 1cm image shift on the screen. User will clearly see blurred effect on overlap region in edge blending setup.

- There will be some image position shift after system setup. The main reasons are as follows:
 - Thermal drift due to projector internal temperature change. When power on the projector, the temperature is lower. After 20-30 minutes, the image position shift may be up to 5-10mm. It will be more obvious in overlap region. Different projector will have different thermal drift range.
 - Stability of mounting system.
 - Projector structure change after installation due to weight and thermal effect.
 - Cable connection and cause weight balance issue.
 - Change lamp
 - Earth quake or caused by human reasons.
- The first projector image position calibration should be done within one month after installation. The second calibration may be required after 3 months, then every 6 months or once a year.

- If user finds big position shift and doesn't know the real issue. Please follow below procedures to confirm the issue is from GeoBox or not.
 - Turn off GeoBox and open projector internal test pattern.
 - Mark the corner positions of the projector image.
 - Check projector image shift condition after some time with GeoBox in OFF condition.
 - User will clearly identify that the position shift is from GeoBox or not after this procedure.
 - GeoBox is digital processor and will not change image position only for few pixels.

10.6. System crash and malfunction

- After FW update, please reset the system through a pin inserting to reset hole on the back panel for 5 seconds to avoid abnormal settings inside the system.
- When the input source is 4:4:4 PC graphics signal, only [Brightness], [Contrast] and [Sharpness] three items under [Picture] menu can be executed. If the input is 4:2:2 video source, all the items are functional.
- When implement [Corner Wall] alignment, other geometry functions will be not functional.
- Remote controller may be interfered by environment and can't be smoothly operation.
- When geometry alignment is over the maximum adjusting range, the system may crash. It can be recovered by decreasing adjustment range or system reset.

10.7. Synchronization issue in the outputs

- The input refresh rate should be the same as output refresh rate so that the system can implement Frame Lock to synchronize all the outputs. If the input source is 50Hz with 60Hz output, it is possible to see some lag or frame tear in the display.
- Please make sure to set [Frame Sync] at [Normal] in all channel to ensure all boxes will be synchronized.

10.8. How to reduce projector re-searching input source

User can set [Frame Sync] at [Disable] to reduce [Source Re-search] in projector during setup. After finish the setup, please set to [Normal] to get synchronization in all outputs.

11. **Technical support**

- User can send e-mail to sales@vnstw.com together with as much information as possible.
- The following information is required for a swift response.
 - Take a picture of the label under the back of the box. It will provide GeoBox model No. and series No.
 - If OSD can be seen, press [Info] key on remote controller to get System Information and send the picture. It will provide input/output timing and F/W version information.
 - Sink device (projector): type and model number
 - Screen or specific application details.
 - Details of the signal source and the resolution.
 - The exact nature of the problem. Please be as detailed as possible.
 - If possible, please attach the Pictures of the issue.
- Usually, we will response within 24 hours (excluding weekends)
- Please note that if the machine is sent back for repair, user needs to pay for the delivery cost.

12. **Safety Precaution and Maintenance**

12.1. **Power Supply**

Please connect electric power for all devices in the system from the same Power Distribution Box with correct grounding. Open the power after finishing system connection to reduce the risk for system damage from high floating voltage.

12.2. **Working Environment**

Please locate GeoBox in an environment free from dust, moisture and high temperature with good ventilation.

12.3. **Warranty**

This device is designed and tested to the highest standards and backed by two years' parts and labor warranty. Warranties are effective upon the first delivery date to the end customer and are non-transferable. Warranty period extension is available up to 5 years through paying extra charges.

12.4. **Maintenance and Repair**

Apart from what is detailed in User Guide, maintenance should be carried out by competent technician assigned by VNS. If GeoBox is physically damaged, it should be returned for repair using VNS RMA procedures. If the unit is opened by user, it will lose the right for warranty protection.

Specification

- Input: 1x HDMI 1.4
- Output: 1x HDMI 1.4
- HDCP compliance: Input: HDMI: HDCP V1.4, Output: HDCP V1.4.
- Max. input resolution: 3840*2160/30 Hz, 300MHz
- 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.
- 15 selectable Outputs: HDMI 1.4 up to WUXGA/60Hz, 2048*1080/60Hz, progressive 4:4:4, RGB.
- 2 frames system latency: 33ms (@V=60Hz)
- Warp engine for geometry alignment up to 17x9 grid control points.
- Maximum geometry adjustment up to +_600 pixels in both H&V directions in each corner.
- Edge blending at 4 edges up to H=1920 pixels, V=1200 pixels with independent RGB gamma correction.
- Edge Mask following the result of geometry alignment up to 500 pixels.
- Support Corner Wall adjustment in H&V at flexible location.
- Support Linearity Grid Line adjustment for quick H&V group line position alignment.
- Embedded video wall function for image split, cropping and overlapped pixel setting for edge blending.
- Selectable grid pattern size from 8-120 pixels in H&V directions. Default is 32*32 pixels.
- Selectable grid pattern color with optional transparency to see background image for external pattern.
- Flexible aspect ratio adjustment in each edge up to +_1800 pixels position shift.
- 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 multiple unit application.
- Frame rate conversion and 50Hz in/out function to eliminate image frame drop or repeat.
- Color and white balance adjustment.
- Image 90/180/270 rotation, flip, cropping, scaling & color adjustment up to 4k/30Hz.
- Selectable and programmable EDID in the range: H=1024-3840, V=720-2400.
- User can save up to 10 settings and can be recalled by remote controller, keypad or RS232.
- ESD Protection: ±8kV (Air-gap discharge), ±4kV (Contact discharge)
- Working environment: 40° C, 10-90% RH
- Control: keypads, IR, RS232
- System settings can be stored and backup in PC.
- Power supply: DC: 12V 1.0A
- Max. Power consumption: DC 12V 0.4A
- Dimensions (Body only): 169mm*116mm*31mm.
- Weight (Body only): 0.53kg
- CE/FCC/RoHS Certified
- 2 Year Warranty, paid extension available up to 5 years.

Revision History

Revision	Date	Originator	Comments
V1.0	2022-0418	Steve Wang	First version