

# SOFTWARE RELEASE NOTES



**Product:** Mbox® Media Server  
**Manufacturer:** PRG  
**Subject:** Projection Setup  
**Bulletin No:** MBX-012  
**Date:** June 24, 2013

## INTRODUCTION

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### Mbox Projection Setup

MBOX software version 3.6.1 provides new projection mapping tools. This tech bulletin contains instructions for using this feature.

### Projection Setup Overview

The MBOX Remote application can be used to configure output settings for simple keystone, warp, and multihead output. Beyond those settings, projection surfaces (Topography files) and more complex projection mapping settings can be created, applied, and adjusted for use with MBOX Designer only.

Compatible functionality works in much the same way with both MBOX Designer and MBOX Studio, although the reduced function set in MBOX Studio will restrict options. Configuration requires compatible versions (v3.6.1 or better) of MBOX Studio/Designer, MBOX Daemon, and MBOX Remote.

#### Important Notes:

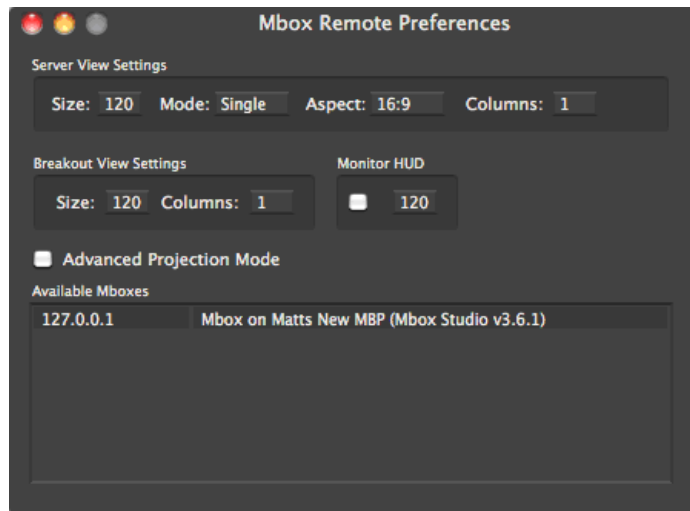
- + Some or all of the functionality will affect or even disable the default Keystone and Camera fixture controls.
- + On your controller (console or MBOX Director) your Keystone Mode (a.k.a. Edge Mode) must be set to a value of 000 for any of this functionality to work. Other values will disable the output and projection settings and revert to the default keystone and camera controls.

# PROJECTION SETUP INSTRUCTIONS

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## Getting Started

To start, launch all three applications. MBOX Studio/Designer and MBOX Daemon must be running on the same computer (the MBOX server), but MBOX Remote can be used on a second computer, if desired. In this situation, make sure that the network settings (CITP port) for MBOX and Daemon are set correctly to communicate with the second computer. (Refer to Appendix A in the MBOX Studio/Designer manual for more information.)

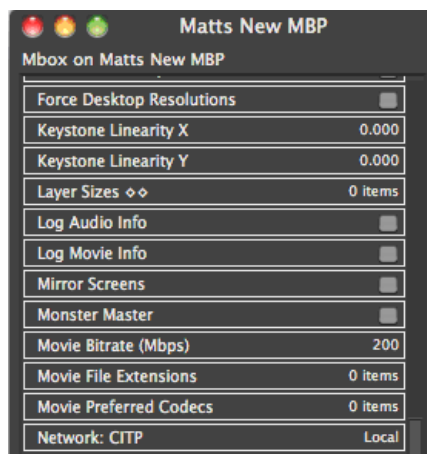


- Step 1. In Remote, press [Cmd ,] to open the Preferences window.
- Step 2. The MBOX server computer should appear in the Available Mboxes list. Double-click on it to add it to the browser window. Make sure (for now) that the "Advanced Projection Settings" checkbox is not checked.
- Step 3. Set any other sizing or layout prefs that you would like and press [Cmd ,] again to close the Preferences window.
- Step 4. Make sure that the Mbox server is selected (white box is drawn around it) in the main window of Remote. Press [Cmd P] to open the Server Preferences window and scroll down to the settings called "Output 1 Identity" and "Output 2 Identity."

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**Note:** You may have to click off then back on the server in the browser window to refresh the Server Preferences window.

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Step 5. By default the Output Identity prefs will both be set to a value of "0". If you are only using one output from the MBOX server you can leave this setting alone, but if you are using both outputs then you will need to set the prefs to unique values. You can use any number 0 thru 255. For this exercise, set the Output 1 Identity to a value of 1, and the Output 2 Identity to a value of 2. Remember to press [return] after editing each value.

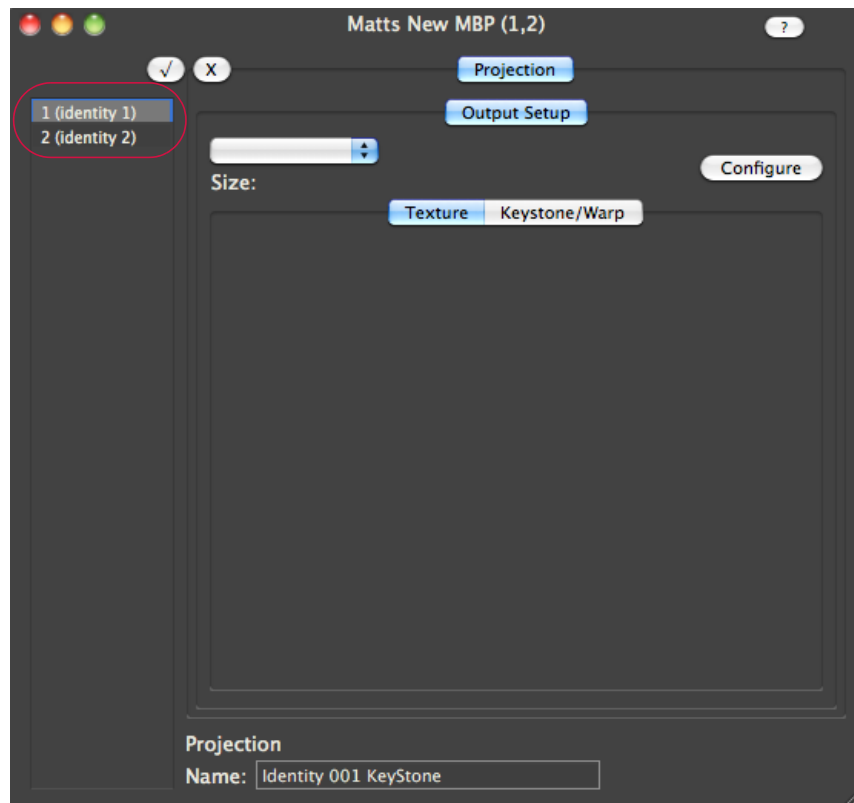


In a system with more than one MBOX server, it is best to have unique Identities for each output of each server.

**Note:** The Identity pref is also used for content management, therefore, the server identity setting also dictates what group content the server will use when grouped content is available. Refer to "Grouped Content" on page 21 for more information about this new feature.

Step 6. Press [Cmd P] to close the Server Preferences window.

Step 7. Press [Cmd E] to open the Projection Editor window. At the top of the Projection Editor window you will see the name of the selected server and the two Identity values in parentheses – e.g. "MBOX123 (1,2)". On the left side of the Editor window you will see a column listing the two Output Identities belonging to the selected server. In order to edit the settings for an output, you need to select the appropriate Identity in this column.



The remainder of the Projection Editor window is devoted to the area where the settings will be configured. In Basic Mode, you will only see a tab called "Projection" on the primary level and a tab called "Output Setup" on the secondary level. (Hereafter referred to using hierarchical notation: **Projection > Output Setup**.)

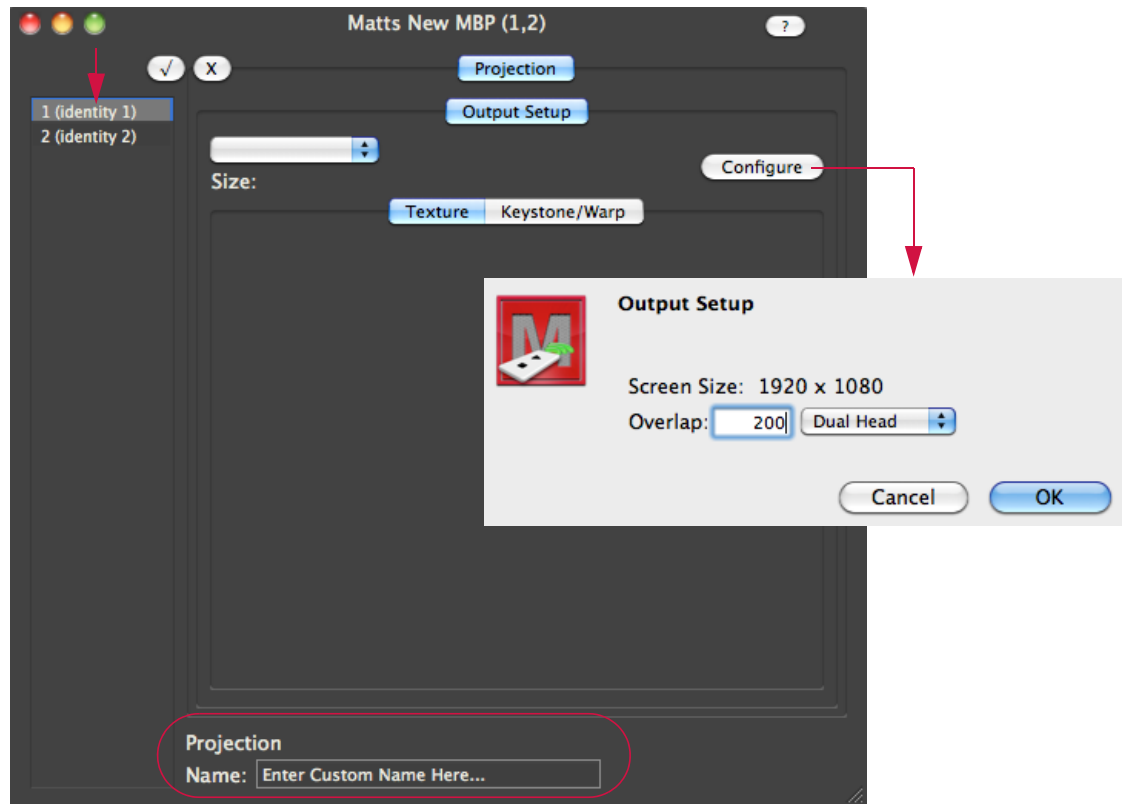
## Basic Mode

### Setting Up Output and Keystone/Warp

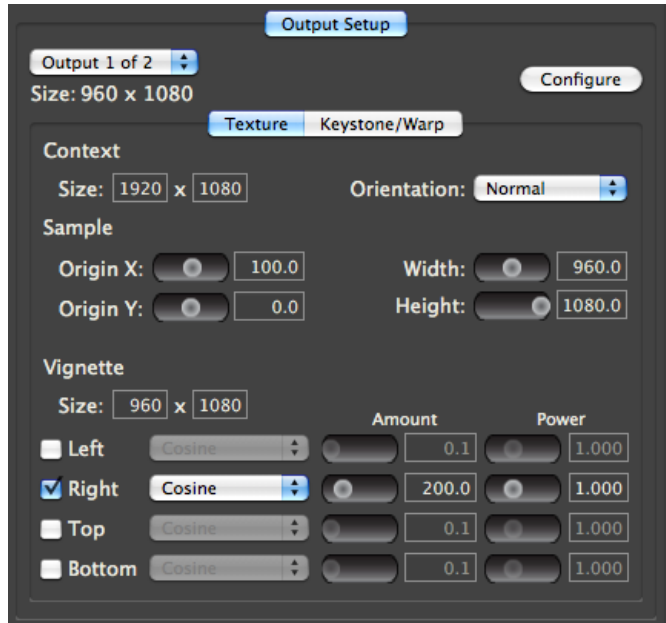
In Basic Mode, the first step to configuring the output is to select the number of outputs that each physical video output on the MBOX server computer is using. Depending on the computer used, each MBOX server can have up to two physical video outputs. Through the use of multi-head adapters, each of these video outputs can be split into up to three outputs. (Use a dual/triple head adapter product e.g. Matrox TripleHead2GO.) Even if you are not using a multi-head adapter, these settings are required to configure a keystone or warp setup.

Be sure to select Identity 1 from the column on the left side of the Projection Editor window before proceeding. This should correspond to the first output of your MBOX server. At the bottom of the Editor window you can enter a custom name of the currently selected item.

Click on the "Configure" button to open the Output Setup pane. On this pane, the current Screen Size (equivalent to the FullScreen Mode resolution on the Setup tab in the MBOX software) for that physical video output from the MBOX server. Below this you will see a box for overlap, a pop-up to select Single, Dual, or Triple output, and if the MBOX software is using a Panoramic Mode, a checkbox labeled "Combined." Select the number of outputs that this physical video output is split to (1, 2, or 3) using the pop-up. If there is an overlap required, enter that value (in pixels) in the box. The "Combined" checkbox should be checked if these outputs will be blended and overlapped with outputs from the other physical video output of the MBOX server (in panoramic Modes only). When the settings are correct, press the OK button. (Note: this explanation will proceed using a Dual output setup using a 200 pixel overlap.)



On the Output Setup tab you will now see a pop-up labeled "Output 1 of 2" that allows the selection of each output for editing. Below this pop-up is a label stating the actual output size of this output. In a dual output setup, this will be 1/2 of MBOX's FullScreen Mode resolution. Below this you will see two tabs labeled "Texture" and "Keystone/Warp." The Texture tab will be set correctly for you, but may be edited as required to adjust image position and scale. If you set a positive overlap (you can have a negative overlap if desired) on the Output Setup pane, you will see information on the Vignette settings below the Texture settings. The Keystone/Warp tab is for editing those specific attributes once they are enabled.



### Projection > Output Setup > Texture

The Texture settings define the manner in which the *Available Texture* gets applied to the physical video output to work properly with the multi-head setup of that output. Available Texture is defined here as the result of all layers composited together on this output of the server and will be the same size as the FullScreen Mode resolution for this output of MBOX.

- + The Available Texture is force-fit (stretched or squished) to fit into the *Context*, therefore the Context size values have an effect on the overall force-fit sizing of the image. By default the Context size is the same as MBOX's FullScreen Mode resolution and the same size as the Available Texture. Note that changing the Context size width or height will result in the Sample Origin X, Width, and Height changing values to maintain the correct aspect ratio. In general the Context size should not be changed, and any sizing should be handled by adjusting the Sample size.
- + The Sample refers to the area of the Context that is shown on the final rendering surface for this output in the multi-head setup. By default the Sample size will be equivalent to the actual output size shown below the output selector pop-up. For a single output this is the same size as the Context, for dual output this is 1/2 the size of the Context, for a triple output this is 1/3 the size of the Context. As with the Context size parameters, adjusting the Sample size will affect the size of the image onscreen. (Note: reducing the Sample width or height will result in the image getting bigger on the corresponding axis. This is because less of the texture is being displayed, but since the Context has not changed size, *fewer pixels will be stretched* across the same area!) When a positive overlap is entered during output configuration, the outputs will be offset along the X-axis to create the necessary overlap.

- + The **Vignette** settings are used for applying a vignette (i.e. edge-blend) to each output. A vignette will be added to the appropriate side(s) of the output by default if you enter a positive overlap value when you configure the output. Even with no overlap or a negative overlap you can manually add a vignette by clicking on the Options pop-up above the column list of Identities and selecting "Add Vignette."

By default, the vignette is created with the same size as the Sample. When a positive overlap is applied, each output receives vignettes on the overlapping sides. Vignettes can be added to any side by clicking the checkbox next to each side. Each vignette will receive a default curve of Cosine, an Amount (width in pixels) equal to the overlap width, and a Power of 1.0.

There are three available curves: Cosine, Raised Cosine, and Linear. For the Cosine and Raised Cosine curves, increasing the Power setting increases the width of the blend curve in the direction of the center of the image. For the Linear curve, increasing the Power setting compresses the blend curve towards the center of the blend area.

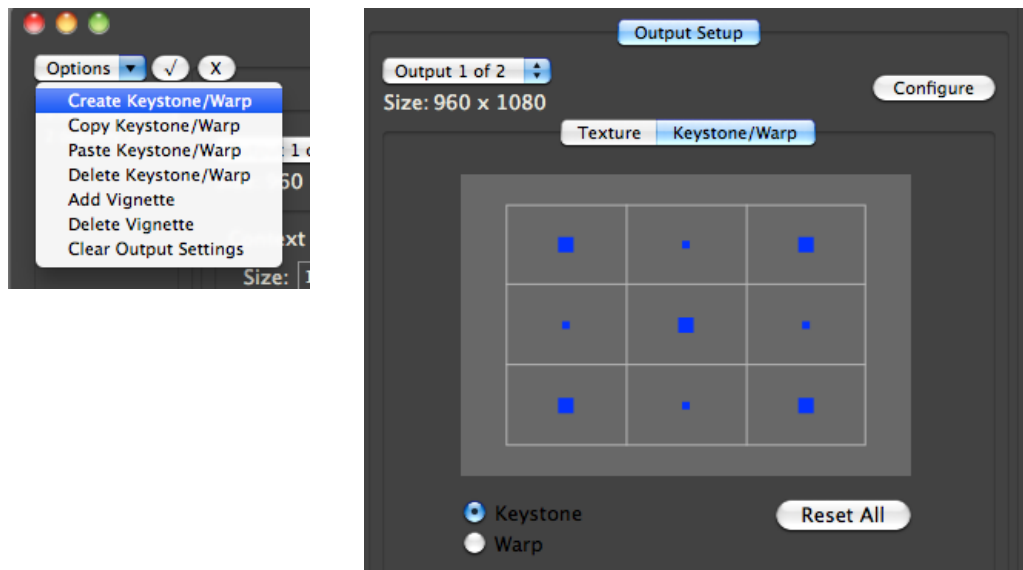
**TIP** You can view guide lines for vignettes by setting the Master HUD parameter to a value of 222 and then performing a media rescan [Cmd R] on the MBOX server. To disable the guide lines, set the HUD parameter to a value other than 222 and perform another rescan.

**TIP** Outputs that overlap each other should use the same curve type for best results.

### Projection > Output Setup > Keystone/Warp

First, select "Create Keystone/Warp" from the Options pop-up to enable *Keystone* or *Warp* functionality. You must create a keystone/warp setup for each output in a multihead setup. The interface will default to Keystone Mode, but you are able to switch to Warp Mode by clicking on the relevant button.

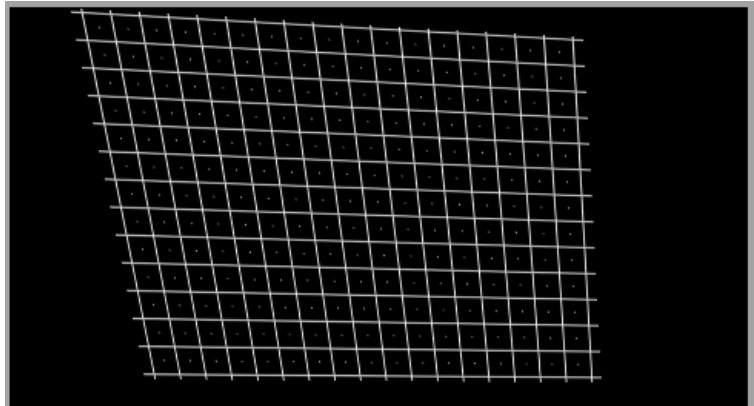
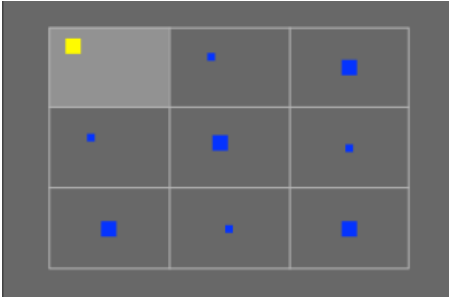
**Keystone Mode** is shown as a 3x3 array of rectangles, with five of the rectangles having large, blue points and the other four rectangles having small blue points. The points are a visual reference for the amount of transformation of that area of the keystone surface. Keystone Mode allows you to adjust the four corners by changing the position of the four corner points and to adjust the linearity of the entire image by changing the position of the center point. The smaller points will reposition themselves to remain on a straight line between adjacent corner points. You cannot edit these intermediate points.



Click inside the rectangle that contains the area you want to adjust and you will note that the corresponding point turns yellow. Use one of the following methods to adjust the geometry:

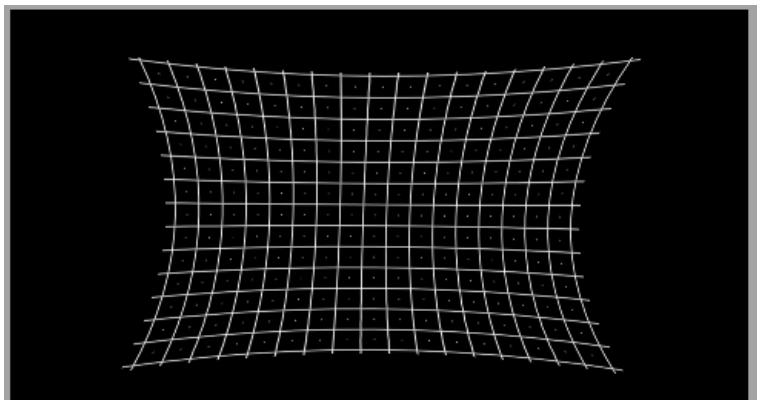
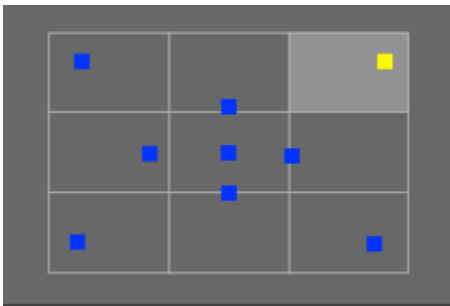
- + Mouse: click and drag.
- + Keyboard: use arrow keys for normal adjustment, and [option] plus arrow keys for finer adjustment.

Note that the points can move outside of their original rectangle in any direction, and that it is the selection of the original rectangle (their "home base") that selects the point, rather than a selection of the point itself.



Double-clicking inside a rectangle will reset the geometry for that area of the output. Pressing the "Reset All" button will reset all geometry.

**Warp Mode** is shown as a 3x3 array of rectangles, with all nine of the rectangles having large, blue point. Warp Mode allows you to adjust the four corners by changing the position of the four corner points and to adjust the intermediate curve using the other points. The warp is drawn as a Bezier curve between the corner points, using the intermediate points as the third point on the curve.



**CAUTION!** Clicking on the Configure button and changing the output setup will reset all keystone/warp settings also!

**Note:** Switching from one Mode to the other will not affect the current settings, but if you switch from Warp Mode to Keystone Mode and then adjust any point, the curves will revert to straight lines between the corner points.



You can show a keystone and warp grid overlay on Mbox's outputs by setting the Master HUD parameter to a value of 221. To disable the grid overlay, set the HUD parameter to a value other than 221.

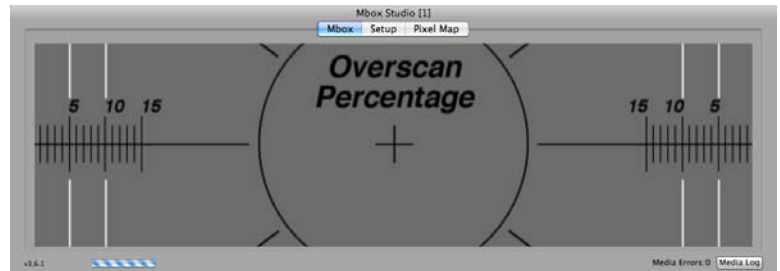
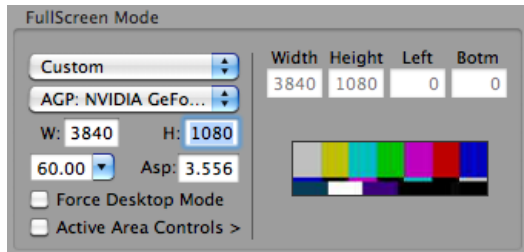


To reset the Output Setup click on the "Options" pop-up above the column list of Identities and select the "Clear Output Settings" option. This will remove all Texture, Vignette, and Keystone/Warp settings. If you intend to use the Advanced Projection Mode, you should clear the Output Setup first.

## Multihead Setup

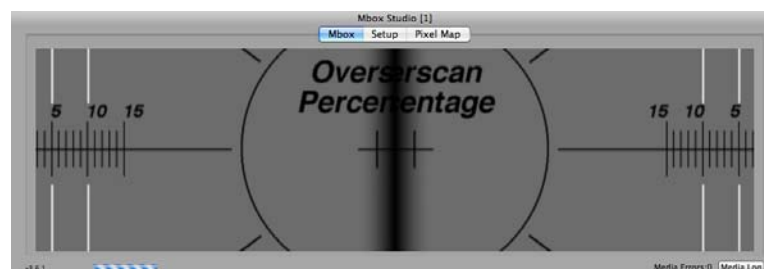
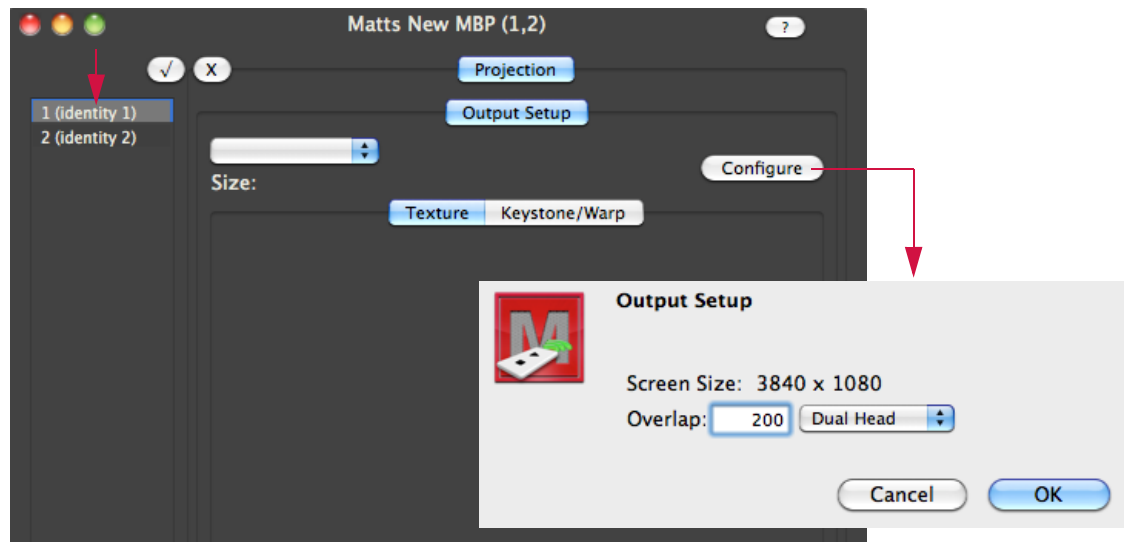
First, connect the multihead adapter to the computer and confirm that the computer sees the adapter and that you are able to output the desired resolution from the desktop. If the desktop can't run at the desired resolution, then MBOX can't either. Some devices may need additional software to tell the computer what to do, or to reprogram the EDID in the device.

Next, determine the resolution that needs to be sent to the multihead adapter. In the case of a dualhead adapter doing a double 1920x1080 output, that will be 3840x1080. In MBOX, go to the Setup tab and select the "Custom" Fullscreen Mode and enter 3840 in the width field and 1080 in the height field. Make sure the frequency is set to something that the multihead adapter supports.



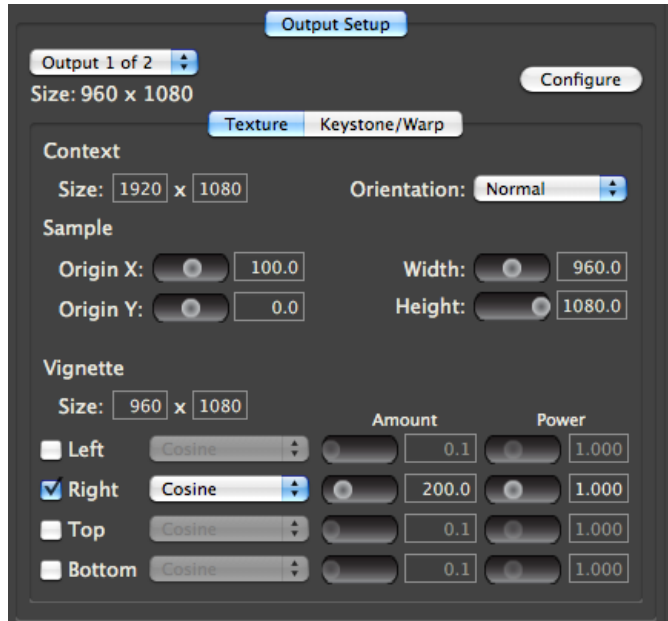
If all the settings are correct, MBOX will output the desired resolution. In Window Mode, the window will now be the same aspect ratio as the fullscreen output (32:9 in the case of 3840x1080). Unless content has been specifically created at the fullscreen resolution, it will have to be scaled up to fill the entire output.

In MBOX Remote, at the Projection Editor window, select the Identity that matches the output of the MBOX server, press the Configure button and select the "Dual Head" option and add an overlap (in screen pixels)

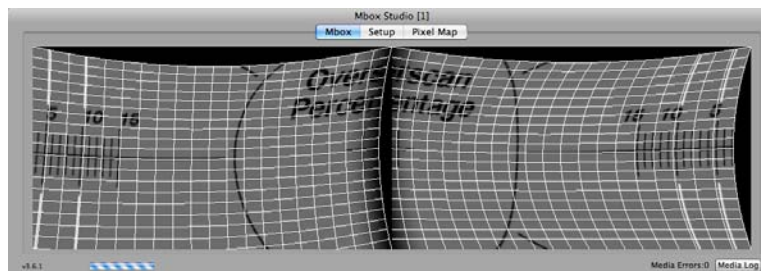
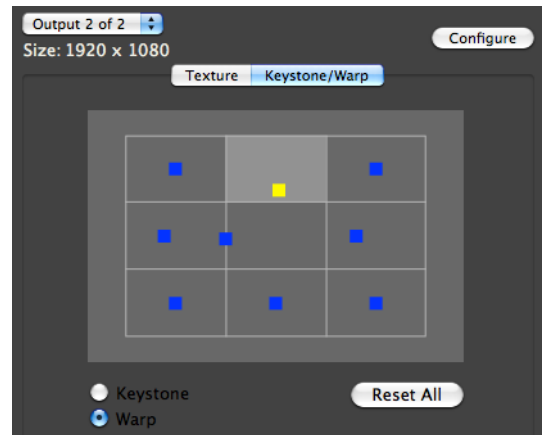
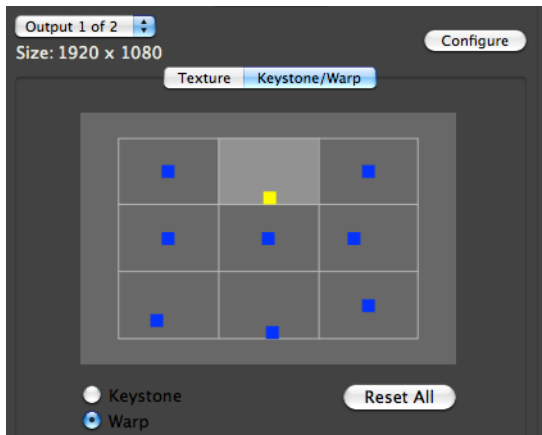




The Projection Editor window will now show the settings for Output 1 of 2 (left side) or Output 2 of 2 (right side), depending on the selection. Note that the size of each output is the same and that both share the same sized Context and Sample Width and Height. However, also note that each output has a unique Origin X. This is so that the image is located properly, both for the left and right halves of the image, but also for the overlap between the two outputs. Also, if you entered an overlap, a vignette will have been created with an amount on both halves equal to the overlap amount.



At this point, the settings can be adjusted to affect the overlap between the two halves, the blend, the aspect ratio, and the orientation. A keystone or warp may be added as described in previous section (refer to [page 6](#)).

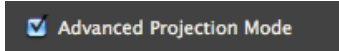


To reset the settings, either press the Configure button again and enter some other multihed and overlap settings, or return to the Options pop-up and select "Clear Output Settings."

## Advanced Mode

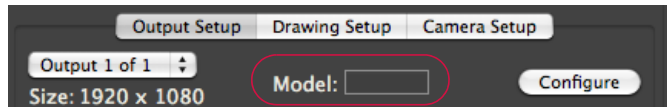
### Advanced Projection Setup (MBOX Designer Only)

Advanced Projection Setup only works with MBOX Designer, not with MBOX Studio.



### Projection > Output Setup

In Advanced Projection Mode, the Output Setup tab is the same except for the addition of a field for entering a Model (i.e. object) file for use as the keystone rendering surface. The Model used must be compatible with MBOX (obj, topo, svg) and must be placed within the standard Mbox/Models folder's 8-bit structure. The Model is selected by typing the 8-bit folder and file index numbers in to the field (e.g. 005.023) and pressing the [return] key.



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**Note:** Different Models can be selected for each output of a multihead configuration.

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Selecting a Model as the keystone surface will immediately disable any keystone or warp settings that have been used. To return to the keystone/warp settings, delete the Model index number from the field and press [return].

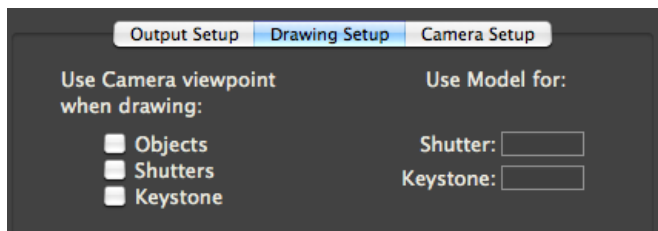
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**CAUTION!** Using the features of the Output Setup tab will also override or disable some or all of the features of the Projection > Drawing Setup and Projection > Camera Setup tabs. To use the features on these tabs properly, you must remove the basic output settings either by selecting "Clear Output Settings" from the Options pop-up while the Projection > Output Setup tab is selected, or by deleting the Model Folder.File reference on the Projection > Output Setup tab.

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### Projection > Drawing Setup

The Drawing Setup tab allows you to configure which onscreen elements will be rendered using the perspective of the active camera for that output, and if Models will be used for creating shuttering or keystone rendering.



Click the appropriate checkbox to enable perspective rendering for each element: Objects (obj, topo, svg), Shutters (when a shutter Model index number is entered), and the keystone surface (when a keystone Model index number is entered).

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**CAUTION!** Most Models may not be appropriate for use as shutters or as keystone rendering surfaces. Great care must be taken in UV mapping such objects when they are created. This functionality is best matched with the simple Topography (topo) objects created by the MBOX system. Refer to "[Topography](#)" on page 13.

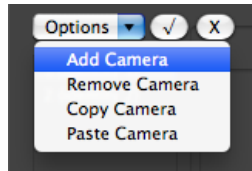
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If you are using Model files on individual playback layers within MBOX as a tool for projection mapping, it is not recommended that you also try to use a keystone Model. As a general rule of thumb you will probably never have the Objects and Keystone checkboxes checked at the same time.

## Projection > Camera Setup

The Camera Setup tab allows you to add and configure a camera whose perspective will be used to render the 3D entities selected on the Drawing Setup tab. This camera uses a true, accurate coordinate space for its position, the point that it is looking at, and other adjustable parameters.

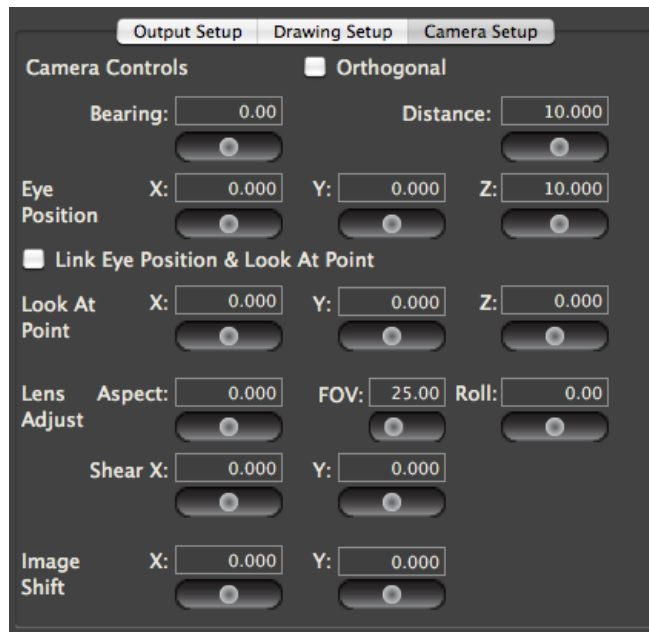


The camera's Eye Position and Look At coordinate are entered in generic real world units (e.g. inches, feet, millimeters, or meters) that must be matched to the measurement scale used when creating objects within your 3D Modeling application. For example, if your show requires projection upon a cube that is 1 meter on each edge, you could create that cube as one unit on each edge within your 3D Modeling application. In which case, you would use meters as your unit of scale when entering values on the Camera Setup tab. If you made your cube 1000 units on each edge (as if using millimeters) then you would need to use millimeters as your unit of measure on the Camera Setup tab.

When setting up a projection mapping system and the objects used, you must also consider the 3D coordinate origin for your system. This should be a real-world reference point that you can mark and measure from when you are physically setting up the objects and projector in the performance venue. Objects created for use in this system must also be created with this origin in mind; without additional manipulation they will appear in space.



Measurements use decimal notation with an accuracy of three decimal places. It is recommended that you use a measurement scale appropriate to realistic numbers. Therefore, large projection mapping setups should not be scaled in small units of measure like millimeters or inches.



## Camera Control Descriptions:

- + **Orthogonal checkbox:** disables perspective rendering and forces camera position to center. Used for flattening view, affects aspect and texture mapping on 3D objects.
- + **Bearing:** camera's horizontal angular offset from the Z axis.
- + **Distance:** camera's horizontal distance from the origin.
- + **Eye Position:** camera location.
  - X: camera's distance from the origin along the X axis.
  - Y: camera's distance from the origin along the Y axis.
  - Z: camera's distance from the origin along the Z axis.
- + **Link Eye Position & Look At Point checkboxes:** links Eye Position and Look At X and Y parameters to allow easy lateral shifting of the image.
- + **Look At Point:** focus point (along a line through the center of the lens) for the camera.
  - X: look at point's distance from the origin along the X axis.
  - Y: look at point's distance from the origin along the Y axis.
  - Z: look at point's distance from the origin along the Z axis.
- + **Lens Adjust:** adjustments to correct the effects of lens zoom or distortion in the output device (typically a projector).
  - Aspect: widens or narrows the image to correct for aspect changes between output and projector's native resolution.
  - FOV: adjusts Field of View to match lens angle of camera to that of the projector.
  - Roll: rotates the camera around the axis drawn through the lens to the Look At Point.
  - Shear X: applies a horizontal rotation to the camera while maintaining both Eye Position and Look At Point. Used to correct the effects of lens shift or keystoneing.
  - Shear Y: applies a vertical rotation to the camera while maintaining both Eye Position and Look At Point. Used to correct the effects of lens shift or keystoneing.
- + **Image Shift**
  - X: moves entire image horizontally without affecting perspective.
  - Y: moves entire image vertically without affecting perspective.



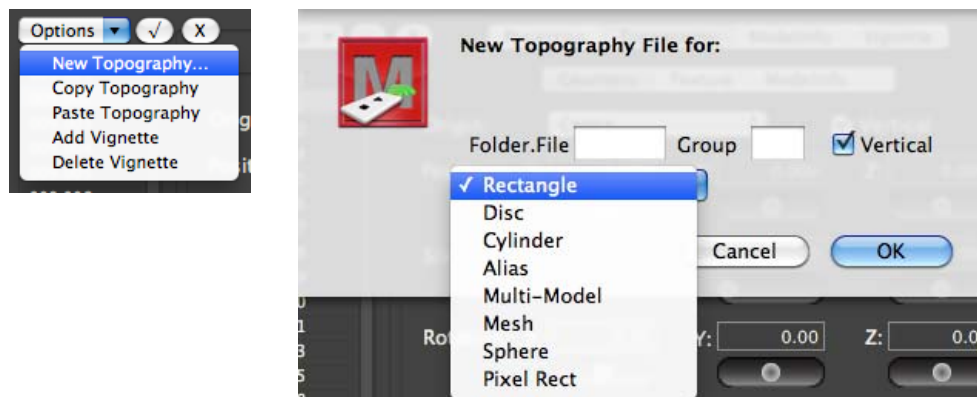
Eye Position, Look At Point, and if known FOV, can be entered in advance from known measurements to set up projection mapping. Other parameters like Aspect, Roll, or Shear may need to be adjusted manually to correct minor issues with perspective or line-up.

## Topography

MBOX's Topography files (topo objects) are 3D objects constructed programmatically within the MBOX Designer and MBOX Remote interactions. Topo objects are intended primarily as projection surfaces to be used for projection mapping. Because they can be created in Remote, there is no need for an external Modeling application. UV mapping (texturing) coordinates are also created and manipulated. There are several topo object types to choose from. Topo objects can be resized, positioned, rotated, and curved as required to create the correct projection surface.

Topo objects (with the exception of the Pixel Rect) use units of measure equivalent to the units of measure used for the Camera positioning. Therefore, if you are using meters for measurement in the projector locations in your venue, any projection objects should be measured in meters as well and their respective topo objects created with dimensions in meters.

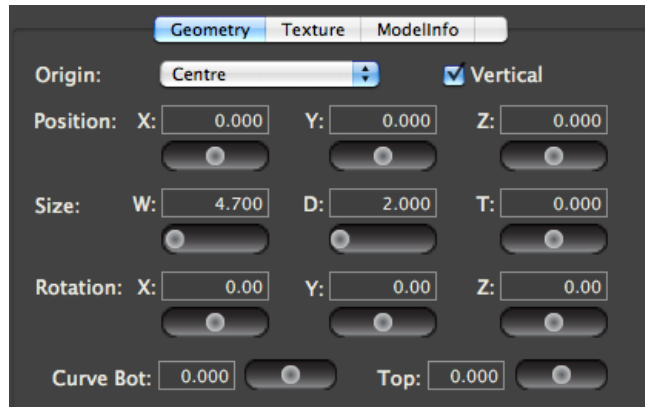
The initial step in using topo file is to create the base object. With the Topography > Geometry *or* Topography > Texture tabs selected, select "New Topography..." from the Options pop-up. In the window that appears, there are five settings to configure for your new topo file.



- + **Folder.File:** 8-bit index number for the topo object file that you are creating. This must be a unique index that does not currently exist. If the index already exists, the topo item will not be created (currently there is no error message to indicate this). Entry must be formatted with the period between the two numbers.
- + **Group:** 8-bit number for the group this topo file should belong to. If this topo file is to be used on all servers, do not enter a group number.
- + **Vertical checkbox:** by default topo files lie flat on the "floor" of your projection environment, extending on the X and Z axes. Clicking the Vertical checkbox will stand the topo file up (rotate it 90° around the X axis) so that it faces forwards. (Note that the Vertical checkbox does not affect cylinders.)
- + **Type pop-up:** selection of one of seven different types of topo files.
  - Rectangle: rectangular shape with no thickness.
  - Disc: round shape with no thickness.
  - Cylinder: rectangular shape that can be bent into a cylindrical shape.
  - Alias: reference to another topo file that can be used to apply different ModelInfo data to an identical physical shape.
  - Multi-Model: a collection of object files (obj, topo, svg) that can be used together on one layer.
  - Mesh: rectangular shape with no thickness and adjustable grid divisions for enhanced warping control.
  - Sphere: spherical shape with adjustable curvature.
  - Pixel Rect: rectangular shape with no thickness. The Pixel Rect's dimensions are translated to actual pixel count.
- + **Mesh dimensions:** number of horizontal and vertical divisions for the mesh.

## Topography > Geometry

The Geometry tab allows you to define the position, rotation, size, and curvature of the selected topo file.



- + **Origin pop-up:** anchor point for the topo object's position coordinates.
- + **Vertical checkbox:** rotates the topo object 90° around its X axis as drawn through the origin point.
- + **Position:** object's home position in 3D space.
- + **Size:** object's size. W refers to width, D refers to depth, T refers to thickness. The different topo objects make different use of the three dimensions depending on their geometry. Because the Vertical checkbox applies a 90° rotation to the object, the apparent axes for depth and thickness may be inverted. Note that:
  - The T setting is not used for Rectangles, Meshes, and Pixel Rects.
  - If you put a value of x in the Width field, and the Depth field has a value of 0.00, then the Depth value is actually equal to the Width value.
- + **Rotation:** object's rotation around global X/Y/Z axes.
- + **Curve (Bottom/Top):** specific to rectangles. Curve refers to the curvature of two distinct edges of a rectangle. Top and Bottom refer those edges of the rectangle when the Vertical checkbox is checked.
- + **Curve (Arc/Angle):** specific to cylinders. Arc refers to the coverage of the cylinder in degrees (e.g. 180° is half a cylinder, 360° is a fully closed cylinder). Angle refers to the rotation of the cylinder around its longitudinal axis.



- + **Lune (Arc/Angle):** specific to spheres. Lune refers to the curvature arc and coverage along the horizontal axis (i.e. as around the equator).



- + **Zone (Arc/Angle):** specific to spheres. Zone refers to the curvature arc and coverage along the vertical axis (i.e. as around a line of longitude).



## Topography > Texture

The Texture tab allows you to define how a texture will be applied to the topo object. Generally topo objects are created for specific texture sizes (movie or still image content). Different-sized content can be applied to topo files, but some amount of scale, aspect, and position adjustment may be required to properly fit such content on a topo file with mismatched texture settings.

The settings on this tab are virtually identical to the texture and vignette settings used in the Projection > Output Setup > Texture tab (refer to [page 5](#) for details). In this case, the available texture is the content selected for use on the layer that is using the topo object. **By default, content is stretched or squished to fit both the size and aspect ratio of the topo file.**

By default, topo objects will have a texture size of 1x1 and a Texture Width and Height of both 1. This means that content will be force-fit onto a topo object. If the aspect of the topo object is not the same as the aspect of the content, the content won't have the correct aspect ratio. If the topo is square and the content rectangular, then you have to adjust the Texture Width to get the correct aspect. Begin by entering the appropriate pixel dimensions of the content in the Context Size fields. Then adjust the Texture Width, Height, and origins to get the right aspect and to show the correct area of the content on topo object. For different content setups you may have to create more than one topo object with the same dimension but different Texture settings.

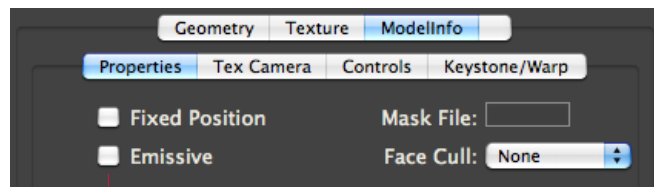
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**Note:** Topo objects need lighting to see them properly. In Designer, use the standard lighting fixtures (ambient & spots). In Studio and Designer, you can also set the Drawmode to a value of 1 for "Light" OR... see the next section and use the "Emissive" checkbox!!

---

## Topography > ModelInfo > Properties

ModelInfo settings for a topo file are used to define core functions of how the topo object reacts to layer scaling and positioning, UV mapping, external Art-Net control (e.g. for remote control of positioning), and keystone/warp.



CAUTION: The two checkboxes each have three states: empty, minus, and checked. To make these properties active, be sure there is a check in the box.

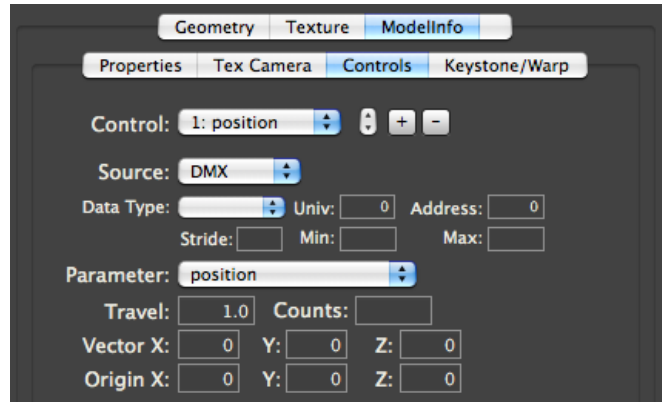
The Properties tab has four settings:

- + **Fixed Position checkbox:** causes the object's position and scale to be disconnected from Art-Net control. These Art-Net controlled parameters will now control the texture position and size on the object instead. (Object position and scale may still be adjusted using the Projection Editor.)
- + **Emissive checkbox:** causes the object to be fully lit. Overrides Art-Net controlled Ambient and Spot lighting fixtures.
- + **Mask File:** 8-bit index number for Folder.File of vignette of PNG files to be used as a mask on the object. Files will be force-fit onto the object based on the object's size not the size of the mask. (Tip: Masks should typically only be used on topo or svg files as the result of applying a mask to an object with more than one face may be undesirable unless great care is taken with the mask.)
- + **Face Cull pop-up:** selects which faces of the object are not drawn. You can choose not to render the front or rear faces of an obj file.

## Topography > ModellInfo > Controls

ModellInfo controls can be added to an object to allow additional Art-Net patched into the MBOX server to modify four aspects of the object: position, rotation, texture position, and opacity.

**CAUTION!** Controls should be added with care and may require consultation with a PRG MBOX specialist before use.



To add a control, click on the "+" button. To remove the currently selected control, click on the "-" button. If more than one control exists, use the up/down arrows or Control pop-up to toggle between the controls. Next, use the Source pop-up to select the type of control data being received – Constant, DMX (Art-Net), or SADI.

- + **Constant:** offset values set on the Controls tab will affect the parameter, but there is no external control.
- + **DMX:** additional Art-Net can be patched to the MBOX server to control the parameter.
- + **SADI:** reserved (DO NOT USE).

Constant controls can be used to make adjustments to an object or the texture on the object without affecting the Geometry or Texture settings of the original file. Using controls with additional Art-Net is where the power and flexibility lies. When you select DMX as the source for data, additional settings will be available for setup.

- + **Data Type:** refers to the format of the incoming Art-Net data.
  - u8: unsigned 8-bit integer, 0-255 with a default of 0.
  - o8: offset 8-bit integer, 0-255 with a default of 127.
  - s8: signed 8-bit integer, -128 - 127
  - u16: unsigned 16-bit integer, 0-65535 with a default of 0.
  - o16: offset 16-bit integer, 0-65535 with a default of 32767.
  - s16: signed 16-bit integer, -32768 - 32767
  - s32: signed 32-bit integer, -2,147,483,648 - 2,147,483,647
- + **Univ:** Art-Net Universe (0 – 255).
- + **Address:** start address for this control, within the selected universe (1 – 512).
- + **Stride:** if this control is to be repeated for each patched layer of MBOX, the Stride parameter sets the offset per layer for the control. For Example, if your server has eight different 8-bit controls, each using one channel of data, then your Stride should use a value of 8. Without a Stride setting, the control will affect all layers at the same time.
- + **Min:** sets a minimum value for the control using the scale of the selected Data Type.
- + **Max:** sets a maximum value for the control using the scale of the selected Data Type.



The most common Data Types are the u8, o8, u16, and o16. These types are easily created by any external Art-Net source and the ranges work well for manual or automated control of any of the selectable parameters (see below). The signed integer types are typically reserved for data coming from a scenic system as require additional data conversion that is not available from normal Art-Net sources.

The Control Parameter refers the property of the layer that the control will affect.

- + **Position:** position of the object in 3D (X/Y/Z) coordinates.
- + **Rotation:** rotation of the object in 3D (X/Y/Z) coordinates.
- + **Texposition:** position of the texture on the object in 2D (X/Y) coordinates.
- + **Opacity:** transparency of the object.

Position, Rotation, and Texposition are well suited for unsigned or offset 8, 16, or even 32-bit controls. Opacity is best suited for an unsigned 8-bit control.

The remaining settings on the Controls tab configure the direction and scaling factor between the control and the incoming data source.

- + **Travel:** range of travel that you want the object to attain. The Travel setting should be entered in the unit scale of the control type and the object type.
  - **Position** is entered in the same units of measurement used for the topo file's geometry settings. This is typically the real-world measurement as used for object and projector positioning. However, in the case of Pixel Rects this would be pixels.
  - **Rotation** is entered in degrees.
  - **Texposition** is entered in pixels.
  - **Opacity** is a value between 0.0 (fully transparent) and 1.0 (fully opaque).
- + **Counts:** number of steps of incoming data that equal the Travel setting's value. For Example, using an unsigned 8-bit (u8) parameter with a range of 0-255, if you want your topo object to move 2 meters across the range of 0-255, you would enter a Travel of 2.0, and Counts of 255.
- + **Vector (X/Y/Z):** direction of travel described as a directional vector -1.0 - 1.0. X is left<->right, Y is up<->down, Z is towards<->away. Positive values would cause movement to the positive side of each axis - right, up, towards. Negative values cause movement to the negative side - left, down, away. For the most flexibility, you may add a position control for each axis, setting each with a single vector. For "diagonal" vectors, a combination of vector values must be entered. (Tip: to reverse the direction of motion for any incoming value, flip the sign on the appropriate vector.)

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**CAUTION!** You must have a non-zero vector value in at least one direction to allow controls to work!

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- + **Origin (X/Y/Z):** the origin point of position adjustment. This is similar to entering an offset for object positioning.

### **Topography > ModellInfo > Keystone/Warp**

A keystone/warp can be added to topography files. Refer to "[Projection > Output Setup > Keystone/Warp](#)" on page 6 for information on how to create and configure a keystone or warp for a topo object.

## Topography > Multi Model

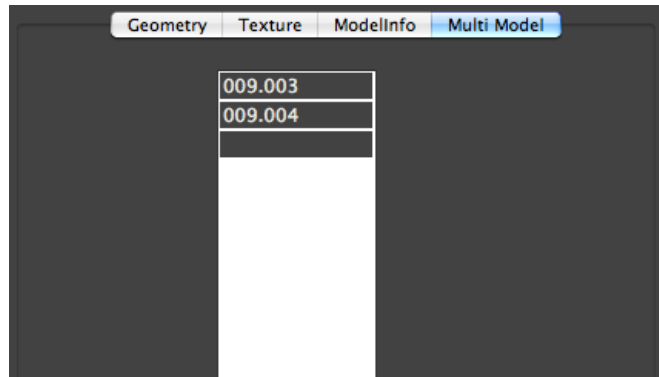
As discussed in the Topography > Geometry section, Remote allows you to create a Multi Model, which is a collection of more than one object file. A Multi Model allows you to use more than one object on a layer, with each object having its own properties. The Multi Model tab is where you designate the object files (in Folder.File syntax) that belong to the Multi Model.

Double-click on the empty grey field to enter editing mode, type in the object's index and press the [return] key.

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**Note:** Currently the edit color scheme makes it hard to read the text when you enter or edit the index.

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## ModelInfo

In addition to being able to affect the ModelInfo properties of MBOX-created topo objects, Remote also allows you to add ModelInfo properties to existing object files (obj, svg). This functionality provides the means to set fixed and emissive properties, override UV mapping, add controls, and apply a keystone/warp.

### ModelInfo > Properties

Refer to the "[Topography > ModelInfo > Properties](#)" on page 15 for information.

### ModelInfo > Tex Camera

The Tex Camera tab allows you to create a custom UV map for an object file based on a specific viewing location unique to that object. This viewing location can be different from the viewing position implied by the UV map settings in the original file. The Tex Camera causes MBOX to apply the texture to the object in a manner that allows the image to appear undistorted from a specific viewpoint – by default, objects are UV mapped based on the UV mapping information included in the original file.

The Tex Camera tab allows you to change some basic settings for the texturing of the topo file. While this tab displays the same settings as the **Projection > Camera Setup** and **ModelInfo > Tex Camera** tabs, most of the available settings have no effect on topo objects. The Bearing and Distance settings will adjust the size and rotation of the texture upon the topo object.

This tab uses the same setup procedure and settings as the **Projection > Camera Setup** tab. (Refer to "[Projection > Camera Setup](#)" on page 11 for more details.)

### ModelInfo > Controls

Refer to the "[Topography > ModelInfo > Controls](#)" on page 16 for information.

### ModelInfo > Keystone/Warp

Refer to the "[Projection > Output Setup > Keystone/Warp](#)" on page 6 for information.

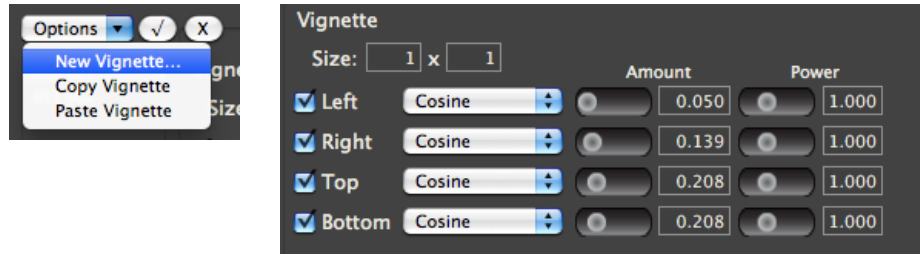
---

**Note:** Keystone and warp changes can only be made to obj files, not to svg files. Changes are not made immediately; you must perform a media rescan in MBOX for the changes to take effect.

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## Vignette

The Vignette tab provides controls to create custom rectilinear edge masking that can be used on any object, although results are best when used with topo objects, not with obj files. Refer to "[Projection > Output Setup](#)" on page 10 for more information on the adjustment of vignette settings. Vignettes created here can use any arbitrary size. The blend amount is reconfigured automatically when the size is changed. Therefore, onscreen, there is little or no visual difference between a size of 100 x 100 with an amount of 5.0 and a size of 1 x 1 with a size of 0.05.



Vignettes are created as .vign files inside the */Mbox/Media* folder's Folder.File 8-bit structure.

## Notes

Recommendations for Model (object) creation for use with MBOX Designer's projection mapping features:

### .noscale compile switch

- + When using obj files for projection mapping with MBOX, it is recommended that you apply the .noscale filename "switch." The .noscale switch will force the object to appear at the designed scale rather than being rescaled (normalized) by MBOX when it is precompiled. To apply the .noscale switch, add ".noscale" to the object's file name, before the file extension.

001.MyObject.obj becomes 001.MyObject.noscale.obj

### obj & topo, but not kmz

- + Obj and topo files are recommended for use with projection mapping functionality. While MBOX can use kmz files for basic 3D objects, they are not recommended for use with projection mapping.

### svg/svge

- + MBOX Designer and Studio can use svg files for projection mapping, but topo files are far more useful and flexible.

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**Note:** To work with the thumbnail generator for MBOX, the svg file extension must be changed to "svge".

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### axes – MBOX XYZ different to Modeling apps' XYZ!!

- + MBOX labels its 3D axes differently than most 3D Modeling applications. MBOX uses a front view version of the axes and most Modeling applications use a top view version.
- + In MBOX, the X axis is left<->right, the Y axis is up<->down, and the Z axis is towards<->away from the viewers (or in<->out of the screen).
- + Most 3D Modeling applications swap the Y and Z axes when compared to MBOX. The Y axis now being the towards<->away and the Z axis being up<->down.
- + When exporting obj files from your Modeling application for use in MBOX, make sure to swap the appropriate axes to ensure the Model appears with the correct orientation within the MBOX 3D environment.

**unit scale**

- + While many 3D Modeling applications allow you to create objects using real-world units such as feet or meters, the obj file format does not support specific units of measure. Therefore, a cube with sides that are 1 meter square, will typically export as an obj with sides that are 1 unit square. The same cube could also be designed with sides being 3.3 feet square in the Modeling application, which would then export as an obj with sides that are 3.3 units square. While these two objects may appear to be the same size within the original 3D Modeling application, they will not be the same size when used within MBOX.

**texturing (uv map)**

- + When obj files are used by MBOX, they must have some form of UV mapping created by the originating 3D Modeling application. MBOX cannot create UV mapping from scratch on obj files. The UV mapping created by the Modeling application will generate texture coordinates for any texture (movie or still image) file applied to the object within MBOX. Typically UV mapping is very specific to the geometry of the object and the desired look of the object. MBOX is able to adjust the UV mapping of the object allow for correct texturing from differing viewpoints. MBOX can also override existing UV mapping using a Tex Camera.

# GROUPED CONTENT

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## Overview

The MBOX Designer and Studio applications v3.6.1 support the use of "content grouping" in order to allow servers to have content for all servers stored on their hard-drive, but to allow each server to play only the content desired for its own output(s). In this manner, automated content synchronization can ensure that all show content is on all servers, thus allowing one server to take over for another. When programming, the selection of a specific folder and file will cause content (with the matching Folder.File index) to be used from the designated group folder only.

To facilitate keystone, warping, and projection mapping setups, each output of each server can be given a numerical "Identity" value (between 0 and 255). (Refer back to "Getting Started" on page 2.) The Identity property is also used for content group designation. In the content database indexing system for MBOX, the content group is a prefixed 8-bit value - i.e., *Group.Folder.File*, with each element being a number 0 - 255. (This concept essentially extends MBOX's content indexing system to be 24-bit rather than 16-bit as prior to v3.6 software.)

If content is not assigned a group number, then it will always be played when a particular Folder and File are selected. Standard rules for file conflicts will apply (for example, repeated Folder.File indices). If content is assigned a group number, then there may be multiple Folder.File indices with the same values. But since each will have a unique Group number there are no conflicts. The playback of content with the matching group index is automatic and no parameter on the controller (console or Director) selects this value. Users will preset the Identity of each output of each server in order to dictate what content is used.

## Usage

The typical usage for grouped content will be when more than one MBOX server is used as a portion of a multi-server setup (widescreen, matrix, etc.) with coordinated outputs. Often these setups will make one larger image with each server supplying one or two sections of each larger image. The content grouping scheme allows you to select the same Folder 023 and File 001 values for all servers and get the appropriate portion of the larger image to play on each server.

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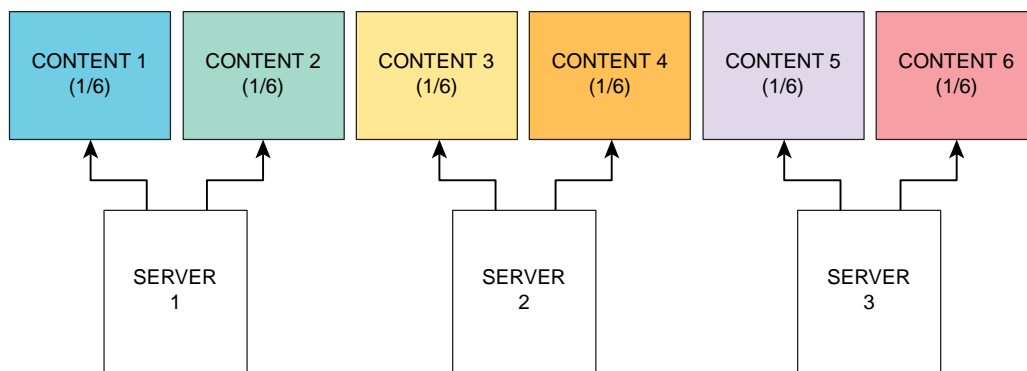
**Note:** Content grouping does not chop up or distribute content automatically to the relevant server. It merely causes the server's designated group's content to play when a Folder.File is selected.

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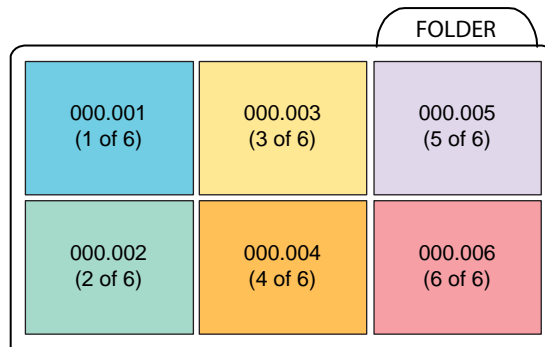
Usage is not limited to multiple servers making up one larger, coordinated raster. Grouped content can be used as a tool for content organization even when disparate content is used on multiple servers.

### Example:

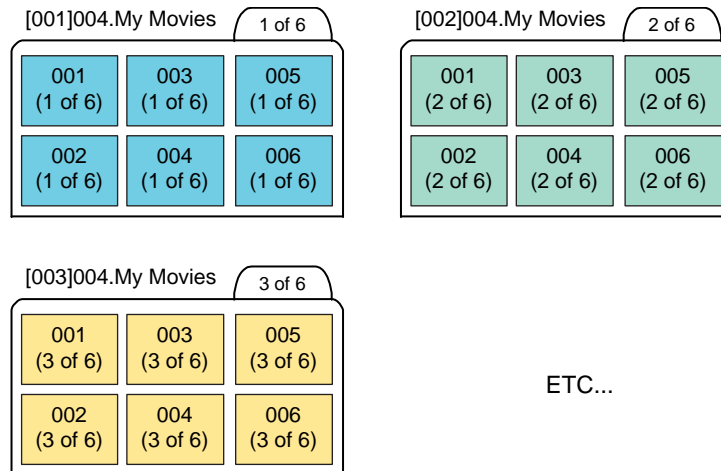
Imagine a system with three servers, each having two outputs in Dual Independent mode. This system has six total outputs, and for a wide blend, each output will display 1/6th of the total image. For best playback results the user may choose to supply six unique pieces of content each being approximately 1/6th of the final image (plus overlap as required).



Prior to MBOX v3.6, the user could place all six pieces of content into the same folder and give each piece a unique file number (e.g., 001.001, 001.002, 001.003 and so on...). When programming the show, the user would have to select six different pieces of media for playback.



With MBOX v3.6, the user would first designate the Identity number for each output in the system (e.g., 1, 2, 3, 4, 5, and 6). Then the user would create six different content folders (one for each group identity) on each of the three servers, labeling them uniquely (see below for details) as Group 1, Group 2, Group 3, etc., but each having the same folder index number. Inside each folder the user would place the content (1/6th of the final content image) that matches that output's position in the overall scheme.



With the identity set in this way, the user could then select folder 004 and file 003 for playback on all the servers. The output designated as Identity 1 would play Group001.Folder004.File003, and so on.

---

**Note:** Because the panoramic output modes are treated as one larger output when placing and sizing content for playback on a server's layers, their output is treated as only one content group by the MBOX server. The identity setting for the server's second output (Output 2) will affect keystone, warp, and projection mapping for that output, but different content will not (and cannot) be selected automatically based on the Identity for Output 2.

---

## Configuration/Setup

Inside the *Mbox/Media* and *Mbox/Models* folders, the actual content folders can be renamed to enable content grouping. Without content grouping a folder might be called "004.My Movies." With content grouping, a user might have several folders - "[001]004.My Movies," "[002]004.My Movies," [003]004.My Movies," and so on.

The actual text name of the folder does not matter in the indexing system, so for added clarity, the folder could be called something like "[002]004.My Movies Group 2."

### Allowed syntax:

- + [Group #]Folder #.Folder Name -> no space or period between [Group] and Folder
- + [Group #] Folder #.Folder Name -> space between [Group] and Folder
- + [Group #].Folder #.Folder Name -> period between [Group] and Folder