MBOX® MEDIA SERVER

QUICKSTART GUIDE (rev. D)

Mbox® Media Server v4.0 Quickstart Guide
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INTRODUCTION

About This Guide

This quickstart guide provides necessary information regarding the operation of the Mbox v4 Media Server software. This guide is provided to explain the new features in the Mbox v4 software and explain differences between the new software and prior versions.

Important Note About Control!

The Mbox v4 software is designed to work with either the Mbox Director software or moving-light consoles. There is a new version of the Mbox Director software (v4) required to control the Mbox v4 software. Mbox v4 will work with any moving-light console that can have a compatible profile, including: PRG V676®, V476®, and V276 consoles, MA Lighting grandMA1 and 2 consoles, High End Systems Hog® 4 series consoles, ETC EOS and Ion consoles, and Martin M-Series consoles. At time of writing, profiles for the PRG Vx76 series consoles and the MA Lighting MA2 console existed. Other profiles have been requested.

Additional Documentation

For more information about DMX512 and sACN protocols, refer to the following documents available from the American National Standards Institute (ANSI) at www.ansi.org:

+   ANSI E1.11 - 2008 (R2013): Entertainment Technology - USITT DMX512-A, Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories
+   ANSI E1.31 - 2009: Entertainment Technology - Lightweight streaming protocol for transport of DMX512 using ACN

The above documents are also available in electronic format free for PLASA members at www.plasa.org

For more information about Art-Net, refer to the following document available from Artistic Licence Engineering at www.artisticlicence.com:

+   Specification for the Art-Net Ethernet Protocol

Customer Service

For technical assistance, contact your nearest PRG office. Contact information for all PRG offices can be found on our website at: www.prg.com

For Mbox support, please contact: mboxsupport@prg.com

For additional resources and documentation, please visit our website at: www.prg.com

1.

NEW CONCEPTS

This chapter talks about features that are entirely new in the Mbox v4 software.

+ COMPATIBILITY WARNING
+ PATCH
+ PREFERENCES
+ OUTPUT SETUP
+ MIX SETUP
+ USING OUTPUTS/MIXES WITH LAYERS
+ PIXEL MAPPING

COMPATIBILITY WARNING

OS Version

Mbox v4 requires OSX 10.9 Mavericks or better to run. macOS 10.12 Sierra is not supported at present time.

CPU Hardware

Mbox v4 requires a computer with a 64-bit processor.

GPU Hardware

Mbox v4 exposes a defect in the ATI/AMD devices drivers in OSX 10.9 Mavericks and OSX 10.10 Yosemite. For best performance with Mbox v4, use OSX 10.11.x El Capitan. Alternately, Nvidia GPUs seem to work without issue in the older versions of the OS.

PATCH

Patch Tab

Mbox v4 has an entirely new tab view for configuring the control input to the server. The Patch tab hosts the controls for adjusting the control input type and universe, as well as the operating mode for the software, the number of playback layers, and the number of output masters.

As with previous versions of the Mbox software, Mbox v4 can receive either Art-Net or sACN directly from a control console or from the Mbox Director application. Mbox v4 uses a minimum of one universe for control, and can use up to eleven universes (Mbox Designer with maxed out layers and output masters).

The version of Mbox (Designer/Studio/Mini) affects both the quantity of parameters and their layout. As in previous versions, some of the functionality of the Mbox v4 software is tiered: with Mini having a slightly reduced feature set and fewer layers than Studio; Studio having almost all features, but fewer layers than Designer; and Designer having all the features. All three versions of Mbox use the same patch conventions and are configured in the same way on the Patch tab.

Control Input Setup

In the Control Input Setup area on the left of the tab view, the profile is selected from a popup. As with previous versions of Mbox, the list of available profiles will depend on the version being used (higher versions allow the use of profiles from lower versions) and may show a legacy (Mbox v3.x) profile option. The profile layouts for Mbox v4 are significantly different from those used with Mbox v3.x and require new console profiles and a new version of Director. If a legacy profile option is selected, Mbox will transpose the incoming data and attempt to produce the same result as would have been achieved using Mbox v3.x. For the majority of the core functionality (e.g. playback, position, scale) this works fine, but the case of some parameters (e.g. animation controls) or functions (alignment rectangles, it will not.
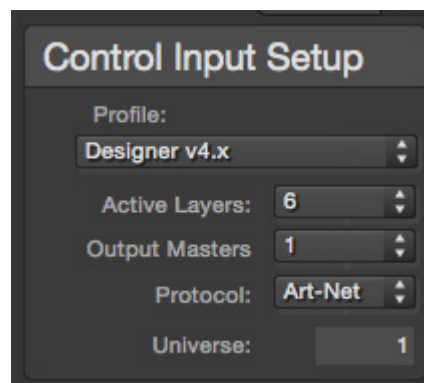
> **WARNING**: Some features (Alignment rectangles, Image Remapping) are handled in a completely different manner in Mbox v4 and cannot be emulated by the new software. Always test the entire show in advance if attempting to use a pre-programmed legacy mode. In general, it is better to reprogram the show using the new Mbox v4 software.

Below the profile version popup are additional popups for setting the number of playback layers, the number of output masters, and the control protocol. Depending on the version of Mbox being used, the maximum number of layers and output masters will vary.

Below the protocol popup is a text field for entering the number of the first universe that Mbox will use for control. As with previous versions, Mbox v4 will always use consecutive universes if more than one universe is required. Art-Net uses universes 0 through 255, and sACN uses universes 1 through 63,999. Of course, if Mbox is configured to use more than one universe, then the maximum universe number should not be used as the start universe; the start universe should be adjusted downwards accordingly.

Note: Remember to hit the [tab] or [return] key after entering the start universe value to accept the edit.

Finally, below the start universe text field is the Source IP field. As in prior Mbox versions, this field reports the IP address of the device sending control data on the start universe. The field can be used to quickly establish if data is being received on the desired universe. Additionally, if the reported IP address flips back and forth between more than one IP address, this is an indication that more than one source for the selected universe exists. This is a problem that needs to be rectified elsewhere, as Mbox cannot merge incoming control data.

Note: The Source IP field is a single indication that the Mbox application is receiving data on the start universe. In the patch tables to right of the configuration area, more detailed information can be seen about the required universe(s), the start address and range for each group of fixtures, and the IP address of the source for their data.

The right-hand side of the Patch tab has a Fixture Patch view that can be used to see more information about the patched "fixtures" that make up Mbox v4 and the individual parameters that make up each fixtures. While Mbox v4 can be considered as one fixture as a whole, it is generally split up into multiple fixtures on the control side (consoles and Director). The patch table follows standardized conventions for splitting Mbox v4 into multiple fixture groups, though the fixtures contained in each group may have different names and do have different parameters to prior versions. The three groups are: Global Master (overall mastering plus lighting), Outputs (3D camera, keystone, shutter, effects), and Layers (texture and object).

Each of the header rows for the three major fixture groups shows the name of the group, the universe it is patched to, the range of channels on that universe that it is using, and the IP address of the source that is sending that universe to Mbox at present. Each of these header rows has a disclosure arrow to allow it to be expanded to show more detail.

Fixture Patch			☐ Show as Percent or Natural
▶ Global Master	Univ: **10** Addr: **1 to 50**	Source IP: **127.0.0.1** (Local)	
▶ Outputs 1	Univ: **10** Addr: **51 to 143**	Source IP: **127.0.0.1** (Local)	
▶ Layers 1-4	Univ: **11** Addr: **1 to 324**	Source IP: **127.0.0.1** (Local)	

Expanding a group reveals the individual parameters that make up that group. In the case of the Global Master, this is a single list.

▼ Global Master	Univ: **10** Addr: **1 to 50**	Source IP: **127.0.0.1** (Local)	
parameter	address offset	master 10.1	
Global Intensity	0	255	
HUD / Ctrl	1	0	
Ctrl Selector	2	0	
Pix Intensity	3	255	
Global Volume	4	255	
Ints	5	255	
Red	6	255	
Green	7	255	
Blue	8	255	
Ambience	9	255	
H Bearing	10	32767	
V Bearing	12	32767	

For Outputs and Layers, the groups will show multiple items side by side, since copies of the same item share the same parameter names and are patched with an offset from each other.

For Outputs and Layers, the groups will show multiple items side by side, since copies of the same item share the same parameter names and are patched with an offset from each other.

▶ Outputs 1		Univ: 10 Addr: 51 to 143		Source IP: 127.0.0.1 (Local)			
▼ Layers 1-6		Univ: 11 Addr: 1 to 486		Source IP: 127.0.0.1 (Local)			
parameter	address offset	layer 1 11.1	layer 2 11.82	layer 3 11.163	layer 4 11.244	layer 5 11.325	layer 6 11.406
Opacity	0	0	0	0	0	0	0
Red	1	127	127	127	127	127	127
Green	2	127	127	127	127	127	127
Blue	3	127	127	127	127	127	127
Brightness	4	127	127	127	127	127	127
Contrast	5	127	127	127	127	127	127
Library	6	0	0	0	0	0	0
File	7	0	0	0	0	0	0
Play Mode	8	0	0	0	0	0	0
Play Speed	9	127	127	127	127	127	127
In Frame	10	0	0	0	0	0	0
Out Frame	12	65535	65535	65535	65535	65535	65535
Sync Stream	14	0	0	0	0	0	0
Sync Offset	15	127	127	127	127	127	127
Aspect	16	0	0	0	0	0	0
Frame Blend	17	255	255	255	255	255	255
xFade Type	18	0	0	0	0	0	0
xFade Time	19	0	0	0	0	0	0
Obj Library	20	0	0	0	0	0	0
Object	21	0	0	0	0	0	0

If multiple items of the same type (outputs or layers) are patched then in the header for each item, their start universe and address (in univ.address notation) will be shown. Each parameter name is listed to the left, with a column showing each parameter's address offset from the start address of the fixture. e.g. If a layer starts at 2.1, and the first parameter (opacity) has an offset of 0, then the address for opacity is 2.1. The aspect parameter has an offset of 16, therefore its address would be 2.17.

The patch table will also show the current received value for every parameter if the Mbox application is receiving Art-Net/sACN on the correct universe. Similar to how the DMX HUDs worked in prior versions of Mbox, the table shows live changes to incoming control data and colors the values based on whether they are at the default (green text) or at some other value (yellow text). The patch tab can be used to not only confirm that the correct or expected parameter values are being received but also to confirm that fixtures are patched in the correct order on the console.

Note: If the console has all fixtures at default values (no active cues and the programmer cleared out) then one or two yellow parameter values may indicate errors in the profile. Yellow parameter values for numerous parameters probably indicates an incorrect patch order or completely wrong profiles.

| ▼ Layers 1-6		Univ: 11 Addr: 1 to 486		S
parameter	address offset	layer 1 11.1	layer 2 11.82	
Opacity	0	255	0	
Red	1	127	127	
Green	2	127	127	
Blue	3	127	127	
Brightness	4	127	127	
Contrast	5	127	127	
Library	6	1	0	
File	7	1	0	
Play Mode	8	10	0	
Play Speed	9	127	127	
In Frame	10	6023	0	
Out Frame	12	58065	65535	
Sync Stream	14	0	0	
Sync Offset	15	127	127	
Aspect	16	31	0	
Frame Blend	17	255	255	
xFade Type	18	0	0	

Preferences

In previous versions of Mbox, setting preferences for the server required a combination of changing values on the Mbox setup tab and making changes in Mbox Remote's server preference window. Mbox v4 moves all preference setting (this does not include the configuration of outputs and mixes) to a table on the Preferences tab in the Mbox application, and Mbox Remote v4 also has a Preferences tab that works the same way.
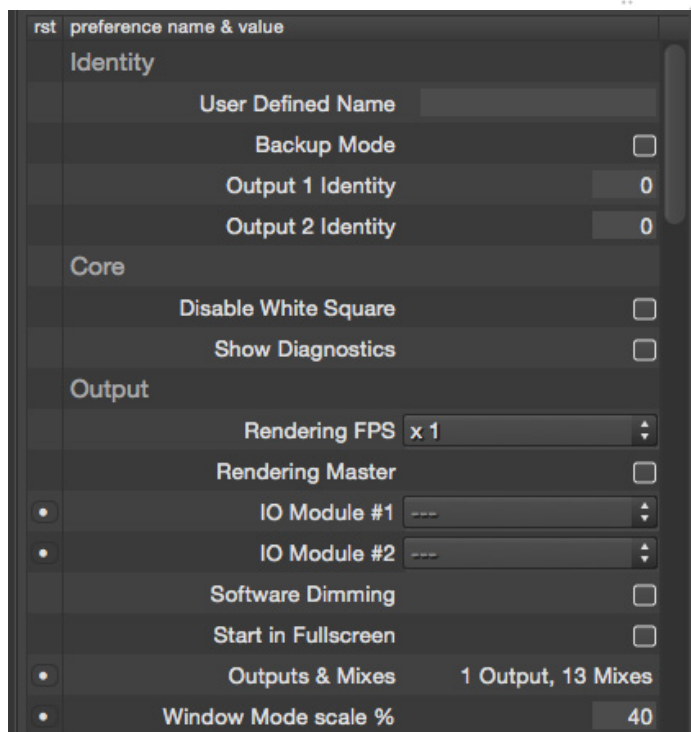
On the Preferences tab, preferences are grouped by their category and in most cases (some important preferences get moved higher up the listing) are listed alphabetically within that grouping. There is a search field at the top of the table to allow preferences to be found more rapidly. Preferences can be on/off checkboxes, popup lists, text fields for text or numeric entry, or more advanced edit tools for multi-item preferences (e.g. video inputs). Preferences have a name and some may show the required formatting or units for their text or numerical entries. A few preferences have a double diamond (⟨⟨⟩⟩) next to their name, indicating that the Mbox application must be quit and relaunched for that preference to take effect.

To the left of the name of each preference is a column that will show a white dot if the preference is not set to the default value. Hovering over the dot will reveal the default value of the preference, shown in yellow text at the bottom of the tab. Clicking on the white dot will reset the preference to the default value.
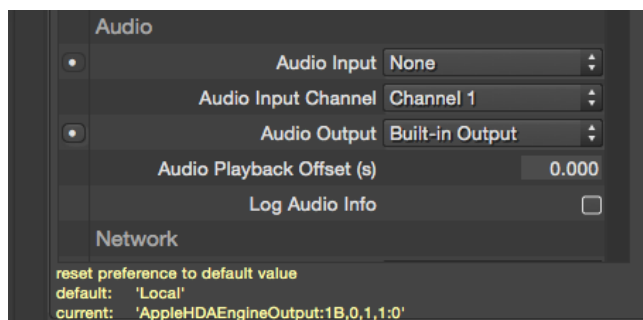
In both the Mbox application and in Mbox Remote, the preferences of one server can be compared to the preferences of another server. This functionality relies on the Mboxes both being on the same Ethernet network.
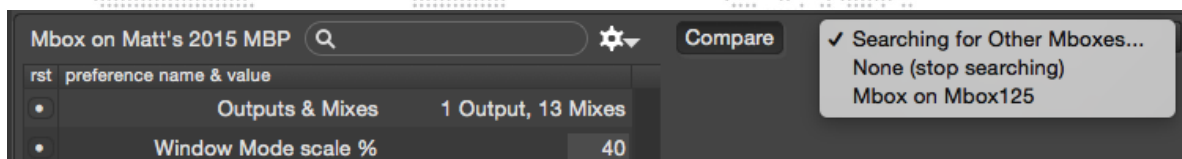
In the Mbox application, the Preferences tab shows the preferences for the local server on the left hand side of the table. In Mbox Remote the left-hand side shows the preferences for the server that is selected in the list of servers on the left side of the main window. The right-hand side of the tab in both applications is designed to show the preferences of another server on the network; as a comparison to the preferences of the server on the left-hand side.

When the preferences of two servers are being compared, the table displays graphical indications when a preference has differing values between the two servers. The difference is indicated by the presence of the word "apply" and arrows in the center column between the preferences of the two servers. Pressing the arrow buttons <- or -> allows a preference to be applied in the corresponding direction from one server to the other.

Note: Unlike the Outputs and Mixes tabs, the Preferences tab does not support the use of undo and redo functionality.

Output Setup

Output setup in Mbox v4 is a simple process in most cases. However, the available options do allow for more complex setups with multiple outputs, overlapped outputs, or multihead adapters. Typically, the server will be set up with between one and four outputs that are each taken from a unique portion of the global surface. In this manner Mbox v4 allows for various arrangements for single, dual, triple, and quad outputs.

Note: In window mode, each output is shown as a window. The global surface can also be shown in a window if desired.

By default, the global surface has a size of 1920x1080 pixels. If there is only one display device connected to the server, and that display is 1920x1080 then there is no additional configuration required. All rendering happens on the global surface and is then "copied" to an output, which is assigned to a display. If the only display is 1920x1080 then the global surface doesn't need to be any bigger.
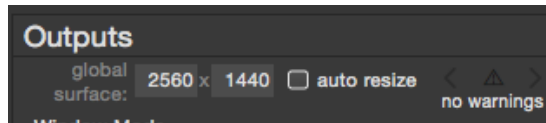
Note: Mbox v4 has eliminated the concept of Texture Size that limited the rendering in previous versions of Mbox. Mbox v4 automatically sizes its playback engine no matter the size of the content, and therefore the size of the content doesn't need to be factored into the configuration of the global surface (or anything else). Of course, the larger the content, the more effect it will have on server performance, so content should be kept as small as possible to meet the needs of the show.

⚠️ **WARNING**: In most cases, the global surface should not be smaller than the total area covered by the outputs.

The global surface's width and height can be independently adjusted keeping two limits in mind:

+ The global surface's width and height both have maximum sizes of 8196 pixels. The larger the global surface is, the more impact it will have on performance, so the global surface's size should be kept to a minimum to allow all outputs and mixes to be placed on it as desired.

+ The global surfaces width and height must each be divisible by 16. If incompatible values are entered, Mbox will make the global surface slightly larger so that the width and/or height are divisible by 16.

The global surface can auto resize to fit all outputs and mixes if desired. When adding and moving outputs or mixes this can be useful. If the auto resizing is disabled, outputs and mixes that have some portion outside the boundaries of the global surface will show that portion in red. The red area of the output or mix will never display any content since content is only ever rendered on the global surface. If an output or mix extends outside the global surface's boundaries but needs to render content across its entirety, then either the output/mix needs to be moved back so that all of it is on the global surface, or the global surface needs to be resized.

On the Outputs Tab, the left side of the tab shows a list of the outputs and sub-outputs, each with its own configuration tile. The right side of the tab shows a pair of graphical views, with the global surface being the top view and the selected output or sub-output being the bottom view. Outputs may be dragged on the global surface on the top view to reposition them. Sub-outputs may be dragged on their parent output on the bottom view.
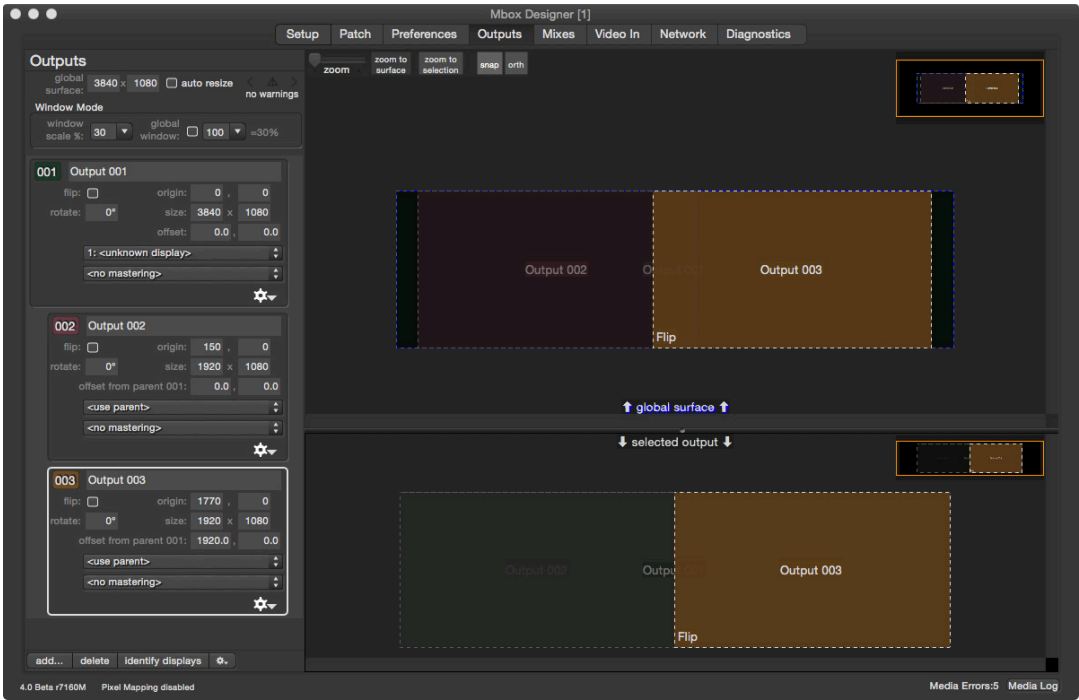
Outputs have configuration parameters that affect how large they are and where they are located (their top-left corner) on the global surface. In the case of the single 1920x1080 output, the output would use that width and height, and its origin would be 0,0. Flip and rotation parameters for the output allow its orientation to be adjusted for front/rear, floor/ceiling, rotated projection and for various creative configurations. The offset parameters are only used for sub-outputs and are explained later in this section.

Moving an output on the global surface changes what pixels the output will copy from the global surface and send to its assigned display.

In order to actually output to a display device, each output must be assigned to a connected display. While it's possible to configure and program a show (in window mode) without the actual display devices connected, at some point they will need to be connected to the computer and outputs assigned to them.
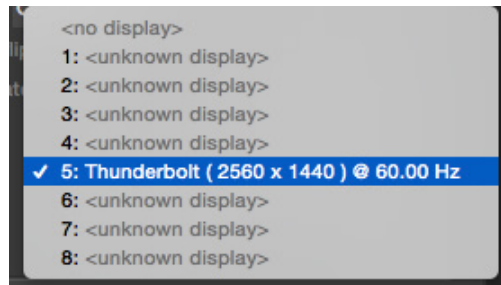
Each display device connected to the computer will have a unique index number. Display devices can include – monitors, projectors, LED processors, scan converters, and Blackmagic capture/output devices. The "standard" display devices connected directly to the computer using DVI, HDMI, or DisplayPort will have an index in the range of 1 – 8. Blackmagic devices will have an index of 9 or higher. The index number of connected displays will depend on which physical video connector that they are attached to on the computer or the order in which they were found if they are Blackmagic devices. Clicking on the display popup for an output will show the list of connected displays. A connected display's specific index number can be determined by finding it by name in the list, however if multiple displays of the same name are connected this may not work. Alternately, pressing the "identify displays" button at the bottom of the primary Mbox window will apply an overlay to every connected display (Blackmagic devices included) that shows the display's name and index.

> **WARNING:** If an output is not assigned to a display then that output will not be rendered when Mbox goes into fullscreen mode! If an output has been assigned to a display that is then disconnected or disconnected and then reconnected on a different physical video connector of the computer, it will not be rendered in fullscreen mode. To fix this, the output must be reassigned to the appropriate display. In such cases, a yellow warning icon will appear in yellow next to the display popup for the output, indicating that corrective action is needed.

The Mbox application knows the current resolution and frequency of the display, as this is provided by the OS. When Mbox goes into fullscreen mode it can only use the resolution and frequency that the display has been previously set to. Unlike older versions of Mbox, Mbox v4 will not attempt to force the display into another format when going into fullscreen mode. To change the resolution and frequency of a display, use the System Preferences > Displays preference pane to adjust these settings before entering fullscreen mode. Upon changing the display's format, the output's display popup will update automatically to reflect the new format.

When the Mbox application goes into fullscreen mode, each output that has been assigned to a display will have its window moved and resized to fully cover that display. If the output size is the same as the display's resolution, then the fullscreen view will be exactly the same as what was seen in the window. In most cases this is not typical operation and would be undesirable. However, it may be unavoidable in some situations. If the display's resolution is different from the output's size, then the output will not look exactly the same when Mbox goes into fullscreen mode.
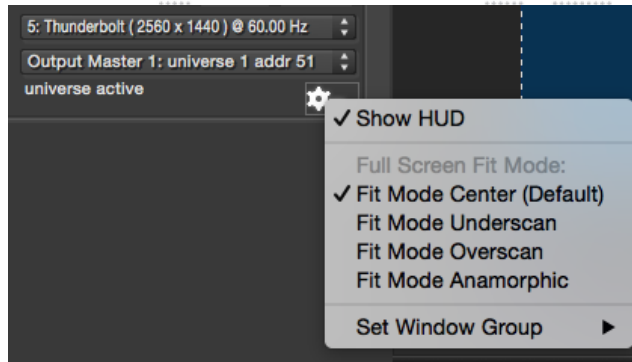
There are four fit modes for how this condition can be handled – center (default), underscan, overscan, and anamorphic fit. The fit options for an output can be selected by clicking on the gear icon at the bottom-right of each output's configuration tile.

+ Center (default): the output is not scaled at all and maintains its aspect ratio. If the output is bigger than the display then it will be clipped; if the output is smaller then it will have a black border around it.

+ Underscan: the output is scaled so that its height matches the height of the output. The output may be clipped on the sides, but its aspect ratio is not affected.

+ Overscan: the output is scaled so that its width matches the width of the output. The output may be clipped on the top and bottom, but aspect ratio is not affected.

+ Anamorphic: the output is scaled so that its width and height match the width and height of the output. The entire output will always be visible but the aspect ratio may be affected.

Below the display popup is another popup for assigning an Output Master to the output. Outputs don't have to have an output master, but in most cases they will. More than one output can use the same output master if desired. The popup will show a list of the currently available output masters. The number of output masters is set on the Patch tab, and the total number is limited depending on the version of Mbox (Designer/Studio/Mini). Each output master has a patch universe and address that is pre-assigned and shown beside the output master's name in the list. If an output master is assigned and the corresponding universe is active, the words "universe active" should appear below the popup. This only denotes that Mbox is receiving the correct universe, not that the data in the universe is correct.
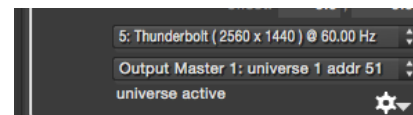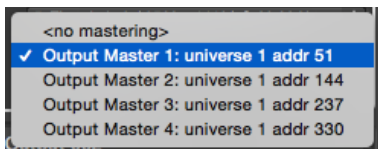
WARNING: As soon as an output has an output master assigned, it will start responding to data on the corresponding channels of that universe. Therefore, if the control console is not sending any data (or the wrong data) the output's visual properties may immediately change or the output may go completely black.

The gear icon at the bottom-right of each output's configuration tile also provides the means to enable/disable HUDs on the output – exclusive of HUDs being shown on other outputs – and the ability to set the output's Window Group. Window groups are used to organize Mbox's output windows when the application is in window mode only. Windows that belong to the same window group will move together if one of the group is moved, and will automatically be arranged with appropriate spacing (in respect to each other) based on their actual spacing on the global surface. All windows default to window group 1, but can be assigned to groups 2 – 8 instead, or to no group.

New outputs that are sub-outputs (i.e. children of existing outputs) can be created by selecting an existing output and clicking on the "add" button at the bottom of the window, then selecting "Add one sub-output…" or "Add matrix of sub-outputs…" from the list. When a single sub-output is first added, it will be the same size as its parent output, with the same origin. When a matrix of sub-outputs is added a dialog window allows the matrix size, overlap, window group, and each sub-output's size to be set.

Sub-outputs have both an origin and an offset. A single sub-output gets created with an offset of 0,0, and each member of a matrix of sub-outputs will have different offset values based on that sub-output's location within its parent output. A sub-output's offset is defined to be its origin's offset from the origin of its parent. It is possible to move a sub-output's position on both the global surface and on its parent output, and the two have different purposes.

+ Moving a sub-output on the global surface changes what pixels the sub-output will copy from the global surface and use for its portion of its parent's output to a display.

+ Sub-outputs stay "attached" to their parent output if the parent output is moved on the global surface. Therefore, when their parent is moved, their origin will change as well.

+ Moving a sub-output on its parent changes where on the output the sub-output's pixels will be copied to.

+ Typically, sub-outputs' positions do not overlap on their parent output. But sub-outputs' positions may overlap on the global surface if overlapped and blended projectors are being used.

Note: The Outputs tab supports the use of undo and redo functionality.

Mix Setup

The Mixes tab of the Mbox v4 application looks and operates similarly to the Outputs tab. Keeping in mind that outputs are mixes, they share many of the same properties and capabilities. The Mixes tab does show the outputs, but does allow them to be edited.

Mixes and sub-mixes are created in the same way that outputs are, and their origin, size and offset (if applicable) can be edited in the same manner. The Mixes tab doesn't have a split view on the right-hand side, as all mixes and sub-mixes copy from the global surface but don't copy their pixel to anywhere else. Mixes are used as compositional aids rather than directly for output to a display.

Note: The Mixes tab supports the use of undo and redo functionality.

Using Outputs/Mixes for Layers

Previous versions of Mbox used the constructs called Alignment Rectangles for the purposes of centering and cropping content to certain rectangular areas of the outputs. Alignment rectangles could be configured live in the Mbox Remote application or offline using a separate application (Mbox Alignment Rectangles). Mbox v4 uses Mixes for this instead, which can be edited live within the Mbox application itself. In Mbox v3, layers were assigned to alignment rectangles by applying the Auto Crop effect (#212) to the layer and then using the effect's modifiers to choose the rectangle by index number and whether or not the content was centered in the rectangle.
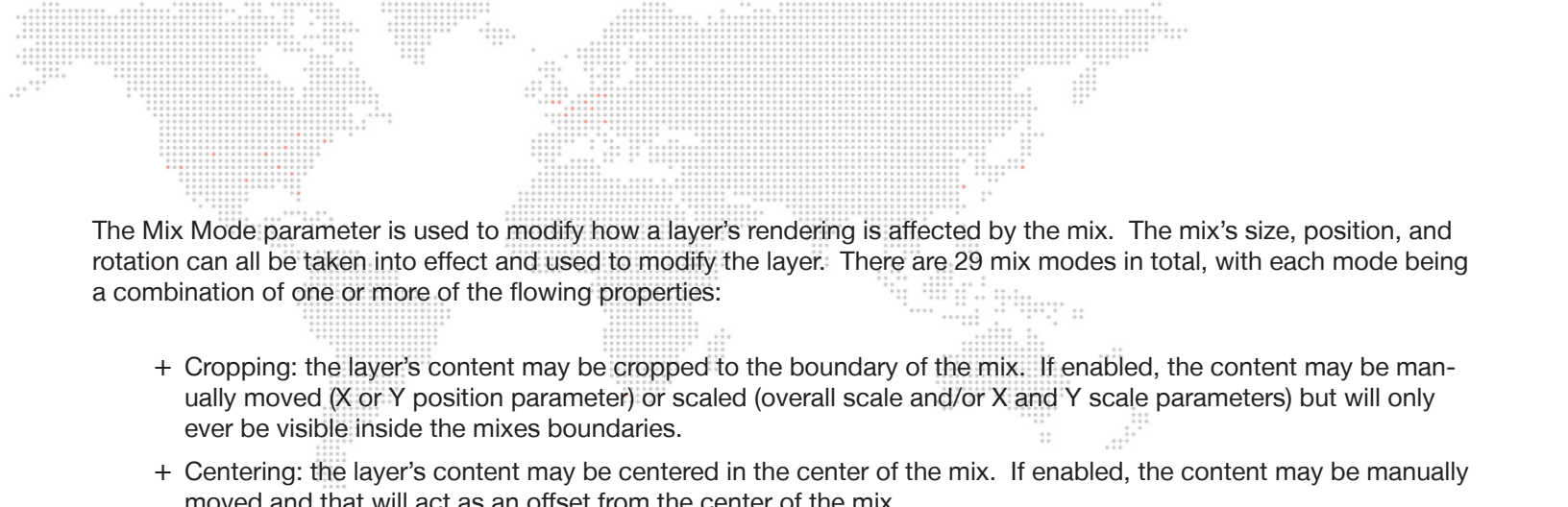
Mbox v4 has dedicated tabs on the primary window for the creation and configuration of outputs and mixes. Once created, both outputs and mixes can be used as destinations for layers. Every layer has two parameters – Mix Select and Mix Mode – that allow the selection of the mix (remember that outputs are also mixes!) using its numerical index and the cropping, centering, rotation, and scaling of the layer's content with respect to the mix's boundaries.

A layer must first be assigned to a mix (using the Mix Select parameter) before the layer will be affected by the properties of the mix (cropping, rotation, 3D camera, etc.). Mixes in Mbox v4 are numbered 0 through 255. The global surface is always available and is always mix 0. Since 0 is the default mix assignment for all layers, they can be affected by the global surface's properties by default. Some of the mix modes (see below for an explanation of mix modes) have no effect on content assigned to the global surface – i.e. no cropping, no rotation.

Mixes 1 through 32 are outputs. All of these mixes are optional, but there must be at least one output for Mbox to do anything useful in fullscreen mode with a connected display. Output mixes can have Output Masters assigned to them (the global surface and mixes 33-255 cannot) which allows them to be mastered from the control console. While Mbox can have a maximum of 32 outputs, the different versions of Mbox (Designer/Studio/Mini) have different limits for the allowed number of output masters (32/16/8). Outputs can also have 3D Cameras and keystone/warp assigned to them using Mbox Remote. 3D Camera and keystone/warp from Mbox Remote does not require the use of output masters and can override the output master control for an output if desired.

The remainder of the mixes (33 through 255) are optional and can be used for any organizational or compositional needs. These mixes can't have output masters assigned to them, but have mix modes like the other mixes, and can have 3D Cameras and keystone/warp assigned to them using Mbox Remote.

When a layer has been assigned to a mix, the default state is to crop the layer's content to the boundaries of the mix. If a layer is assigned to the global surface (mix 0, the default) then no cropping occurs. But as there is no rendering outside the boundaries of the global surface, there is no content rendered outside those boundaries anyway.

The Mix Mode parameter is used to modify how a layer's rendering is affected by the mix. The mix's size, position, and rotation can all be taken into effect and used to modify the layer. There are 29 mix modes in total, with each mode being a combination of one or more of the flowing properties:

+ Cropping: the layer's content may be cropped to the boundary of the mix. If enabled, the content may be manually moved (X or Y position parameter) or scaled (overall scale and/or X and Y scale parameters) but will only ever be visible inside the mixes boundaries.

+ Centering: the layer's content may be centered in the center of the mix. If enabled, the content may be manually moved and that will act as an offset from the center of the mix.

+ Fit H: the layer's content will be scaled up or down to fit the width of the mix. The width of a rotated mix is different to the width of the same mix if it were not rotated; it's the distance between the two opposite corners. If enabled, the content can be scaled, and that will act as an offset from the automatic horizontal fit scaling. The aspect ratio of the content will not be affected.

+ Fit V: the layer's content will be scaled up or down to fit the height of the mix. The height of a rotated mix is different to the height of the same mix if it were not rotated; it's the distance between the two opposite corners. If enabled, the content can be scaled, and that will act as an offset from the automatic vertical fit scaling. The aspect ratio of the content will not be affected.

+ Fit H and V: a combination of the above two properties. However, in this case, the aspect ratio of the content may be affected.

+ Rotate: the layer's content will be rotated to match the rotation of the mix. If enabled, the content can be manually rotated using the Z rotation parameter, and that will act as an offset from the automatic rotation.
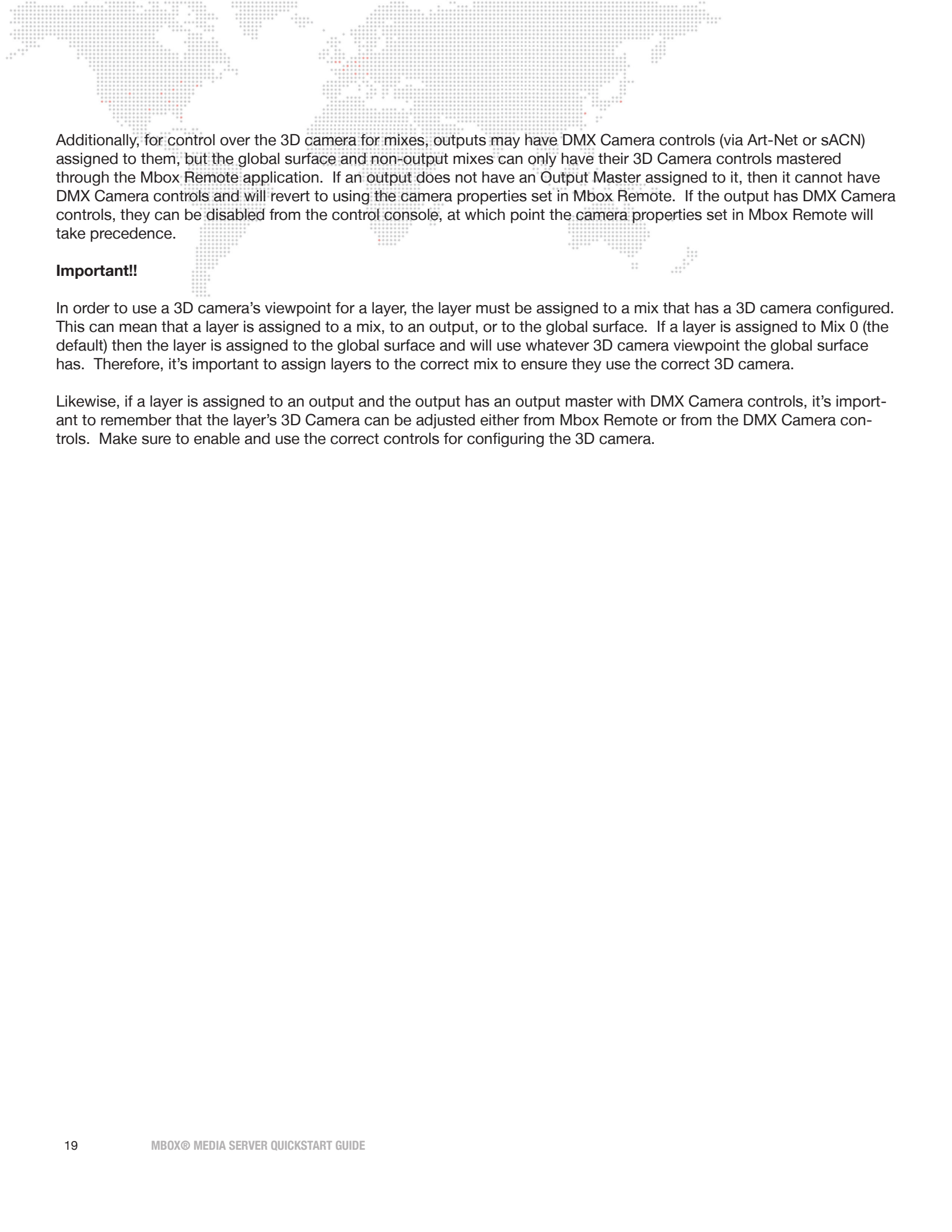
In Mbox Designer, mixes (including outputs) can have 3D cameras applied to them using the Mbox Remote Projection Editor toolset. Typically, 3D cameras will only be used on outputs when projection mapping, but it is possible to create and configure a 3D camera for the global surface and also mixes that are not outputs.

Note: In Mbox Studio and Mini, only the global surface has a 3D camera.

In the default state, none of Mbox's mixes have a 3D camera assigned to them, except for the global surface. In this state it is possible to use 3D objects and to see them in perspective, with the center of 3D space being the center of the global surface and the camera's view being centered on the center of the global surface. Objects on layers can be moved and their camera's view of them will change perspective as the objects move. However, in this default state, the position, look-at point, and properties of the camera are preset and cannot be changed.

The hierarchical nature of mixes in Mbox v4 means that the global surface is the "parent" of all mixes (including outputs) and that every mix can be the parent of sub-mixes (i.e. can have "children"). The assignment and control of the 3D perspective view for a mix depends on whether it has its own projection settings (3D camera) and controls. If a mix is lacking projection settings, then it will use its parent's settings instead. And if the mix's parent is lacking projection settings, then that parent's parent's (i.e. the mix's grandparent" -> typically the global surface) settings will be used.

Hierarchy = Global Surface -> Output -> Sub-Output …or… Global Surface -> Mix -> Sub-Mix.

Additionally, for control over the 3D camera for mixes, outputs may have DMX Camera controls (via Art-Net or sACN) assigned to them, but the global surface and non-output mixes can only have their 3D Camera controls mastered through the Mbox Remote application. If an output does not have an Output Master assigned to it, then it cannot have DMX Camera controls and will revert to using the camera properties set in Mbox Remote. If the output has DMX Camera controls, they can be disabled from the control console, at which point the camera properties set in Mbox Remote will take precedence.

Important!!

In order to use a 3D camera's viewpoint for a layer, the layer must be assigned to a mix that has a 3D camera configured. This can mean that a layer is assigned to a mix, to an output, or to the global surface. If a layer is assigned to Mix 0 (the default) then the layer is assigned to the global surface and will use whatever 3D camera viewpoint the global surface has. Therefore, it's important to assign layers to the correct mix to ensure they use the correct 3D camera.

Likewise, if a layer is assigned to an output and the output has an output master with DMX Camera controls, it's important to remember that the layer's 3D Camera can be adjusted either from Mbox Remote or from the DMX Camera controls. Make sure to enable and use the correct controls for configuring the 3D camera.

Pixel Mapping

In the Mbox v4 application the pixel mapping engine has been enhanced in that individual contexts can use different sources for their sampling. In previous versions of Mbox, only the final output of the server (Output 1 in Single and Dual Independent modes or the combination of Output 1 and Output 2 in the Panoramic modes) was available to be the source for sampling. As a result of the changes in Mbox v4 - the addition of the Global Surface and Mixes - the pixel mapping engine can now use a variety of sources: the Global Surface, Mixes (which include outputs), and Layers.

The pixel mapping configuration is still handled by the Mbox Remote application, and aside from the additional sources the remainder of the interface and setup process is the same. What is different is the area below the context grid, where the context tabs are shown and the contexts' properties are set.

Each context now has a popup that allows the source for that context's sampling to be selected. The popup provides selections for the global surface, mixes (which includes outputs), and layers. The global surface is always available for selection, but unless the pixel mapping editor is in a live editing session - using a network connection to the Mbox v4 application, mixes and layers will not be available. This is because Mbox Remote does not know the configuration of the Mbox application (how many mixes and how many layers) unless a live session has been started. If mixes or layers were previously set (in a live session) as the source for pixel mapping, they will remain the source even during an offline editing session.
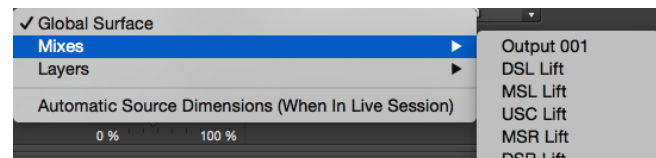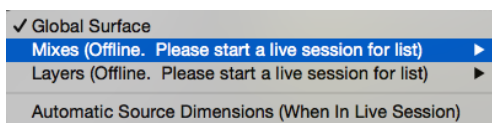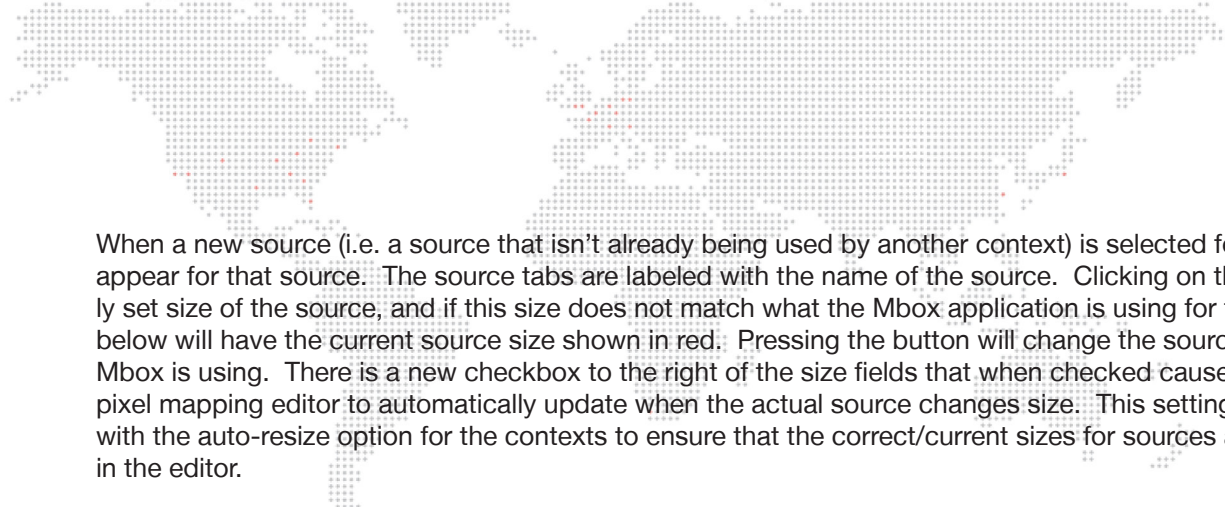
Note: If a pixel mapping configuration is created from scratch without a live session, the global surface should be used as the initial source for every context. When offline, the selected source does not affect the remainder of the configuration – sampling rate, fixture placement/patch, protocol selection, etc. Later, a live connection to the Mbox application can be established and the desired sources can be set.

At the bottom of the source popup is an item that allows the context to automatically resize based on the size of the source. This is a very important option. In all cases, the sources for pixel mapping in Mbox v4 can change size, and that change in size may affect the sampling for pixel mapping. While enabling the auto resize option still means that the result of pixel mapping can change if the source size changes, it does mean that there will always be a result, rather than no output.

When pixel mapping sources change size, they typically to change size because they have been intentionally reconfigured. e.g. the global surface is resized to accommodate an additional output or a different layout. For the most part, the resizing of the global surface, outputs, and mixes are user-initiated. However, if the global surface auto-resize option is checked, it will change size automatically if outputs or mixes are moved/added. In addition, if a layer is used as the source for pixel mapping, the source size will always change when the size of the content on the layer changes. Layers have no preset size!

This means that attention should be given to what the pixel mapping sources are and whether they might need to change size during setup and programming, or whether (in the case of layers) they might even change size at different moments during the show. If the sources are the global surface and/or outputs and mixes, then once setup is complete these will likely never change size again, and for the most part these sources won't need the auto-resizing enabled. But if the source is a layer and content sizes change during the show, it's a very good idea to enable the auto-resizing. Of course, if a particular layer only ever plays a single size of content, then that size could be set and the auto-resizing not enabled.

When a new source (i.e. a source that isn't already being used by another context) is selected for a context, a tab will appear for that source. The source tabs are labeled with the name of the source. Clicking on the tab shows the currently set size of the source, and if this size does not match what the Mbox application is using for that source, the button below will have the current source size shown in red. Pressing the button will change the source's size to whatever size Mbox is using. There is a new checkbox to the right of the size fields that when checked causes the source size in the pixel mapping editor to automatically update when the actual source changes size. This setting can be used together with the auto-resize option for the contexts to ensure that the correct/current sizes for sources and contexts are shown in the editor.

If Mbox Remote is in a live editing session when a pixel mapping source changes size and both of the resizing preferences are enabled then the only indication will be that content may no longer fill, or may overfill the current layout of fixtures. With the source size automatic updating disabled, the tab for that source will be colored red if the source changes size.

Warning: If the pixel mapping is set up to for pixel-for-pixel sampling between content and fixtures, then enabling the auto-resizing can affect that relationship severely. Care should be taken if the source size changes, and changes on the fly (i.e. using a layer as a source and playing content of a different size) should be avoided.

2.

NOTABLE CHANGES

This chapter talks about changes between Mbox v3 and v4.

Notable changes from Mbox v3.x

[This section reviews features that have changed or been removed from Mbox v4 as compared to Mbox v3.x]

There have been some fairly substantial changes in the Mbox software between Mbox v3.10 and Mbox v4.0. Some of these changes have resulted in adding features and are explained elsewhere. Some of the changes have meant removing outdated features or changing how they work to improve them.

When switching between versions it may be necessary to change the way that certain results are achieved so as to avoid using features that have been removed.

Quantity of Layers and Outputs

Mbox v4 increases the number of playback layers for each version of the software. Mbox mini increases to six layers, Studio to twelve, and Designer to twenty-four. All three versions of the software may now have more than two outputs. While there is no limitation on the number of physical outputs, there are limitations on the number of output masters and the total number of pixels in the outputs, depending on the version of the software.

Alignment Rectangles become Mixes

Alignment rectangles have been superseded by the new concept of Mixes. Mbox v4 does not read the alignment plist files, therefore information from these files needs to be manually re-entered as mixes within the Mbox application.

Mixes have the same functionality as alignment rectangles, plus more. They allow for cropping and centering of content, plus scale and rotation of content. Mixes can have a parent/child relationship, allowing one mix to be moved and having other mixes move by the same amount.

Mixes can be used as a source for a pixel mapping context. Mixes can also be used as a CITP source without any additional setup (i.e. no more CITP_additions file).

Layer Copy

Layer Copy FX- has been removed from the Mbox application. Layer Copy FX+ and Raw remain however. The media locations for these items has changed, with FX+ now being located at 255.1 – 255.24 (depending on the version of Mbox) and Raw being located at 255.31 – 255.54

Texture Size (Width and Height)

Mbox v4 no longer needs to have the texture size values manually entered in advance. The "texture size" for each layer is dynamically adjusted on the fly.

Output Modes (e.g. Dual Independent, Pan Wide, etc.)

The new configuration tools for outputs in the Mbox v4 software mean that the four outputs modes found in Mbox v3.x are no longer used. Outputs may be set up as desired to be independent or panoramic. Both may be used on the same computer at the same time if desired. Output Masters allow each output to have controls for mastering color, intensity, 3D camera, keystone, etc.

Output Identity

Mbox v4 currently does not use the concept of output identities that was used in Mbox v3.x. Every output of a server can be viewed and edited separately within the Mbox application, and the projection settings of each output can be adjusted in Mbox Remote.

For purposes of main/backup operation, output identities may be reintroduced in future versions.

Object (3D) Effects

The majority of the object effects remain in Mbox v4. Some have been removed – Specular Highlight, Allegiance, Auto-Crop. The AutoCrop effect's functionality has been replaced by mixes and the mix selection and mix mode parameters on every layer. Meaning that an effect no longer has to be used to get the same result.

The Texture scale, rotate, and x/y position effects do not work in Mbox v4.0 but should be included in a future version.

Texture Effects

Mbox v4 keeps all the same texture (2D) effects as Mbox v3.x [except for a couple that are broken in El Capitan] but the numbering of effects has been changed to group similar effects. Additionally, the majority of the effects have received some enhancements made possible by the addition of three effect modifier parameters for each effect, giving a total of five per effect. Where possible, effects now have a Mix parameter that allows the effect to be blended in, rather than just on or off as in Mbox v3.x.

WARNING: Some effects take a while (2-3 seconds) to load the first time you use them. This appears to be due to delays in the OS. As a safety workaround, it may be necessary to create some pre-show cues that turn on the effects in order to preload them. Alternately, load the effect onto a background layer or a layer with opacity of 0 prior to using it on a visible layer. <- This is something we will be looking to fix.

WARNING: Loading some effects will cause a brief click or pop in audio output. As with the previous warning above, preloading the effect is a valid work around. This is also something we are looking to fix.

Timecode Input

Mbox v4 allows an audio input (for timecode) directly into the application. Previously, Mbox v3.x required the use of the TC Reader application or Mbox Remote to receive timecode audio and send that to Mbox over the network. The Mbox application is now able to recognize and automatically compensate for the rate of the incoming timecode.

TC Reader and Mbox Remote are still able to perform the task of receiving timecode and broadcasting it to the Mbox application over the network. This will continue to work for some timecode formats (a notable exception is 29.97ndf). However the recommended practice for Mbox v4 is to input audio directly into the application as this will apply the correct compensation for all timecode formats.

The timecode input preference allows for the selection of the input device and the channel on that device. The selected device does not have to be the same as the default audio input device selected in the System Prefs.

Note: The Mbox application now supports timecode hours beyond 23:29:59:29. While times above 23 aren't officially kosher, situations have come up where a show uses times beyond 24 hours. Mbox v4 allows times up to 39:59:59:29.

Linking Files to Timecode Values (for timecode playmodes)
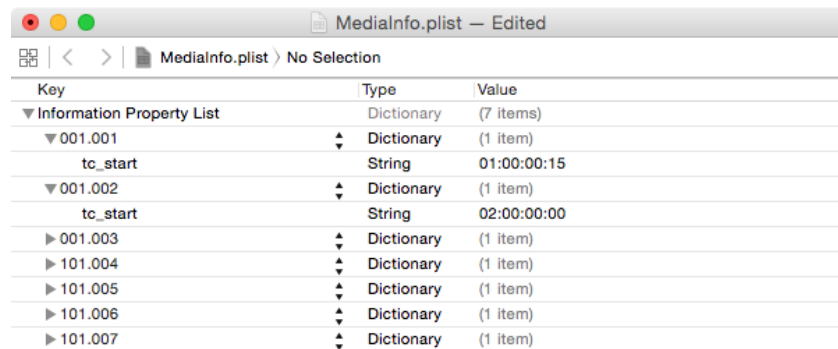
Previous versions of the Mbox software supported two different methods of permanently assigning timecode start times to movie files. These two methods included appending a suffix to the file name (e.g. "TC-01-00-00-00") and also using a separate file, the MediaTimeCodes.plist file.

In Mbox v4, the first method - using the file name suffix - has been eliminated completely and is no longer supported. The second method does still work, but has been deprecated.

Mbox v4 has also made the DMX Timecode controls (extra parameters on each layer) a standard patched feature.

The MediaInfo.plist file

Mbox v4 uses a new plist file for metadata for 2D content. At present time this file only supports timecode start time assignment and enabling embedded audio playback, but in future versions of Mbox, additional functionality will be added. Ultimately, Mbox Remote's UI will allow users to edit this file more easily.

The MediaInfo.plist file is located in the /Mbox/Media folder. Its structure is new, but quite simple. The root of the plist holds dictionary keys for each media file that has active metadata, and each dictionary holds the metadata keys.

The "tc_start" key is used to assign a timecode start time to the file, and uses a string value to designate that time.

IMPORTANT! The formatting of both the file index and the start time are critical, and incorrect formatting will lead to the metadata not being applied. The file index must be formatted as Folder.File, using a period between the two numbers and the numbers must have padding zeros - e.g. 001.100. The timecode value must use the HH:MM:SS:FF format, with the numbers separated by colons and all numbers using padding zeros.

Mbox v4 automatically creates the MediaInfo.plist file if none exists. You can use the empty file as the basis for new metadata by adding new items. Also, if you place a MediaTimeCodes.plist file into the Media folder, Mbox v4 will automatically add that data to the existing MediaInfo.plist file the next time content is rescanned. Ideally you should stop using the MediaTimeCodes.plist once that data has been copied into the MediaInfo.plist file.

DMX Timecode controls

The last four parameters on each layer of Mbox v4 may be used to directly control the timecode start time for content on the layer. The four parameters represent Hours, Minutes, Seconds, and Frames and may be modified at any time - even while a file is playing.

IMPORTANT! Unless all four values are at zero, the DMX Timecode value will always override any timecode start time set in the MediaInfo plist.

Audio Output

Mbox v4 provides a preference for selecting the audio output device that Mbox will use when playing back audio. The selected device does not have to be the same as the default audio output device selected in the System Prefs. The default output device should be left as the "built-in" audio output in most cases, to direct system noises to the computer's speaker, rather than to the same audio output that Mbox is using.

There is also an audio playback offset preference which allows the audio to be advanced/delayed vs. the video playback when playing a movie. This is a global preference, affecting all audio playback on the server. Typically, this preference will be set to a positive number, indicating that the audio is advanced with respect to the video. This is because sound travels more slowly that light, resulting in an audio delay over longer distances. The preference has a range of -2.0 (delay) to +2.0 (advance) seconds.

Note: Mbox v4 can play eight files with audio at the same time. Files (for v4.0) can be stereo, future versions will allow >2 channels.

3D Camera

As in previous versions of Mbox, there is a 3D camera that allows perspective views of 3D objects within Mbox's 3D environment. Mbox Designer has a configurable/controllable 3D camera, but Mbox Studio and Mbox Mini have a default 3D camera that is not configurable.

Mbox Designer v4's 3D camera and its control parameters work differently to the camera and controls in Mbox v3.x. In Mbox v3.x the camera was always pointing towards the center of 3D space (X,Y,Z = 0,0,0) unless the pitch or yaw controls were changed. The v3.x camera could be orbited around the center of 3D space. While these controls were simple, they meant that the camera could not be horizontally or vertically panned, and that the camera position, which used 16-bit controls, couldn't be related to actual 3D coordinates.

In Mbox v4, the camera itself has an adjustable X,Y,Z position (which defaults to 0,0,10) and also has an adjustable lookat position (which defaults to 0,0,0). This allows both the camera and its position to be adjusted, either independently or at the same time – thereby allowing for panning. The orbit, pitch, and yaw controls have been eliminated.

Due to the changes in the 3D camera in Mbox v4, two of the controls have non-typical defaults. The camera Z position default is 42767, which equates to a value of 10 units in 3D space. And the camera FOV has a default value of 71, which equates to 25°, which is the default FOV in the projection editor in Mbox Remote. These defaults allow the camera to be seamlessly switched between DMX and Mbox Remote control without any perspective shift if the values (in both DMX and Remote) are at their defaults.

Keystone controls from console/Director (AKA "DMX Keystone" controls)

Mbox v4 uses 16-bit controls for DMX keystone corner control – as opposed to the 8-bit controls in Mbox v3.x. Also, the Mbox v4 keystone corners can be moved outwards as well as inwards. The DMX keystone controls also include X and Y linearity parameters.

The DMX keystone controls include a parameter to enable/disable the controls (DMX control is disabled by default) and this parameter has different options for the blend area curve type/mode. The new options match those found in Mbox Remote for vignettes – linear, raised cosine, and sine. For most situations, the linear option is the most appropriate. Each curve also has a grid option, allowing a grid to be overlaid onto the output image. Finally, there is an option to have the DMX keystone enabled but to disable the blending and turn on the grid without the blending.

Output Geometry

New in Mbox v4 are the output geometry controls. Some of these parameters were included in camera or keystone functionality in Mbox v3.x. They have been separated into a more logical fixture here. Output position, scale, and rotation allow the entire image for that output to be adjusted (in 2D space) to tweak the output. Whether for matching other outputs in an overlap/blend setup, or for overall adjustment. These controls are 16-bit, but their values are not pixel accurate.

There are also two controls for X and Y mix offset that are pixel accurate. These controls allow the imagery for an output to be moved left/right and up/down on the Global Surface by an exact pixel amount with control from the console/Director. These 16-bit controls have a default of 32767 and therefore allow 32767 pixels of movement. This is far more pixels than is supported by the GS size limits, so care is required. The mix offset controls are exactly that, offsets. They act to offset the output's position on the global surface from its position as set up in the initial configuration on the Output tab of the Mbox application. Therefore, if an output has an X position of 100 on the Outputs tab, setting the mix offset X parameter to a value of 32867 will move the mix 100 pixels to the right on the global surface. Note that this is a live offset and does not affect the stored values on the Outputs tab, and which is not saved when the application quits, nor recalled when the application launches.

Color controls

Color controls on Mbox's layers and output masters now have both subtractive and additive controls. These controls are still 8-bit, and now have a default of 127. Controls for both brightness and contrast have been added, eliminating the need to use layer/master effects to perform these tasks.

Sync Streams

The number of sync streams available has been increased. All versions are capable of listening to streams 1 – 32, but the number of output streams is limited. Mbox Designer now has 32 streams, Studio 16, and Mini 8.

Image Remapping (Multiscreen gobo)

In Mbox v3.x, the Multiscreen gobo was a discrete item of content (in the Models folder) which was required to be selected on a layer for use. An additional parameter was used to select the individual configuration from with the currently selected image remapping file.

In Mbox v4, the multiscreen gobo "object" is built into the Mbox application itself, and is no longer selected as an actual object on each layer. There is a new Image Remapping parameter that can select the configuration from within the currently selected image remapping file.

Because image remapping needs to be disabled, a value of 0 for the image remapping parameter disables image remapping. This means that image remapping files can no longer have a configuration 0, and now start with configuration 1. There is a new version of the Image Remapping (previously known as Multiscreen Editor) application that implements this new scheme. The new application also allows a background image to be applies to the editor when creating configurations.

CITP/MSEX

Mbox v4 continues to use CITP/MSEX (v1.1) for the transfer of thumbnails to consoles and the streaming of imagery to consoles and visualizers.

In Mbox v3 only outputs and layers were available as CITP stream sources, but in Mbox v4 mixes can now be used as sources for CITP streams.

Audio playback

Mbox v4 follows many of the same rules/guidelines that Mbox v3.x did in terms of audio playback. In most cases the audio works better and performance overall is greatly improved. Like Mbox v3.x, Mbox v4 has two playback engines, a preferred engine for movie content that is rendered using spatially compressed codecs (ProRes, Photo-JPEG) and movies without embedded audio, and a secondary engine (AVFoundation player) for movies using temporally compressed codecs (H264) and movies with embedded audio that have the .audio tag. Use of the AVFoundation player does not mean second class performance as it did in Mbox v3.x but some aspects of playback may be unavailable in the AVFoundation player (see below).

You can use separate ("side car") audio files or use audio that is embedded in the QuickTime movie. Both should produce the same result with regard to performance and sync between audio and video. To use embedded audio, add ".audio" to the end of the file name, before the .mov file extension – the same as with Mbox v3.x.

Movies with embedded audio should use AAC encoding for the audio, files with Linear PCM encoding will exhibit audio playspeed issues. Side car audio files can use AAC, MP3, AIF, or WAV encoding. Side car files should have the same index number as the movie they are associated with and should be in the same content folder.

As with Mbox v3.x some playmodes may not produce useful audio output – e.g. Random, reverse modes… due to the use of the AVFoundation player.

Profile Emulation

Mbox v3 allowed you to use a greater version of the product software in a mode emulating a lesser version of the software. e.g. Running Mbox Studio as if it were Mbox Mini. However, in Mbox v3 you could not use a lesser version of the software to emulate a greater version. Mbox v4 has added the ability for a lesser version to emulate a greater version. Of course, if a feature is limited or disabled in the lesser version, it will still be limited not be available for use. However, the emulation mode will allow Mbox to replicate a show programmed in a greater version as correctly as possible given the differences in the product capabilities.

Also, there are emulation modes for the most recent previous version of Mbox software (v3.8 – 3.10.2 footprint) to allow you to use a previously programmed show file to control the new Mbox software. Emulation for versions prior to Mbox v3.8 is not supported.

These emulation features are intended as a convenience to allow you to more easily run a show that has been programmed using a different version of the Mbox software. While every attempt has been made to ensure compatibility, some features may not work in emulation modes. Testing the functionality in advance is strongly recommend, and no guarantee of full compatibility is given.

Licenses

Mbox v4 uses a different license than Mbox v3.x. Therefore a soft license or USB license key for Mbox v3.x will not license the Mbox v4 software. A license upgrade is required, contact mboxsupport@prg.com or a PRG rep for more details.

3.

FIXTURE PROFILE REFERENCE

This chapter talks about changes in fixture profiles

+ FIXTURE DESCRIPTIONS
+ PATCHING NOTES
+ DESIGNER PATCH ORDER
+ STUDIO PATCH ORDER
+ MINI PATCH ORDER
+ FIXTURE PARAMETER DATA
+ DESIGNER PARAMETER DESCRIPTIONS
+ STUDIO PARAMETER DESCRIPTIONS
+ MINI PARAMETER DESCRIPTIONS
+ DISCRETE VALUES FOR SLOTTED PARAMETERS

Fixture Descriptions

Outputs

Mbox v4 allows for the creation of multiple video outputs, and each output can optionally have Output mastering controls assigned to it. The standard Output controls are: Output Master, Output Camera, Output Geometry, Output Keystone, and Output Shutter. The default patch for an "Mbox Output Master" fixture includes all of the fixtures detailed below. Output controls for an output affect only that output and not any other output.

Note: Fixture Profile layouts for Mbox Director or lighting consoles may combine some or all of these fixtures into different fixture groupings depending on the desired layout.

Output Master Fixture

The Output Master Fixture provides controls for mastering intensity, color, brightness, and contrast for the output.

Intensity

The Output Intensity parameter allows for mastering of the intensity of the output. It does not affect the opacity of any layers or Global Master Intensity.

Color, Brightness, and Contrast

Red, Green and Blue color channels present in the output may be adjusted in both a subtractive and additive fashion. The Brightness and Contrast of the imagery in the output may also be adjusted.

Output Effects

The Output Effects are pulled from the shader-based texture effects (1-200) that may be used on each layer. The effect will be applied only across the imagery in the output, not affecting imagery on layers or other outputs. Mbox v4 expands the flexibility of effects by allowing for up to five modifiers.

Output Camera Fixture

The Output Camera modifies the 3D perspective viewpoint for only the output it is applied to, allowing a virtual camera position and look-at point for that camera. 3D objects that are visible within the boundaries of the output will be rendered using the perspective of the camera. With default values, the camera is located at a point 10 units in front (0,0,10) of the center of Mbox's 3D space, and is focused on the center of that 3D space (0,0,0).

+ Enable Projection Camera – This parameter acts as an on/off control to switch between the DMX controlled camera parameters and camera properties defined using the Mbox Remote application.
+ Camera Position – These parameters move the camera's position in 3D space.
+ Camera Look-at – These parameters move the point at which the camera is pointed in 3D space.
+ Camera Field of View – This parameter is analogous to setting the narrow vs. wide adjustments of a lens. Rather than simply zooming the image – making it large or smaller – FOV will also affect the perspective of objects in view.
+ Camera Roll – The Roll parameter affect the rotation of the camera viewpoint around an axis drawn through the lens of the camera.

Note: Multiple outputs can each have a camera applied to them, allowing for projection mapping onto multiple objects, or onto the same object but from different perspectives.

Output Geometry Fixture

The Output Geometry Fixture controls may be used to modify supplemental 2D rendering parameters for only this output, not affecting any other outputs from the server. None of the output geometry controls affect the 3D perspective of object rendered on the output.

+ Output Position X & Y – The output position parameters move the imagery within the output left/right and up/down using 16-bit control. These controls may be used to quickly adjust the 2D position of composited imagery within the output. However, since outputs only render imagery that "belongs" to them, any area outside the original rendering boundaries of the output will not be rendered when the output position is adjusted. Meaning that those areas will be black. The output position controls are most useful when the output scale parameter has been set above the default. Use the Mix Offset controls instead to allow imagery from outside the original rendering boundaries to be seen.

+ Output Scale – The output scale parameter may be use to scale down/up the imagery within the output. As with the output position controls, only the imagery within the output's original boundaries will be scaled.

+ Output Rotation – The output rotation parameter rotates the imagery within the output. As with the output position and scale controls, only the imagery within the output's original boundaries will be rotated.

+ Mix Offset X & Y – The mix offset parameters work in the same manner as adjusting the output's position on the global surface on the Outputs tab of the Mbox application. These controls are scaled so that one "tick" of DMX is equal to one onscreen pixel, meaning that the controls can be used for extremely precise, pixel-accurate offsets. Unlike the output position controls, the mix offset controls do allow imagery from outside the output's original boundaries to me moved into view. This is because these controls effectively move the outputs boundaries.

Output Keystone Fixture

The Output Keystone Fixture controls are used to enable and modify keystone and edge-blending parameters for only this output, not affecting any other outputs from the server.

+ Curve – This control enables the DMX keystone controls (as opposed to using the keystone/warp tools in Mbox Remote's projection editor), selects which edge blend curve (Linear/Raised Cosine/Sine) is used, and also enables an overlay grid to assist with keystone setup. The Linear blend curve is recommended for most normal usage.

+ Gamma – The keystone gamma control affects the overall brightness of the edge blend area, allowing for better blending with overlaid projector outputs.

+ Edge Controls – Each of the four output edge controls affects the position of the edge blend area on the corresponding side of the output. The output edge blend begins at the outside edge of the image and may be moved inwards towards the center of the image. Edge blends follow the angle of the corresponding side of the image, as adjusted by the corner controls (see below).

+ Corner Controls – The keystone corner controls adjust the X/Y position of each of the four corners in the image, and may be used to square up an output image that has been distorted due to projection from an oblique angle. As the corners are adjusted the geometry of the output image is also adjusted to correct for perspective skewing. These controls are 16-bit for greater precision and allow the corners to be moved both inwards and outwards.

+ Linearity X & Y – The linearity controls move the center of the keystone surface to the left/right and up/down, allowing the output image to have compensation for oblique projection angles where some pixels become larger than others due to a greater distance from projector to projection surface.

Output Shutter Fixture

The Output Shutter Fixture may be used to apply 2D shuttering that can obscure portions of the output, but which does not affect any other outputs from the server. The shutters can be thought of as sitting between the composited imagery of the output and the virtual camera that provide the view of the imagery.

+ Shape – The shutter shape control enables the shutter controls and selects which shape (Moving Light/Leko/Iris/Blob) is used. The Moving Light mode is recommended for most normal usage, where individual sides of the output image need to be cropped.

Note: The default value for the Shutter Shape parameter is 0, which turns the shutters off. This parameter must be set to one of the four shapes for the shutters to work.

+ Color – The shutter blades may have an RGB color other than black applied to them. All four shutter blades share the same color.

+ Shutter Edge – The shutter edges can have a blur added to help soften the edge to aid in creating a more subtle shuttering result or to create a vignette effect. The softened edge of the shutter is centered on the line of the original shutter edge.

+ Corner Controls – When using the Moving Light shape, the shutter corner controls adjust the position of each end of each shutter blade. When using the Leko shutter shape, these controls are used to set shutter Insertion (the A control) and angle (the B control). The corner controls have no effect when using the Iris shutter shape. Finally, when using the Blob shutter shape, these controls work in the same manner as with the Leko shape, but a Bezier curve is drawn between the center points of adjacent shutter blades, allowing for non-linear shutter compositions.

+ Shutter X & Y – The shutter blades may be moved as a unit left/right and up/down without affecting their position relative to each other.

+ Shutter Scale – The shutter blades may be scaled (moved inwards or outwards) as a unit without affecting their angle.

+ Shutter Rotation – The shutter blades may be rotated as a unit without affecting their position relative to each other.

+ Shutter Damping – Sometimes if the shutter blades are moved using live control from a DMX source, the movement can appear to be "steppy." Similar to the motor speed control on a moving light, the shutter damping parameter allows a smoothing action to be applied to shutter movement. The damping control acts in 30th's of a second increments, adding time to an existing crossfade when applied.

Patching Notes

Output Master Guidelines
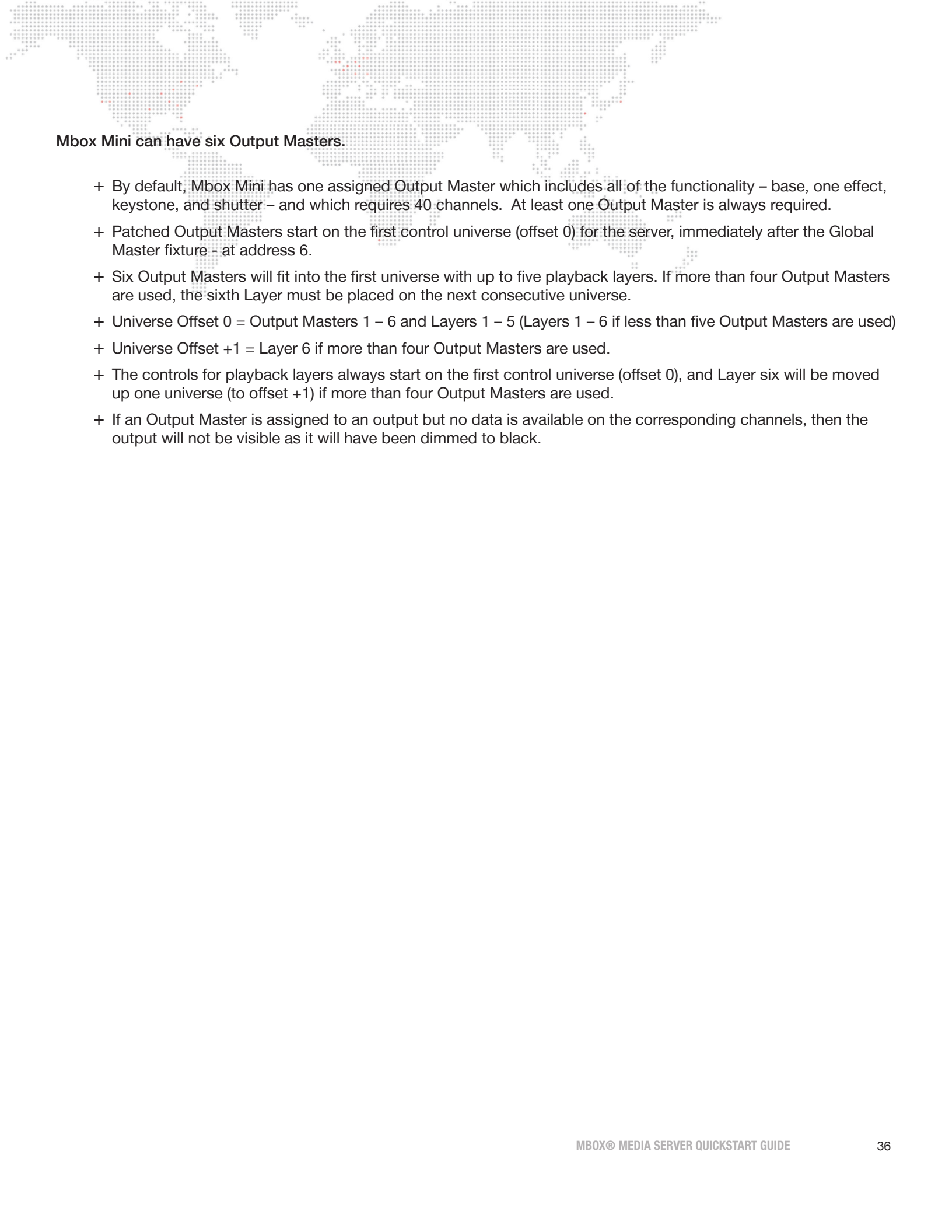
⚡ **WARNING:** When patching multiple Output Masters care must be taken to get the patch ordering correct.

Mbox Designer can have 32 Output Masters.

+ By default, Mbox Designer has one assigned Output Master which includes all of the functionality – base, two effects, camera, geometry, keystone, and shutter – and which requires 93 channels. At least one Output Master is always required.

+ Patched Output Masters start on the first control universe (offset 0) for the server, immediately after the Global Master and Lighting fixtures - at address 51.

+ Only four Output Masters will fit into the first universe. Additional Output Masters must be placed on the next consecutive universe, with each universe after the first having room for five Output Masters total.

+ Universe Offset 0 = Output Masters 1 – 4

+ Universe Offset +1 = Output Masters 5 – 9

+ Universe Offset +2 = Output Masters 10 – 14

+ And so on…

+ When more than four Output Masters are required, the controls for playback layers, which normally start on the second control universe (offset +1), will be moved up one universe (to offset +2). Because of this, the playback layers will always be moved up by one universe when Output Masters are added beyond the limit of the existing universe.

+ If an Output Master is assigned to an output but no data is available on the corresponding channels, then the output will not be visible as it will have been dimmed to black.

Mbox Studio can have eight Output Masters.

+ By default, Mbox Studio has one assigned Output Master which includes all of the functionality – base, one effect, geometry, keystone, and shutter – and which requires 63 channels. At least one Output Master is always required.

+ Patched Output Masters start on the first control universe (offset 0) for the server, immediately after the Global Master and Lighting fixtures - at address 51.

+ Seven Output Masters will fit into the first universe. The eighth Output Master must be placed on the next consecutive universe.

+ Universe Offset 0 = Output Masters 1 – 7

+ Universe Offset +1 = Output Master 8

+ When eight Output Masters are required, the controls for playback layers, which normally start on the second control universe (offset +1), will be moved up one universe (to offset +2).

+ If an Output Master is assigned to an output but no data is available on the corresponding channels, then the output will not be visible as it will have been dimmed to black.

Mbox Mini can have six Output Masters.

+ By default, Mbox Mini has one assigned Output Master which includes all of the functionality – base, one effect, keystone, and shutter – and which requires 40 channels. At least one Output Master is always required.

+ Patched Output Masters start on the first control universe (offset 0) for the server, immediately after the Global Master fixture - at address 6.

+ Six Output Masters will fit into the first universe with up to five playback layers. If more than four Output Masters are used, the sixth Layer must be placed on the next consecutive universe.

+ Universe Offset 0 = Output Masters 1 – 6 and Layers 1 – 5 (Layers 1 – 6 if less than five Output Masters are used)

+ Universe Offset +1 = Layer 6 if more than four Output Masters are used.

+ The controls for playback layers always start on the first control universe (offset 0), and Layer six will be moved up one universe (to offset +1) if more than four Output Masters are used.

+ If an Output Master is assigned to an output but no data is available on the corresponding channels, then the output will not be visible as it will have been dimmed to black.

PATCH ORDER SUMMARIES

Summary: Mbox Designer

Start	Size	Type	Sub-Type	Universe
1	5	Global Master		
6	9	Light 1		
15	9	Light 2		
24	9	Light 3		
33	9	Light 4		
42	9	Light 5		1st
51	6	Output Master 1	Base	
57	6		FX 1	143 Total
63	6		FX 2	Channels
69	16		Camera	(1 Master)
85	12		Geometry	
97	26		Keystone	
123	21		Shutter	
Up to 31 additional Output Masters may be added, 93 channels each, using consecutive universes as necessary.				
1	81	Layer 1	Base	
53	6		FX 1	
59	6		FX 2	
65	6		FX 3	
71	6		FX 4	Next
77	1		Audio Volume	Universe
78	4		DMX Timecode	after Masters
82	81	Layer 2		486 Total
163	81	Layer 3		Channels
244	81	Layer 4		(6 Layers)
325	81	Layer 5		
406	81	Layer 6		
Up to 18 additional Layers may be added, 81 channels each, using consecutive universes as necessary.				

Summary: Mbox Studio

Start	Size	Type	Sub-Type	Universe
1	5	Global Master		
6	9	Light 1		
15	9	Light 2		
24	9	Light 3		
33	9	Light 4		1st
42	9	Light 5		
51	6	Output Master 1	Base	113 Total
57	6		FX	Channels
63	12		Geometry	(1 Master)
75	26		Keystone	
101	13		Shutter	
Up to 7 additional Output Masters may be added, 63 channels each, using consecutive universes as necessary.				
1	41	Layer 1	Base	
42	6		FX 1	
48	6		FX 2	
54	1		Audio Volume	
55	4		DMX Timecode	Next
59	58	Layer 2		Universe
117	58	Layer 3		after Masters
175	58	Layer 4		
233	58	Layer 5		464 Total
291	58	Layer 6		Channels
349	58	Layer 7		(8 Layers)
407	8	Layer 8		
Up to 4 additional Layers may be added, 58 channels each, using the next consecutive universe.				

Summary: Mbox Mini

Start	Size	Type	Sub-Type	Universe
1	5	Global Master		1st
6	6	Output Master 1	Base	
15	6		FX	45 Total
24	16		Keystone	Channels
33	12		Shutter	(1 Master)
		Up to 5 additional Output Masters may be added, 40 channels each, using consecutive addresses. Patch before any layers!!		
46	41	Layer 1	Base	
87	6		FX	
93	1		Audio Volume	Same Universe after Masters
94	4		DMX Timecode	
98	52	Layer 2		
150	52	Layer 3		312 Total
202	52	Layer 4		Channels
254	52	Layer 5		(6 Layers)
306	52	Layer 6		
		If 6 Output Masters are used, Layer 6 must be moved to the next consecutive universe.		

Pixel Mapping Group Control Fixture

Start	Size	Type	Sub-Type	Universe
1	5	PixMap Control	n/a	Varies
		The Pixel Mapping Control fixture is an optional add-on fixture for all versions of Mbox. Between 1 and 2000 of this fixture may be added and patched wherever desired. Patch location is set in the Mbox Remote application.		

FIXTURE PARAMETER DATA

The data in these charts is organized by fixtures and/or sub-fixture components. See tables beginning on page 48 for information on how sub-fixtures are combined into fixtures. In some cases, PRG recommends combining sub-fixtures (e.g. the Layer fixture) to create one fixture rather than several.

Note: The following tables are for Designer, Studio, and Mini. The applicable version is noted in the title for each table (e.g. [Designer/Studio]) and in the case of effects, the differing quanities per product version are noted in parentheses.

Global Master [Designer/Studio/Mini]

Chan	Size	Function	Default	Snap	Notes
1	1	Intensity	255	N	Overall Dimming (in IO Module if present)
2	1	Control	0	Y	see Global Master Control Channel
3	1	Control Selector	0	Y	Modifier for control macros
4	1	Pixel Mapping Intensity	255	N	Master level for pixel mapping output
5	1	Master Volume	255	N	Master level for all audio output
	5	Total Channels			

Light [Designer/Studio only]

Chan	Size	Function	Default	Snap	Notes
1	1	Intensity	255	N	
2	1	Red	255	N	
3	1	Green	255	N	
4	1	Blue	255	N	
5	1	Ambience	0	N	
6	2	Horizontal Bearing	32767	N	
8	2	Vertical Bearing	32767	N	
	9	Total Channels			

Output Master Base [Designer/Studio/Mini]

Chan	Size	Function	Default	Snap	Notes
1	1	Intensity	255	N	Software dimming of output
2	1	Red	127	N	Subtractive 0-126, Additive 128-255
3	1	Green	127	N	Subtractive 0-126, Additive 128-255
4	1	Blue	127	N	Subtractive 0-126, Additive 128-255
5	1	Brightness	127	N	
6	1	Contrast	127	N	
	6	Total Channels			

Output Master Effect [Designer(2)/Studio(1)/Mini(1)]

Chan	Size	Function	Default	Snap	Notes
1	1	Effect Select	0	Y	see Combined Effects
2	1	Modifier 1	0	N	
3	1	Modifier 2	0	N	
4	1	Modifier 3	0	N	
5	1	Modifier 4	0	N	
6	1	Modifier 5	0	N	
	6	Total Channels			

Output Master Camera [Designer only]

Chan	Size	Function	Default	Snap	Notes
1	1	Enable Projection Camera	0	Y	Value of 0 applies DMX controls, 255 applies Projection Mapping Camera matrix from Mbox Remote
2	2	Position X	32767	N	
4	2	Position Y	32767	N	
6	2	Position Z	42767	N	Note: non-standard default
8	2	Lookat X	32767	N	
10	2	Lookat Y	32767	N	
12	2	Lookat Z	32767	N	
14	1	Field of View	71	N	Note: non-standard default
15	2	Roll	32767	N	
	16	Total Channels			

Output Master Geometry [Designer/Studio only]

Chan	Size	Function	Default	Snap	Notes
1	1	Output Position X	32767	Y	
3	2	Output Position Y	32767	N	
5	2	Output Scale	32767	N	
7	2	Output Rotation	32767	N	
9	2	Mix Offset X	32767	N	
11	2	Mix Offset Y	32767	N	
	12	Total Channels			

Output Master Keystone [Designer/Studio]

Chan	Size	Function	Default	Snap	Notes
1	1	Curve	0	Y	see Keystone Blend Mode/Curves
2	1	Gamma	127	N	
3	1	Edge Top	0	N	
4	1	Edge Right	0	N	
5	1	Edge Bottom	0	N	
6	1	Edge Left	0	N	
7	2	Keystone 1x	32767	N	
9	2	Keystone 1y	32767	N	
11	2	Keystone 2x	32767	N	
13	2	Keystone 2y	32767	N	
15	2	Keystone 3x	32767	N	
17	2	Keystone 3y	32767	N	
19	2	Keystone 4x	32767	N	
21	2	Keystone 4y	32767	N	
23	2	Linearity X	32767	N	
25	2	Linearity Y	32767	N	
	26	**Total Channels**			

Output Master Keystone [Mini]

Chan	Size	Function	Default	Snap	Notes
1	2	Keystone 1x	32767	N	
3	2	Keystone 1y	32767	N	
5	2	Keystone 2x	32767	N	
7	2	Keystone 2y	32767	N	
9	2	Keystone 3x	32767	N	
11	2	Keystone 3y	32767	N	
13	2	Keystone 4x	32767	N	
15	2	Keystone 4y	32767	N	
	16	**Total Channels**			

Output Master Shutter [Designer]

Chan	Size	Function	Default	Snap	Notes
1	1	Shape	0	Y	see Shutter Mode/Shapes
2	1	Red	0	N	Additive
3	1	Green	0	N	Additive
4	1	Blue	0	N	Additive
5	1	Edge Softness	0	N	
6	1	Shutter 1a	0	N	
7	1	Shutter 1b	0	N	
8	1	Shutter 2a	0	N	
9	1	Shutter 2b	0	N	
10	1	Shutter 3a	0	N	
11	1	Shutter 3b	0	N	
12	1	Shutter 4a	0	N	
13	1	Shutter 4b	0	N	
14	2	X Position	32767	N	
16	2	Y Position	32767	N	
18	2	Scale	32767	N	
20	1	Rotation	127	N	
21	1	Damping	0	N	
	21	Total Channels			

Output Master Shutter [Studio]

Chan	Size	Function	Default	Snap	Notes
1	1	Shape	0	Y	see Shutter Mode/Shapes
2	1	Red	0	N	Additive
3	1	Green	0	N	Additive
4	1	Blue	0	N	Additive
5	1	Edge Softness	0	N	
6	1	Shutter 1a	0	N	
7	1	Shutter 1b	0	N	
8	1	Shutter 2a	0	N	
9	1	Shutter 2b	0	N	
10	1	Shutter 3a	0	N	
11	1	Shutter 3b	0	N	
12	1	Shutter 4a	0	N	
13	1	Shutter 4b	0	N	
	13	Total Channels			

Output Master Shutter [Mini]

Chan	Size	Function	Default	Snap	Notes
1	1	Red	0	Y	Additive
2	1	Green	0	N	Additive
3	1	Blue	0	N	Additive
4	1	Edge Softness	0	N	
5	1	Shutter 1a	0	N	
6	1	Shutter 1b	0	N	
7	1	Shutter 2a	0	N	
8	1	Shutter 2b	0	N	
9	1	Shutter 3a	0	N	
10	1	Shutter 3b	0	N	
11	1	Shutter 4a	0	N	
12	1	Shutter 4b	0	N	
	12	**Total Channels**			

Layer Base [Designer]

Chan	Size	Function	Default	Snap	Notes
1	1	Opacity	0	N	
2	1	Red	127	N	Subtractive 0-126, Additive 128-255
3	1	Green	127	N	Subtractive 0-126, Additive 128-255
4	1	Blue	127	N	Subtractive 0-126, Additive 128-255
5	1	Brightness	127	N	
6	1	Contrast	127	N	
7	1	Texture Folder	0	Y	Folder 255: see Video and Utility Inputs
8	1	Texture File	0	Y	
9	1	Play Mode	0	Y	see Play Modes
10	1	Play Speed	127	N	see Play Speed
11	2	In Frame	0	N	
13	2	Out Frame	32767	N	
15	1	Sync Stream	0	Y	see Sync Streams
16	1	Sync Offset	0	N	
17	1	Aspect Ratio	0	N	see Aspect Control
18	1	Frame Blending	255	N	see Frame Blending Control
19	1	Texture Xfade Type	0	Y	see Texture Transitions
20	1	Texture Xfade Time	0	Y	
21	1	Object Folder	0	Y	
22	1	Object File	0	Y	
23	1	Object Xfade Type	0	Y	see Object Transitions
24	1	Object Xfade Time	0	Y	
25	2	X Position	32767	N	
27	2	Y Position	32767	N	
29	2	Z Position	32767	N	
31	2	Scale	32767	N	
33	2	X Scale	32767	N	
35	2	Y Scale	32767	N	
37	2	Z Scale	32767	N	
39	2	Z Rotation	32767	N	
41	2	X Rotation	32767	N	
43	2	Y Rotation	32767	N	
45	1	Z Spin	127	N	
46	1	X Spin	127	N	
47	1	Y Spin	127	N	
48	1	Mix Select	0	Y	
49	1	Mix Mode	0	Y	see Layer Mix Modes
50	1	Blend Mode	0	Y	see Blend Modes
51	1	Draw Mode	0	Y	see Draw Modes
52	1	Image Remap	0	Y	
	52	**Total Channels**			

Layer Base [Studio/Mini]

Chan	Size	Function	Default	Snap	Notes
1	1	Opacity	0	N	
2	1	Red	127	N	Subtractive 0-126, Additive 128-255
3	1	Green	127	N	Subtractive 0-126, Additive 128-255
4	1	Blue	127	N	Subtractive 0-126, Additive 128-255
5	1	Brightness	127	N	
6	1	Contrast	127	N	
7	1	Texture Folder	0	Y	Folder 255: see Video and Utility Inputs
8	1	Texture File	0	Y	
9	1	Play Mode	0	Y	see Play Modes
10	1	Play Speed	127	N	see Play Speed
11	2	In Frame	0	N	
13	2	Out Frame	32767	N	
15	1	Sync Stream	0	Y	see Sync Streams
16	1	Sync Offset	0	N	
17	1	Frame Blending	255	N	see Frame Blending Control
18	1	Texture Xfade Type	0	Y	see Texture Transitions
19	1	Texture Xfade Time	0	Y	
20	1	Object File	0	Y	
21	2	X Position	32767	N	
23	2	Y Position	32767	N	
25	2	Scale	32767	N	
27	2	X Scale	32767	N	
29	2	Y Scale	32767	N	
31	2	Z Rotation	32767	N	
33	2	X Rotation	32767	N	
35	2	Y Rotation	32767	N	
37	1	Mix Select	0	Y	
38	1	Mix Mode	0	Y	see Layer Mix Modes
39	1	Blend Mode	0	Y	see Blend Modes
40	1	Draw Mode	0	Y	see Draw Modes
41	1	Image Remap	0	Y	
	41	**Total Channels**			

Layer Effect [Designer(4)/Studio(2)/Mini(1)]

Chan	Size	Function	Default	Snap	Notes
1	1	Effect Select	0	Y	see Combined Effects
2	1	Modifier 1	0	N	
3	1	Modifier 2	0	N	
4	1	Modifier 3	0	N	
5	1	Modifier 4	0	N	
6	1	Modifier 5	0	N	
	6	Total Channels			

Layer Volume [Designer/Studio/Mini]

Chan	Size	Function	Default	Snap	Notes
1	1	Layer Volume	255	N	
	1	Total Channels			

Layer DMX Timecode [Designer/Studio/Mini]

Chan	Size	Function	Default	Snap	Notes
1	1	Hours	0	N	maximum of 23
2	1	Minutes	0	N	maximum of 59
3	1	Seconds	0	N	maximum of 59
4	1	Frames	0	N	maximum of 29
	4	Total Channels			

Pixel Mapping Group Control [Designer/Studio/Mini]

Chan	Size	Function	Default	Snap	Notes
1	1	Mode	0	Y	see Pixel Mapping Group Control Modes
2	1	Intensity	255	N	
3	1	Red/Cyan	255	N	
4	1	Green/Magenta	255	N	
5	**1**	**Blue/Yellow**	255	N	
	5	Total Channels			

FIXTURE PARAMETER DESCRIPTIONS

The data in these charts is organized by product version. Fixtures are listed in basic patch order and show detail of their component subfixtures. Fixture quantities (required or optional) are noted. Parameters are listed in patch order.

Parameter Descriptions: Mbox Designer

Fixture	Sub-Fixture	Parameter	Description
Global Master		Intensity	Master intensity of all video output
		Control	Selects control Macros and HUDs
		Control Selector	Used with Control to select specific modes for macros/HUDs
		Pixel Mapping Intensity	Master intensity of all pixel mapping output
		Master Volume	Master volume for all audio output
Light (5 required)		Intensity	Intensity of the light
		Red	Red Subtractive
		Green	Green Subtractive
		Blue	Blue Subtractive
		Ambience	Beam spread - spot to full ambient
		Bearing	Horizontal orbit around center of 3D space
		Elevation	Vertical orbit around center of 3D space

Parameter Descriptions: Mbox Designer continued...

Fixture	Sub-Fixture	Parameter	Description
Output Master (1 required, up to 32 total)	Base	Intensity	Master intensity of output
		Red	Red subtractive & additive for output
		Green	Green subtractive & additive for output
		Blue	Blue subtractive & additive for output
		Brightness	Brightness for output
		Contrast	Contrast for output
	FX	Effect Select	2D effect applied to the output
		Modifier A	First modifier
		Modifier B	Second modifier
		Modifier C	Third modifier
		Modifier D	Fourth modifier
		Modifier E	Fifth modifier
	Camera	Enable Projection Camera	Enables/Disables DMX control of the 3D perspective camera for output
		Position X	Left/Right position of camera in 3D space
		Position Y	Down/Up position of camera in 3D space
		Position Z	Forward/Backward position of camera in 3D space
		Lookat X	Left/Right aiming point of camera in 3D space
		Lookat Y	Down/Up aiming point of camera in 3D space
		Lookat Z	Forward/Backward aiming point of camera in 3D space
		Field of View	Adjusts the camera lens between narrow and wide
		Roll	Rotates the camera around the axis of its lens
	Geometry	Output Position X	Moves imagery within the output left/right
		Output Position Y	Moves imagery within the output down/up
		Output Scale	Scales imagery within the output
		Output Rotation	Scales imagery within the output
		Mix Offset X	Moves the output's mix left/right on the Global Surface in 1px increments
		Mix Offset Y	Moves the output's mix down/up on the Global Surface in 1px increments

Parameter Descriptions: Mbox Designer continued...

Fixture	Sub-Fixture	Parameter	Description
Output Master continued... (1 required, up to 32 total)	Keystone	Curve	Enables and elects keystone curve/mode
		Gamma	Gamma of edge blend area
		Edge Top	Position/depth of top edge blend area
		Edge Right	Position/depth of right edge blend area
		Edge Bottom	Position/depth of bottom edge blend area
		Edge Left	Position/depth of left edge blend area
		Keystone 1x	Left/right position of top-left corner
		Keystone 1y	Down/up position of top-left corner
		Keystone 2x	Left/right position of top-right corner
		Keystone 2y	Down/up position of top-right corner
		Keystone 3x	Left/right position of bottom-right corner
		Keystone 3y	Down/up position of bottom-right corner
		Keystone 4x	Left/right position of bottom-left corner
		Keystone 4y	Down/up position of bottom-left corner
		Linearity X	Adjusts center of keystone surface left/right
		Linearity Y	Adjusts center of keystone surface down/up
	Shutter	Shape	Enables and selects shutter shape
		Red	Red Additive
		Green	Green Additive
		Blue	Blue Additive
		Edge Softness	Set the soft edge amount for all shutters
		Shutter 1a	Left-bottom | Left Amount
		Shutter 1b	Left-top | Left Angle
		Shutter 2a	Top-left | Top Amount
		Shutter 2b	Top-right | Top Angle
		Shutter 3a	Right-top | Right Amount
		Shutter 3b	Right-bottom | Right Angle
		Shutter 4a	Bottom-right | Bottom Amount
		Shutter 4b	Bottom-left | Bottom Angle
		X Position	Overall left/right position of shutters
		Y Position	Overall down/up position of shutters
		Scale	Overall scale of shutters
		Rotation	Overall rotation of shutters
		Damping	Adds smoothing to shutter motion in 0.33sec increments

Parameter Descriptions: Mbox Designer continued...

Fixture	Sub-Fixture	Parameter	Description
Layer	Base	Opacity	Transparency of the layer
		Red	Red subtractive & additive for layer
		Green	Green subtractive & additive for layer
		Blue	Blue subtractive & additive for layer
		Brightness	Brightness of layer
		Contrast	Contrast of layer
		Texture Folder	Selects numbered 2D content folder
		Texture File	Selects numbered file within Texture Folder
		Play Mode	Selects play mode of movie content
		Play Speed	Selects play speed of movie content
		In Frame	Sets in-frame of movie content
		Out Frame	Sets out-frame of movie content
		Sync Stream	Selects 1 of 32 channels for playback synchronization
		Sync Offset	Adjusts playback sync offset
		Aspect Ratio	Adjusts the aspect ratio of the layer
		Frame Blending	Adjusts the amount of interframe blending for movie content
		Texture Xfade Type	Selects the type of crossfade for 2D content on the layer
		Texture Xfade Time	Adjusts the duration of crossfades for 2D content on the layer
		X Position	Moves the layer left/right
		Object Folder	Selects numbered 3D content folder
		Object File	Selectes numbered file within Object Folder
		Object Xfade Type	Selects the type of crossfade for 3D content on the layer
		Object Xfade Time	Adjusts the duration of crossfades for 3D content on the layer
		Y Position	Moves the layer down/up
		Z Position	Moves the layer away/towards the camera (3D objects only)
		Scale	Adjusts the size of 2D/3D content on the layer
		X Scale	Adjusts the width of 2D/3D content on the layer
		Y Scale	Adjust the height of 2D/3D content on the layer
		Z Scale	Adjusts the depth of 3D content on the layer
		Z Rotation	Adjusts rotation of the content around the Z axis
		X Rotation	Adjusts rotation of the content around the X axis
		Y Rotation	Adjusts rotation of the content around the Y axis

Parameter Descriptions: Mbox Designer continued...

Fixture	Sub-Fixture	Parameter	Description
Layer continued...	Base continued...	Z Spin	Adjusts spin of content around the Z axis
		X Spin	Adjusts spin of content around the X axis
		Y Spin	Adjusts spin of content around the Y axis
		Mix Select	Assigns content on layer to a mix
		Mix Mode	Sets the mode for the selected mix
		Blend Mode	Selects a 2D blending mode
		Draw Mode	Selects a 2D draw mode (stencilling)
		Image Remap	Selects image remapping configuration for the layer
	FX	Effect 1 Select	First 2D effect applied to the layer
		Modifier 1a	First modifier
		Modifier 1b	Second modifier
		Modifier 1c	Third modifier
		Modifier 1d	Fourth modifier
		Modifier 1e	Fifth modifier
		Effect 2 Select	Second 2D effect applied to the layer
		Modifier 2a	First modifier
		Modifier 2b	Second modifier
		Modifier 2c	Third modifier
		Modifier 2d	Fourth modifier
		Modifier 2e	Fifth modifier
		Effect 3 Select	Third 2D effect applied to the layer
		Modifier 3a	First modifier
		Modifier 3b	Second modifier
		Modifier 3c	Third modifier
		Modifier 3d	Fourth modifier
		Modifier 3e	Fifth modifier
		Effect 4 Select	Fourth 2D effect applied to the layer
		Modifier 4a	First modifier
		Modifier 4b	Second modifier
		Modifier 4c	Third modifier
		Modifier 4d	Fourth modifier
		Modifier 4e	Fifth modifier
	Volume	Volume	Audio volume for layer
	Timecode	Hours	Hours value for DMX timecode
		Minutes	Minutes value for DMX timecode
		Seconds	Seconds value for DMX timecode
		Frames	Frames value for DMX timecode

Parameter Descriptions: Mbox Studio

Fixture	Sub-Fixture	Parameter	Description
Global Master		Intensity	Master intensity of all video output
		Control	Selects control Macros and HUDs
		Control Selector	Used with Control to select specific modes for macros/HUDs
		Pixel Mapping Intensity	Master intensity of all pixel mapping output
		Master Volume	Master volume for all audio output
Light (5 required)		Intensity	Intensity of the light
		Red	Red Subtractive
		Green	Green Subtractive
		Blue	Blue Subtractive
		Ambience	Beam spread - spot to full ambient
		Bearing	Horizontal orbit around center of 3D space
		Elevation	Vertical orbit around center of 3D space

Parameter Descriptions: Mbox Studio continued...

Fixture	Sub-Fixture	Parameter	Description
Output Master (1 required, up to 8 total)	Base	Intensity	Master intensity of output
		Red	Red subtractive & additive for output
		Green	Green subtractive & additive for output
		Blue	Blue subtractive & additive for output
		Brightness	Brightness for output
		Contrast	Contrast for output
	FX	Effect Select	2D effect applied to the output
		Modifier A	First modifier
		Modifier B	Second modifier
		Modifier C	Third modifier
		Modifier D	Fourth modifier
		Modifier E	Fifth modifier
	Geometry	Output Position X	Moves imagery within the output left/right
		Output Position Y	Moves imagery within the output down/up
		Output Scale	Scales imagery within the output
		Output Rotation	Scales imagery within the output
		Mix Offset X	Moves the output's mix left/right on the Global Surface in 1px increments
		Mix Offset Y	Moves the output's mix down/up on the Global Surface in 1px increments
	Keystone	Curve	Enables and elects keystone curve/mode
		Gamma	Gamma of edge blend area
		Edge Top	Position/depth of top edge blend area
		Edge Right	Position/depth of right edge blend area
		Edge Bottom	Position/depth of bottom edge blend area
		Edge Left	Position/depth of left edge blend area
		Keystone 1x	Left/right position of top-left corner
		Keystone 1y	Down/up position of top-left corner
		Keystone 2x	Left/right position of top-right corner
		Keystone 2y	Down/up position of top-right corner
		Keystone 3x	Left/right position of bottom-right corner
		Keystone 3y	Down/up position of bottom-right corner
		Keystone 4x	Left/right position of bottom-left corner
		Keystone 4y	Down/up position of bottom-left corner
		Linearity X	Adjusts center of keystone surface left/right
		Linearity Y	Adjusts center of keystone surface down/up

Parameter Descriptions: Mbox Studio continued...

Fixture	Sub-Fixture	Parameter	Description
Output Master continued... (1 required, up to 8 total)	Shutter	Shape	Enables and selects shutter shape
		Red	Red Additive
		Green	Green Additive
		Blue	Blue Additive
		Edge Softness	Set the soft edge amount for all shutters
		Shutter 1a	Left-bottom | Left Amount
		Shutter 1b	Left-top | Left Angle
		Shutter 2a	Top-left | Top Amount
		Shutter 2b	Top-right | Top Angle
		Shutter 3a	Right-top | Right Amount
		Shutter 3b	Right-bottom | Right Angle
		Shutter 4a	Bottom-right | Bottom Amount
		Shutter 4b	Bottom-left | Bottom Angle

Parameter Descriptions: Mbox Studio continued...

Fixture	Sub-Fixture	Parameter	Description
Layer	Base	Opacity	Transparency of the layer
		Red	Red subtractive & additive for layer
		Green	Green subtractive & additive for layer
		Blue	Blue subtractive & additive for layer
		Brightness	Brightness of layer
		Contrast	Contrast of layer
		Texture Folder	Selects numbered 2D content folder
		Texture File	Selects numbered file within Texture Folder
		Play Mode	Selects play mode of movie content
		Play Speed	Selects play speed of movie content
		In Frame	Sets in-frame of movie content
		Out Frame	Sets out-frame of movie content
		Sync Stream	Selects 1 of 8 channels for playback synchro-nization
		Sync Offset	Adjusts playback sync offset
		Frame Blending	Adjusts the amount of interframe blending for movie content
		Texture Xfade Type	Selects the type of crossfade for 2D content on the layer
		Texture Xfade Time	Adjusts the duration of crossfades for 2D con-tent on the layer
		Object File	Selectes numbered file within Object Folder
		X Position	Moves the layer left/right
		Y Position	Moves the layer down/up
		Scale	Adjusts the size of 2D/3D content on the layer
		X Scale	Adjusts the width of 2D/3D content on the layer
		Y Scale	Adjust the height of 2D/3D content on the layer
		Z Rotation	Adjusts rotation of the content around the Z axis
		X Rotation	Adjusts rotation of the content around the X axis
		Y Rotation	Adjusts rotation of the content around the Y axis
		Mix Select	Assigns content on layer to a mix
		Mix Mode	Sets the mode for the selected mix
		Blend Mode	Selects a 2D blending mode
		Draw Mode	Selects a 2D draw mode (stencilling)
		Image Remap	Selects image remapping configuration for the layer

Parameter Descriptions: Mbox Studio continued...

Fixture	Sub-Fixture	Parameter	Description
	FX	Effect 1 Select	First 2D effect applied to the layer
		Modifier 1a	First modifier
		Modifier 1b	Second modifier
		Modifier 1c	Third modifier
		Modifier 1d	Fourth modifier
		Modifier 1e	Fifth modifier
		Effect 2 Select	Second 2D effect applied to the layer
		Modifier 2a	First modifier
		Modifier 2b	Second modifier
		Modifier 2c	Third modifier
		Modifier 2d	Fourth modifier
		Modifier 2e	Fifth modifier
	Volume	Volume	Audio volume for layer
	Timecode	Hours	Hours value for DMX timecode
		Minutes	Minutes value for DMX timecode
		Seconds	Seconds value for DMX timecode
		Frames	Frames value for DMX timecode

Parameter Descriptions: Mbox Mini

Fixture	Sub-Fixture	Parameter	Description
Global Master		Intensity	Master intensity of all video output
		Control	Selects control Macros and HUDs
		Control Selector	Used with Control to select specific modes for macros/HUDs
		Pixel Mapping Intensity	Master intensity of all pixel mapping output
		Master Volume	Master volume for all audio output
Output Master (1 required, up to 6 total)	Base	Intensity	Master intensity of output
		Red	Red subtractive & additive for output
		Green	Green subtractive & additive for output
		Blue	Blue subtractive & additive for output
		Brightness	Brightness for output
		Contrast	Contrast for output
	FX	Effect Select	2D effect applied to the output
		Modifier A	First modifier
		Modifier B	Second modifier
		Modifier C	Third modifier
		Modifier D	Fourth modifier
		Modifier E	Fifth modifier
	Keystone	Keystone 1x	Left/right position of top-left corner
		Keystone 1y	Down/up position of top-left corner
		Keystone 2x	Left/right position of top-right corner
		Keystone 2y	Down/up position of top-right corner
		Keystone 3x	Left/right position of bottom-right corner
		Keystone 3y	Down/up position of bottom-right corner
		Keystone 4x	Left/right position of bottom-left corner
		Keystone 4y	Down/up position of bottom-left corner

Parameter Descriptions: Mbox Mini continued...

Fixture	Sub-Fixture	Parameter	Description
Output Master continued... (1 required, up to 6 total)	Shutter	Red	Red Additive
		Green	Green Additive
		Blue	Blue Additive
		Edge Softness	Set the soft edge amount for all shutters
		Shutter 1a	Left-bottom | Left Amount
		Shutter 1b	Left-top | Left Angle
		Shutter 2a	Top-left | Top Amount
		Shutter 2b	Top-right | Top Angle
		Shutter 3a	Right-top | Right Amount
		Shutter 3b	Right-bottom | Right Angle
		Shutter 4a	Bottom-right | Bottom Amount
		Shutter 4b	Bottom-left | Bottom Angle

Parameter Descriptions: Mbox Mini continued...

Fixture	Sub-Fixture	Parameter	Description
Layer	Base	Opacity	Transparency of the layer
		Red	Red subtractive & additive for layer
		Green	Green subtractive & additive for layer
		Blue	Blue subtractive & additive for layer
		Brightness	Brightness of layer
		Contrast	Contrast of layer
		Texture Folder	Selects numbered 2D content folder
		Texture File	Selects numbered file within Texture Folder
		Play Mode	Selects play mode of movie content
		Play Speed	Selects play speed of movie content
		In Frame	Sets in-frame of movie content
		Out Frame	Sets out-frame of movie content
		Sync Stream	Selects 1 of 8 channels for playback synchro-nization
		Sync Offset	Adjusts playback sync offset
		Frame Blending	Adjusts the amount of interframe blending for movie content
		Texture Xfade Type	Selects the type of crossfade for 2D content on the layer
		Texture Xfade Time	Adjusts the duration of crossfades for 2D con-tent on the layer
		Object File	Selectes numbered file within Object Folder
		X Position	Moves the layer left/right
		Y Position	Moves the layer down/up
		Scale	Adjusts the size of 2D/3D content on the layer
		X Scale	Adjusts the width of 2D/3D content on the layer
		Y Scale	Adjust the height of 2D/3D content on the layer
		Z Rotation	Adjusts rotation of the content around the Z axis
		X Rotation	Adjusts rotation of the content around the X axis
		Y Rotation	Adjusts rotation of the content around the Y axis
		Mix Select	Assigns content on layer to a mix
		Mix Mode	Sets the mode for the selected mix
		Blend Mode	Selects a 2D blending mode
		Draw Mode	Selects a 2D draw mode (stencilling)
		Image Remap	Selects image remapping configuration for the layer

Parameter Descriptions: Mbox Mini continued...

Fixture	Sub-Fixture	Parameter	Description
	FX	Effect 1 Select	First 2D effect applied to the layer
		Modifier 1a	First modifier
		Modifier 1b	Second modifier
		Modifier 1c	Third modifier
		Modifier 1d	Fourth modifier
		Modifier 1e	Fifth modifier
	Volume	Volume	Audio volume for layer
	Timecode	Hours	Hours value for DMX timecode
		Minutes	Minutes value for DMX timecode
		Seconds	Seconds value for DMX timecode
		Frames	Frames value for DMX timecode

DISCRETE VALUES FOR SLOTTED PARAMETERS

Global Master Control Channel

Value	Command	Notes	Macro Trigger Action	Master Control Selector
10-19	Output Stats HUD	Shows output size, re-fresh, rendering stats	n/a	n/a
20-29	Performance HUD	Shows overall perfor-mance, layer playback and rendering	n/a	n/a
40-49	Lights/Master/Shutter/Keystone HUD	Shows control input values - v3 format	n/a	n/a
50-54	Texture HUD - Layers 1-6	Shows control input values - v3 format	n/a	n/a
55-59	Texture HUD - Layers 7-12	Shows control input values - v3 format	n/a	n/a
60-64	Layer Effects HUD - Layers 1-6	Shows control input values - v3 format	n/a	n/a
65-69	Layer Effects HUD - Layers 7-12	Shows control input values - v3 format	n/a	n/a
70-71	Raw Control Input HUD Universe A	Texture File	n/a	n/a
72-73	Raw Control Input HUD Universe B	Play Mode	n/a	n/a
74-75	Raw Control Input HUD Universe C	Play Speed	n/a	n/a
76-77	SADI Stats	In Frame	n/a	n/a
80-89	Show PixMap Context View	80 = All contexts, 81-89 = contexts 1-9	n/a	n/a
110-111	Show Timecode HUD (Center)	Sync Stream	n/a	n/a
112-113	Show Timecode HUD (Top Right)	Sync Offset	n/a	n/a
114-115	Show Timecode HUD (Top Left)	X Rotation	n/a	n/a
116-117	Show Timecode HUD (Bottom Right)	Y Rotation	n/a	n/a
118-119	Show Timecode HUD (Bottom Left)	Mix Select	n/a	n/a
201	Run Script	Mix Mode	Value then 0	0-255 for script index number
202	Change Pixel Mapping File	Blend Mode	Value then 0	0-255 for config index number
203	Cancel Keyboard HUD	Draw Mode	Value then 0	n/a
220	Show Object Mesh	Image Remap	n/a	0 = all, 1-24 = by layer number
222	Show Edge-blend guides	Shows guides for blend areas	n/a	n/a
224	Show Single Mix	Shows outline of one mix at a time	n/a	Mix index number

Global Master Control Channel continued...

Value	Command	Notes	Macro Trigger Action	Master Control Selector
225	Show All Mixes	Shows outlines of all mixes at the same time	n/a	n/a
226	Show Output Mixes Only	Shows outlines of output mixes only	n/a	n/a
227	Show Keystone Mesh	Shows keystone mesh	n/a	0 = all, 1-32 = by output number
230	File Sharing On		Value then 0	n/a
231	File Sharing Off		Value then 0	n/a
232	Remote Management On		Value then 0	n/a
233	Remote Management Off		Value then 0	n/a
234	Backup Mode On	Disables Layer Sync and PixMap output	Value then 0	n/a
235	Backup Mode Off	Enables Layer Sync and PixMap output	Value then 0	n/a
240	Rescan Media Library		Hold 3-sec then 0	n/a
241	Audio Offset	Sets audio playhead offset in relation to video playhead in 20mS increments	Immediate	0-126 = audio late, 127 = default, 128-255 = audio ahead
244	Pixel Mapping Output Enable	Turn ON pixel mapping engine and output	Value then 0	n/a
245	Pixel Mapping Output Disable	Turn OFF pixel mapping engine and output	Value then 0	n/a
246	Pixel Mapping Masking Off	Masked fixtures use normal output values	Value then 0	n/a
247	Pixel Mapping Masking On	Masked fixtures' output forced to 0	Value then 0	n/a
250	Quit Mbox Application		Hold 3-sec then 0	n/a
251	Shutdown Computer		Hold 3-sec then 0	n/a
252	Restart Computer		Hold 3-sec then 0	0-255 for script index number
253	Restart Mbox Application		Hold 3-sec then 0	0-255 for config index number
254	Restart Daemon Application		Hold 3-sec then 0	n/a

Combined Effects

Value	Effect	Description	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5
0	NONE	no effect					
1	Hue	simple hue adjustment	hue angle				
2	Hue & Saturation	combines hue and saturation	hue angle	saturation			
3	Gamma	gamma adjustment	gamma				
4	Exposure	exposure adjustment	exposure				
5	Monochrome	converts to grayscale, adds color	amount	red	green	blue	
6	Sepia Tone	converts to sepia tone image	amount				
7	Invert	color invert					
8	Hilight & Shadow	adjusts tonal mapping	radius	hilight amount	shadow amount		
9	Vibrance	adjusts saturation	amount				
10	Solarize	solarize effect	intensity				
11	X-Ray	inverted grayscale	intensity				
12	Color Switch	RGB becomes RBG/ BGR/BRG/GBR/GRB	intensity	mode			
13	Color Shift	dynamic color shift (sine function)	mixer	range	speed		
14	Posterize	reduce color space	amount				
15	Bloom	soften edges, add glow	intensity	radius			
16	Gloom	dulls highlights	intensity	radius			
17	Sharpen	increases detail by sharpending	sharpness				
18	Unsharp Mask	increases contrast at edges to enhance details	intensity	radius			
19	Median	reduce noise with median calculation					
20	Black Threshold	renders dark areas as true black	intensity	threshold			
21-31	Reserved						
32	Blur - Quick	simple/quick image blur	mixer	amount			
33	Blur - Quick X	quick blue on X axis	mixer	amount			
34	Blur - Quick	quick blur on Y axis	mixer	amount			
35	Blur - Box	box-shaped convolution	radius				
36	Blur - Gaussian	sophisticated/slow blur	radius				
37	Blur - Zoom	blurs outwards from point in image	size	x position	y position		

Combined Effects continued...

Value	Effect	Description	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5
38	Blur - Motion	blurs along variable axis	radius	angle			
39-43	Reserved						
44	Key - Black	dark areas transparent	intensity	threshold			
45	Key - White	white areas transparent	intensity	threshold			
46	Key - Red	red areas transparent	intensity	threshold			
47	Key - Green	green areas transparent	intensity	threshold			
48	Key - Blue	blue areas transparent	intensity	threshold			
49	Key - Invert White	all but white areas transparent	intensity	threshold			
50	Key - Invert Red	all but red areas transparent	intensity	threshold			
51	Key - Invert Green	all but green areas transparent	intensity	threshold			
52	Key - Invert Blue	all but blue areas transparent	intensity	threshold			
53	Key - RGB	specific RGB color transparent	intensity	threshold	red	green	blue
54	Key - HSV	specific HSV color transparent	intensity	threshold	hue	saturation	value
55	Key - XY	specific XY location color transparent	intensity	threshold	x position	y position	
56	Key - Luma	brighter areas transparent	intensity	threshold			
57	Key - Luma Inverse	darker areas transparent	intensity	threshold			
58-63	Reserved						
64	Crop - Circular	circular image crop with soft edge	mixer	size	edge		
65	Crop - Rectangular	rectangular image crop with soft edge	mixer	size	edge		
66	Crop - Circular XY	circular image crop with soft edge & xy position adjust	mixer	size	edge	x position (127=def.)	y position (127=def.)
67	Crop - Rectangular XY	rectangular image crop with soft edge & xy position adjust	mixer	size	edge	x position (127=def.)	y position (127=def.)
68	Crop - Oval XY	oval image crop with soft edge & xy position adjust	size	edge	x position (127=def.)	y position (127=def.)	aspect
69	Crop - Horizontal	horizontal 90° shutters	mixer	width	position (127=def.)		

Combined Effects continued...

Value	Effect	Description	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5
70	Crop - Vertical	vertical 90° shutters	mixer	height	position (127=def.)		
71	Crop - Orth Shutter	horizontal and vertical 90° shutters	mixer	horizontal insertion	vertical insertion		
72	Crop - Slitscan Horizontal	horizontal 90° shutters	mixer	width	position (127=def.)		
73	Crop - Slitscan Vertical	vertical 90° shutters	mixer	height	position (127=def.)		
74	Crop - Slitscan Horizontal Swing	horizontal shutters with motion	mixer	width	scanrate	swing	
75	Crop - Slitscan Vertical Swing	vertical shutters with motion	mixer	height	scanrate	swing	
76	Crop - Slitscan Horizontal Random Swing	horizontal shutters with random motion	mixer	width	scanrate	swing	
77	Crop - Slitscan Vertical Random Swing	vertical shutters with random motion	mixer	height	scanrate	swing	
78-80	Reserved						
81	Layer Edge Blend Right	per-layer edge blend on right side	amount	edge softness			
82	Layer Edge Blend Left	per-layer edge blend on left side	amount	edge softness			
83	Layer Edge Blend Top	per-layer edge blend on top side	amount	edge softness			
84	Layer Edge Blend Bottom	per-layer edge blend on bottom side	amount	edge softness			
85	Layer Edge Blend L/R	per-layer edge blend on left & right side	left amount	left edge softness	right amount	right edge softness	
86	Layer Edge Blend T/B	per-layer edge blend on top & bottom side	top amount	top edge softness	bottom amount	bottom edge softness	
87-89	Reserved						
90	Mask from File	creates mask using external file with alpha	mixer	file index number	flip mode 0-7		
91	Matte from Layer	creates alpha matte using selected layer and mode	mixer	1-24 = layer w/o FX, 101-124 = layer w/ FX	mode[1]		
92-95	Reserved						

Combined Effects continued...

Value	Effect	Description	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5
96	Distortion - Bump	bump distortion	radius	scale	x position	y position	
97	Distortion - Linear Bump	linear bump distortion	radius	angle	scale	x position	y position
98	Distortion - Hole	hole distortion	radius	x position	y position		
99	Distortion - Pinch	pinch distortion	radius	scale	x position	y position	
100	Distortion - Torus	torus distortion	width	radius	x position	y position	
101	Distortion - Twirl	twirl distortion	radius	angle	x position	y position	
102	Distortion - Vortex	vortex distortion	radius	angle	x position	y position	
103	Distortion - Lozenge	lozenge distortion	radius	refraction	point 1	point 2	
104	Distortion - Circular Wrap	wraps image into tube shape	radius	angle	x position	y position	
105	Distortion - Circular Splash	clamps image from center outwards	size	x position	y position		
106	Distortion - Glass	applies a glass-like texture	layer	scale	x position	y position	
107	Distortion - Displacement	applies grayscale of input image to layer to create texture	layer	scale			
108-112	Reserved						
113	Smear - Horizontal	spread single column over horizontal space	mixer	column			
114	Smear - Verticl	spread single row over vertical space	mixer	row			
115-117	Reserved						
118	Pixellate - Square	pixellates image, square	radius	angle	scale	x position	y position
119	Pixellate - Hexagonal	hole distortion	radius	x position	y position		
120	Crystallize	break up image into crystal pattern	radius	x position	y position		
121	Pointillize	break image into points	radius	x position	y position		
122-126	Reserved						
127	Tile - 1	image tiling no gaps	mixer	divisions			
128	Tile - 2	image tiling with gaps	mixer	horizontal divisions	horizontal spacing	vertical divisions	vertical spacing
129	Tile - Glide Reflected	rectangular tile effect	angle	width	x position	y position	

Combined Effects continued...

Value	Effect	Description	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5
130	Tile - 4-fold Rotated	four-sided tile effect	angle	acute angle	width	x position	y position
131	Tile - 4-fold Reflected	four-sided tile effect	angle	acute angle	width	x position	y position
132	Tile - 4-fold Translated	four-sided tile effect	angle	width	x position	y position	
133	Tile - 6-fold Rotated	six-sided tile effect	angle	width	x position	y position	
134	Tile - 6-fold Reflected	six-sided tile effect	angle	width	x position	y position	
135	Tile - 8-fold Reflected	eight-sided tile effect	angle	width	x position	y position	
136	Tile - 12-fold Reflected	twelve-sided tile effect	angle	width	x position	y position	
137	Tile - Parallelogram	parallelogram tile effect	angle	acute angle	width	x position	y position
138	Tile - Triangle	triangular tile effect	angle	width	x position	y position	
139-143	Reserved						
144	Screen - Line	line patterned halftone screen	width	angle	sharpness		
145	Screen - Circular	line patterned halftone screen	width	sharpness	x position	y position	
146	Screen - Dot	line patterned halftone screen	width	angle	sharpness		
147	Screen - Hatched	line patterned halftone screen	width	angle	sharpness		
148	Screen - CMYK Halftone	color, halftoned rendition	width	angle	sharpness	GCR	UCR
149-152	Reserved						
153	Decay	creates decay trails	mixer	amount			
154	Black & White	converts image to transparent/color	mixer	threshold	red	green	blue
155	Mirrors	various mirror modes	mixer	mode			
156	Horizontal Bars	break image into bars	mixer	number	width		
157	Vertical Bars	break image into bars	mixer	number	width		
158	Double Vision	offset image and overlay	mixer	x offset	y offset		
159	Rippling	simple ripple effect	mixer	size	granularity		
160	Flicker	dynamic flickering effect	mixer	size	speed		
161	Shake 2D	dynamic shaking effect	mixer	size	speed		

Combined Effects continued...

Value	Effect	Description	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5
162	Wobble	dynamic wobbling effect	mixer	size	speed		
163	Edge Work	resampled conversion to white and transparent	radius				
164	Edge Detect	edge detection with color	intensity				
165	Kaleidoscope	geometric distorion	angle	divisions			
166	LED Wall	break up into dots	mixer	dot amount	dot size		
167	Op Tile	glass block tile effect	scale	width	angle	x position	y position
168	Luma Lines	uses color and luma averaging to create line effect	mixer	width	rows	gap	
169	Luma Blocks	uses color and luma averaging to create block effect	mixer	width	rows	gap	
170	Lattice - Positive	divides image into squares	mixer	divisions	size		
171	Lattice - Negative	reverse of lattice - positive	mixer	divisions	size		
172	Duotone - Simple	two-color duotone effect	mixer	mode	threshold		
173	Duotone - Hue & Saturation	duotone effect using hue & saturation for color	threshold	hue 1	saturation 1	hue 2	saturation 2
174	Channel Shift	separates RG&B channels	mixer	horizontal offset	vertical offset		
175	ASCII Art	classic ASCII art effect	mixer	scale	saturation		
176	Meta-Image	uses plugin image[2] to replaced sampled areas in source	mixer	file	scale	saturation	
177	Drop Shadow 1	drop shadow effect	intensity	softness	x offset	y offset	
178	Drop Shadow 2	drop shadow effect	intensity	offset			
179	Roll - Down	vertical roll down	mixer	speed	pause		
180	Roll - Up	vertical roll down	mixer	speed	pause		
181	Roll - Right	horizontal roll right	mixer	speed	pause		
182	Roll - Left	horizontal roll left	mixer	speed	pause		
183	Freeze	freezes image	0 = off, 1-254 = increase, 255 = frozen				
184	Droste	geometric distortion	strands	period	rotation	zoom	
185	Comic Effect	posterize/halftone effect					

Combined Effects continued...

Value	Effect	Description	Mod 1	Mod 2	Mod 3	Mod 4	Mod 5
186	Cartoon	cartoon effect	mixer	line width	color re-duction		
187	Shaded Material	luma of input creates a releif map	layer	scale			
188	Histogram		height	low limit	high limit		
189	Roll - XY	horizontal & vertical roll	mixer	x amount (127=def.)	y amount (27=def.)		
190-220	Reserved						
221	LRBT Shutter	mask sides of layer	left	right	bottom	top	
222	Move Center	offsets rotational center of image	x (127=def.)	y (127=def.)			
223	Shake 3D	X/Y shake effect	x	y			
224	Strobe	strobe effect	off time	on time			
225	Object Tile	tiling effect	number	spacing			
226	Texture Scale/ Rotation	adjusts scale and rotation of texture on gobos	scale	rotation			
227	Texture X/Y Position	adjusts x/y position of texture on gobos	x (127=def.)	y (127=def.)			
228	X/Y Position & Scale Damping	damps movement of parameters in 1/30sec increments	xy posi-tion	scale			
229	Z Rotation & Scale Damping	damps movement of parameters in 1/30sec increments	z rotation	scale			
230	Texture Flip	flips texture drawing on objects	mode[3]				
231	Spin	drop shadow effect	z spin: 0=home, 1-126=rev, 127=stop, 128-255=fwd	x spin: 0=home, 1-126=rev, 127=stop, 128-255=fwd	y spin: 0=home, 1-126=rev, 127=stop, 128-255=fwd		

Notes for Combined Effects

Note 1: Modes for Effect 91 - Matte from Layer

Value	Description
0	Luma
1	Luma Invert
2	Red
3	Red Invert
4	Green
5	Green Invert
6	Blue
7	Blue Invert
8	Alpha
9	Alpha Invert

Note 2: Modes for Effect 176 - Meta-Image

Plugin image must be located in /Mbox/plugins/images/masks and must have an 8-bit index number. File should be 900x75 pixels, with twelce square areas (75x75 pixels each) in dark to light progression left to right.

Note 3: Modes for Effect 230 - Texture Flip

Value	Description
0-31	Flip X
32-63	No Flip
64-95	Flip XY
96-127	Flip Y
128-159	Flip XZ
160-191	Flip Z
192-223	Flip XYZ
224-255	Flip YZ

Keystone Blend Mode/Curve

Value	Mode	Blend Curve	Grid Overlay	Controls
0	Disable DMX Keystone controls	n/a	N	Keystone/Warp is set from Mbox Remote
1	Use DMX controls	Linear	N	X/Y corner controls
2	Use DMX controls	Raised Cosine	N	X/Y corner controls
3	Use DMX controls	Sine	N	X/Y corner controls
4	Use DMX controls	No Blending	N	X/Y corner controls
11	Use DMX controls	Linear	Y	X/Y corner controls
12	Use DMX controls	Raised Cosine	Y	X/Y corner controls
13	Use DMX controls	Sine	Y	X/Y corner controls
14	Use DMX controls	No Blending	Y	X/Y corner controls

Note 1: A Keystone Mode/Curve value of 0 enables the advances toolset that is accessed through the UI in the Mbox Remote application

Note 2: When the value is set to 0, settings from the advanced toolset will negate the standard corner, edge-blend, and linearity controls, but not the Output Geometry controls.

Shutter Mode/Shapes

Value	Shape	Notes
0-9	Disabled	
10-19	Moving Light Mode	Separate controls for each end of shutter. If both controls are at 0, the shutter disappears.
20-29	Leko Mode	Distance and angle controls. If distance is zero, the shutter disappears.
30-39	Iris Mode	A round iris. Scale is used to adjust the size of the iris. No other controls.
40-49	Blob mode	A bezier curve is drawn touching the midpoints of the quadrilateral formed by the Leko mode shutters.

Video and Utility Inputs (Texture Folder 255)

Texture Folder 255 is reserved for special uses such as selecting video/syphone inputs or copying layers.

Texture Value	Input
0	Patch Info Display
1	Copy Layer 1 FX+
2	Copy Layer 2 FX+
3	Copy Layer 3 FX+
4	Copy Layer 4 FX+
5	Copy Layer 5 FX+
6	Copy Layer 6 FX+
7	Copy Layer 7 FX+
8	Copy Layer 8 FX+
9	Copy Layer 9 FX+
10	Copy Layer 10 FX+
11	Copy Layer 11 FX+
12	Copy Layer 12 FX+
13	Copy Layer 13 FX+
14	Copy Layer 14 FX+
15	Copy Layer 15 FX+
16	Copy Layer 16 FX+
17	Copy Layer 17 FX+
18	Copy Layer 18 FX+
19	Copy Layer 19 FX+
20	Copy Layer 20 FX+
21	Copy Layer 21 FX+
22	Copy Layer 22 FX+
23	Copy Layer 23 FX+
24	Copy Layer 24 FX+

Texture Value	Input
31	Copy Layer 1 Raw
32	Copy Layer 2 Raw
33	Copy Layer 3 Raw
34	Copy Layer 4 Raw
35	Copy Layer 5 Raw
36	Copy Layer 6 Raw
37	Copy Layer 7 Raw
38	Copy Layer 8 Raw
39	Copy Layer 9 Raw
40	Copy Layer 10 Raw
41	Copy Layer 11 Raw
42	Copy Layer 12 Raw
43	Copy Layer 13 Raw
44	Copy Layer 14 Raw
45	Copy Layer 15 Raw
46	Copy Layer 16 Raw
47	Copy Layer 17 Raw
48	Copy Layer 18 Raw
49	Copy Layer 19 Raw
50	Copy Layer 20 Raw
51	Copy Layer 21 Raw
52	Copy Layer 22 Raw
53	Copy Layer 23 Raw
54	Copy Layer 24 Raw

Texture Value	Input
201	Syphon Input 1
202	Syphon Input 2
203	Syphon Input 3
204	Syphon Input 4
205	Syphon Input 5
206	Syphon Input 6
207	Syphon Input 7
208	Syphon Input 8
209	Syphon Input 9
210	Syphon Input 10
211	Syphon Input 11
212	Syphon Input 12
241	Video Input 1
242	Video Input 2
243	Video Input 3
244	Video Input 4
245	Video Input 5
246	Video Input 6
247	Video Input 7
248	Video Input 8
254	CG Color Bars
255	Null Image

Note 1: Depending on the product version (Designer/Studio/Mini) there are limits placed on the number of layers, syphon inputs, and number of video inputs. This table represents the full list of available inputs for Mbox Designer.

Studio only has 12 layers, and Mini only 6. Therefore the Copy Layer values will be limited to those maximums for each. Studio only has 4 Syphon inputs, and Mini only 2. Therefore the Syphon Input values will be limited to those maximums for each. Studio only has 4 video inputs, and Mini only 2. Therefore the video input values will be limited to those maximums for each.

Play Modes

Value	Play Mode
0	Forward Loop
1	Forward Loop, Pause when Lyaer Opacity = 0
2	Forward Loop, Pause and Reset to In-Point when Layer Opacity = 0
10	Reverse Loop
11	Reverse Loop, Pause when Layer Opacity = 0
12	Reverse Loop, Pause and Reset to In-Point when Layer Opacity = 0
20	Forward Once
21	Forward Once, Pause when Layer Opacity = 0
22	Forward Once, Pause and Reset to In-Point when Layer Opacity = 0
30	Reverse Once
31	Reverse Once, Pause when Layer Opacity = 0
32	Reverse Once, Pause and Reset to In-Point when Layer Opacity = 0
40	Forward Bounce
50	Reverse Bounce
60	Random
70	Forward Once - Restart on In Frame Change
80	Scrub - In Frame
90	Scrub - Out Frame
100	Forward Loop - Crossfade on Out Frame
110	Reverse Loop - Crossfade on In Frame
120	Forward Loop - Restart on In Frame Change
130	Timecode sync - strict lock
135	Timecode sync - sync then freewheel
136	Timecode sync - jam sync
140	Layer Slave
150	Layer Master - Forward Loop
160	Layer Master - Forward Once
180	Kiosk Mode - play once through folder
181	Kiosk Mode - play once through folder, loop last file
182	Kiosk Mode - play once through folder, fade out last file
185	Kiosk Mode - play through folder then loop
190	Kiosk Mode - timecode
240	Play out Mode - last 5 seconds
241	Play out Mode - last 10 seconds
242	Play out Mode - last 15 seconds
243	Play out Mode - last 20 seconds
244	Play out Mode - last 30 seconds
255	Restart Movie from In Point

Play Speed

Value	Play Mode
0	Paused
1	Increasing speeds from paused to normal
2	Normal speed = movie fps
10	Compensated speed - match output refresh rate (with +/- ~5% deviation)
11	Increasing speeds from normal to 4x normal

Sync Stream

Value	Stream	Notes
0	Layer to Layer	Used for syncing to layer of same number on master
1	Stream 1	Used for syncing to any layer on master which is set to same stream
2-32	Streams 2 thru 32...	As above...
33-96	Streams 33-96	All versions of Mbox can listen to 96 streams, but cannot output above their limit. See note below.

Note 1: Depending on the product version (Designer/Studio/Mini) there are limits placed on the number of sync stream outputs. This table represents the full list of available streams for Mbox Designer.

Studio only has 16 layers, and Mini only 8 sync streams. Therefore the Sync Stream values will be limited to those maximums for each.

Aspect Control

Value	Mode
0	Square pixels (default)
1-126	Ratios scaling from 1:4 to 1:1
127	1:1 ratio
128-255	Ratios scaling from 1:1 to 4:1

Frame Blending Control

A value of 0 = no frame blending (or more accurately, blend time = 0). The range of 1 - 255 = variable frame blend time, as a proportion of the normal frame time. This is a square-law control, and 50% blend time is achieved at DMX 210, 25% blend time at DMX 165.

Texture Transitions

Value	Transition	Description
0	Dissolve	dissolve (a la EX1)
1	Dissolve 2	dissolve (alternate curve)
2	Wipe Right	left to right wipe with hard edge
3	Wipe Left	right to left wipe with hard edge
4	Wipe Down	top to bottom wipe with hard edge
5	Wipe Up	bottom to top wipe with hard edge
6	Wipe Diagonal	diagonal wipe with hard edge
7	Wash Right	left to right wipe with soft edge
8	Wash Left	right to left wipe with soft edge
9	Wash Down	top to bottom wipe with soft edge
10	Wash Up	bottom to top wipe with soft edge
11	Wash Diagonal	diagonal wipe with soft edge
12	White Right	left to right wipe with white bar at edge
13	White Left	right to left wipe with white bar at edge
14	White Down	top to bottom wipe with white bar at edge
15	White Up	bottom to top wipe with white bar at edge
16	White Diagonal	diagonal wipe with white bar at edge
17	Through Black	fade to black then back in
18	Through White	fade to white then back in
19	Through Red	fade to red than back in
20	Bright First	transition through bright areas first
21	Dark First	transition through dark areas first
22	Dots	fade with small dots
23	Big Dots	fade with large dots
24	Burst	white star burst transition
25	Flash	white flash transition
26	Slow Dissolve	dissolve that comes in more slowly
27	Slower Dissolve	dissolve that comes in even more slowly
28	Rotate Left	simple 3D rotate effect to left
29	Rotate Right	simple 3D rotate effect to right
30	Rotate Down	simple 3D rotate effect downwards
31	Rotate Up	simple 3D rotate effect upwards
32	Rotate Center Vertical	simple 3D rotate effect around vertical center
33	Rotate Center Horizontal	simple 3D rotate effect around horizontal center
34	Zoom Out	zoom out and back in
35	Zoom In	zoom in and back out
36	Horizontal Bars	10 horizontal bars, hard edge
37	Horizontal Bars + Blend	10 horizontal bars, soft edge

Texture Transitions continued...

Value	Transition	Description
38	Vertical Bars	20 vertical bars, hard edge
39	Vertical Bars + Blend	20 vertical bars, soft edge
40	Circle Center	circle out from center
41	Circle Center + Blend	circle out from center, blended edge
42	Concentric Circles	circles out from center, blended edges
43	Push Right	new image pushes in left to right
44	Push Left	new image pushes in right to left
45	Push Down	new image pushes in top to bottom
46	Push Up	new image pushes in bottom to top
47	Split Right	outgoing image splits and slides to the right
48	Split L/R Center	outgoing image splits and slides left & right from the center
49	Split Down	outgoing image splits and slides down
50	Split Up	outgoing image splits and slides up
51	Split U/D Center	outgoing image splits and slides up & down from the center
52	Split XY	outgoing image splits and slides outwards from the center
53	Bar Swipe Right	outgoing image slides to the right in strips
54	Bar Swipe Left	outgoing image slides to the left in strips
55	Bar Swipe Up	outgoing image slides upwards in strips
56	Bar Swipe Down	outgoing image slides downwards in strips
57	Page Curl 1	page corner curls from bottom-right to top-left
58	Page Curl 2	page corner curls from top-right to bottom-left
101-110	Custom Hard-edge Wipe 1-10[1]	hard-edge wipe using custom grayscale file
111-120	Custom Soft-edge Wipe 1-10[2]	hard-edge wipe using custom grayscale file
255	Object Dissolve	fade out on current object, fade in on new object

Note 1: The custom hard-edge transitions require JPEG still image files to be placed at /Mbox/plugins/images/grayscale with each image having an index number 1 through 10.

Note 2: The custom soft-edge transitions require JPEG still image files to be placed at /Mbox/plugins/images/grayscale with each image having an index number 11 through 20.

Layer Mix Modes

Value	Mode	Fit	Center	Cropping	Rotation	Description
0	Crop Only	N	N	Y	N	crops to mix boundary, no fit, no scale, no rotation
1	Center, No Crop	N	Y	N	N	content center is placed in center of Mix, no scale-to-fit, no rotation, NO CROP to mix boundary
2	Center, Crop	N	Y	Y	N	content center is placed in center of Mix, no scale-to-fit, no rotation, crops to mix boundary
3	Center, Horizontal Fit, No Crop	H	Y	N	N	content center is placed in center of Mix, scale-to-fit mix horizontally, no rotation, NO CROP to mix boundary
4	Center, Horizontal Fit, Crop	H	Y	Y	N	content center is placed in center of Mix, scale-to-fit mix horizontally, no rotation, crops to mix boundary
5	Center, Vertical Fit, No Crop	V	Y	N	N	content center is placed in center of Mix, scale-to-fit mix vertically, no rotation, NO CROP to mix boundary
6	Center, Vertical Fit, Crop	V	Y	Y	N	content center is placed in center of Mix, scale-to-fit mix vertically, no rotation, crops to mix boundary
7	Center, Horizontal & Vertical Fit, No Crop	HV	Y	N	N	content center is placed in center of Mix, scale-to-fit mix horizontally & vertically, no rotation, NO CROP to mix boundary
8	Center, Horizontal & Vertical Fit, Crop	HV	Y	Y	N	content center is placed in center of Mix, scale-to-fit mix horizontally & vertically, no rotation, crops to mix boundary
11	Center, Rotate, No Crop	N	Y	N	Y	content center is placed in center of Mix, no scale-to-fit, rotated to match mix rotation, NO CROP to mix boundary
12	Center, Rotate, Crop	N	Y	Y	Y	content center is placed in center of Mix, no scale-to-fit, rotated to match mix rotation, crops to mix boundary
13	Center, Horizontal Fit, Rotate, No Crop	H	Y	N	Y	content center is placed in center of Mix, scale-to-fit mix horizontally, rotated to match mix rotation, NO CROP to mix boundary
14	Center, Horizontal Fit, Rotate, Crop	H	Y	Y	Y	content center is placed in center of Mix, scale-to-fit mix horizontally, rotated to match mix rotation, crops to mix boundary
15	Center, Vertical Fit, Rotate, No Crop	V	Y	N	Y	content center is placed in center of Mix, scale-to-fit mix vertically, rotated to match mix rotation, NO CROP to mix boundary
16	Center, Vertical Fit, Rotate, Crop	V	Y	Y	Y	content center is placed in center of Mix, scale-to-fit mix vertically, rotated to match mix rotation, crops to mix boundary
17	Center, Horizontal & Vertical Fit, Rotate, No Crop	HV	Y	N	Y	content center is placed in center of Mix, scale-to-fit mix horizontally & vertically, rotated to match mix rotation, NO CROP to mix boundary

Layer Mix Modes continued...

Value	Mode	Fit	Center	Cropping	Rotation	Description
18	Center, Horizontal & Vertical Fit, Rotate, Crop	HV	Y	Y	Y	content center is placed in center of Mix, scale-to-fit mix horizontally & vertically, rotated to match mix rotation, crops to mix boundary
21	Horizontal Fit, No Crop	H	N	N	N	content is not centered in Mix, scale-to-fit mix horizontally, no rotation, NO CROP to mix boundary
22	Horizontal Fit, Crop	H	N	Y	N	content is not centered in Mix, scale-to-fit mix horizontally, no rotation, crops to mix boundary
23	Vertical Fit, No Crop	V	N	N	N	content is not centered in Mix, scale-to-fit mix vertically, no rotation, NO CROP to mix boundary
24	Vertical Fit, Crop	V	N	Y	N	content is not centered in Mix, scale-to-fit mix vertically, no rotation, crops to mix boundary
25	Horizontal & Vertical Fit, No Crop	HV	N	N	N	content is not centered in Mix, scale-to-fit mix horizontally & vertically, no rotation, NO CROP to mix boundary
26	Horizontal & Vertical Fit, Crop	HV	N	Y	N	content is not centered in Mix, scale-to-fit mix horizontally & vertically, no rotation, crops to mix boundary
31	Horizontal Fit, Rotate, No Crop	H	N	N	Y	content is not centered in Mix, scale-to-fit mix horizontally, rotated to match mix rotation, NO CROP to mix boundary
32	Horizontal Fit, Rotate, Crop	H	N	Y	Y	content is not centered in Mix, scale-to-fit mix horizontally, rotated to match mix rotation, crops to mix boundary
33	Vertical Fit, Rotate, No Crop	V	N	N	Y	content is not centered in Mix, scale-to-fit mix vertically, rotated to match mix rotation, NO CROP to mix boundary
34	Vertical Fit, Rotate, Crop	V	N	Y	Y	content is not centered in Mix, scale-to-fit mix vertically, rotated to match mix rotation, crops to mix boundary
35	Horizontal & Vertical Fit, Rotate, No Crop	HV	N	N	Y	content is not centered in Mix, scale-to-fit mix horizontally & vertically, rotated to match mix rotation, NO CROP to mix boundary
36	Horizontal & Vertical Fit, Rotate, Crop	HV	N	Y	Y	content is not centered in Mix, scale-to-fit mix horizontally & vertically, rotated to match mix rotation, crops to mix boundary

Object Transitions

Value	Transition	Description
0	Dissolve	dissolve
1-10	TBD	in Mbox v4 these transitions are unavailable, status TBD

Blend Modes

Value	Blend Mode	Description
0	Standard	no blending
1	Additive	layer's colors are added to underlying colors (blacks appear transparent)
2	Screen	similar to Additive, with less of underlying color (blacks appear transparent)
3	Multiply	multiplies layer's color with underlying color (blacks appear opaque)
4	Subtractive	layer's colors are subtracted from underlying colors (blacks appear transparent)
5	Exclusion	underlying colors are inverted where layer color is lighter; layer's colors are then added to underlying colors (blacks appear transparent)
6	Invert Subtractive	underlying colors are subtracted from layer's colors (blacks appear opaque)
7	Invert Additive	layer's colors are inverted and are added to inverse of underlying colors (blacks appear transparent)

Draw Modes

Value	Draw Mode	Description
0	None	no effect
1	Light/Trim	automatic ambient lighting of object/trims edge of backgrounds
2	Cut	cuts holes in stencil mask, based on opacity of layer
3	Cut + Light	as above w/ lighting
4	Cut & Draw	as mode 2 but texture is drawn on object too
5	Cut & Draw + Light	as above w/ lighting
6	Draw Thru Stencil	this layer's texture is drawn where holes have been cut in stencil
7	Draw Thru Stencil + Light	as above w/ lighting
8	Draw Onto Stencil	this layer's texture is drawn where stencil is not cut
9	Draw Onto Stencil + Light	as above w/ lighting
14	Opacity Fades to Black	opacity parameter causes layer to fade to black rather than transparent

Pixel Map Group Control Modes

Value	Mode	Description
0	Off	no effect
1	IRGB Master	RGB controls act as inhibitive submasters for Mbox's RGB data on all fixtures in the group and Intensity control masters the final output
2	IRGB Replace	RGB controls generate a color that replaces Mbox's RGB data for all fixtures in the group and the Intensity control masters the final output
3	IRGB Master, Merge Replace	merge data replaces Mbox's output and is then mastered by the group IRGB controls
4	IRGB Master, Merge Multiply	RGB controls act as inhibitive submasters for incoming merge data. Mbox data is then multiplied by the result of the first operation and the Intensity control masters the final output
5	RGB Master, Merge XFade	RGB controls act as inhibitive submasters for Mbox's RGB data on all fixtures in the group, and the intensity control is used to crossfade between that result and the merge data
6	RGB Replace, XFade	RGB controls generate a color that replaces Mbox's RGB data for all fixtures in the group, and the intensity control is used to crossfade between that result and the Mbox data
7	IRGB Master, Merge HTP	merge data and Mbox data are merged using HTP, the result is then mastered by the group IRGB controls
8	RGB Replace, HTP	RGB controls generate a color that is HTP merged with Mbox's data and the result is mastered by the group intensity control
101	ICMY Master	RGB controls act as inhibitive submasters for Mbox's RGB data (using CMY inversion) on all fixtures in the group and Intensity control masters the final output
102	ICMY Replace	RGB controls generate a color (using CMY inversion) that replaces Mbox's RGB data for all fixtures in the group and the Intensity control masters the final output
103	ICMY Master, Merge Replace	merge data replaces Mbox's output and is then mastered by the group IRGB controls (using CMY inversion)
104	ICMY Master, Merge Multiply	RGB controls (using CMY inversion) act as inhibitive submasters for incoming merge data. Mbox data is then multiplied by the result of the first operation and the Intensity control masters the final output
105	CMY Master, Merge XFade	RGB controls (using CMY inversion)act as inhibitive submasters for Mbox's RGB data on all fixtures in the group, and the intensity control is used to crossfade between that result and the merge data
106	CMY Replace, XFade	RGB controls (using CMY inversion) generate a color that replaces Mbox's RGB data for all fixtures in the group, and the intensity control is used to crossfade between that result and the Mbox data
107	ICMY Master, Merge HTP	merge data and Mbox data are merged using HTP, the result is then mastered by the group IRGB controls (using CMY inversion)
108	CMY Replace, HTP	RGB controls (using CMY inversion) generate a color that is HTP merged with Mbox's data and the result is mastered by the group intensity control
255	Group Force OFF	all output for the group is suppressed, i.e. sent to 0