



SOFTWARE VERSION v4.2.1

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MBOX® DIRECTOR

USER MANUAL (rev. B)



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Mbox® Director v4.2 User Manual
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TABLE OF CONTENTS

Introduction

About This Manual	1
Important Note About Companion Applications	1
Additional Documentation	1
Customer Service	1

OVERVIEW

About Mbox Director	3
Software Versions	3
Communication Protocol	3
Important Concepts	3

INSTALLATION AND SETUP

Installing Mbox Director	4
Network Configuration	5
Running Mbox Director on the same computer as the Mbox application	6
Running Mbox Director on a separate computer	8
Adding Fixtures	10
Changing Server Configuration	12

GENERAL OPERATION

Mbox Director Window	16
Preview Tiles, Menus, and Hot-Keys (Keyboard Shortcuts)	16
Hot-Key (Keyboard Shortcut) List	17
Hot Key (Keyboard Shortcut) Notes	19
Preference Settings	20
General Preferences	20
Media Preferences	21
MIDI Preferences	21
OSC Preferences	22
Keyboard Macro Preferences	25
Art-Net/sACN Trigger Preferences	26
Media Picker	28
Fetching Thumbnails	29
Enabling Feedback	30
Using Fullscreen Mode in Local Configurations	30
Pinning Windows	31
Undo/Redo	31

QUICK START

Up and Running	32
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CREATING SHOWS

About Show Files	34
Changing Between Servers	35
Adjusting Parameters on the Global Master or Output Masters	35
Adding Content to Layers	36
Creating and Editing Scenes	38
Adding or Deleting Scenes	40
Editing Scenes	40
Editing Multiple Scenes	42
Separators	43
Searching the Scene List (Find)	43
Editing Layers Using Drag and Drop	44
Duplicating Layers	44
Copying Parameter Settings From Layer to Layer	44
Editing Scenes Using Drag and Drop	45
Copying All Layer Parameter Values to a Scene	45
Copying Selective Parameters to a Scene	46
Editing Multiple Layers	47
Setting All Layer Parameters to Same Value	47
Adjusting Relative Offset Across Layers	48
Fanning Layers	49
Copying Multiple Layers From One Server to Another	50

PLAYBACK

Overview	51
Scene Recall Using Manual Control	51
Scene Recall Using Autofollows	51
Scene Recall Using Art-Net/sACN Triggers	52
Playback Using Loops	53
Implicit Loops	54
Playback Using Timecode	55
Timeline Overview	55
Timecode Triggered Recall for Scenes	56
Timecode Input Options	57
Display FPS	58
24-Hour Clock	60
Scrub	61
Timecode Editing	62
Timeline Contextual Menu	62
Overlapping Scenes	63

MIDI OPERATION

Setting MIDI Preferences	64
Recalling Scenes Using MIDI Triggers	65
External MIDI Control Setup	67
Controlling Director with External MIDI Controllers	67



PARAMETER STORE AND RECALL

Presets	68
Store and Recall	69
Editing Presets	70
Unlinking vs. Deleting	72
Window Indicators	73
Updating Scenes with Presets	73
Palettes	74
Groups	77
Motley Selection Drag and Drop	79
Group Hotkeys	80

ADVANCED FEATURES

Value vs. Delay vs. Time	81
Resetting Parameter Values, Delays, and Times	81
Ease In/Out	82
Submasters	83
Enabling Submasters	83
Recalling a Scene On A Submaster	84
Filtering Specific Layers and Parameters	84
Submaster Priority	85
Smart Fade Out	85
Timecode	85
OSC/MIDI	85
Hotkeys	85
Blind Mode	86
Hide and Solo Functions	87
Contextual Menus	88
Server Contextual Menu	88
Master Contextual Menu	89
Layer Contextual Menus	89
Parameter Contextual Menus	90

EXTERNAL CONTROL

Combined Control with an External Console (Passthrough)	91
Serial-Over-Ethernet Control	94
OSC Output	96
Mbox Director Trigger Output	97



TROUBLESHOOTING

Network Configuration Errors	98
DHCP Networks	98
IP Address Changed	99
No Reply	100
Receive Only and Subnet Mismatch	101
Passthrough Errors	102
Passthrough universe # not received / Passthrough universe # stale	102
Art-Net/sACN Trigger Errors	102
Serial-Over-Ethernet Errors	103

APPENDIX A. OSC REFERENCE

OSC Syntax Examples	105
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APPENDIX B: MBOX NETWORKING GUIDELINES

Concepts	113
Subnet Masking Basics	114
Routing Ethernet Communications	114



REVISION HISTORY

This manual has been revised as follows:

Version	Release Date	Notes
4.2 (revA)	June 19, 2017	Initial Release
4.2.1 (revB)	November 6, 2017	Typos, add new TC scene trigger option, scene copy/paste



INTRODUCTION

About This Manual

This user manual provides necessary information regarding the operation of the Mbox Director v4 software. This guide is provided to explain the features in the Mbox Director v4 software in detail. This manual is written to cover the use of Mbox Director with all three versions of the Mbox application - Designer, Studio, and Mini. Differences between the operation of the three versions of software are noted wherever applicable.

This manual assumes a basic understanding of Mbox Media Server concepts. For more in-depth explanations of the configuration and use of the Mbox application and its features, refer to the latest version of the Mbox User Manual.

Important Note About Companion Applications

The Mbox Director v4 software is designed to work with other applications in the Mbox v4 software family. There are new versions of each of the Mbox applications - Designer, Studio, and Mini - as well as Mbox Daemon and Mbox Remote.

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

Notes

OVERVIEW

About Mbox Director

Mbox Director is a software application that allows control of an Mbox media server from a personal computer. It can be used to configure and control all aspects of the Mbox media server software, therefore eliminating the need for a lighting console.

Mbox Director will run on any 64-bit Intel-based Mac® computer (MacBook Pro, MacBook, Mac Mini, Mac Pro, etc.) using the OS X 10.9 Mavericks or newer operating systems.

Mbox Director can also be run on the Mbox media server itself with minimal effect upon performance during playback. (Mbox Director can allocate processing priority to the Mbox server using a Preference setting.)

Mbox Director is capable of controlling one or more Mbox servers which are connected by an Ethernet network.

Software Versions



In order for Mbox Director to communicate properly with an Mbox server, both software versions must match. For example, Mbox Director v4.1 and Mbox Designer v4.1.

Communication Protocol

Mbox Director controls Mbox servers by sending Art-Net or sACN messages to specific Mbox network IP addresses. In most lighting applications Art-Net is a broadcast protocol, but in the case of Mbox Director, the messages are sent to a specific IP address (i.e. unicast). sACN is typically a multicast protocol, but as with Art-Net, Director unicasts sACN.

Unicasting makes it safer to run Mbox Director on a network which may have other Art-Net or sACN data present since the IP-specific Mbox Director transmissions will not affect other devices. It also allows Mbox Director to control multiple Mbox servers having the default Art-Net/sACN universe, thereby making the initial setup a little bit simpler.

Important Concepts

It is important to note the following differences between the terms “Fixture” and “Server” in the Mbox Director user interface.

Fixture:

A Fixture is abstract, and can refer to either the “Server,” the “Global Master,” an “Output Master,” or an individual “Layer” on the server.

Server:

A Server is a fixture unto itself.

A Server is also a collection of sub-fixtures, the “Global Master” fixture, one or more “Output Master” fixtures, plus one or more “Layer” fixtures.

INSTALLATION AND SETUP

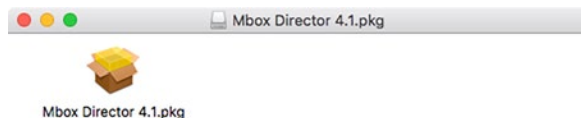
Installing Mbox Director

When installing Mbox Director on a separate Mac computer, be sure it meets the following requirements:

- + Intel-based. (MacBook Pro, MacBook, Mac Mini, Mac Pro, etc.)
- + Running OS X 10.9 Mavericks or newer.

To install Mbox Director application:

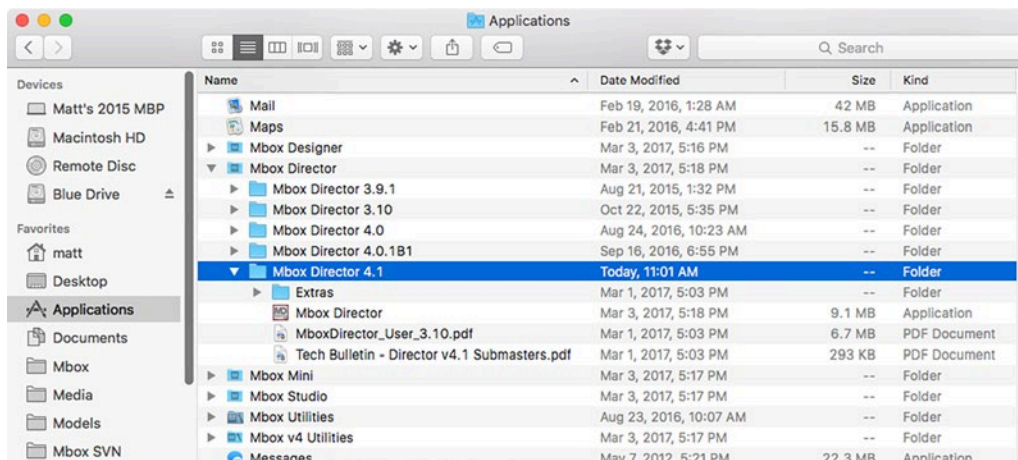
- Step 1. Download or copy Mbox Director installer file to computer.
- Step 2. Double-click installer icon.



- Step 3. Follow instructions to accept license and choose destination. (It is recommended that Director be installed on the main Mac hard drive.) Mbox Director will be installed into the Mac's /Applications folder.
- Step 4. After installation is complete, close installer window.

To launch Mbox Director for the first time:

- Step 1. Locate Mbox Director application on Mac hard drive. Double-click to launch.



Note: For easier launching of the application in the future, drag the Mbox Director application icon to the dock.

- Step 2. To enable Mbox Director to communicate with the connected servers, proceed to “Network Configuration” on the next page.

Network Configuration

When first setting up Mbox Director, it is important to configure the network settings properly so the application will detect the Mbox server (or servers). This is especially critical when running Mbox Director on a separate computer, since the network setup will be more involved than when running Director locally on the same computer as the Mbox software.

Mbox Director

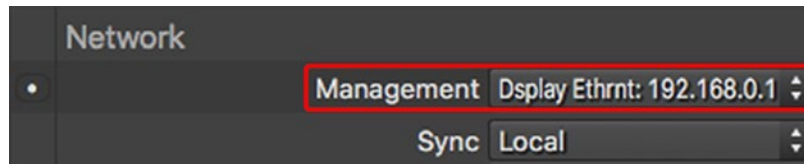
Mbox Director can use any network interface(s) on the computer to communicate with networked Mbox servers. The interface(s) that Director uses can be automatically or manually selected. In most cases, it's best to choose the automatic setting as this allows for multiple connections, both local and over an external network. Refer to [“Preference Settings”](#) on page 20 for more information.

When connecting Mbox Director to an external Mbox server, any network interface can be used. But of course, the actual network interfaces on both computers must be configured to be on the same subnet. A network switch can be used if multiple Mbox servers need to be controlled by Mbox Director.

Note: Mbox Director controls uses the same network interface and subnet for all communications with Mbox servers. Therefore, care should be taken to provide adequate network bandwidth and to allow all protocols to pass.

Mbox Management Network Interface Setting

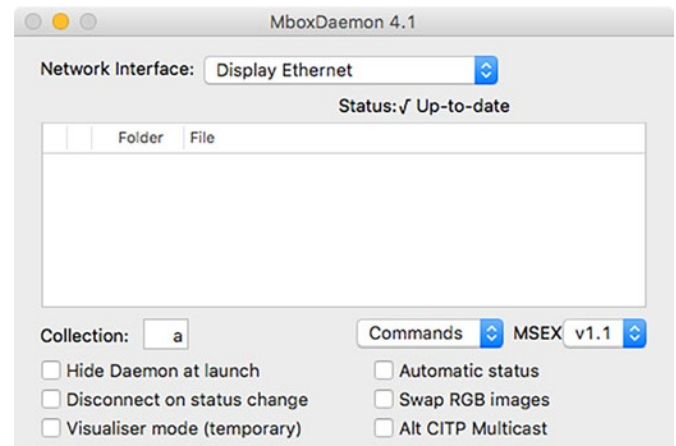
The Management network interface setting should always be configured at the Mbox application's Preferences tab. This setting is located in the Network section of the Preferences tab as shown below:



Mbox Daemon

Mbox network communication involves a software application called Mbox Daemon. The Mbox Daemon application is required on all Mbox servers to enable remote feedback and content management. When the Mbox application is launched (on the Mbox server), it will automatically launch the last version of Mbox Daemon used on that computer.

To view the Mbox Daemon window, click on the application icon in the dock or press [⌘ D] while the Mbox application is in Window mode. The Mbox Daemon window will show the current Network Interface setting as configured on the Preferences tab in the Mbox application (see above). The Network Interface setting can also be changed on the Mbox Daemon window, as this will change the setting in the Mbox application. A sample Mbox Daemon screen is shown to the right.



More Information and Network Troubleshooting

For additional information and concepts specific to setting up an Mbox network, refer to [“Appendix B. Mbox Networking Guidelines”](#) on page 113. For troubleshooting assistance while setting up or reconfiguring your network settings, refer to [“Troubleshooting”](#) on page 98.

Running Mbox Director on the same computer as the Mbox application

Use this procedure when running Mbox Director locally. If Mbox Director will be running on a separate computer or you will be controlling multiple Mbox servers, go to page 8 for networking instructions.

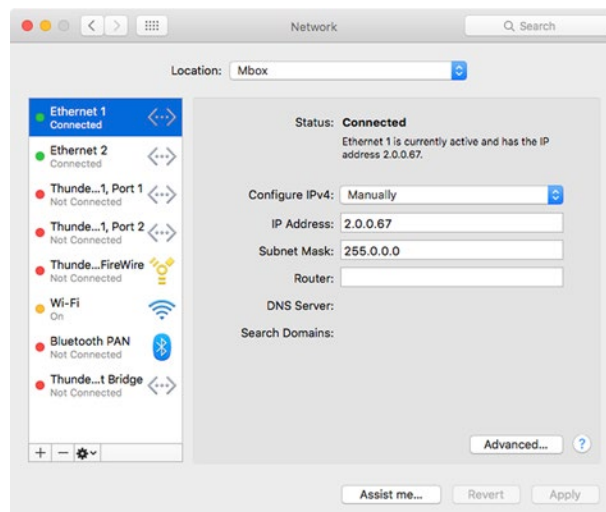
Note: When running Mbox Director directly on an Mbox server, it is important that Mbox Director not affect performance of the server. In order to guarantee this, Mbox Director can sacrifice the amount of time it spends drawing on its own graphical user interface. This setting can be adjusted in the Mbox Director Preferences window. Refer to “[Preference Settings](#)” on page 20.

To configure network when running Mbox Director on an Mbox server:

- Step 1. Select **System Preferences** from Apple menu.
- Step 2. On the System Preferences window, click on **Network**.

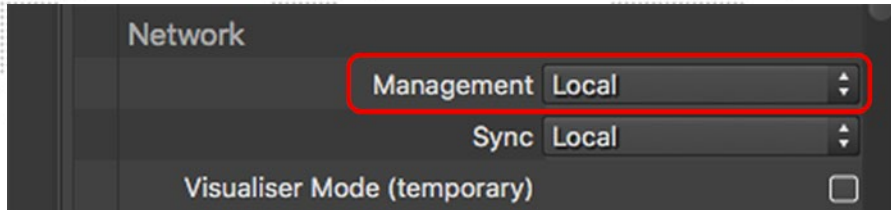


- Step 3. If any Ethernet interface is being used for external communications (e.g. to Mbox Remote), on the Network pref pane, in the left-hand column select that Ethernet interface. Then, either select a pre-configured Location (e.g. the “Mbox” location on rental Mboxes as shown below) that sets up that interface with the desired IP address and subnet mask, or manually configure the interface’s IP address and subnet mask.

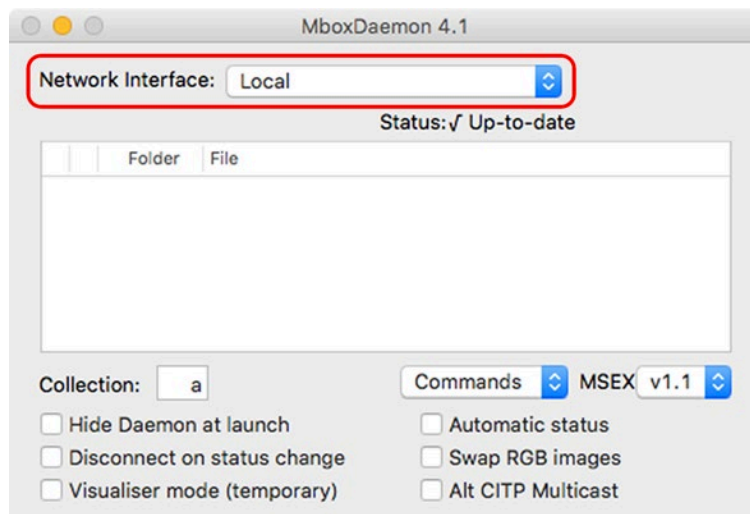


Step 4. Launch the Mbox application if not already running.

Step 5. On the Preferences tab of the Mbox application, scroll to the Network section and find the Management and Sync interface preferences. Set the Management interface to “Local”.



Step 6. Confirm that the Mbox Daemon application is also using the Local interface. When the Mbox application is in the foreground, press [⌘ D] to make the Daemon window visible if it is hidden. [Note: The interface should change automatically in Daemon when it is changed in Mbox, and vice-versa.]



Step 7. At this point, Mbox Director will be able to communicate with the Mbox software. Proceed to “[Adding Fixtures](#)” on page 10.

CAUTION: If using Mbox Director and the Mbox software on the same computer, the Mbox Director software must be on the computer’s primary display with the Mbox application using other displays for its fullscreen output.

Running Mbox Director on a separate computer

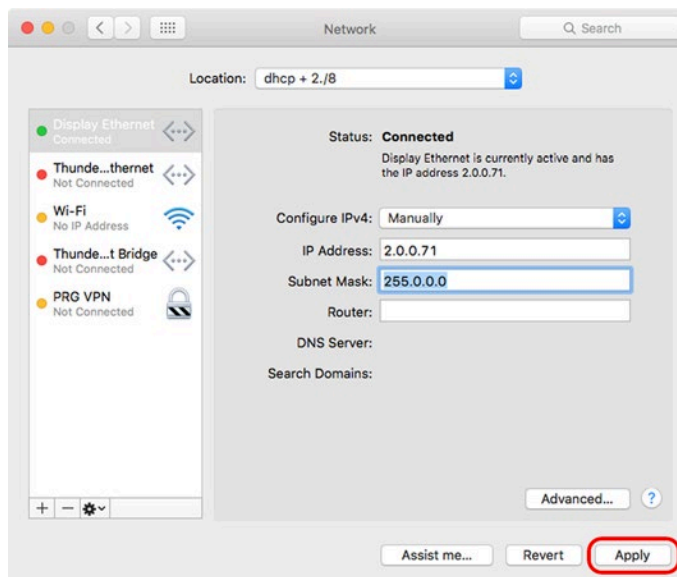
Use this procedure when running Mbox Director on a separate computer to operate one or more networked Mbox servers. The computer, in this case, could be a stand-alone Mac or an Mbox server itself. If Mbox Director will be run on an Mbox server where it will control only that server, go back to page 7 for instructions.

Note: For additional information and concepts specific to setting up an Mbox network, refer to “[Appendix B. Mbox Networking Guidelines](#)” on page 113.

To configure network when running Mbox Director on a separate computer:

On the computer that is running Mbox Director...

- Step 1. Select System Preferences from Apple menu.
- Step 2. On the System Preferences window, click on Network.
- Step 3. On the Network pref pane, configure the Ethernet interface that connects to the Mbox computer as follows:
 - a. Set Configure IPv4 to Manually.
 - b. Enter IP Address and Subnet Mask settings. These will typically be an IP Address format of 2.0.0.###, where ### is a number from 1 to 254. However, they can be set to any allowable values provided the Director computer and the Mbox computer are on the same subnet. Observe the following guidelines:
 - 1) IP Address must be unique for every computer on the network
 - 2) Subnet Mask must be the same for every machine on the sub-network, and will typically be 255.0.0.0 or 255.255.0.0.
 - c. Click Apply button to apply changes to the network settings.



Note: For more information about IP address and subnet mask settings, refer to “[Appendix B. Mbox Networking Guidelines](#)” on page 113.

Note: If the “Using DHCP” option is chosen and/or the computer is connected to a network with a DHCP server, Mbox Director will display a warning saying that controlling an Mbox server over a DHCP-enabled network is not recommended unless the network administrator can guarantee that IP addresses will not change dynamically. Because this essentially defeats the purpose of DHCP networks, their use is not recommended with Mbox Director and Mbox.

On each networked Mbox computer...

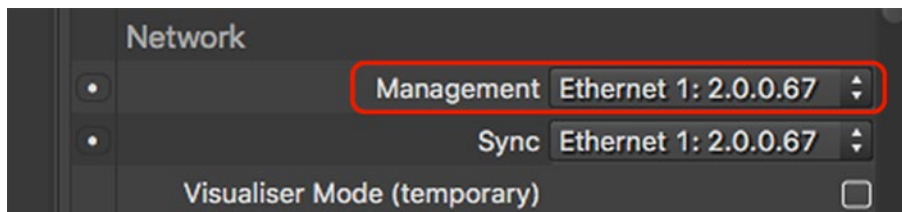
Step 4. Open the Mac System Preferences and click on Network.

Step 5. Configure the Ethernet interface on the Mbox computer as follows:

- a. If the Mbox Director computer is using the standard IP address of 2.x.x.x with a subnet mask of 255.0.0.0, confirm that the network Location on the Mbox computer is set to “Mbox”
- b. If the Mbox Director computer is using any other IP address and/or subnet mask values then confirm that the Mbox computer has its IP address and subnet mask configured to be on the same subnet.

Step 6. Launch the Mbox application if it is not already running.

Step 7. On the Preferences tab of the Mbox application, scroll to the Network section and find the Management and Sync interface preferences. Set the Management interface to the name of the Ethernet interface that is being used to communicate with Mbox Director - e.g. “Ethernet 1”.



Step 8. Confirm that the Mbox Daemon application is also using the same interface.

Step 9. Connect an Ethernet cable between the two computers (using network switch as required) connecting to the Ethernet interface on each computer as configured to be on the same subnet.

Step 10. At this point, Mbox Director will be able to communicate with the Mbox software. Proceed to “**Adding Fixtures**” on page 10.

Adding Fixtures

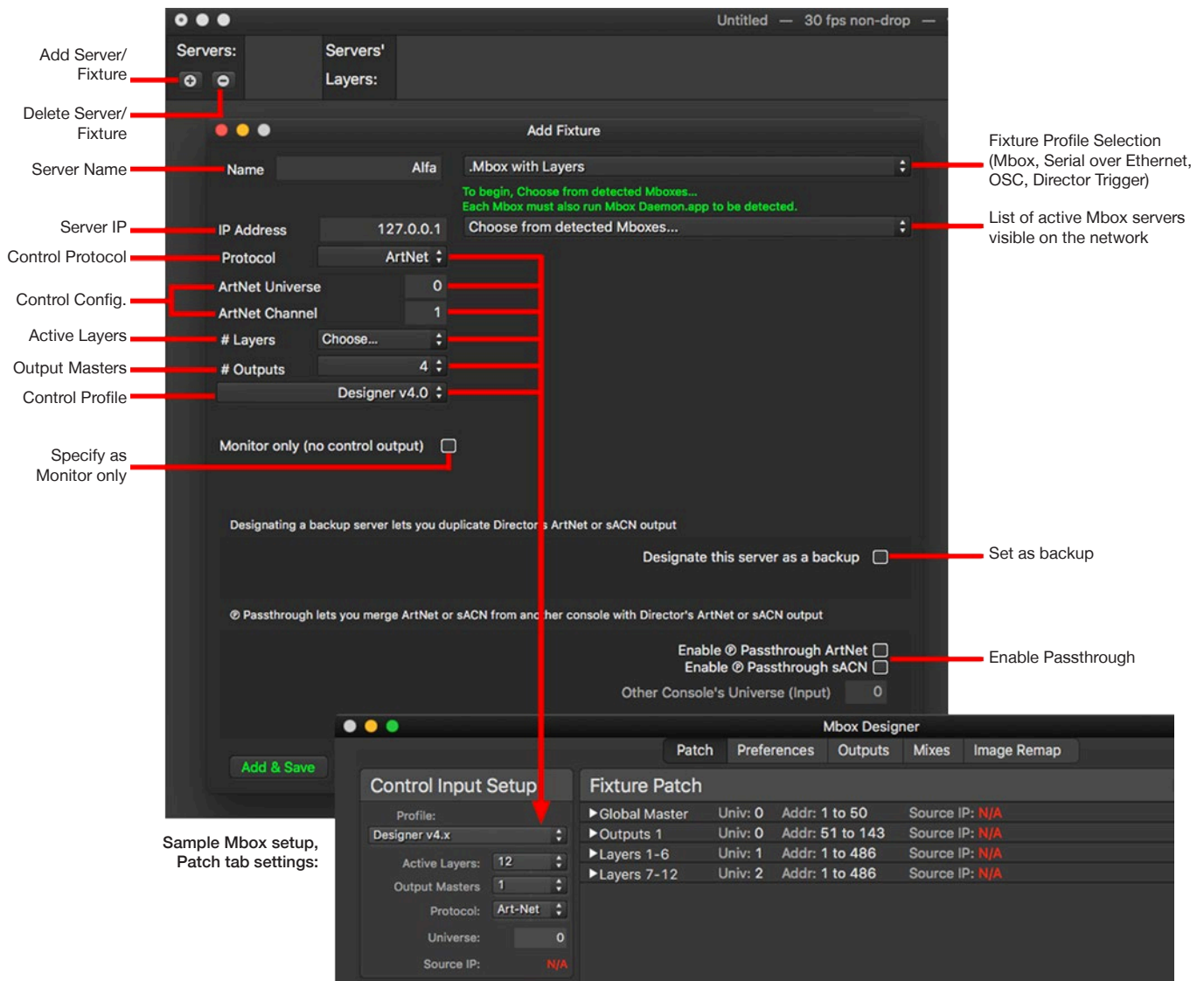
Once the network is configured and the Mbox servers are connected, the servers need to be added to Mbox Director so they can be controlled. The “Add Fixture” window is used to locate Mbox servers on the network and add them to Director for control.

Before adding servers and their related fixtures, it is a good idea to configure the control preference for each server on the Mbox server’s Patch tab window - items such as Profile, Active Layers, Output Masters, Protocol, and Universe. For more information, refer to “[Changing Server Configuration](#)” on page 12.

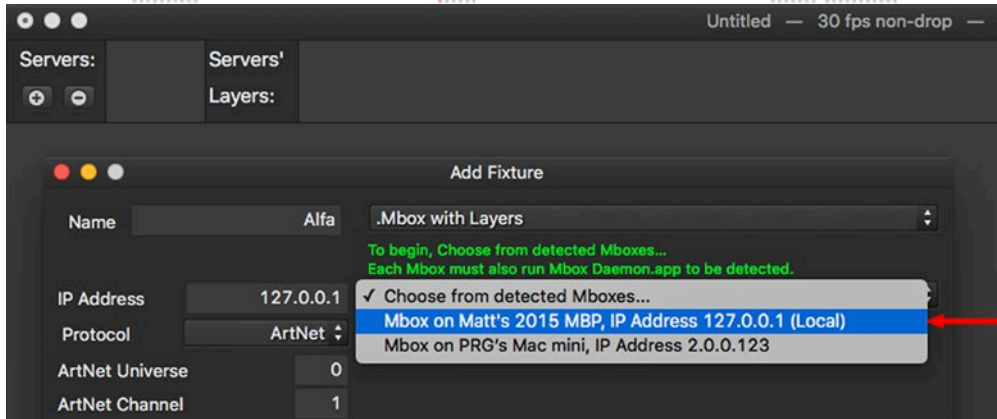
Note: Refer to “[Important Concepts](#)” on page 3 for definitions of “Fixture” and “Server.”

To add fixtures:

Step 1. On Mbox Director’s main screen, click the Add Fixture button [+]. (If no servers are connected, the button will be flashing.)



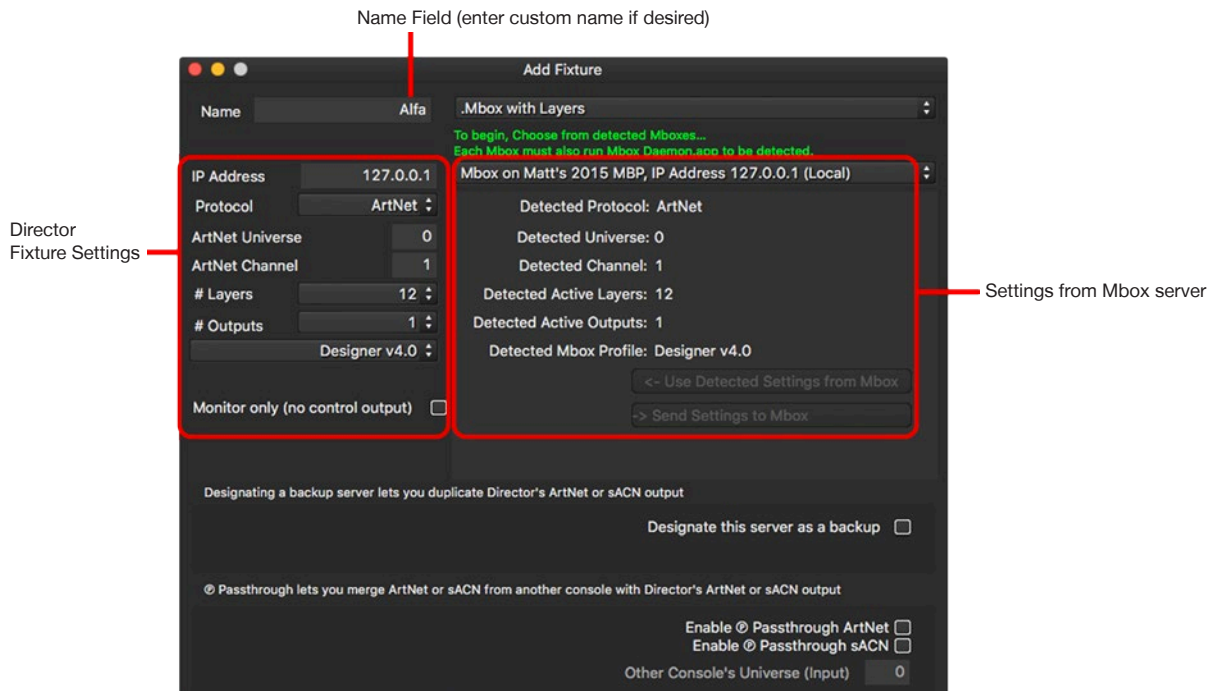
- Step 2. Make sure the “.Mbox with Layers” Profile setting is selected. For more information on the other options (OSC & Show Control, Serial-Over-Ethernet, and Mbox Director), refer to “[External Control](#)” on page 91.
- Step 3. Using the “Choose from detected Mboxes” pop-up, select an Mbox server to add. (If the network settings are configured properly, any connected Mbox servers will appear in this list.)



The Mbox servers visible here will depend on the network settings of both the Director computer and the Mbox computers

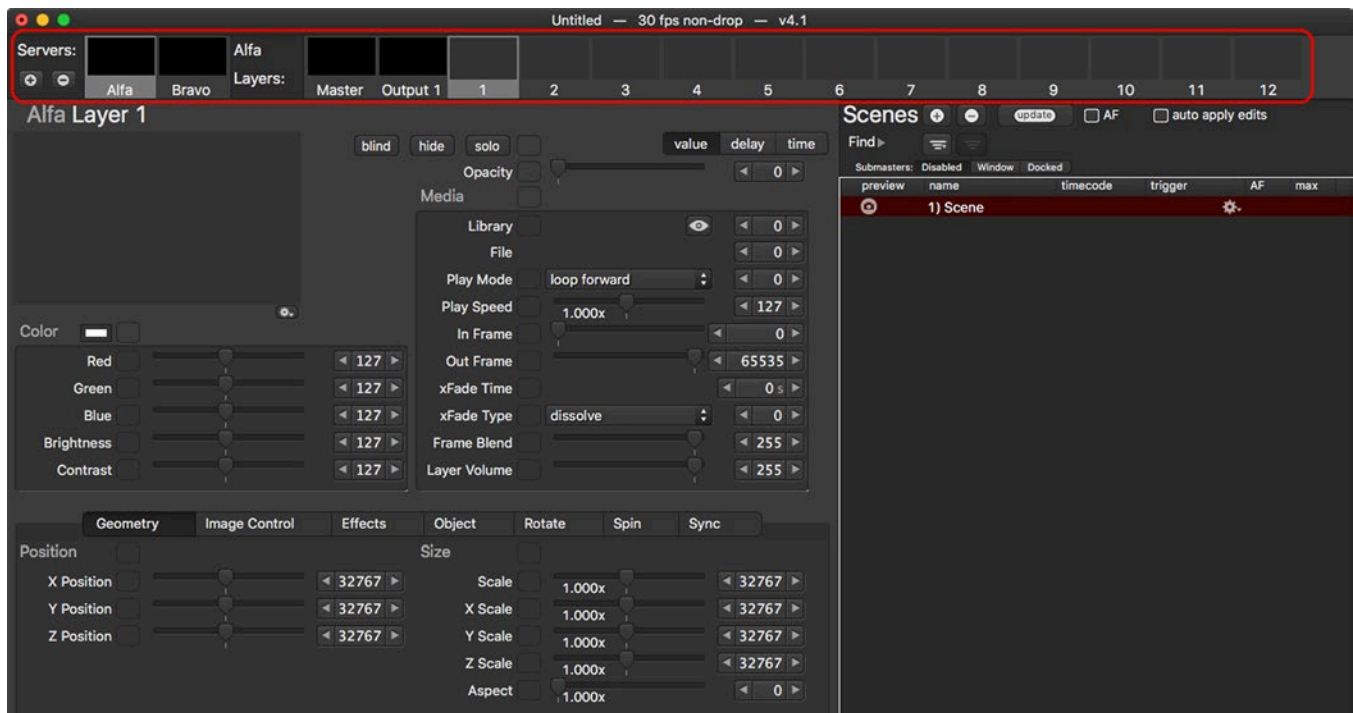
- Step 4. Once an Mbox server is chosen, the IP Address, Protocol, Art-Net/sACN Universe and Channel, # of Layers, # of Output Masters, and DMX Profile fields will be populated according to the settings configured on that Mbox server's Preferences tab.

Note: If any of these values or settings are changed here in the Mbox Director Add Fixture window, the conflicting value will be highlighted in green, but will not be changed on the actual Mbox server. Differences between the server's settings and those in Director can be applied by pressing either the Use Detected Settings from Mbox or Send Settings to Mbox buttons.



- Step 5. Enter a custom name in the Name field if desired. (The name can be edited after the fixture has been created.)

- Step 6. Use optional checkboxes to designate the servers as “Monitor Only” and/or “Backup.”
- Step 7. Enable Passthrough (Art-Net or sACN) as required. For more information on this advanced feature, refer to “**External Control**” on page 91.
- Step 8. When complete, click the **Add & Save** button to add (patch) the fixture.
- Step 9. If controlling multiple Mbox servers, repeat steps 2-7 until all servers have been added. When finished, close the Add Fixture window. The main window will now show the added fixture(s) in the fixture browser area.



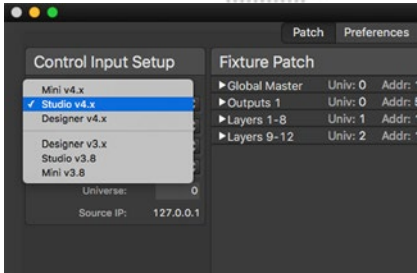
Changing Server Configuration

Depending on the version of Mbox v4 software being used, each server can have up to 24 layers and up to 32 output masters. The default configurations for Designer, Studio, and Mini have a preset number of layers and only one outputs. Additional layers and outputs can be enabled by modifying the quantities of each on the Mbox server itself, or in Director:

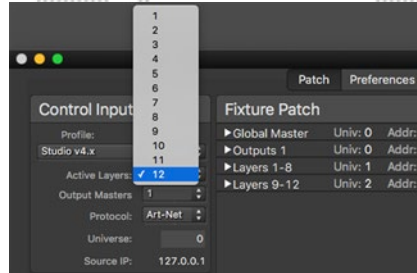
- + Designer - up to thirty-two output masters, up to twenty-four layers.
- + Studio - up to eight output masters, up to twelve layers.
- + Mini - up to six output masters, up to six layers.

Note: The Mbox v4 software can emulate the older v3 software in certain circumstances, and Director v4 can be patched to control Mbox v4 in these emulation modes. However, the emulation modes only works with fairly simple, single output configurations and some features (Keystone, Image Remapping, Alignment Rectangles/Mixes) will not work.

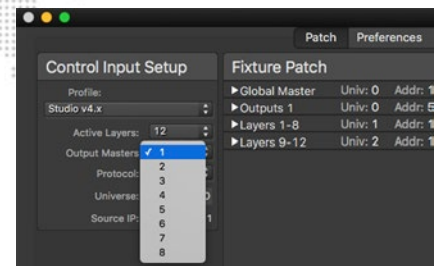
The Mbox server's patch configuration is set up on the Mbox server's Patch tab. This configuration is “pulled into” Mbox Director when a fixture is added (patched).



Profile Setting

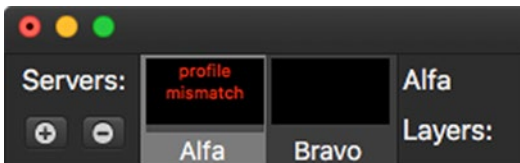


Active Layers Setting

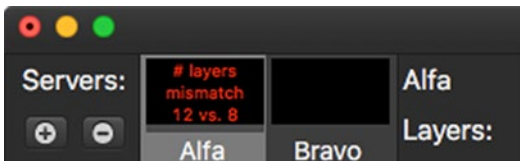


Output Masters Setting

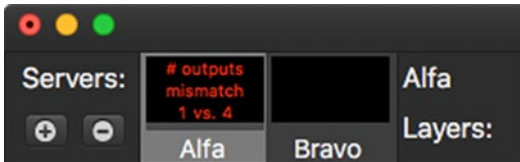
If any part of the patch configuration is changed on the Mbox server's Preferences tab, the Change Configuration feature provides a way to update the settings in Director. For example, if the server's Profile is changed from Designer v4.x to Studio v4.x, this conflict will be noted in Director's main window by displaying “profile mismatch” in the fixture preview tile as shown below. When this occurs, the Mbox system will no longer function correctly. To correct this, use the Change Configuration window (refer to the steps on the following page).



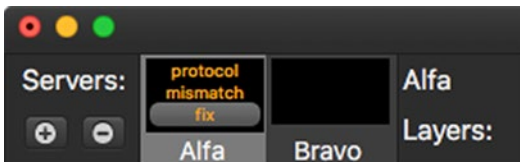
The profile of the connected server has changed.



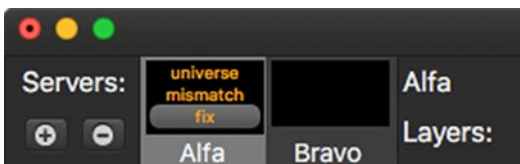
The number of layers on the connected server has changed.



The number of output masters on the connected server has changed.



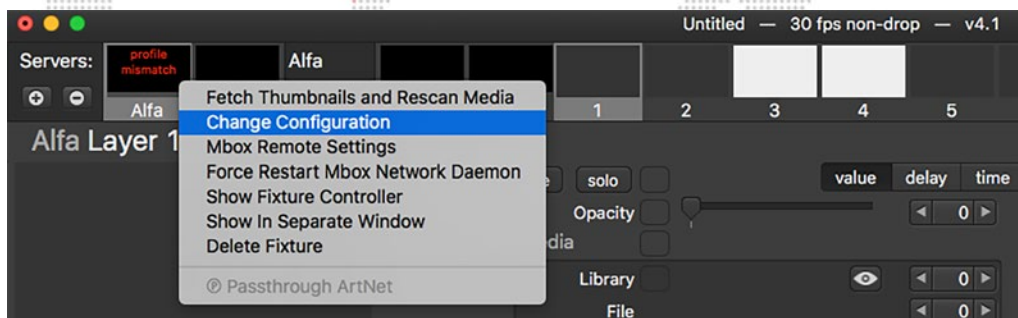
The control protocol (Art-Net or sACN) of the connected server has changed.



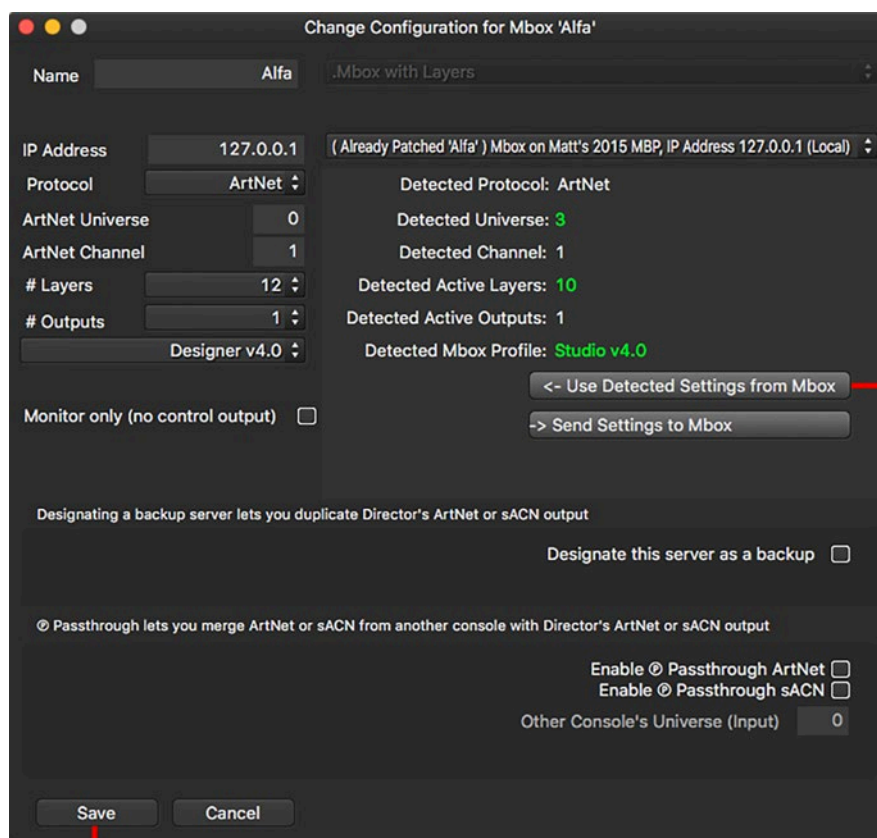
The control universe of the connected server has changed.

To correct a configuration mismatch:

Step 1. If the mismatch warning has a button labeled “fix,” press that button and the Change Configuration window will open. Otherwise, right-click on the fixture’s preview tile and a pop-up menu will open. On the pop-up menu, select **Change Configuration**.



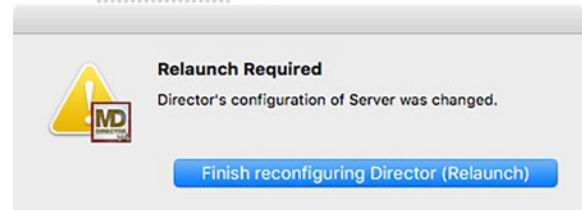
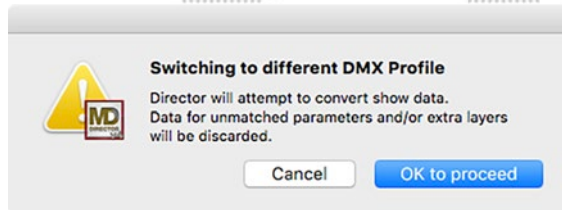
Step 2. In the Change Configuration window, conflicting settings will be highlighted in green. Click the **Use Detected Settings from Mbox** button to pull in new settings from Mbox server.



2) Click to accept changes

Step 3. Click the Save button to accept changes.

Step 4. If switching between profiles, two confirmation alerts will open. In the first alert, click the **OK to proceed** button to accept the changes. In the second alert, click the **Finish Reconfiguring Director** button to relaunch the Mbox Director application with the changes.



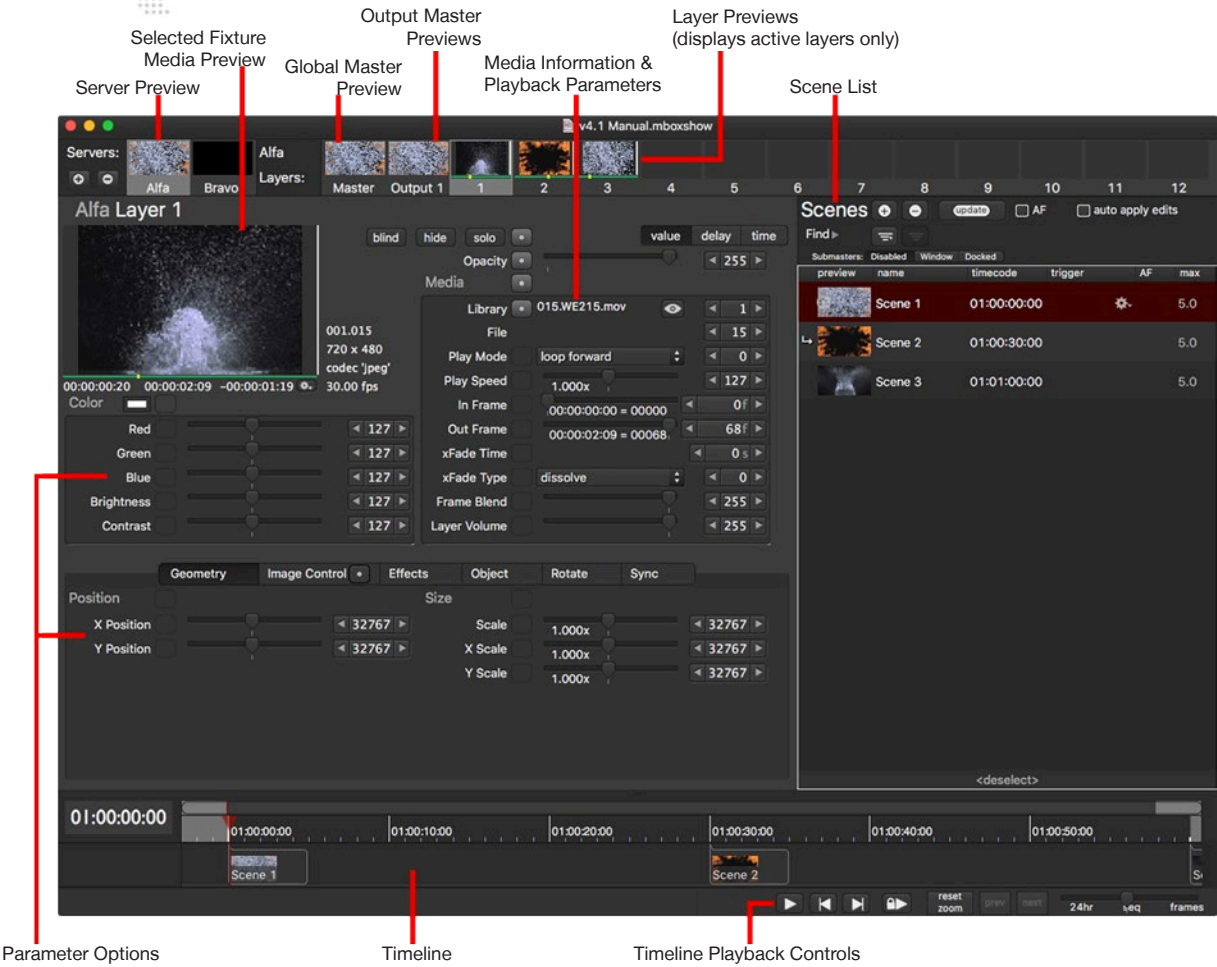
Once Mbox Director has relaunched, the configuration changes will be made and the preview tiles in the server and master/layer areas will reflect the new configuration.

Note: For a more in-depth explanation of the Mbox control configuration settings, refer to the latest version of the Mbox Media Server User Manual (02.9800.0001.xx).

GENERAL OPERATION

Mbox Director Window

The Mbox Director main window is divided into several sections which are used to set media content on layers, configure parameters, and store “scenes” for recall. The primary sections are shown below:



Preview Tiles, Menus, and Hot-Keys (Keyboard Shortcuts)

Most operations can be done using the cursor in the main window. For example, click on preview tiles to select a fixture, move sliders, and click arrow buttons to increment/decrement data values.

Many operations can also be done using the drop-down menu and/or hot-key combinations. For example, playback can be toggled by pressing the play button [▶] in the timeline, by selecting Play from the Playback menu, by pressing the spacebar on the keyboard, or by pressing [⌘ P] on the keyboard.

Note: All hot-key equivalents are noted beside the menu selection, where applicable.

Playback	Window	Help
Play		⌘P
Play		Space
Run & Lock		⌘R
Unlock & Stop		⇧⌘R
Rewind (Home key)		⌘←
Forward To End		⌘→
Next Frame		→
Forward 10 Frames		⇧→
Forward 1 Second		⇧⌘→
Previous Frame		←
Backward 10 Frames		⇧←
Backward 1 Second		⇧⌘←
Go to selected scene/keyframe		⌘G
View Playhead		D
Add marker at playhead		⌘*
Zoom In		.
Zoom Out		,
Zoom In to frames		/
Reset Zoom		⇧;
Hide Timeline		

Hot-key
Equivalent

Hot-Key (Keyboard Shortcut) List

File	
Open Show	⌘O
Save Show	⌘S
Save Show As	⇧⌘S
Show/Hide Media Library	F3 or option T
Follow Updates in Media Library	⇧⌘T
Show Log File	⌘L
Edit	
Undo	⌘Z
Redo	⇧⌘Z
Cut	⌘X
Copy	⌘C
Paste	⌘V
Select All (items in timeline)	⌘A
Find in scene list	⌘F
Fade Time Editing Mode	⌘T
Fade Delay Editing Mode	⌘D
Blind Editing	⌘B
Resend All MIDI Feedback	option ⌘M
Show Palettes	⇧Y
Show Groups	⇧⌘Y
Preset Reference Edit Mode (Show Presets)	⌘Y
Relative Move	hold down [v] key & drag numeric values
Fan Move	hold down [f] key & drag numeric values
Layer > Select Layer	
Select All Layers	⇧⌘A
Select All Layers + Output Masters	press ⇧⌘A a second time
Next Layer	⇧=
Previous Layer	⇧-
Select Layers 1-24	1-24
Toggle selection of Layers 1-24	⇧1-24
Global Master	0
Toggle selection of Global Master	⇧0
Output Master 1-32	⌘1-32
Toggle selection of Output Master 1-32	⇧⌘1-32
Toggle Hide Layer	⇧⇧⌘H
Toggle Show Layer	⇧⇧⌘S

Layer > Select Server	
Next Server	⇧⌘=
Previous Server	⇧⌘-
Select Server 1-9	⌘1-9
Toggle selection of Server 1-9	⇧⌘1-9
Layer Navigation	
Show Intensity/Opacity	T
Full Intensity or Opacity	option =
Out Intensity or Opacity	option -
Show Effects	E
Show Media	M
Show Geometry	G
Show Object	O
Show Rotate	R
Show Spin	W
Show Sync	Y
Show Image Control	I
Master Navigation	
Show Effects	E
Show Keystone	K or ⇧K
Show Shutter	⇧S
Show Camera	C or ⇧C
Show Geometry	G
Playback	
Play	⌘P or spacebar
Run & Lock	⌘R
Unlock & Stop	⇧⌘R
Rewind	home
Forward to End	end
Next Frame	→
Forward 10 Frames	⇧→
Forward 1 Second	⇧⌘→
Previous Frame	←
Backwards 10 Frames	⇧←
Backwards 1 Second	⇧⌘←
Go to Selected Scene	⌘G
View Playhead	D
Zoom In	.
Zoom Out	,
Zoom in to Frames	;
Reset Zoom	⇧;

Scene	
Previous Scene	↑ (up arrow)
Next Scene	↓ (down arrow)
Next Scene after End of Loop	option ↓
Create New Scene	option S
Update Selected Scene	option ⇧S or ⌘U
Create New Scene at Playhead	⌘S
Move Selected Scene to Playhead	⌘option ⇧S
Nudge Left	option ←
Nudge Left 10 Frames	option ⇧←
Nudge Left 1 Second	option ⇧⌘←
Nudge Right	option →
Nudge Right 10 Frames	option ⇧→
Nudge Right 1 Second	option ⇧⌘→
Select Next Scene in Timeline]
Select Previous Scene in Timeline	[
Delete Scene, Remove from Scene, or Remove Preview Image	⌘> (forward delete)
Delete Scenes without prompt	⇧ Delete
Timeline Editing	
Create New Scene at Playhead	⌘S
Move Selected Scene to Playhead	⌘option ⇧S
Nudge Left	option ←
Nudge Left 10 Frames	option ⇧←
Nudge Left 1 Second	option ⇧⌘←
Nudge Right	option →
Nudge Right 10 Frames	option ⇧→
Nudge Right 1 Second	option ⇧⌘→
Select Next Scene in Timeline]
Select Previous Scene in Timeline	[
Window	
Minimize	⌘M
Cycle Mouse Cursor to Next Screen	option `
Help	
Mbox Director QuickStart Guide	⌘?
Mbox Director	
Preferences	⌘,
Hide Mbox Director	⌘H
Hide Other	option ⌘H
Quit Mbox Director	⌘Q

Refer to Hot Key (Keyboard Shortcut) Notes on the following page for important notes regarding some of these operations.



Hot Key (Keyboard Shortcut) Notes

Previous Scene	Recalls the previous scene in the scene list.
Next Scene	Recalls the next scene in the scene list.
Next Scene After End of Loop	Break out of an Autofollow loop by advancing to the scene after the end of loop.
Create New Scene	Creates a new scene in scene list, inserting after the currently selected scene.
Update Selected Scene	Applies manual changes to the current selected scene.
Create New Scene at Playhead	Creates a new scene with current values, with timecode at playhead. If timecode is running, this can be used to create 'markers' that you update at a later time.
Move Selected Scene to Playhead	Changes timecode of the selected scene to the playhead time.
Nudge Left	Moves item backward 1 frame (10 frames if the shift key held down).
Nudge Right	Moves item forward 1 frame (10 frames if the shift key held down).
Select Next Scene in Timeline	If a scene is selected in the timeline, this selects the next scene in the timeline.
Select Previous Scene in Timeline	If a scene is selected in the timeline, this selects the previous scene in the timeline.
Rewind (home key)	Goes to first event in the timeline.
Forward To End	Goes to the last event in the timeline.
Next Frame	Moves the playhead forward 1 frame in the timeline.
Forward 10 Frames	Moves the playhead forward 10 frames in the timeline.
Forward 1 Second	Moves the playhead forward 1 second in the timeline.
Previous Frame	Moves the playhead backward 1 frame in the timeline.
Backward 10 Frames	Moves the playhead backward 10 frames in the timeline.
Backward 1 Second	Moves the playhead backward 1 second in the timeline.
Go to selected scene	Moves the playhead to the currently selected event in the timeline. (This can be different than the currently selected scene in the scene list.)
View Playhead	Scrolls the timeline view to make the playhead visible.
Zoom In to frames	Zooms the timeline to the sub-second level. Choosing this again zooms in even further.
Reset Zoom	Sets the zoom level so that all events (in the current sequence) are visible.
Full Intensity or Opacity	Sets Intensity or Opacity to 100% for selected layer(s).
Out Intensity or Opacity	Sets Intensity or Opacity to 0 for selected layer(s).

Preference Settings

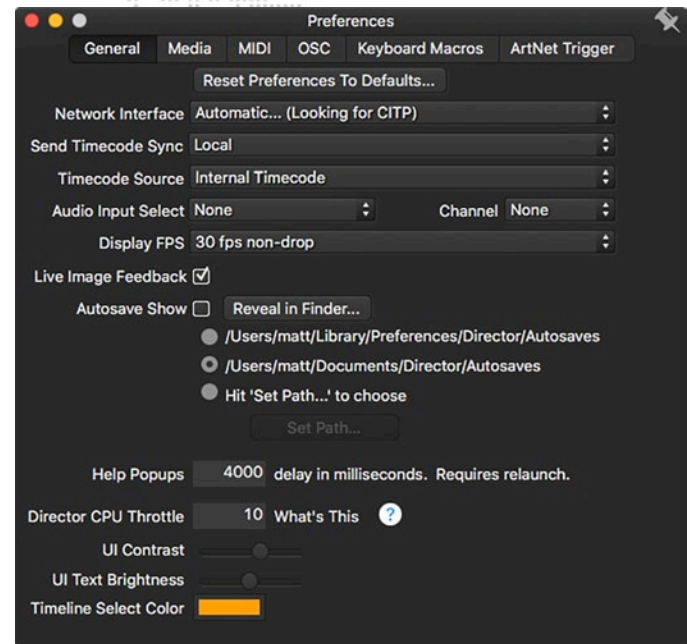
Mbox Director's preferences can be set in the application's Preferences window.

- + To open the Preferences window, click on the Preferences item in the Mbox Director menu. Or press [⌘,] on the keyboard.

General Preferences

General preferences can be set on the General tab:

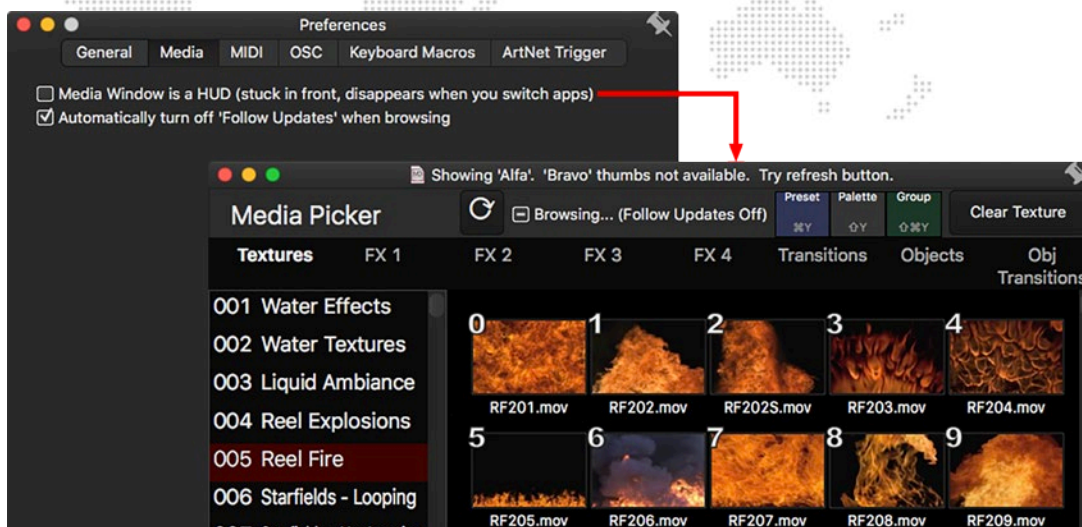
- + **Network Interface** - Selects the network interface used for communication with Mbox servers - either locally or externally. In most cases, this should be left set to the **Automatic** setting to ensure that servers can be controlled no matter which Ethernet interface they are connected to.
- + **Send Timecode Sync** - Enables Director to output network timecode to the Mbox application for playback synchronization when the only timecode source is Director's internal clock.
- + **Timecode Source** - Selects a source for timecode: Internal, Audio (SMPTE), MIDI, or 24-hour clock. (Refer to "**Timecode Input Options**" on page 57 for more information.)
- + **Audio Input Select & Channel** - Selects which audio interface & channel to use when the Timecode Source is set to Audio.
- + **Display FPS** - Selects the Frames Per Second format displayed in Director's timeline. This does not set the timecode format that Director receives. (Refer to "**Display FPS**" on page 58 for more information.)
- + **Live Image Feedback** - Enables the reception and display of live image feedback from Mbox servers.
- + **Autosave Show** - Enables/disables the show file autosave feature and specifies a file path for autosave files.
- + **Help Popups** - Sets the delay time for the tooltip help pop-up feature, in milliseconds.
- + **Director CPU Throttle** - Controls how much CPU time Mbox Director uses. When running Director on the same computer as Mbox, it is important to minimize Director's performance impact on the Mbox software. To help with this, Director can reduce the amount of time it spends drawing its UI. The value defaults to 10%, and can be set from 5% to 100%.** Note that reducing this value does not affect Director's real-time show execution.
- + **UI Contrast** - Adjusts the contrast of Director's user interface.**
- + **UI Text Brightness** - Adjusts the brightness of the text in Director's user interface.
- + **Timeline Select Color** - Specifies the highlight color for selected scenes in the timeline.



** When changing these settings, Mbox Director must be re-launched to take effect.

Media Preferences

Media Picker (library) preferences can be set on the Media tab:

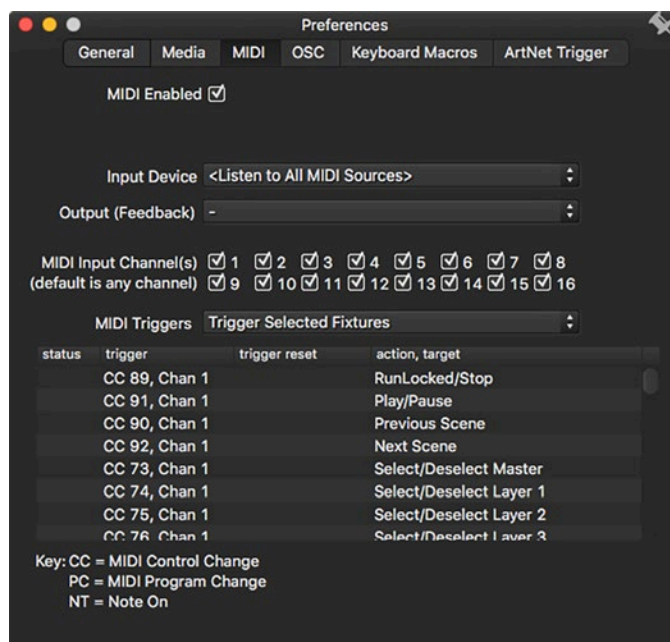


- + When “Media Window is a HUD” is checked, the Media Picker window will always stay on top of other application windows.
- + It is recommended to leave the “Automatically turn off Follow Updates when browsing” option checked.

Note: Refer to “Media Picker” on page 28 for more information about the Media Picker window.

MIDI Preferences

When receiving MIDI timecode or commands from an external source, MIDI preferences are set at the MIDI tab. For complete instructions on these MIDI settings, refer to “Setting MIDI Preferences” on page 64.

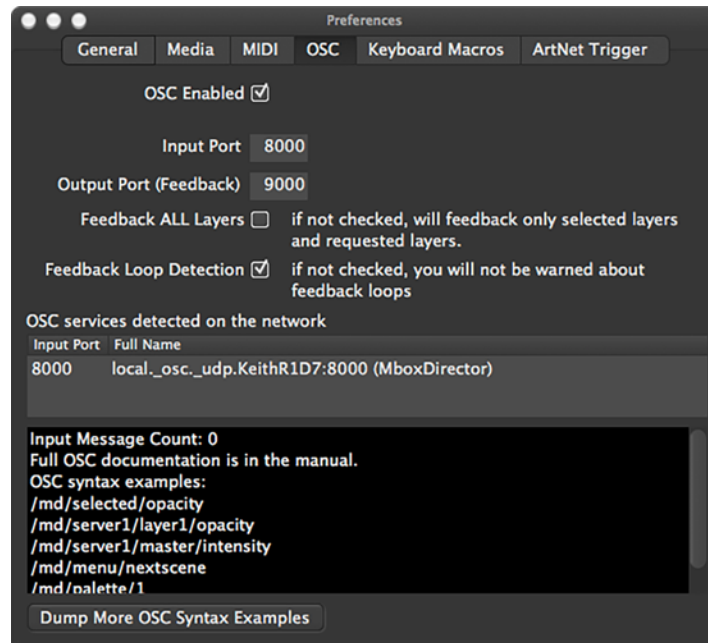


OSC Preferences

The Open Sound Control (OSC) feature allows many features of Mbox Director to be controlled from an external device running OSC output software (e.g. Lemur or TouchOSC) using UDP protocol over a WiFi or Ethernet connection. OSC communications require one of the Director computer's Ethernet interfaces to be configured to communicate with the external device. OSC can be enabled and configured on the OSC tab, but the Ethernet interface must be configured in the System Preferences > Network pref pane.

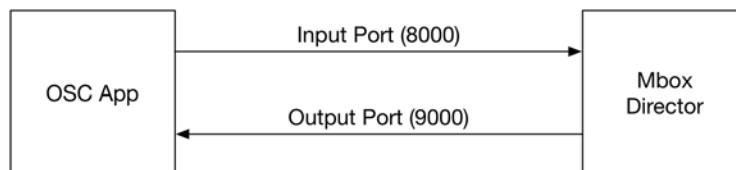
To enable and configure OSC in Director:

Step 1. On the OSC tab, check the OSC Enabled checkbox. The window will now display configuration settings.



Step 2. In the Input Port field, enter the port number on which Director will receive commands from the OSC application. Port 8000 is the default.

Step 3. In the Output Port field, enter the port number that Director will use to send feedback to the OSC application. Port 9000 is the default.



Syntax Examples:

To view a list of all possible syntax for use with OSC applications, press the Dump More OSC Syntax Example} button at the bottom of the window. More syntax examples are printed at the end of this manual. Refer to “Appendix A: OSC Reference” on page 105.

```
OSC syntax examples:
/md/selected/opacity
/md/server1/layer1/opacity
/md/server1/master/intensity
/md/menu/nextscene
/md/palette/1
Dump More OSC Syntax Examples
```

```
OSC Syntax Examples
Please excuse the formatting of this programmatic dump!
The pdf manual has a *much* prettier summary.

General syntax rules:
- OSC syntax paths must be ALL lowercase with ALL spaces removed! For example: /md/palette/1/timeonly
- Input and output values, if required, must be a float within the range 0.0 to 1.0
  unless you are using a '/dmx' suffix (see below)
- Values are mapped to the range of the parameter where 1.0 = 100%.
- Alternately, you can add a '/dmx' suffix to the path of any layer or master parameter.
  For example: /md/server1/layer1/effect1/dmx
- dmx value ranges are either (0 to 255) or (0 to 65535).
- Paths ending in '/label' are for feedback only. OSC apps cannot send labels to Director.
  For example, if you choose Effect 'saturation', then Director will send back the
  '/md/selected/effect1/label' of 'saturation'.
- Command any master or layer parameter, either for selected layers (for example: /md/selected/opacity)
  or a specific server/layer (for example: /md/server1/layer1/opacity).
- Command any main menu item. For example: /md/menu/nextscene
- Command any palette item or scene by number. For example: /md/palette/1
- Command any scene by its number (where the scene name begins with a number).
  For example: /md/scenes/2.1
  Alternately, advanced OSC users could send /md/scenes with a floating-point number value.
- Open a .mboxshow file without prompting:
  For example: /md/menu/openshow/1
  Looks in the folder of the current show for a file name which starts with number '1'.
  The number should be non-zero.
  For example: /md/menu/openshow/summershow.mboxshow
  Looks in the folder of the current show for a file with exact name 'summershow.mboxshow'.
  File names with spaces or non-alphanumeric characters may be problematic.

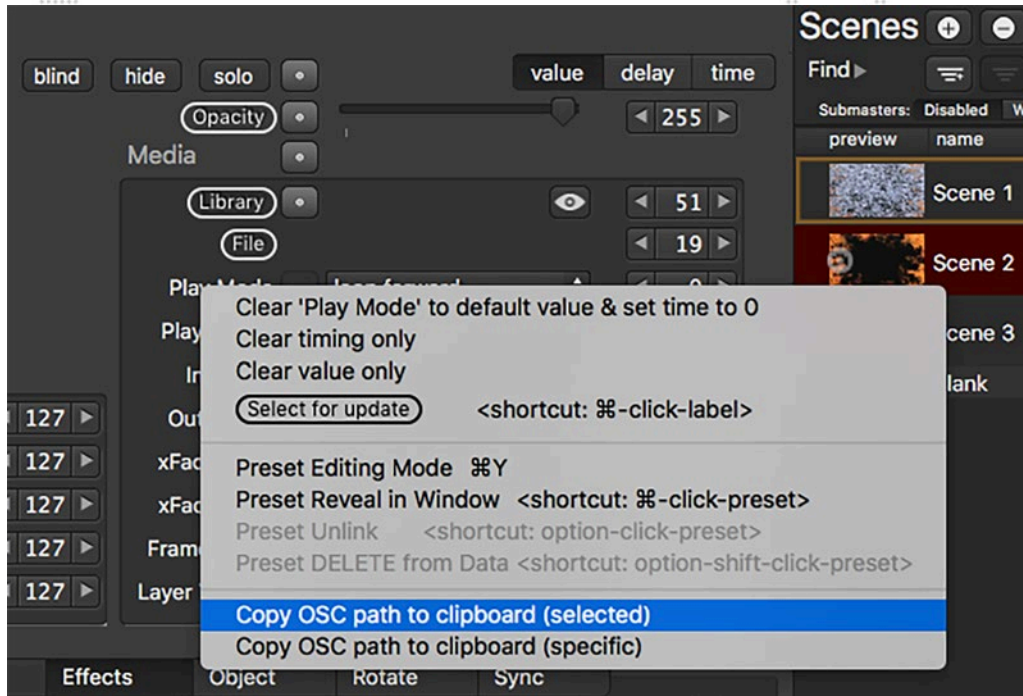
OSC syntax examples:

path                                value range    description
/md                                (no value)    resend feedback for all OSC
parameters
/md/menu/layer1                    1.0            select only layer 1
/md/menu/layer1+                   0.0 or 1.0     toggle selection of layer 1
/md/menu/server1+                  0.0 or 1.0     toggle selection of server 1
/md/selected/opacity               0.0 to 1.0     set opacity for selected layer.
/md/server1/layer1/opacity         0.0 to 1.0     set opacity for server 1, layer 1.
/md/server1/master/intensity       0.0 to 1.0     set intensity for server 1, global
master.
/md/server1/outputmaster1/intensity 0.0 to 1.0     set intensity for server 1, output
master 1.
/md/menu/nextscene                 (no value)     recall next scene in scene table
/md/scenes/2.1                     (no value)     recall scene with name beginning
with '2.1'
/md/palette/1                      (no value)     recall palette 1
/md/palette/1/time                 (no value)     recall palette 1 with timing
/md/palette/1/timeonly             (no value)     recall palette 1 (timing only, not
values)

labels output:
/md/selected/effect1/label         string         Name of the effect 1
```

To copy an OSC path to clipboard:

Right-click on a parameter name in the main window to copy the appropriate syntax for that parameter (selected or specific) to the computer's clipboard. That syntax can then be pasted into an OSC application. For example, copying 'Playmode' (selected) to the clipboard would result in the following text: `/md/selected/playmode`, and copying 'Playmode' (specific) would result in: `/md/server1/layer5/playmode`, with the appropriate server and layer number used.

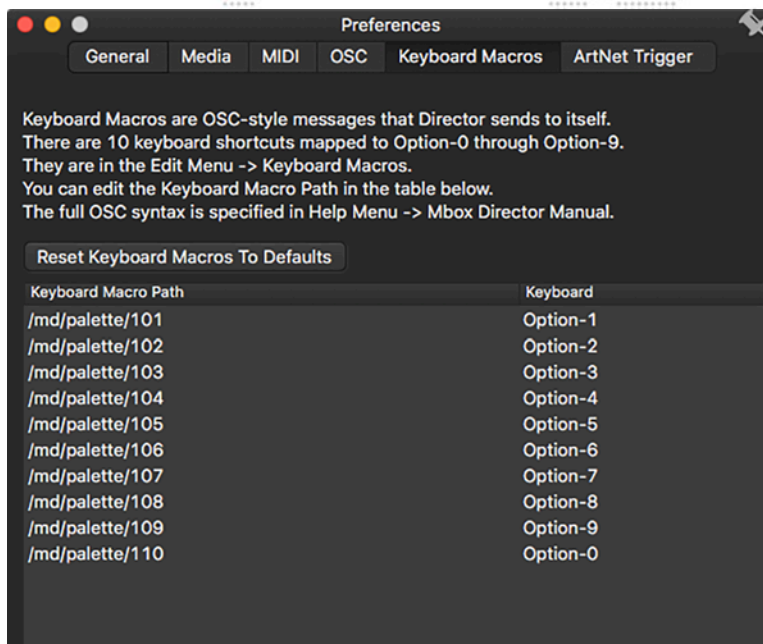


General syntax rules:

- + OSC syntax paths must be ALL lowercase with ALL spaces removed! For example: `/md/palette/1/timeonly`
- + Input and output values, if required, must be a float within the range 0.0 to 1.0 unless you are using the `'/dmx'` suffix (see below). For example: `/md/server1/layer1/opacity/0.5` would set layer 1's opacity to 50% (i.e. 127).
- + Float values are mapped to the range of the parameter where 1.0 = 100%.
- + Alternately, you can add the `'/dmx'` suffix to the path of any layer or master parameter. For example: `/md/server1/layer1/effect1/dmx/56` would set layer 1, effect 1 to a value of 56 (i.e. key - luma).
- + DMX value ranges are either (0 to 255) or (0 to 65535) depending on the range of the parameter being controlled.
- + Paths ending in `'/label'` are for feedback only. OSC applications cannot send labels to Director. For example, if the Effect 'saturation' is selected, then Director will send back the `'/md/selected/effect1/label'` of 'saturation'.
- + Command any master or layer parameter, either for selected layers (e.g. `/md/selected/opacity`) or a specific server/layer (e.g. `/md/server1/layer1/opacity`).
- + Command any main menu item. For example: `/md/menu/nextscene`
- + Recall any palette item by number. For example: `/md/palette/1`
- + Recall any scene by its number (where the scene name begins with a number). For example: `/md/scene/2.1`

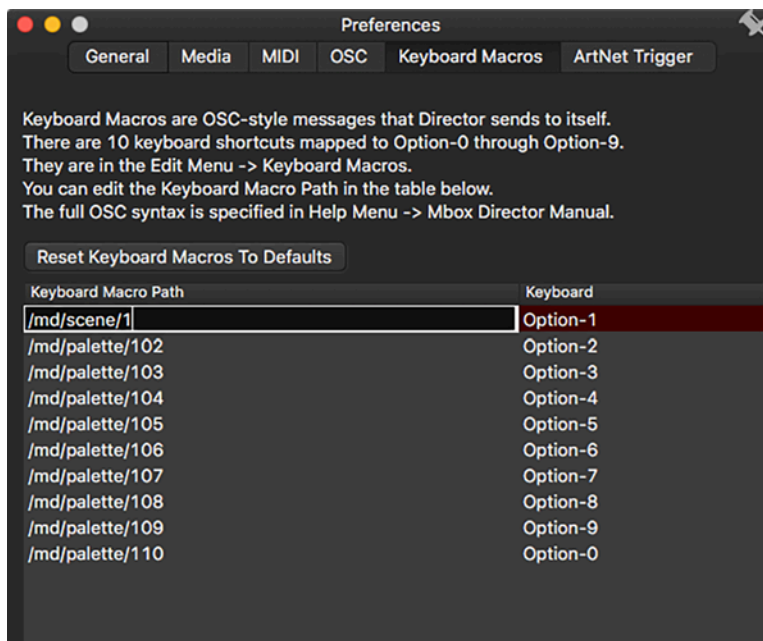
Keyboard Macro Preferences

Mbox Director provides 10 programmable shortcuts that can be used to send internal OSC messages. These shortcuts are mapped to the key combinations [option + 0] through [option + 9], and are also available in the Edit > Keyboard Macros menu. The Keyboard Macros tab can be used to customize these shortcuts.



To customize a keyboard macro:

- Step 1. On the Keyboard Macros tab, click on one of the path field items to edit.
- Step 2. Type in a new path. Follow the OSC syntax rules and examples provided in “OSC Preferences” on page 22.



Art-Net/sACN Trigger Preferences

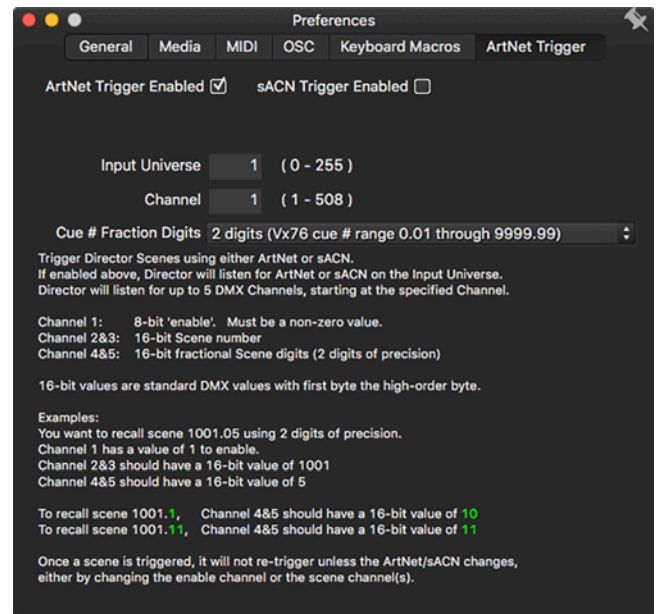
Mbox Director scenes can be triggered using Art-Net or sACN. Incoming values are compared to the numerical values at the beginning of scene names as entered in the scene list. For example, a scene named '1.15) Top of Show' would be triggered by sending the correct values for 1.15.

Note: When entering numerical prefixes for scene names, make sure to leave a space between the numbers and the letters in the scene name for this to function properly. Director will automatically add the ')' character between the prefix and the rest of the scene name.

To use the Trigger feature, it must be enabled at the Art-Net Trigger tab of the Preferences window. When enabled, Director will listen for either Art-Net or sACN (but not both) on a specified Input Universe.

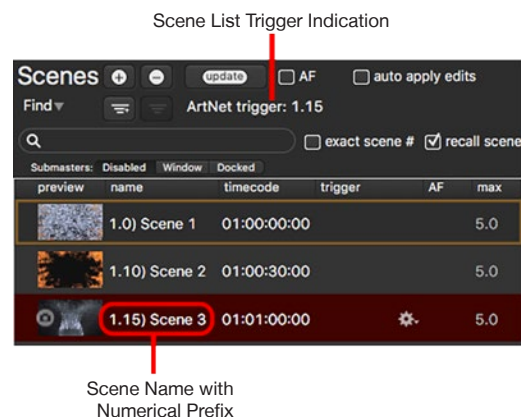
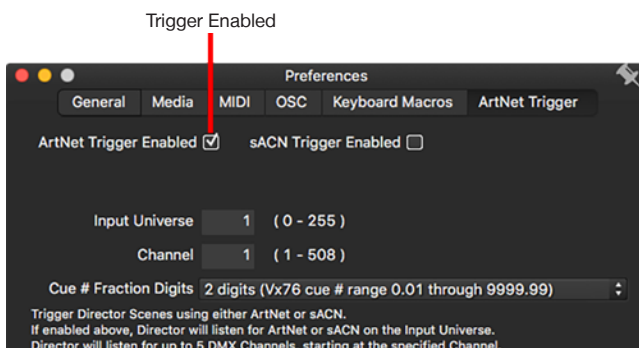
Triggering uses five sequential channels, on the specified universe, starting at the specified channel offset. The five channels are split into three parts: the first channel is used to enable/disable the trigger, the second and third channels provide the scene's number value before the decimal point, and the fourth and fifth channels to provide the scene's fractional value after the decimal point. The numerical values before and after the decimal point are represented by 16-bit numbers (0-65535).

The number before the decimal point is always interpreted literally. However, depending on the setting for Cue # Fraction Digits (see next page), the value after the decimal point will be interpreted differently.



To enable and configure Art-Net trigger:

- Step 1. On the Art-Net Trigger tab, click either the **ArtNet Trigger Enabled** or **sACN Trigger Enabled** checkbox.
- Step 2. In the Input Universe field, enter a universe number from 0 to 255 for Art-Net or 1 to 63,999 for sACN.
- Step 3. In the Channel field, enter a starting channel from 1 to 508.



Guidelines:

- + If the first channel is set to any value greater than 0, and a scene with a name that starts with the trigger number exists in the scene list, then the scene will be recalled and the trigger number will be highlighted.
- + Once a scene is triggered, it will not re-trigger unless the incoming data changes, either by changing the enable channel to a different non-zero value, or by changing the scene number channels to different values and then returning them to the values to trigger the original scene.
- + Director can handle rapid triggering of multiple scenes if the desire is to trigger scene chases from the console, however, avoid applying timing to these channels on the console.
- + If errors are encountered, they will be displayed as warnings. Refer to “Art-Net/sACN Trigger Errors” on page 102.

Cue # Fraction Digits

The Cue # Fraction Digits is a required setting which is used to control how Director converts the incoming data from the fourth and fifth channels’ combined 16-bit value into the scene number’s fractional value. The Cue # Fraction Digits setting is selected using the pop-up menu.

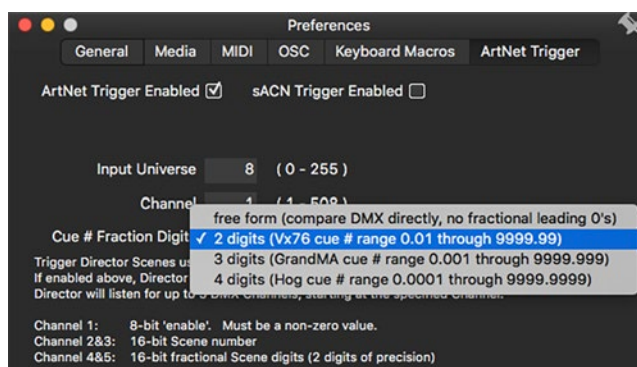
There are four possible selections on the Cue # Fraction Digits pop-up: free form, 2 digits, 3 digits, and 4 digits. The 2, 3, and 4 digit options can be used to make exact numerical matches to cue numbering sequences on lighting consoles. Console cue sequences typically use a system based on how computers count (e.g. 1.0, 1.01, 1.02... ..1.09, 1.1 and so on) without trailing zeros. When using one of these modes, the incoming Art-Net values will be interpreted differently depending on the mode selected (see the examples below for details).

If you would like to use scene triggers where the number after the decimal point follows a natural counting order (e.g. 1.8, 1.9, 1.10, 1.11 and so on), you can use the “free form” option. The following guidelines apply to the free form option:

- + Free form simply compares incoming numerical values to those used in the scene names.
- + Free form does not allow you to use fractions with leading zeros such as “.01” or “.001”.
- + Fractions in the scene number must have trailing zeros to be triggered by incoming fractional values with trailing zeros.

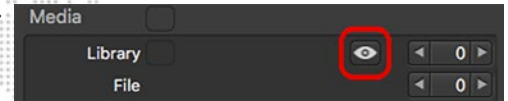
The other three modes affect how the numerical values after the decimal point are interpreted with respect to leading zeros:

- + Free form: value of “1” represents “.1”, value of “10” represents “.10”
- + 2 digits: value of “1” represents “.01”, value of “10” represents “.1”
- + 3 digits: value of “1” represents “.001”, value of “100” represents “.1”
- + 4 digits: value of “1” represents “.0001”, value of “1000” represents “.1”



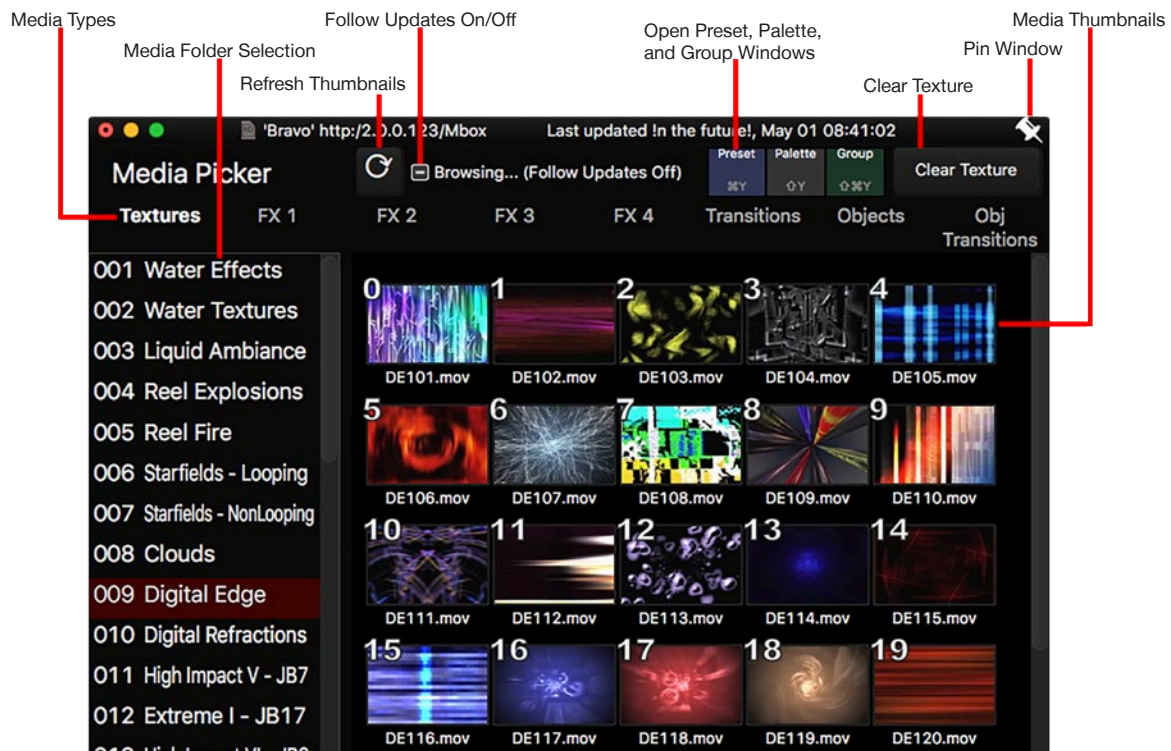
Media Picker

The Media Picker is used to select media content for layers. The Media Picker can be opened by clicking the “eye” icon in the Media section of the Mbox Director window.




The Media Picker displays the media content files available in the Mbox server library. These consist of textures, effects, transitions, and objects. It will display the standard Mbox library along with any custom files that may have been added to the server(s). (Refer to the Mbox Media Server User Manual for more information on media types and the library configuration.)

When more than one Mbox server is connected, you can fetch thumbnails from both servers. In this case, the Media Picker dynamically displays the content of whichever server is selected in the browser.

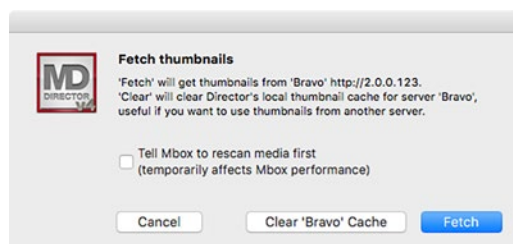


- + **Refresh Thumbnails** - Mbox Daemon automatically generates thumbnails of the media on each server. Director can show the thumbs for each connected Mbox server. After they have been generated and “fetched” by Mbox Director, the thumbnails will be displayed in the Media Picker any time it is opened. To refresh the thumbnails (e.g. if content has been added to an Mbox server) in the Media Picker window, click the Refresh Thumbnails button.
- + **Follow Updates On/Off** - When this feature is enabled, the Media Picker window will follow the media selection (library and file) of the current layer on the current server. Note: When browsing content, ‘Follow Updates’ automatically turns off. The shortcut for turning it back on is [⇧⌘T].
- + **Preset** - Pressing this button opens the Preset window. (Refer to “Presets” on page 68)
- + **Palette** - Pressing this button opens the Palette window. (Refer to “Palettes” on page 74)
- + **Group** - Pressing this button opens the Group window. (Refer to “Groups” on page 77)
- + **Clear Texture** - This button’s label and function changes depending on which Media Type tab is selected - e.g. if the ‘FX 1’ tab is selected, the button would ‘Clear FX 1’ of the selected Layer(s).

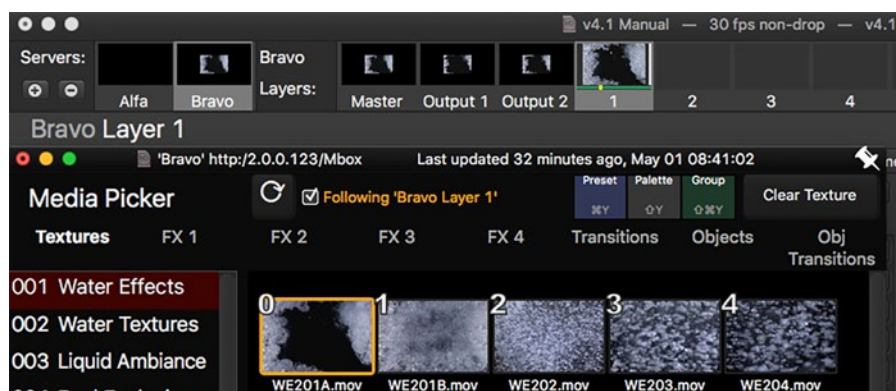
 To keep the Media Picker window on top, be sure the HUD setting is checked in the Preferences window (Refer to “Media Preferences” on page 21) or click the pin icon in the upper-right corner.

Fetching Thumbnails

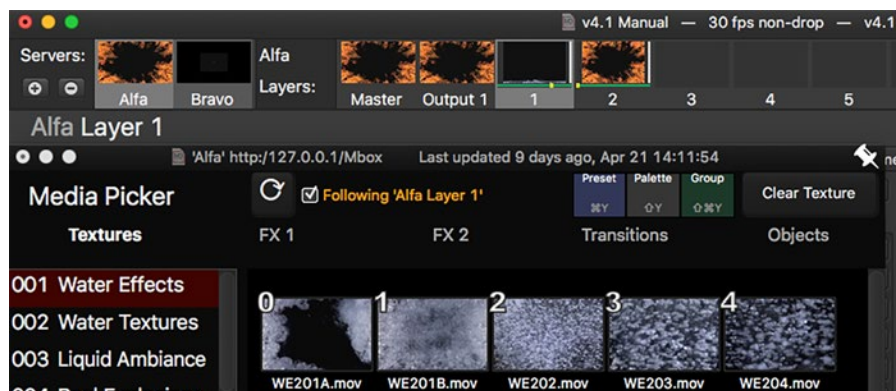
When the Refresh Thumbnails button is clicked, the Fetch Thumbnails window will appear. If media has recently been added/changed/deleted, checking the box will force Mbox to perform a rescan after which thumbnails will be built automatically and then fetched by Director.



When more than one server is patched, but only one server is selected, the Media Picker will display the content of the selected server and layer in the browser as shown below:



When two or more servers are selected, the Media Picker will display the content of the server and layer that was selected first in the browser (this server's highlight color will be brighter than that of other selected servers) as shown below:



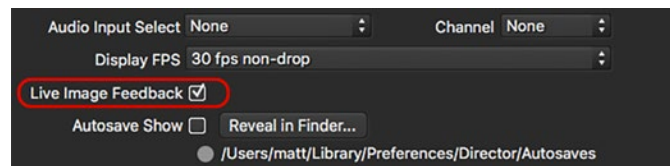
Enabling Feedback

Mbox Director is able to show live feedback of the content playing on each layer of the Mbox server and the composited imagery for each output and the Global Surface. In order to show feedback, the Mbox application must be running on the Mbox server and the server must be have a network connection to the computer running Mbox Director. Unlike with older versions of the Mbox software, the new Mbox software does not have to be on a specific tab or in fullscreen mode to send live feedback to Director.

Note: Mbox will only output live feedback from outputs that have an output master. One or more output masters must be enabled on the Patch tab of the Mbox application and the output must be associated with one of the output masters.

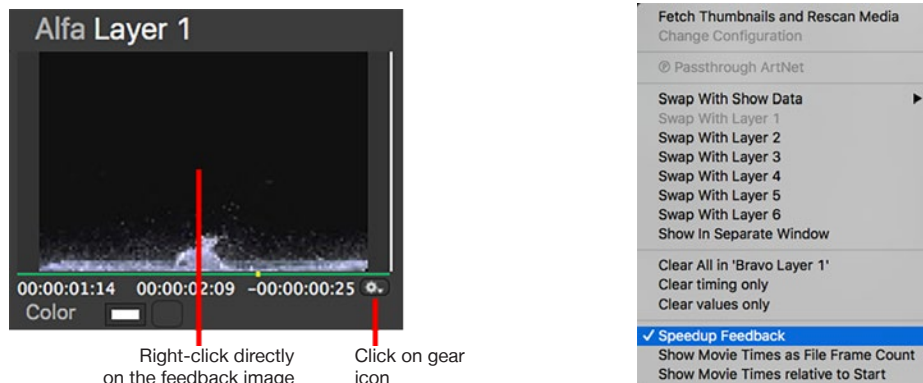
There are two preferences that affect feedback in Mbox Director:

- + On the General tab of Directors Preference window, the Live Image Feedback checkbox enables/disables all feedback for the Director application.



- + The feedback framerate can be increased to provide smoother imagery. Enabling the “Speedup Feedback” option causes Director to ask for feedback at a rate of 30fps, much faster than normal. Speeding up the feedback can have a negative impact on both Mbox server performance and network bandwidth, so this preference should be used with caution.

To Enable the Speedup Feedback option, either right-click on the feedback image for a layer, output, or Global Surface, or click on the gear icon below and to the right of one of these images. This will open a contextual menu where the option can be enabled. Because of the possible performance impact, this setting will automatically be disabled after one hour.



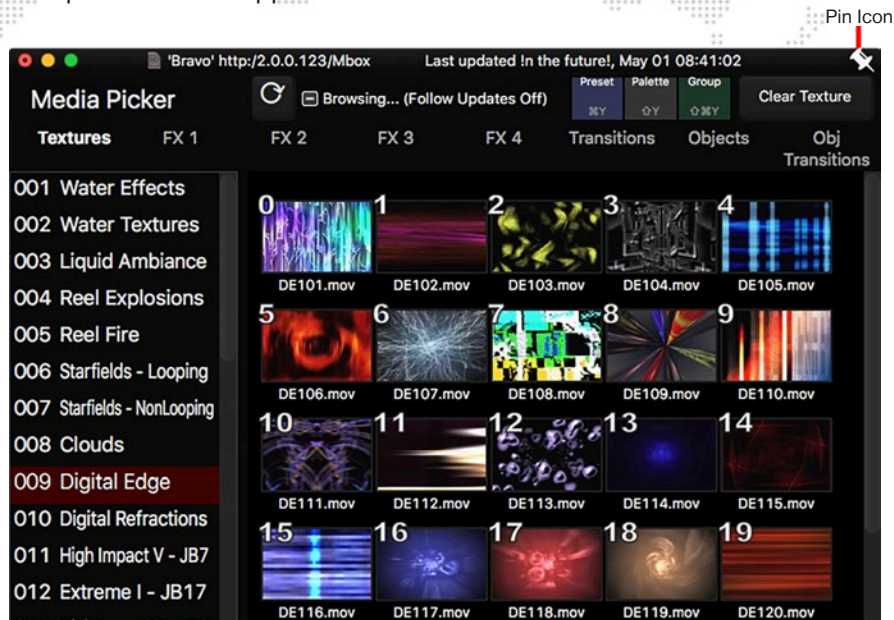
Using Fullscreen Mode in Local Configurations

If Mbox Director and Mbox are running on the same computer, and Mbox will be used in Fullscreen mode, the Mbox Director application must run on the primary display of the computer. This is the display with the menu bar and dock. If Director is on another display and Mbox is in fullscreen mode, many of the keyboard and menu commands within Director will not be available for use.

Pinning Windows

Windows with the pin icon can be “pinned” so that they stay in front of other windows.

To pin a window, click on its pin icon in the upper-left corner.



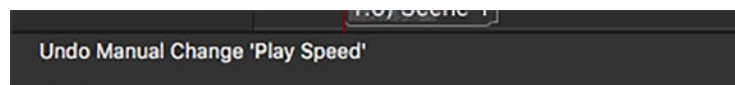
Undo/Redo

Mbox Director supports a robust, unlimited undo/redo system. Undo/Redo is not only useful to back out of any unwanted changes, but it's a great tool for exploring Mbox features, since it's always possible get back to the previous look if undesired changes have been made.

The following edits can be undone:

- + Scene list edits.
- + Mbox Master/Layer parameter edits (including manual parameter changes).
- + Timeline edits.
- + Palette edits.

When the [⌘Z] and [⇧⌘Z] shortcuts are used to undo/redo, the info bar below the timeline, at the bottom of the main window will display what is being undone or redone:



Changes that are not reversible:

- + Mbox server configuration changes (adding/deleting servers, and the Change Configuration window accessible via right-click on a server).
- + Mbox Remote settings (the window accessible via right-click on a server).
- + Application preferences.

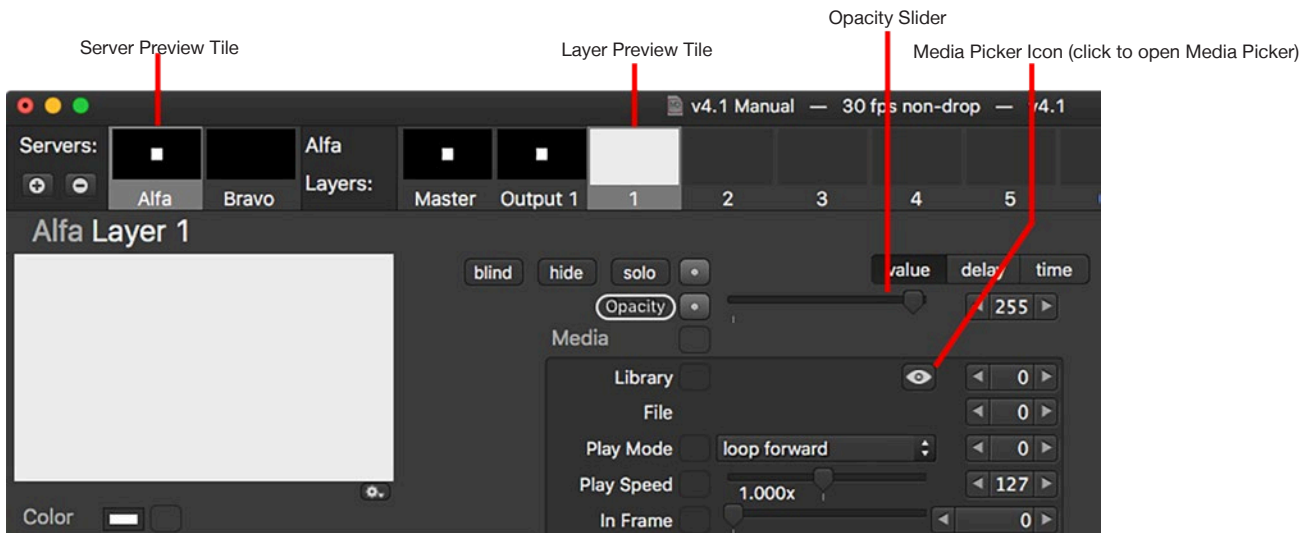
QUICK START

Up and Running

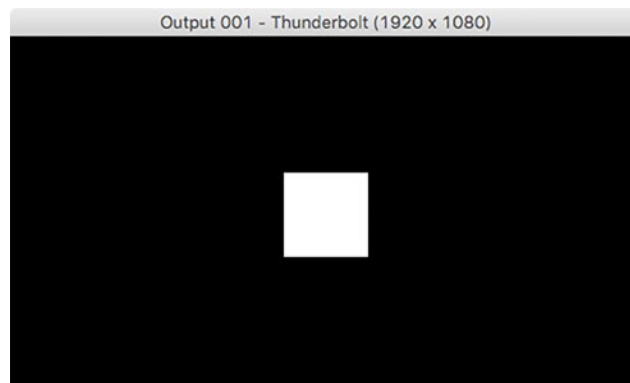
Mbox Director is a powerful program which can be used to configure an extensive number of layer parameters and scenes. However, it is not difficult to quickly select some media content and display it in the Mbox server window. Once basic operation becomes familiar and it has been verified that the media will play on the Mbox server, scenes can be created with more complex layer configurations.

Quick Start:

- Step 1. Install Mbox Director and set up proper communication between the application and at least one Mbox server. Refer to **“Installation and Setup”** on page 4.
- Step 2. Be sure that both the Mbox Director and Mbox applications are running.
- Step 3. On the Mbox Director window, click on the preview tile for an Mbox server and then click on the Layer 1 preview tile.



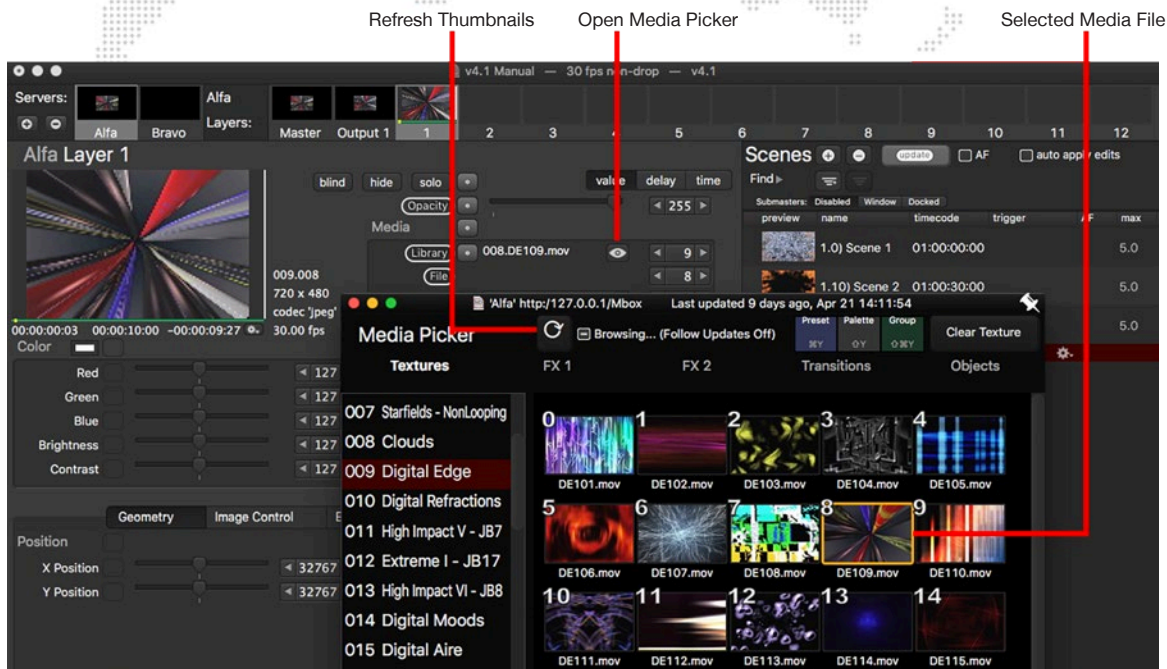
- Step 4. Use the opacity slider control to raise the layer's opacity to full (255).
- Step 5. At this point, Mbox should be displaying a white box (this is provided the white square has not been disabled - refer to the Mbox user manual for more information).



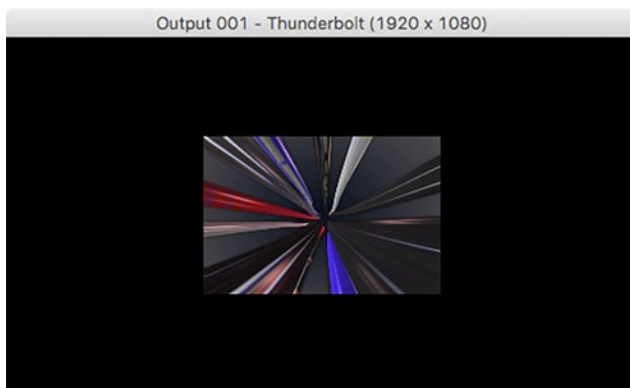
Step 6. Open the Media Picker by clicking on the “eye” icon.

Step 7. If thumbnails are not visible in the Media Picker, press the Refresh Thumbnails button. Wait for thumbnails to appear.

Step 8. Select a texture by clicking directly on its thumbnail.



Step 9. Return to Mbox to view results. The selected texture should be visible.

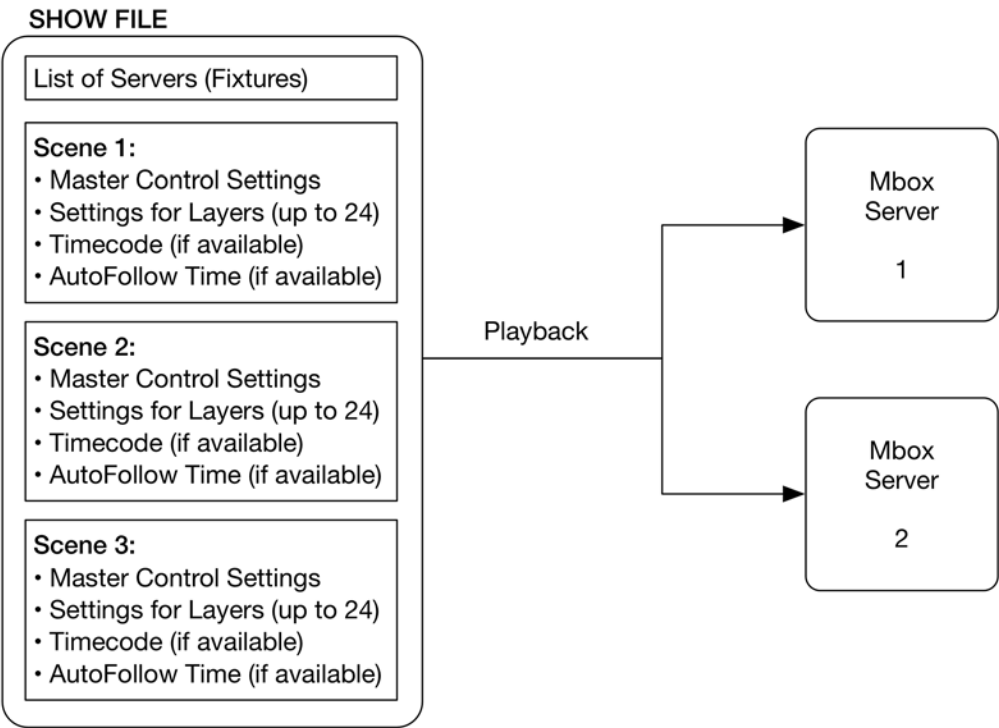


CREATING SHOWS

About Show Files

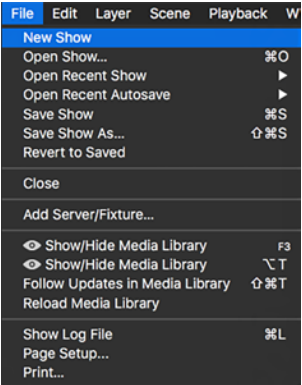
A *show file* is a series of media events which can be played back on one or more Mbox servers. The playback events are organized into “scenes,” which are stored in the show file. A *scene* is a pre-programmed event which defines what happens on each layer during playback. The show file also stores the list of configured servers (fixtures) where the scenes will be played back.

The following diagram illustrates the concept of a show file. In this example, the show file contains three (3) scenes which are configured to run on two (2) Mbox servers.



Creating, Opening and Saving Show Files

Show files are stored on the Mac hard drive and can be opened and/or edited at any time. Use the options at the File menu to create new show files, open existing show files or save show files. Show files can also be copied from one computer to another for use on different Mbox Director setups. Use the Mac Finder to copy files to portable devices such as USB flash drives.

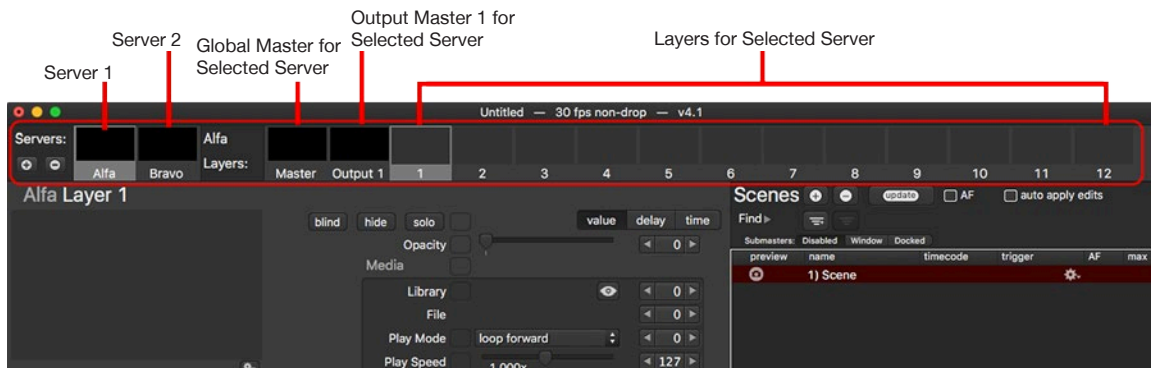


Changing Between Servers

When Mbox Director is connected to multiple Mbox servers, each server will have a preview tile in the main window.

To change between servers, click the server's preview tile or press command [⌘] + a number [1 - #] to select the corresponding server. The window will now display the Global Master, output master(s), and active layers for that server.

- + Each server's total number of output masters and layers was defined when the server (fixture) was added to Mbox Director. These quantities can be changed, but adding or removing output masters and/or layers may affect existing scenes.



The keyboard can also be used to switch between the Global Master, output master, and layers. For the selected server, press number keys 1-24 to select different layers or press ^⌘ and number keys to select different output masters. Press 0 to select the global master.

Adjusting Parameters on the Global Master or Output Masters

Each Mbox server has a Global Master with parameters that affect overall output of the server. Global Master parameters include: Global Intensity, HUD and Macro Control, Global Audio Volume, and Pixel Mapping Intensity. For more information on these parameters, refer to the Mbox Media Server User Manual.

Mbox servers also have at least one Output Master with parameters that affect an output of the server. One or more outputs can respond to an output master, but an output does not have to have an output master. Output master parameters include: Output Intensity, Color, Brightness and Contrast, Effects, Geometry, Keystone, and 3D Camera.

Global and Output Master parameter values can be edited in the Mbox Director window.

To adjust the Global Master parameter values:

- Step 1. Select the desired server by clicking on its preview tile.
- Step 2. Select the Global Master preview tile.
- Step 3. Adjust parameters using sliders, pop-ups, arrow buttons, or numeric fields.

To adjust output master parameter values:

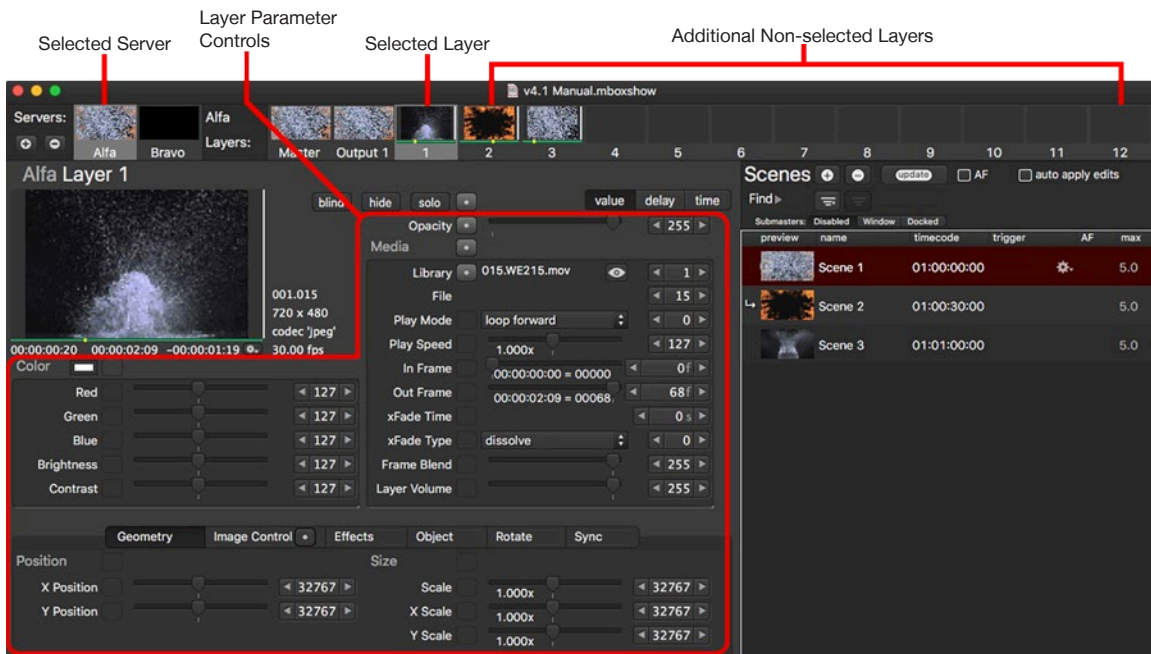
- Step 1. Select the desired server by clicking on its preview tile.
- Step 2. Select an output master preview tile.
- Step 3. Adjust parameters using sliders, pop-ups, arrow buttons, or numeric fields.

Adding Content to Layers

Each server has a predefined number of active layers. Each layer has its own visual content and parameters that affect that content. Content can include still images, movies, and 3D objects. Parameters include options such as: opacity, color, brightness and contrast, position, rotations, and so on. The composite imagery created by all layers together results in the final “look” of the server’s outputs. Looks can then be saved as a scene and recalled as part of a show.

Guidelines:

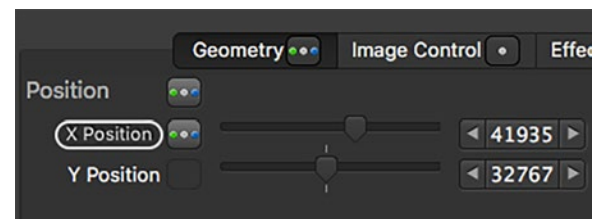
- + A layer must have an opacity level above 0 to be visible. The default Opacity setting is 0, therefore this must be changed before the layer’s content will appear. The opacity can be set to a level between 0 (not visible) and 255 (full).
- + The lowest-numbered layer is in the background, behind higher-numbered layers. For example, in a three layer configuration Layer 1 would be at the very back, Layer 2 in the middle, and Layer 3 at the front.
- + To switch between layers, click the layer’s preview tile. Director’s main window will now display the various parameters for that particular layer.
- + Once content has been added to a layer and the layer’s opacity brought above 0, the layer’s preview tile will display the imagery on that layer.



Parameter Value/Fade/Delay Modification Indicators

To the right of each parameter or parameter group name is a button that can be used to reset the parameters’ values and timing to their defaults. Colored dots on the button indicate which values have been modified from default. A WHITE dot indicates a change from the default parameter value. A BLUE dot indicates a change from the default delay time. A GREEN dot indicates a change from the default fade time.

- + Click a button to return to default value and time/delay. Note: Buttons on parameter group tabs require a right-click.
- + Press and hold [⌘] while clicking a button to reset time/delay only.
- + Press and hold [⇧] while clicking a button to reset parameter value only.








To customize layers:

- Step 1. Select desired server by clicking on its preview tile. Any active layers will show in the layer preview tiles.
- Step 2. Select desired layer by clicking on its preview tile.
- Step 3. Using the Opacity slider, raise the layer's opacity to a level above 0. (255 is full.)
- Step 4. Add content to the layer as follows:
 - a. Open the Media Picker window by clicking on the “eye” icon.
 - b. If thumbnails are not visible, press Refresh Thumbnails button.
 - c. Select a media file by clicking directly on its thumbnail. A preview of the selected media will appear in the layer's media preview area, above the color parameter controls.
 - d. Close the Media Picker window or move it out of the way.
- Step 5. Adjust the layer's parameters using sliders, pop-ups, arrow buttons and/or numeric fields. Note that in order for a current numerical entry to be accepted, the [tab] or [return] key must be pressed.

Note: Some changes, such as objects and image remapping, will not show up in the layer's media preview.

 All parameter values can also be modified using direct numeric entry. At any numerical field, use the arrow buttons or click on the numerical value then enter a value on the keyboard.

 Pressing [tab] after entering numerical data will cause the value to be accepted and the edit action to move to the next field, allowing for quick edits to sequential parameters. Pressing [return] will accept the entry but finish the edit action and stay in the current field.

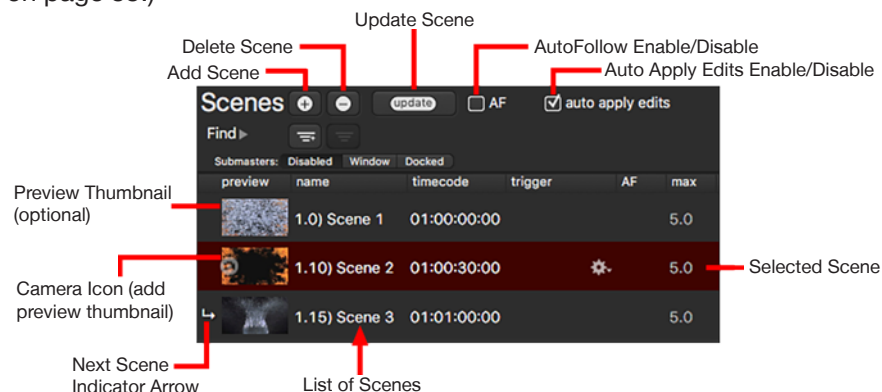
 Click on any numerical field and drag either left or right to increase or decrease the parameter value. Press and hold the control [⌘] key to slow down the adjustment speed, or the shift [⇧] key to speed up the adjustment speed.

Creating and Editing Scenes

A *scene* is a pre-programmed event which defines what happens on each layer during playback. Each scene contains the pre-programmed parameter, fade time, and delay time for the Global Master, output master(s), and layer parameters of all servers in the show. Scenes can be named and played back in sequence using manual control, autofollow times, or the timeline. In addition, they may be triggered using MIDI, OSC, or Art-Net/sACN.

Guidelines:

- + Each scene stores all data for all servers, all outputs, all layers, all the time. This is sometimes referred to as a “snapshot” method of data storage.
- + In order to successfully recall a stored scene on an Mbox server, the server should be connected and properly synchronized before the scene recall begins.
- + If a new Mbox server (fixture) is added to the showfile after a scene has been programmed, that scene will have no parameter data for the new server. In such cases, Director will therefore only send default values (i.e., a black screen). After a server is added, scenes must be updated to include parameter data for that server.
- + When editing a scene, first select the scene in the Scene list. Selecting a scene will cause it to be recalled. Therefore, all edits are typically made “live.” However, Director does provide a Blind editing mode - Refer to “**Blind Mode**” on page 86 for more information.
- + The order of scenes in the scene list does not need to be sorted sequentially by time (timecode entries), so they can be recalled or edited in any order. However, the scenes will always be shown in time order in the timeline. (Refer to “**Timeline Overview**” on page 55.)

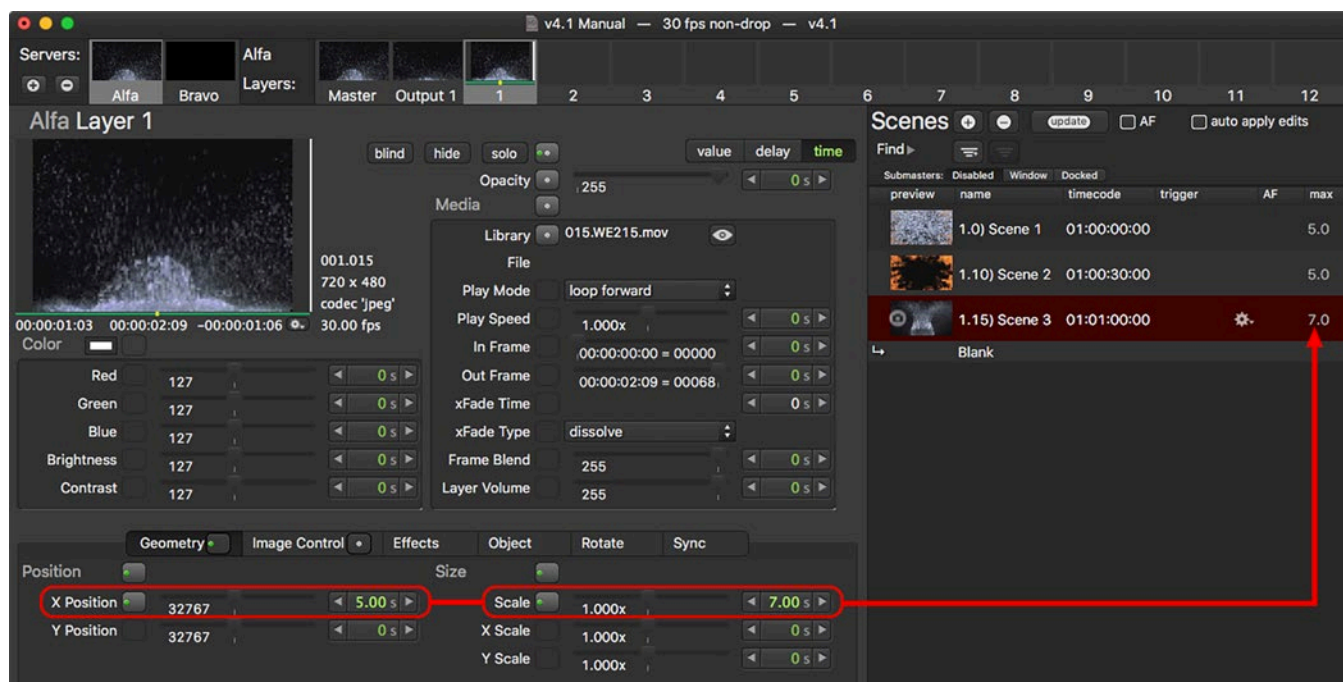


Button and Checkbox Overview:

- + **Add Scene** - To create a new scene, click the Add [+] button. The scene will be added after the currently selected scene and will hold the current state of all parameters and timing. If no scene is selected, then it will be added at the end of the list.
- + **Delete Scene** - To delete a scene, select it in the list, then click the Delete [-] button.
- + **Update Scene** - To update the selected scene, press the Update button. This will save all current changes (parameter values and timing) to the scene.
- + **Camera Icon** - To add or update a scene’s preview thumbnail, click on the camera icon to the left of the scene name. The thumbnail image will be the same as the image currently displayed in the selected server’s preview tile.
- + **AutoFollow (AF)** - If AF is checked, autofollow times will execute when the scene is recalled (unless a timecode value has been specified for the scene, in which case autofollows will be ignored).
- + **Auto Apply Edits** - When this box is checked, manual changes will be immediately saved to the currently selected scene and pressing the Update button is not necessary.

Scene List Columns:

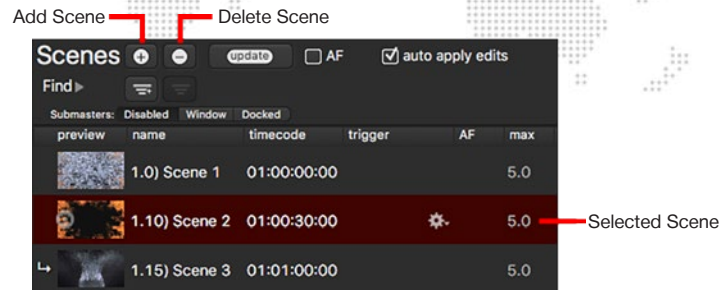
- + **preview** - If a preview image has been created, it will be shown here.
- + **name** - Specifies a user-defined name for the scene. To enter a name, click in the Name field. Names can include both letters and numbers. If the name begins with numbers and a space, Director will automatically format this as a scene number by adding a ')' between the numbers and the letters. Refer to [“Art-Net/sACN Trigger Preferences”](#) on page 26 for more information on scene numbering.
- + **timecode** - Specifies starting point for a scene when running timecode. To enter timecode, click in the timecode field. Use the following format: <Hours>:<Minutes>:<Seconds>:<Frames>
- + **trigger** - Clicking on the gear icon will show a drop-down menu that provides the trigger options. Enabling a trigger allows a scene to be recalled by one of three trigger types: MIDI Show Control, MIDI Control Change, and MIDI Note.
- + **AF (AutoFollow)** - Specifies an autofollow time. To enter a time, click in the AF field. Format: <Minutes>:<Seconds> or <Seconds>
- + **max** - This is the computed maximum fade time of all parameters in the scene, in seconds. If there are no timed fades, this will be blank. This field is not editable in the scene list, but as parameters in the scene are given (crossfade) time values this value will change to display the longest fade time. For example, if you have an X Position time of 5 seconds and a Scale time of 7 seconds, then the 7 second time would be used/displayed in the max field.



Note: Right-clicking on a scene in the scene list will open a contextual menu that shows many options for modifying the selected scene. Refer to ["Contextual Menus"](#) on page 88 for more information on this contextual menu.

Adding or Deleting Scenes

When starting a new show, the scene list starts with one scene labeled “1st Scene.” This scene can be renamed or deleted as desired.



To add a scene:

- Step 1. In the scene list, uncheck the “Auto Apply Edits” box or click on the <deselect> button at the bottom of the scene list to deselect the current scene.
- Step 2. Select a fixture and configure layers as desired. (Refer to [“Adding Content to Layers”](#) on page 36.)
- Step 3. In the scene list, click the Add [+] button to add new scene. All current parameter information for all servers will be stored in the new scene.
- Step 4. Click on the Name field to enter a custom name.

To delete a scene:

- Step 1. In the scene list, select a scene to be deleted. The scene will be recalled.
- Step 2. Click the Delete [-] button. Scene will be removed from the list.

Note: The first time a scene is deleted an alert will appear. The alert provides options for deleting the scene and/or its preview, or just removing the scene from the timeline. This alert can be disabled so it does not appear again.

To copy/paste scenes:

Beginning in Director v4.2.1 it is possible to copy and paste scenes in the scene list.

- Step 1. Using shift-click or command-click, select one or more scenes in the scene list.
- Step 2. Press [⌘C] to copy the selected scene(s).
- Step 3. Select a scene in the scene list, then press [⌘V] to paste the copied scene(s) after the selected scene.

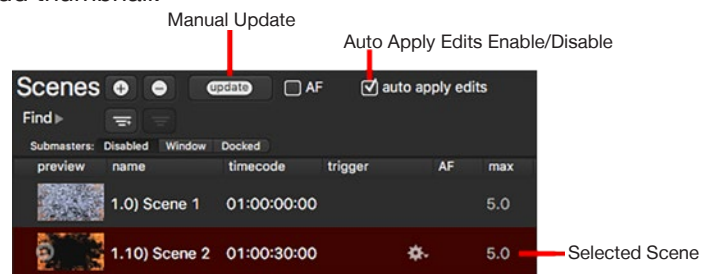
To add a preview thumbnail:

The preview thumbnail will be the same as the image being displayed in the selected server’s preview tile.

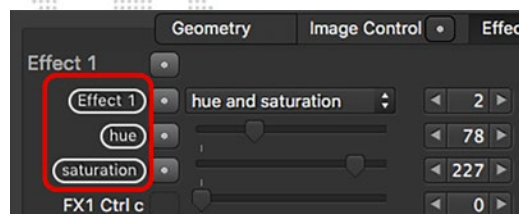
- + Click the camera icon at the left of the scene name to add thumbnail.

Editing Scenes

The scene list can be configured to automatically save changes using the Auto Apply Edits checkbox. If this box is not checked, then the manual Update button will need to be pressed in order to save any changes.



When scenes are being edited with Auto Apply Edits disabled, Director will circle the names of all parameters that have been changed from the current scene's stored value and that will be changed if the manual Update button is pressed.



To edit an existing scene with manual update (Auto Apply Edits Disabled):

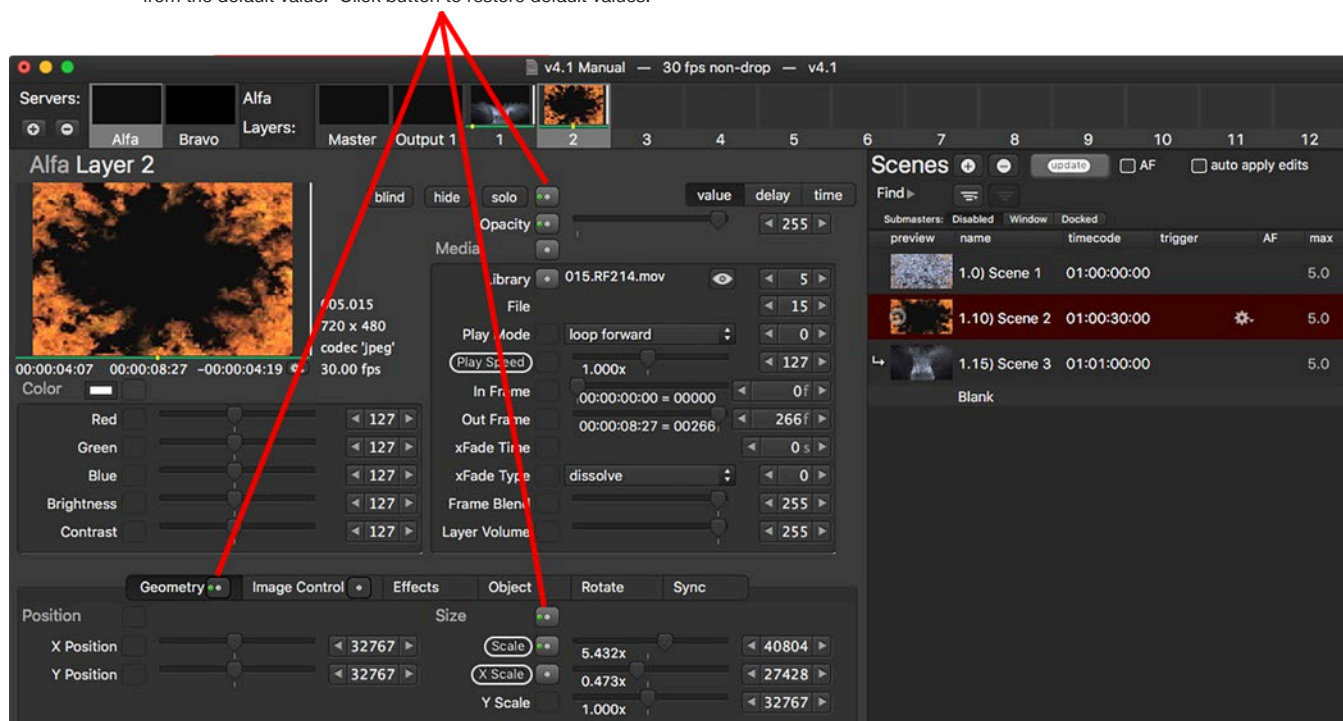
- Step 1. In the scene list, select the scene to be edited. The scene will be recalled.
- Step 2. Make changes to layer content and parameters. (Director will circle the parameters that have changed.)
- Step 3. In the scene list, click the Update button.

To edit an existing scene while Auto Apply Edits is enabled:

- Step 1. In the scene list, select required scene. The scene will be recalled.
- Step 2. Make changes to parameter values and timing. While the Auto Apply Edits box is checked, all changes will be saved to the selected scene immediately.

Note: A white, green, and/or blue dot on the button to the right of a parameter's name indicates that the parameter's value or timing has been changed from its default value. To reset the parameter's value and/or timing to its default value, click the button. The button above the Opacity slider and to the right of the Solo button can be used to reset ALL fixture values to their default. Refer to ["Parameter Modification Indicators"](#) on page 36 for more information on the indicator dots and their meanings.

Parameter Value/Timing Reset Button - Colored dots indicate a change from the default value. Click button to restore default values.



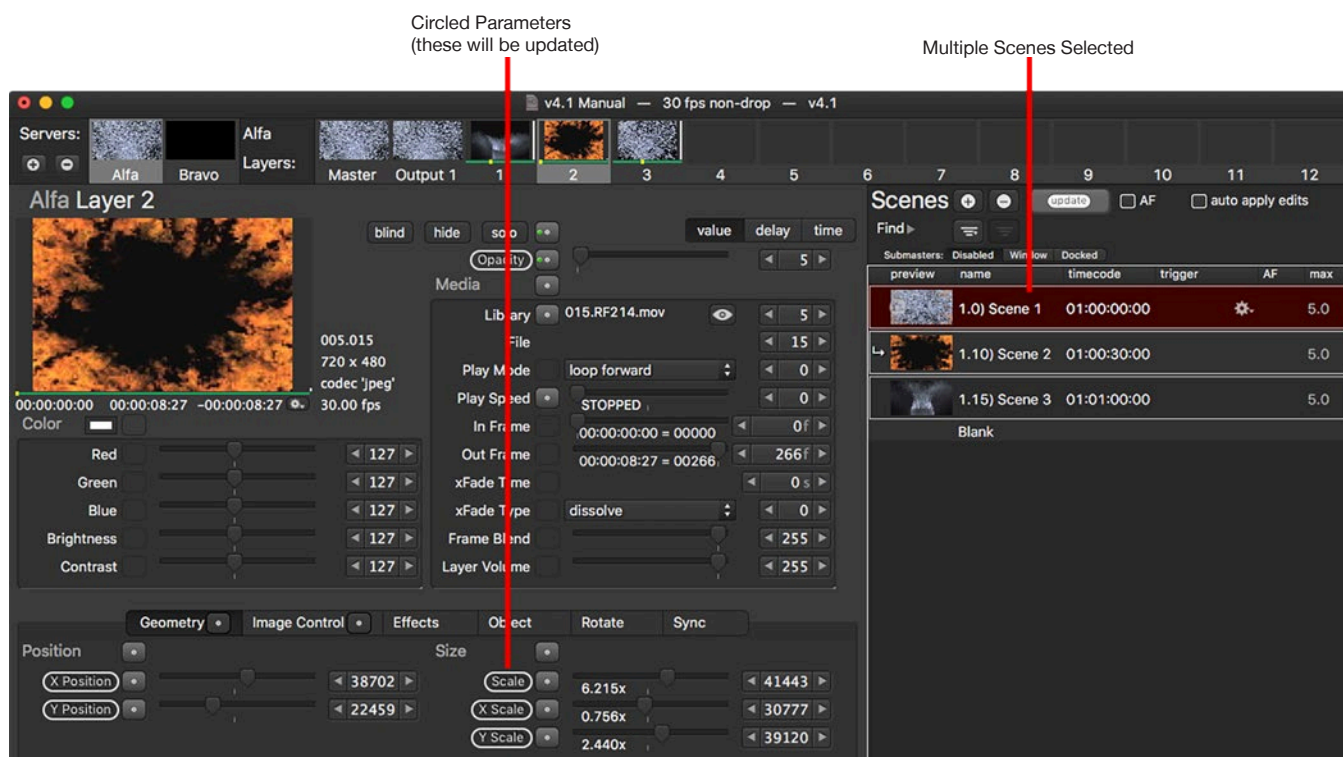
Editing Multiple Scenes

Multiple scenes may be edited at one time when multiple scenes are selected in the scene list.

To select multiple scenes, use [shift] or [command] while selecting two or more scenes in the list. Each of the selected scenes will have a white rectangle drawn around its boundary.

Guidelines:

- + When multiple scenes are selected, Director will circle the parameters that will be changed in the event of an update.
- + All edits to multiple scenes require a manual update, even if the Auto Apply Edits checkbox is checked. It will be necessary to click the Update button in order to save the changes to the scenes.
- + If a change is made to a timing value while the Time tab is active and you switch back to the Value tab before saving the change, Director will still circle the parameter's name to indicate that a change is pending. The new time value will only be saved when the Update button is pressed.



Update Specific Parameter Changes in Multiple Scenes:

Changes made to one scene can also be saved to additional scenes using the multiple selection feature.

- Step 1. Select a scene and make the necessary changes. Director will circle the parameters that will be changed.
- Step 2. Select multiple scenes in the scene list.
- Step 3. Click Update to save changes.

Note: Press and hold the command key [⌘] while clicking on a parameter's label to revert the parameter's value to the value stored in the selected scene. Similarly, you can command-click on the labels of unmodified parameters to quickly mark them for update.

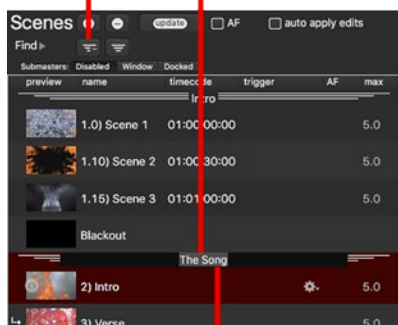
Separators

Two or more sequential scenes can be organized into groups using “separators.” The separators can be labeled and will provide quick access to the first scene of each group.

To insert a separator:

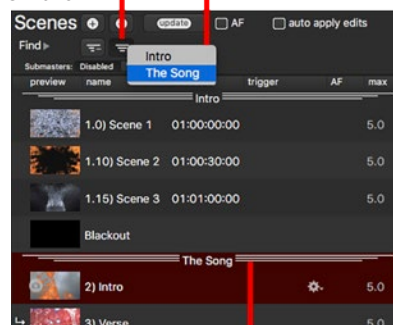
- Step 1. Select the first scene of the group. The separator will be placed above this scene.
- Step 2. Click the Add Separator button. The separator will be inserted.
- Step 3. Click in the separator’s title field to enter a custom name.
- Step 4. Press [return].
- Step 5. To navigate among separators, click on the Separator List button and choose a separator.

Add Separator Enter Separator Title



Separator Name Field

Separator List Button Separator List



Separator Bar

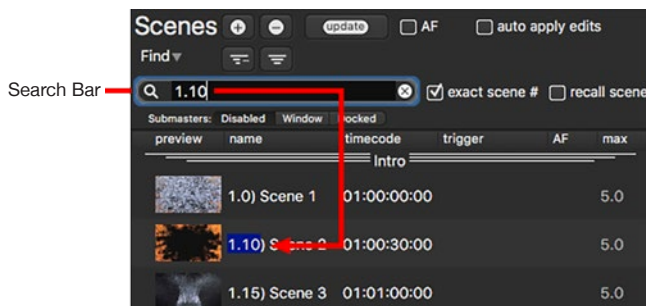
Searching the Scene List (Find)

The Find feature can be used to search the scene list.

- + Scenes can be searched by name and/or number.
- + If the ‘exact scene #’ button is checked, Director will find the scene name which begins with a specific number.
- + If the ‘recall scene’ button is checked, when [return] is pressed Director will recall the scene that is found.

To search:

- Step 1. Press [⌘F] or click on the disclosure arrow to the right of Find to reveal the search bar.
- Step 2. Enter a search term (name or number).
- Step 3. Check option boxes as required (exact scene / recall scene).
- Step 4. Press [return] on the keyboard to start the search.



Editing Layers Using Drag and Drop

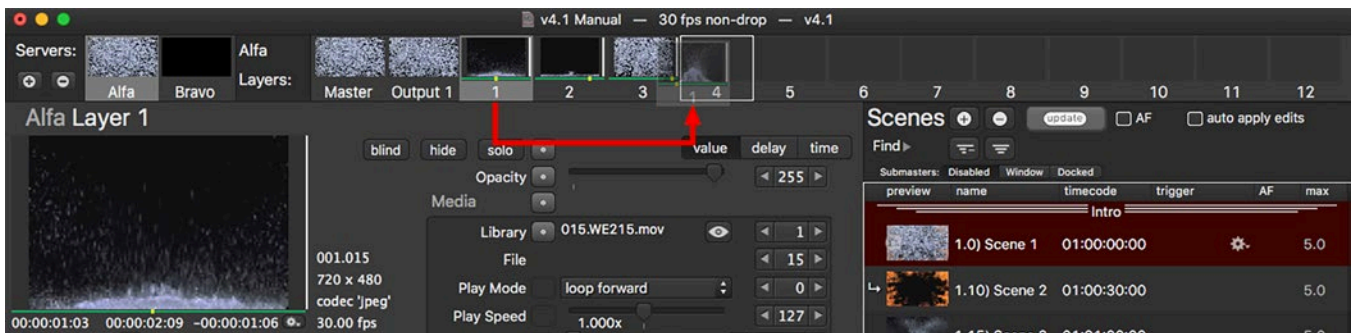
Mbox Director has a drag and drop feature which can be used to create new duplicate layers or copy a layer's parameter settings onto another layer. It can also be used to add layers to scenes.

Duplicating Layers

Duplicate layers can be easily created using drag and drop. The target layer can be blank or have existing data. In either case, an exact copy of the dragged layer will be created in that position. If the layer is blank, it will be new content, if the layer already has data, its data will be overwritten.

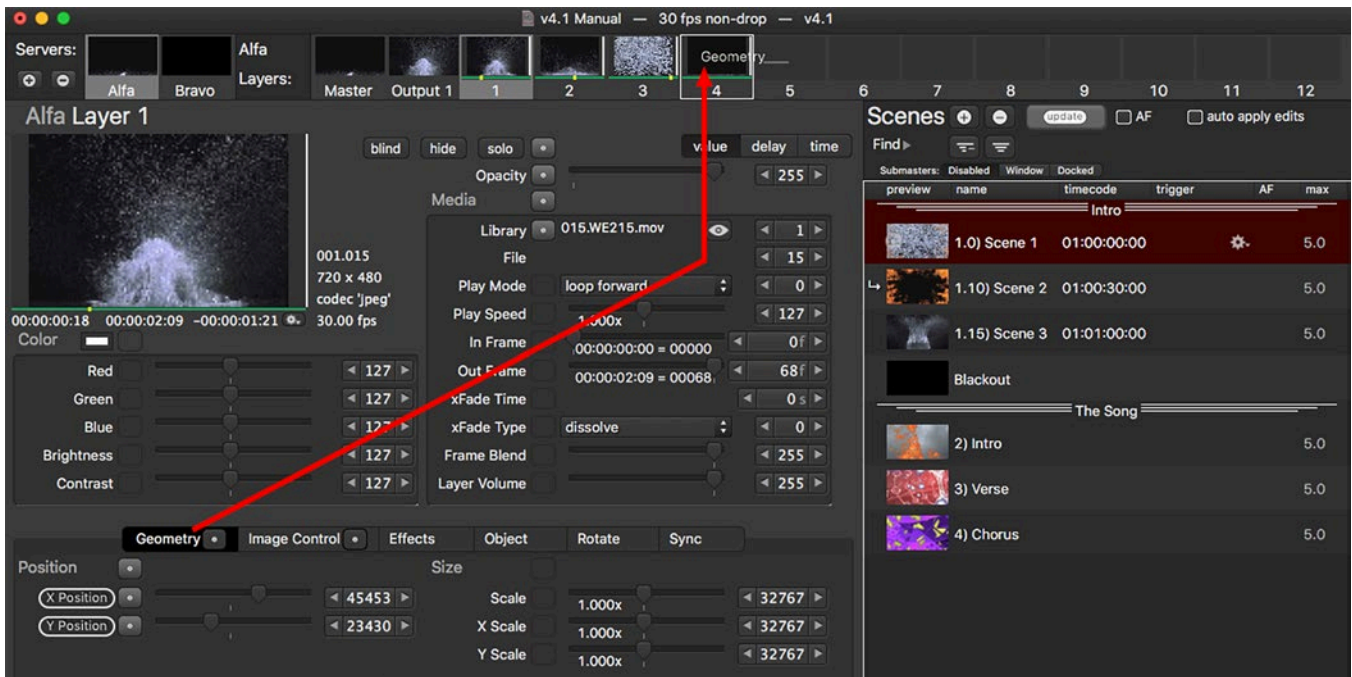
To duplicate a layer on the same server:

- + Using the mouse, click on an existing layer's preview tile then drag and drop it onto the preview tile for a different layer. For example, dragging Layer 1 onto Layer 4 will create an exact copy of Layer 1 on Layer 4.



Copying Parameter Settings From Layer to Layer

Parameter values can be easily copied from one layer to another layer using drag and drop. The target layer's matching parameter values will be replaced with the new dragged parameter values. This feature works for entire parameter groups (e.g. Color, Size, Position, Effects) or individual parameters.



To copy parameter settings to another layer:

- Step 1. Click on a layer preview tile to select a layer that contains the parameter values to be copied.
- Step 2. Using the mouse, click on a parameter group or an individual parameter and drag it up to the target layer's preview tile. For example, dragging the "Geometry" tab of Layer 1 and dropping it on the layer preview tile of Layer 4 will replace all of Layer 3's Geometry parameter values with those of Layer 1.

Note: After copying entire layers or parameter data from one layer to another, if Auto Apply Edits is disabled, the Update button must be pressed to store the changes in the current scene.

Editing Scenes Using Drag and Drop

Entire layers or parameters can be dragged and dropped onto pre-existing scenes in the scene list in order to copy the parameter data into the scene. When copying layers or parameter data into a scene, the changes are stored immediately.

Copying All Layer Parameter Values to a Scene

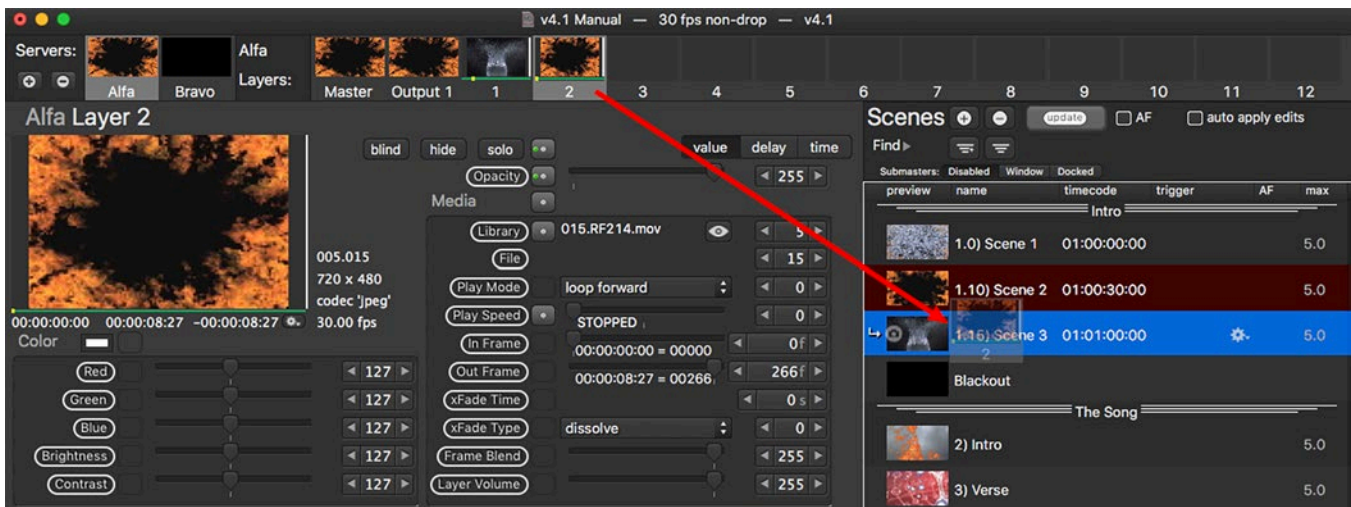
All parameter values for one or more layers can easily be copied to different scenes using the drag and drop method.

To copy a layer to a scene:

- + Using the mouse, click on an existing layer's preview tile then drag and drop it onto a scene in the scene list. Every parameter value for that layer will be copied to the scene, replacing any existing parameter values for that layer.

To copy multiple layers to a scene:

- + Using the mouse, command-click or shift-click on an existing layers' preview tiles to select multiple layers. Then drag and drop the selected layers onto a scene in the scene list. The parameter values for those layers will be copied to the scene, replacing all existing parameter values for those layers.



Note: When dragging and dropping layer(s) onto a scene, the target scene will be highlighted in blue as shown in the illustration above.

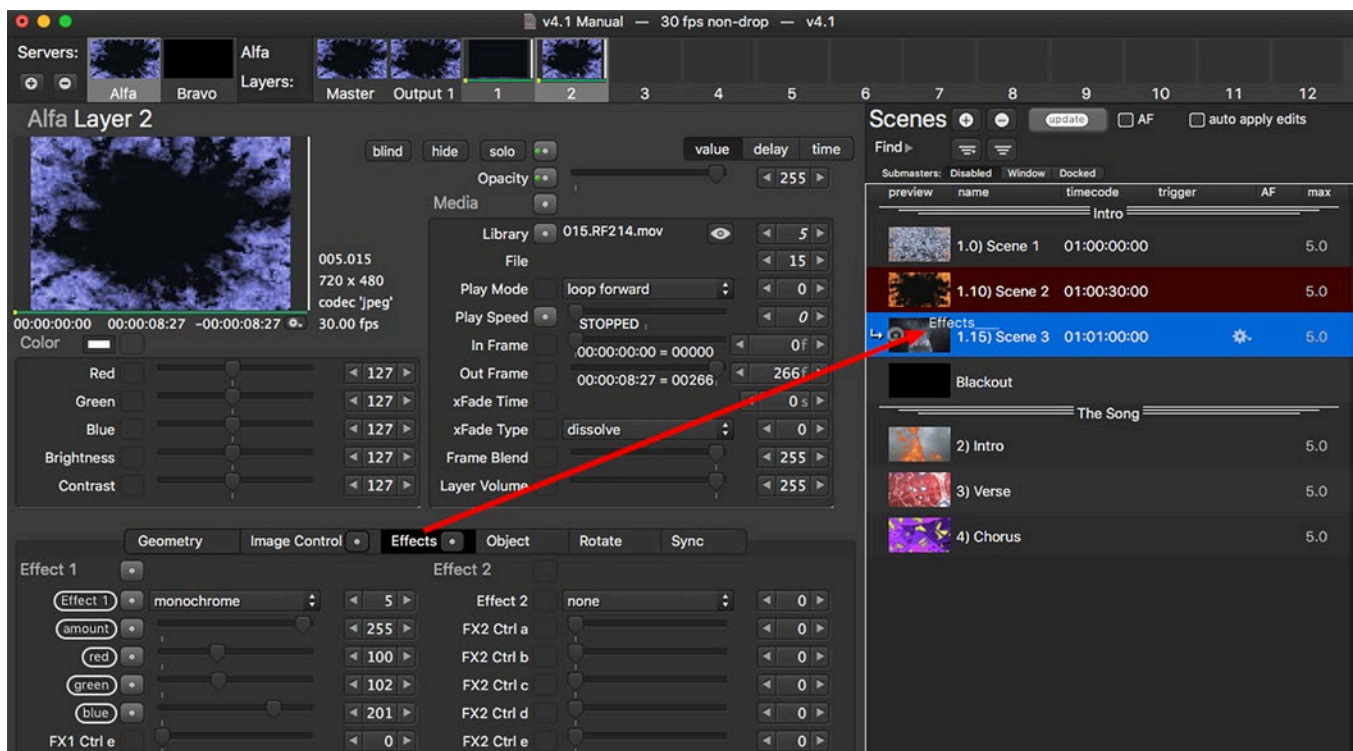
Copying Selective Parameters to a Scene

It is possible to selectively copy individual parameters or entire parameter groups from one scene to another.

To perform a selective copy:

- + Using the mouse, click on a parameter or parameter group then drag and drop onto a scene in the scene list.

The illustration below shows the Effects parameter group being copied into the scene:



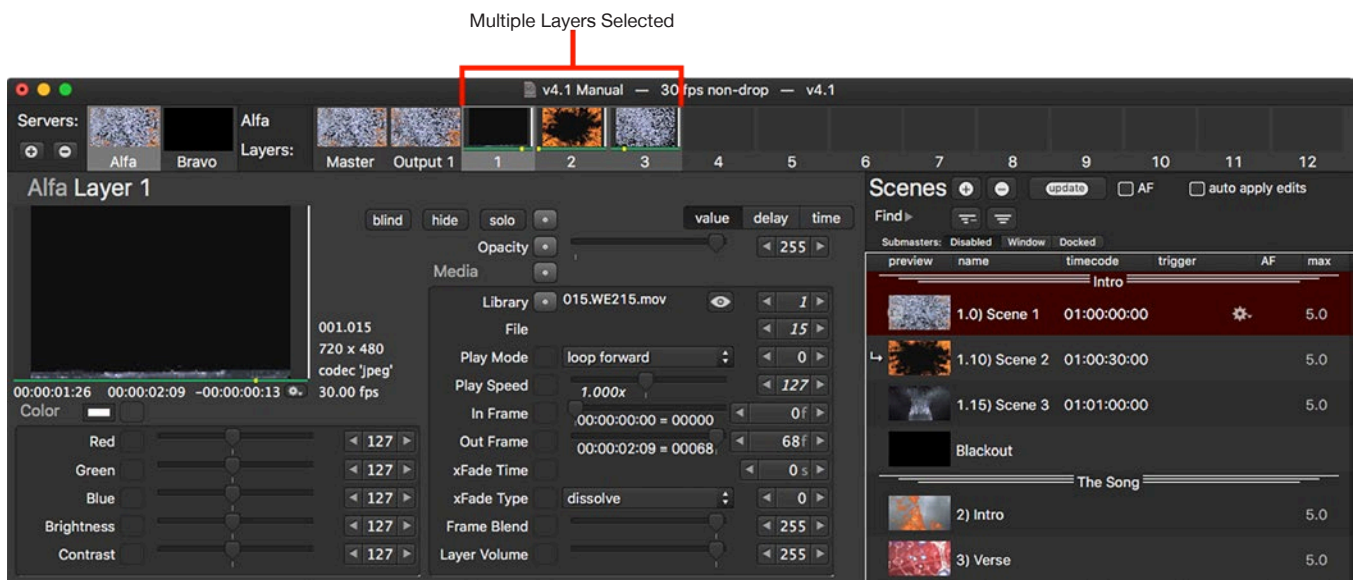
Editing Multiple Layers

Multiple layers can be selected and edited at the same time. This can be used for quick editing or to create fan offsets.

Selecting Multiple Layers

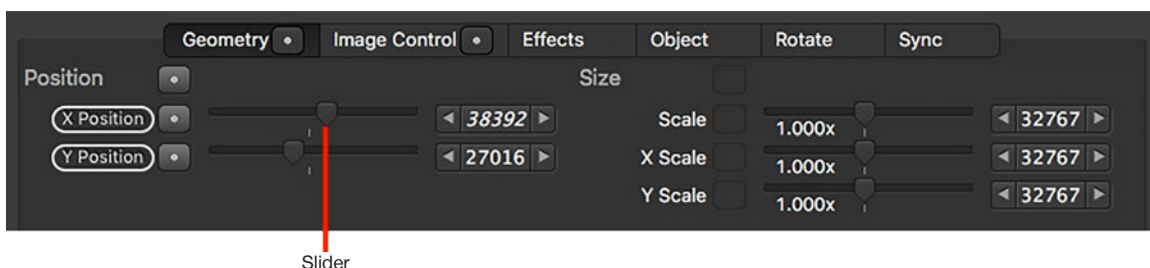
Multiple layers can be selected using the shift [⇧] and command [⌘] keys.

- + Hold down [⇧] while clicking on layer preview tiles to select a range of layers.
- + Hold down [⌘] while clicking on layer preview tiles to select individual layers.
- + Selected layers will have highlighted preview tiles. The layer that was selected first will have a brighter highlight, and that layer's parameter values will be shown below in the editing area.



Note: When multiple layers are selected and different layers have different values for the same parameter, the parameter's numeric value will be italicized. Refer to [“Adjusting Relative Offset Across Layers”](#) on page 48 for more information.

Setting All Layer Parameters to Same Value



If multiple layers are selected and a slider is used to change a parameter value, or a numeric value is manually entered into the parameter field, Director will set that parameter to the same value for all selected layers.

Adjusting Relative Offset Across Layers

If multiple layers are selected, the relative offset values can be adjusted using the [V] key. This method allows the parameter to be changed by the same amount on each layer while maintaining any relative offsets in the parameter values for the selected layers.

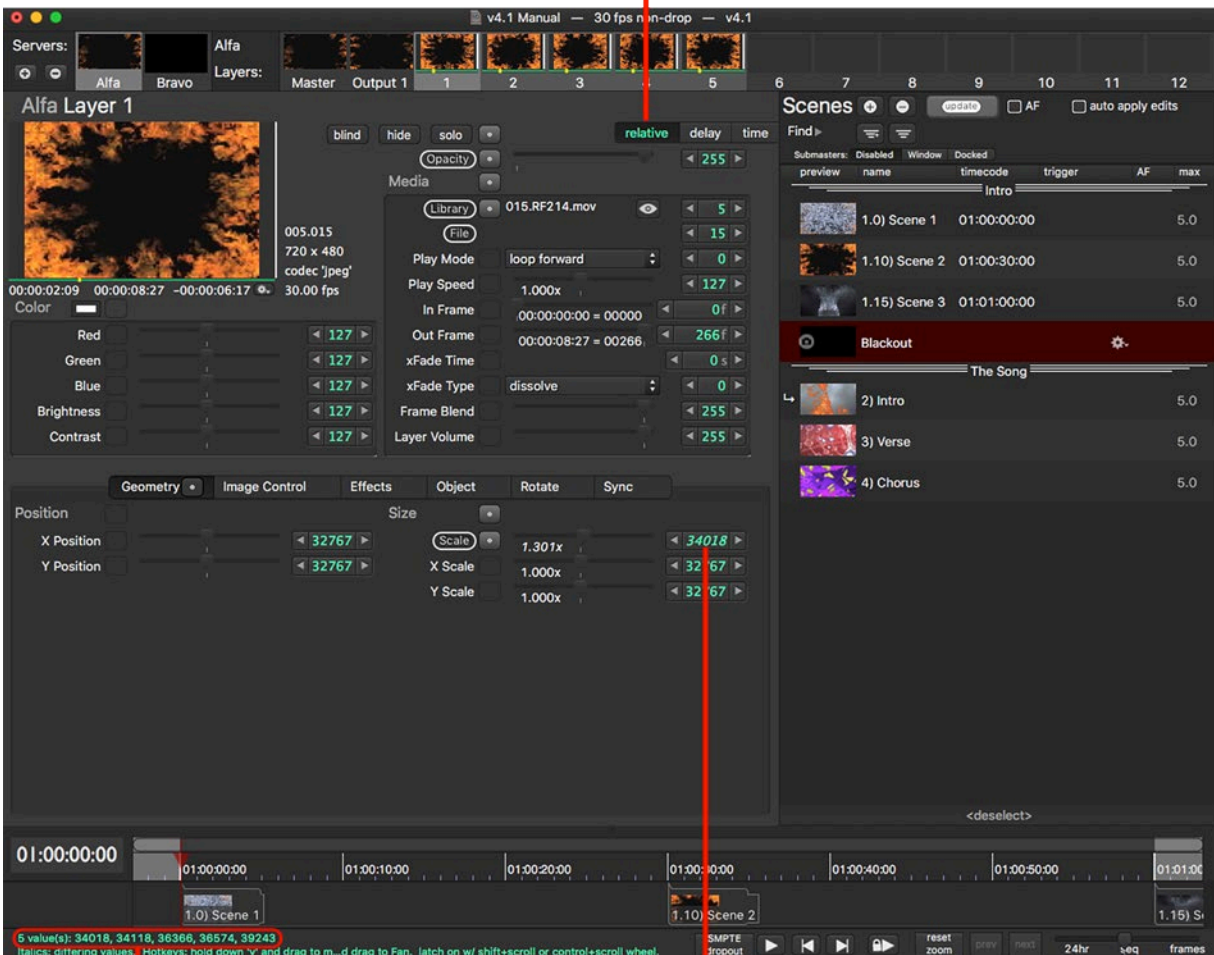
Notes:

- + During this action, the parameter sliders will be disabled to prevent accidental override of layer offsets.
- + The Value button will change to say “relative” and parameter values will be colored green.
- + The number of values changing, and the values, will be shown in the status text field at the bottom of the window.
- + When multiple layers are selected and different layers have different parameter values, the value will be italicized.
- + Click on a numerical field and enter ‘+n’ or ‘-n’ to add relative deltas. (Note: The [V] key must still be held down while entering the numerical values.)

To adjust relative offset:

- Step 1. Select multiple layers.
- Step 2. Press and hold the [V] key while dragging in a numeric value field.

Indicates that Director is in Relative mode



Relative Offset Details

Italics indicates that the relative offset is maintained

Fanning Layers

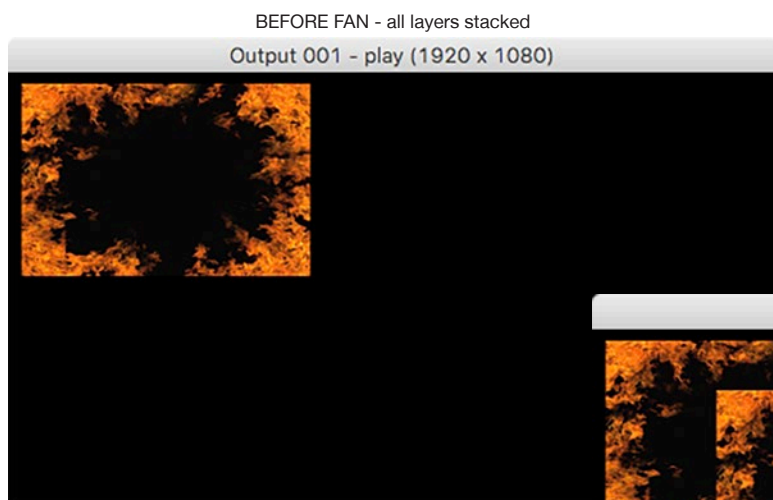
A fan effect can be applied to multiple layers using the [F] key. This is especially useful with parameters like X-Position to create a nice spread across layers. Fanning Time or Delay values will also create impressive results.

Notes:

- + When setting a fan, the first-selected layer's value will stay the same while all other selected layers' values will change.
- + The Value button will change to say "fan" and parameter values will be colored green.
- + The number of values changing, and the values, will be shown in the status text field at the bottom of the window.
- + When multiple layers are selected and different layers already have different parameter values, the value will be italicized.
- + Enter '+n' or '-n' in value/time/delay field to add relative deltas.

To fan:

- Step 1. Select multiple layers.
- Step 2. Press and hold the [F] key while dragging in a numeric value field.



Example: Fan being applied to the X and Y Position parameters of 5 layers.



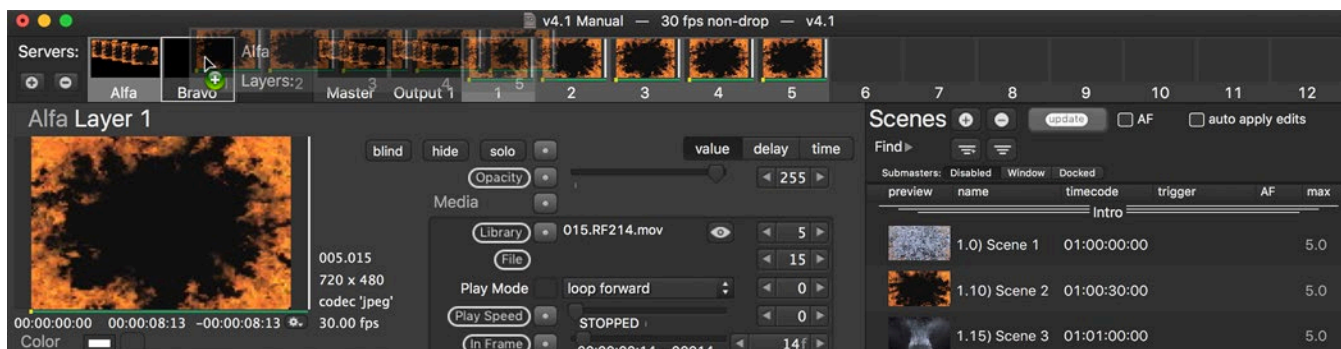
Copying Multiple Layers From One Server to Another

Multiple layers can be copied from one server to another using the multiple selection feature and drag and drop. Even if the servers are configured differently, Director will duplicate the parameters that are common to both.

To copy multiple layers:

- + Select multiple layers then drag and drop them onto the preview tile for a different server.

In the example below, five layers from the Alfa server have been selected and are being dragged to the Bravo server:



PLAYBACK

Overview

Once scenes have been created and stored in a show file, they can be recalled individually using manual control or automatically using timecode, autofollows, and/or triggers.

Guidelines:

- + If a scene has an assigned timecode value, this will take precedence over its autofollow time (which is ignored).
- + Triggers (MIDI, OSC, Art-Net/sACN) take precedence over both timecode and autofollow.

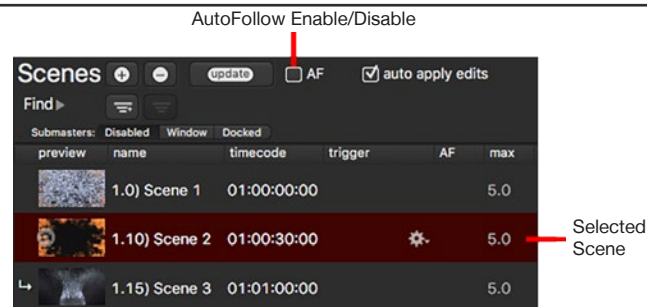
Scene Recall Using Manual Control

Regardless of whether timecode or autofollow information is provided, scenes can always be recalled individually by manually selecting them using the mouse or the arrow keys.

Note: When using manual scene recall, if autofollow times have been programmed they will take place. Make sure to uncheck the AF box to disable autofollows if desired.

To play back scenes manually:

- Step 1. Click on any scene in the scene list. The scene will be recalled immediately.
- Step 2. Use the keyboard up and down arrow keys to move forward or backward in the scene list.



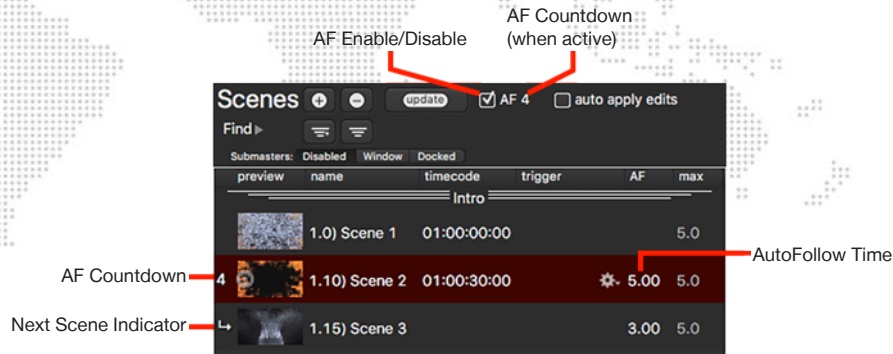
Scene Recall Using Autofollows

Scenes can be configured so they are recalled in sequence by using autofollow times. This feature is useful for looping between two scenes or for automating shows when timecode is not available. The autofollow time starts counting down as soon as the scene is recalled. i.e. If an autofollow time of 2 seconds is specified for a scene, the scene can be recalled (using any method) and will run for 2 seconds before the following scene is recalled. An autofollow time can be entered directly in the scene list using the format: <Minutes>:<Seconds> or just <Seconds>.

The AF Enable/Disable checkbox is used to turn the autofollow feature on and off. This is useful during editing to prevent scenes from being automatically recalled.

Guidelines:

- + If AF is checked, autofollow times will start counting down as soon as the scene is recalled (unless the following scene has a timecode value, in which case any autofollow time for the scene will be ignored).
- + It is not necessary to have timecoded scenes in order for the autofollow feature to work. It is best to use one or the other, not both (except in the case of Implicit Loops -- see below).
- + When timecode is enabled, even if AF is not checked it will automatically be enabled. During timecode playback, when a scene with an autofollow time is recalled (using any method), the autofollow will happen.



To recall scenes using autofollows:

- Step 1. Make sure the AF checkbox is not checked - i.e. autofollows are disabled.
- Step 2. Click in the AF field for a scene in the scene list.
- Step 3. Enter an autofollow time using the format: <Minutes>:<Seconds> or just <Seconds>.
- Step 4. Advance to the next scene and enter an autofollow time until all scenes are complete.
- Step 5. Enable autofollows by checking the AF box.
- Step 6. Recall the first scene. The following scenes will autofollow as programmed.

If no scenes in the scene list have timecode values, the timeline can be used as an alternative method for enabling and disabling autofollows. If the timeline Play button is clicked (or the [spacebar] pressed) autofollows will be enabled. When the Pause button is clicked (or [spacebar] pressed again) autofollows will be disabled.

However, if some scenes have timecode values, then playing/pausing the timeline can cause those scenes to be recalled (depending on the location of the timeline playhead) which may cause scenes to be recalled out of order. Except in the case of implicit loops, using timecoded scenes and autofollows at the same time is not recommended.

Scene Recall Using Art-Net/sACN Triggers

Mbox Director can receive either Art-Net or sACN control data in order to trigger scenes in the scene list. This feature allows a show to be programmed using Director and rather than using manual scene recall or timecode, scenes can be recalled when the appropriate Art-Net/sACN is received.

Scenes that are triggered in this manner must have a name with a numerical prefix (e.g. "1.10) Act One") that signifies the scene number. Director must be configured to receive the Art-Net or sACN from the external controller. Refer to "[Art-Net/sACN Trigger Preferences](#)" on page 26 for more information on the configuration and operation of this feature.

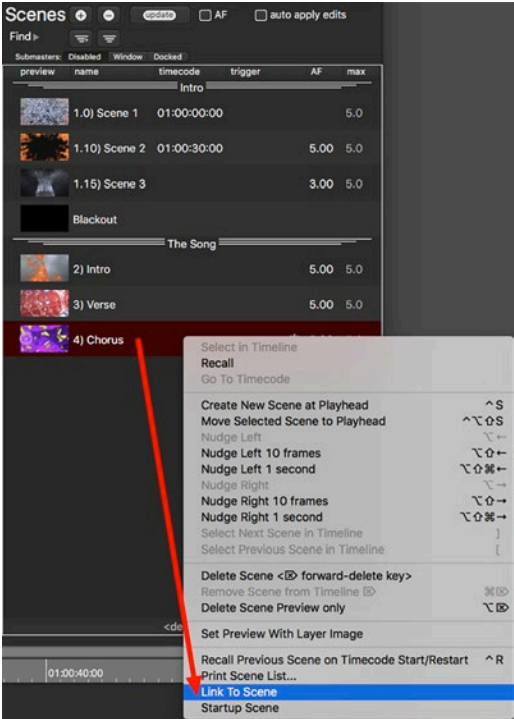
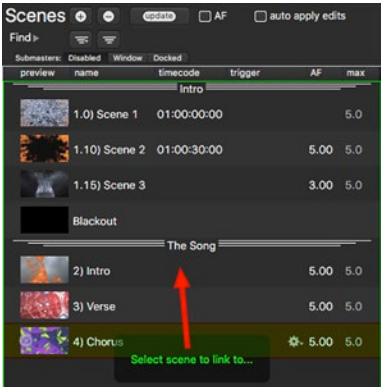
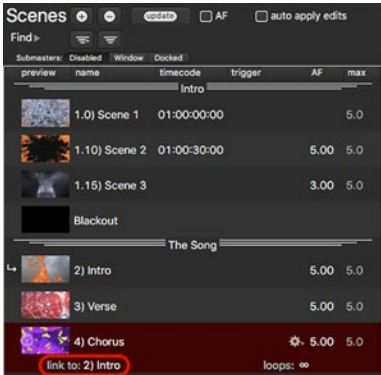
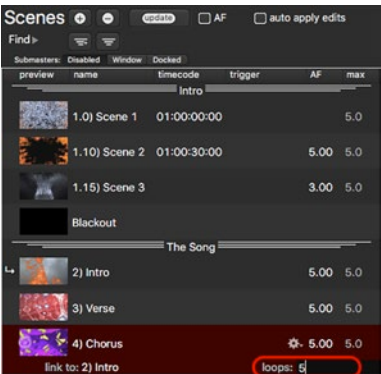
Playback Using Loops

Loops can also be used to control scene recall. A loop is specified by linking together a scene later in the scene list to a scene earlier in the scene list. The number of loops - between 1 and infinite - will specify how many times the event will occur.

Note: Loops can be triggered manually using the keyboard down arrow [↓] or with an autofollow.

To create a loop:

- Step 1. Right-click on any scene in the scene list.
- Step 2. In the contextual menu that appears, select Link To Scene. Director will enter Link mode.
- Step 3. Click on any earlier scene to create the link and therefore a loop. The link will be displayed after the “link to” text on the scene’s row in the scene list.
- Step 4. Click on the loop field, to enter the desired number of loops or leave as infinite (default).

- 
- 
- 
- 

To delete a link/loop:

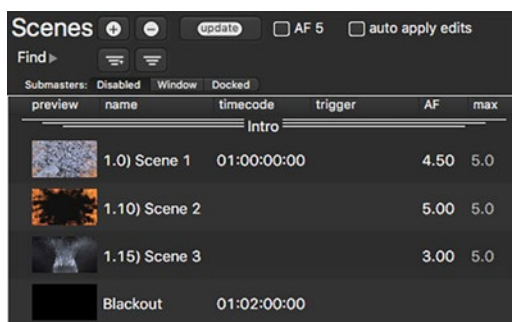
- Step 1. In the scene list, right-click on the scene with the link.
- Step 2. In the contextual menu, select Delete Link.

Implicit Loops

Loops can also be “implied” by using a combination of scenes with timecode values and scenes with no timecode values but with autofollow times. This configuration requires at least two scenes with timecode values to be separated by one or more scenes without timecodes. The first timecoded scene must have an autofollow time and the last scene without a timecode value must also have an autofollow value.

For example, while timecode is running and the next timecoded scene in the scene list has a timecode value greater than the current timecode, the autofollows will happen, and when the scene list reaches the last scene it will loop back to the previous timecoded scene in the list. The looping will continue until the timecode reaches the value for the next timecoded scene. At which point that timecoded scene will be recalled, “breaking” the loop.

Example Scene List:



preview	name	timecode	trigger	AF	max
	Intro				
	1.0) Scene 1	01:00:00:00		4.50	5.0
	1.10) Scene 2			5.00	5.0
	1.15) Scene 3			3.00	5.0
	Blackout	01:02:00:00			

In the above example, Scene 1 has a timecode value of 01:00:00:00 (1 hour). Scene 1, Scene 2, and Scene 3 each have an autofollow time, and the Blackout scene has a timecode value of 01:02:00:00 - two minutes after the timecode value for Scene 1. In this case, Scenes 1 through 3 will loop for 2 minutes until timecode reaches the Blackout timecode value, at which time the scene list will advance to the Blackout scene.

Note that even though the scene list is looping back to Scene 1, timecode continues to run forward. Timecode does not reset to 01:00:00:00 each time through the loop.

To remove the loop, simply clear Scene 3’s autofollow time. The show will autofollow to Scene 2, then to Scene 3, and then advance normally to the Blackout scene when its timecode is reached.

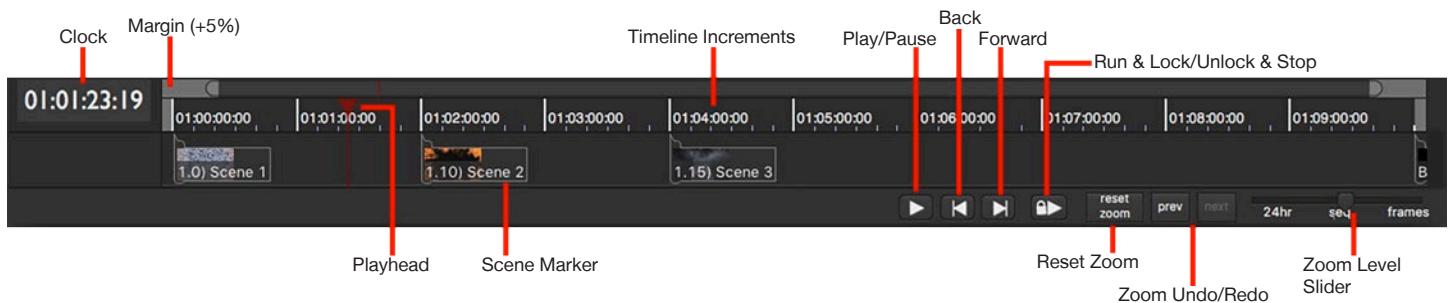
CAUTION: The scene list is not automatically sorted by timecode, so it can be edited in any order. However, it is best to keep the scenes ordered by timecode, so that when a loop is inserted, it’s easier to visualize the progression through the show.

Playback Using Timecode

Timeline Overview

When a timecode value is entered for a scene, the scene will be displayed in the timeline graphic at the bottom of the Mbox Director window. The timeline shows all scenes with timecode values, the current position of playback within the timecode sequence, and provides transport controls for play, pause, forward, and back.

Note: Regardless of the scene order in the scene list, scenes in the timeline will always display in time-sequential order.

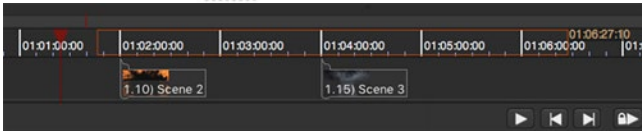


- + **Clock** - The timecode clock read-out. Shows current timecode value - from external or internal sources.
- + **Timecode Sequence** - The span of time from the first (earliest) scene with a timecode value to the last scene (latest) with a timecode value.
- + **Margin** - A +5% margin is added at the start and at the end of the timeline to provide a buffer before timecoded scenes begin to execute and after they are complete.
- + **Playhead** - Provides a graphical indication of the current time within the playback sequence. As time progresses, the playhead will advance along the timeline. If the timecode stops or the Pause button is pressed, the playhead can be dragged to move forwards or backward along the timeline.
- + **Scene Marker** - Scenes that have timecode values are shown in the timeline at the position in time they will be triggered. The scene name will be shown and if the scene has a preview image that will also be displayed. The width of the scene marker represents the longest crossfade time in the scene - this is the same value as shown in the "max" column of the scene list.
- + **Play/Pause** - When this button displays the ► symbol, clicking it will tell Director to start "listening" for timecode using the selected timecode source. When this button displays the || symbol, clicking it will tell Director to stop "listening" for timecode.
- + **Back & Forward** - These buttons cause the playhead to jump to the beginning or end of the timecode sequence respectively.
- + **Run & Lock/Unlock & Stop** - Similar to the Play/Pause button, this button will tell Director to start/stop listening for timecode, and also disable other elements in Director's user interface. The lock of the user interface is useful to prevent accidental interruptions during a timecoded show.
- + **Reset Zoom** - Resets the timeline's zoom level to display from the starting point of the first scene to the endpoint of the last scene (i.e. the entire Timecode Sequence). The default zoom level is to show the entire sequence.
- + **Prev / Next** - These zoom undo/redo buttons will restore the zoom level to the previous value or advance it to the next zoom level.
- + **24hr / Sequence / Frames Slider** - Allows the zoom level to be manually adjusted between 24 Hour, Sequence, or Frames.

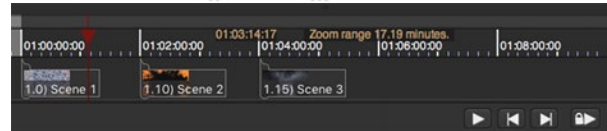
Important! Zoom Controls

The timeline's zoom level can be scaled from 24 Hours (widest zoom) down to individual Frames (narrowest zoom). The increment markers at the top of the timeline will change according to the zoom level.

Zoom Drag (note the orange box)



Zoom Scroll (note the range display)



The zoom slider levels are as follows:

- + **24 Hour** - The timeline displays a span of 24 hours (00:00:00:00 to 23:59:59:29) regardless of the total length of scenes.
- + **Sequence** - The timeline displays a span from the timecode of the first scene to the timecode of the last scene.
- + **Frames** - The timeline zooms to the least significant time possible (frame level) for the highest accuracy. 30 frames = 1 second = 1/60 minute, etc.

The best way to zoom is to hold down [option] and use the mouse scroll wheel to zoom while centered on a particular point in the timeline. When doing this, the mouse pointer must be held over the ruler.

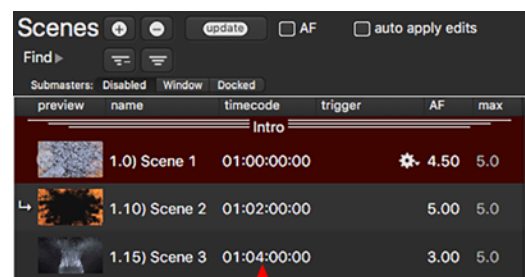
Another way to zoom is to hold down [option] and then drag-select the area to be displayed.

Timecode Triggered Recall for Scenes

Scenes can be given timecode values to allow them to be recalled in sequence using timecode from either internal or external sources. A scene's timecode value specifies the time at which the scene will be recalled. Timecode values can be entered directly in the scene list using the format: `<Hours>:<Minutes>:<Seconds>:<Frames>`. Alternately, scenes can be dragged from the scene list and dropped onto the timeline.

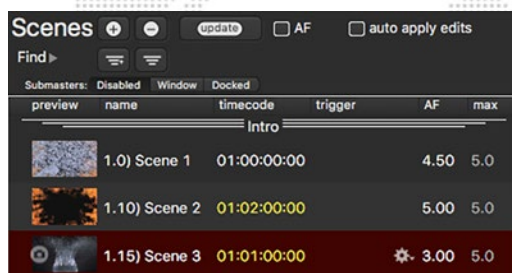
Guidelines:

- + In order for all scenes to be recalled using timecode, a timecode value must be entered for all scenes.
- + Internal or external timecode must be running in order for scenes to execute. This means that the Play or Run & Lock button must be pressed, and in the case of external timecode, Director must be receiving timecode from the source.
- + A scene's timecode value will take precedence over its autofollow time (if both are specified).
- + Running timecode triggers scenes at their assigned time. Normally, if the timecode input starts and the time lies between the times for two timecoded scenes, the most-recent scene with an earlier time will be recalled. This behavior can be overridden by enabling the "Timecode triggers scene only when timecode matches" preference item in the Scene menu or by pressing [^T]. When this preference is enabled, scenes will only be recalled if timecode exactly matches their timecode value and not if timecode starts with a time later than their value.
- + Timecode values can be entered using periods rather than colons. Leading zeros are not required (however, trailing zeros are). Therefore, the value of 01:10:02:25 could be entered as 1.10.2.25 instead. Also, following values may be skipped if they are zero. Therefore, 01:00:00:00 could be entered as just 1.



Timecode Values

If a timecode entry is out of sequence, its timecode will be displayed in yellow as shown below. In a completely timecoded show, having the scenes out of order in the scene list should not be a problem when actually running the show since scene recall will follow the timecode values.



preview	name	timecode	trigger	AF	max
Intro					
	1.0) Scene 1	01:00:00:00		4.50	5.0
	1.10) Scene 2	01:02:00:00		5.00	5.0
	1.15) Scene 3	01:01:00:00		3.00	5.0

To remove a timecode value, select the text and press [delete] on the keyboard.

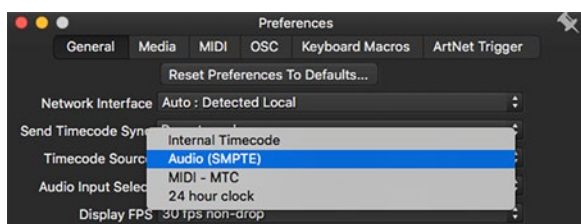
Timecode Input Options

Mbox Director offers four timecode input options:

- + **Internal**
 - Director generates its own timecode.
 - Director uses the computer's 24-hour clock as timecode.
- + **External**
 - Timecode is received from an Audio (SMPTE) source.
 - Timecode is received from a MIDI (MTC) source.

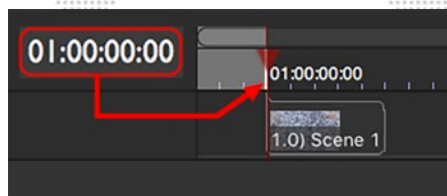
To specify a timecode source, open Director's Preferences window and click on the Timecode Source pop-up.

When Audio SMPTE is selected as the timecode source, the audio input device and channel must be configured. The Audio Input Select pop-up allows the selection of the audio input device. This can be any CoreAudio compliant device connected to the computer - e.g. line-in, USB/Audio interfaces, FireWire/Audio interfaces. The Channel pop-up allows the selection of channels 1 - 4 for the timecode signal. This option is provided because in many cases both music and timecode will be included in the audio feed and the correct channel for the timecode must be selected.



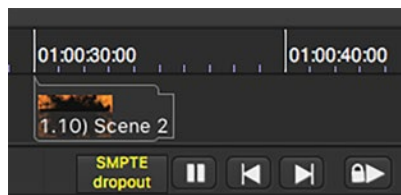
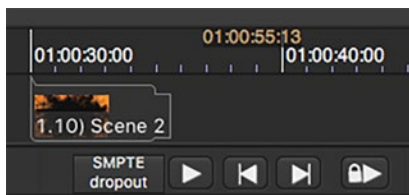
Note: Any external device for timecode audio or MIDI input must be configured to work with the computer prior to being used with Director. Many USB/Audio and USB/MIDI devices work on the Mac platform without drivers, but some require drivers to be installed prior to their use. Prior to using MTC, the "MIDI Enabled" preference must be checked on the MIDI tab of Director's Preference window. (Refer to "MIDI Preferences" on page 21)

No matter what the source for timecode is, the timecode readout clock at the top-left of the timeline shows the current time (HH:MM:SS:FF) which is also the playhead location. If timecode is being received and Director is listening to it then the clock will be counting upwards, otherwise it will show a static value.



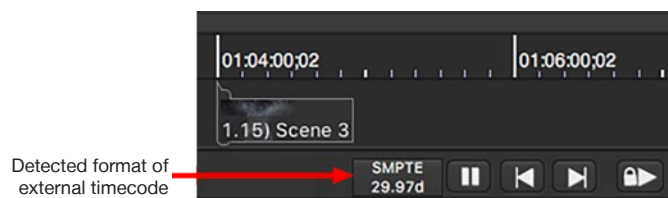
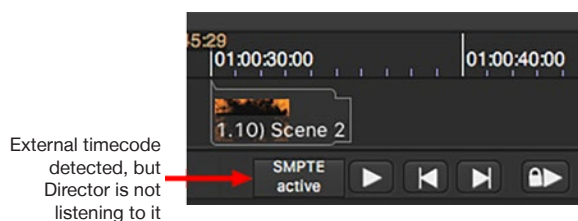
The status of timecode reception is indicated below the timeline, to the left of the Play/Pause button. The following two images provide examples of what happens if the timecode is not present or stops:

- + If neither the Play/Pause or Run & Lock button has been pressed, the indicator will show “SMPTE/MIDI Dropout” in white. In this state the indicator is only providing information
- + If either the Play/Pause or Run & Lock button has been pressed, the indicator will show “SMPTE/MIDI Dropout” in yellow. This state, with the yellow text, is intended as a warning that Director is listening for timecode but none is being received.



If timecode is being received, the status indicator will display this in one of two ways:

- + If neither the Play/Pause or Run & Lock button has been pressed, the indicator will show that timecode is active.
- + If either the Play/Pause or Run & Lock button has been pressed, Director will automatically detect the format. The indicator will show the detected format.



Display FPS

For best accuracy, Director always stores timecode values in a high-precision format. This allows Director to receive different timecode formats but still recall scenes at the precise intended time. The Display FPS (Frames Per Second) preference affects how timecode values are displayed and edited in Director's scene list and the timeline. But it does not set the incoming timecode format or affect how that format is interpreted by Director, it merely converts the displayed timecode values so they are displayed (and entered) according to this preference setting.

Different timecode formats use slightly different ways of counting frame time and therefore require different ways of displaying the time. Non-drop frame timecode formats count from frame 0 to the frame having a value one less than the format's FPS value - e.g. 30 non-drop timecode counts from frame 0 to frame 29, and 25 non-drop timecode counts from 0 to 24. On the other hand, drop frame formats also count up to the frame having a value one less than the format's FPS value, but don't always start at frame 0 - e.g. 29.97 drop frame timecode skips frames 0 and 1 once every minute, except for minutes that end in zero (0).

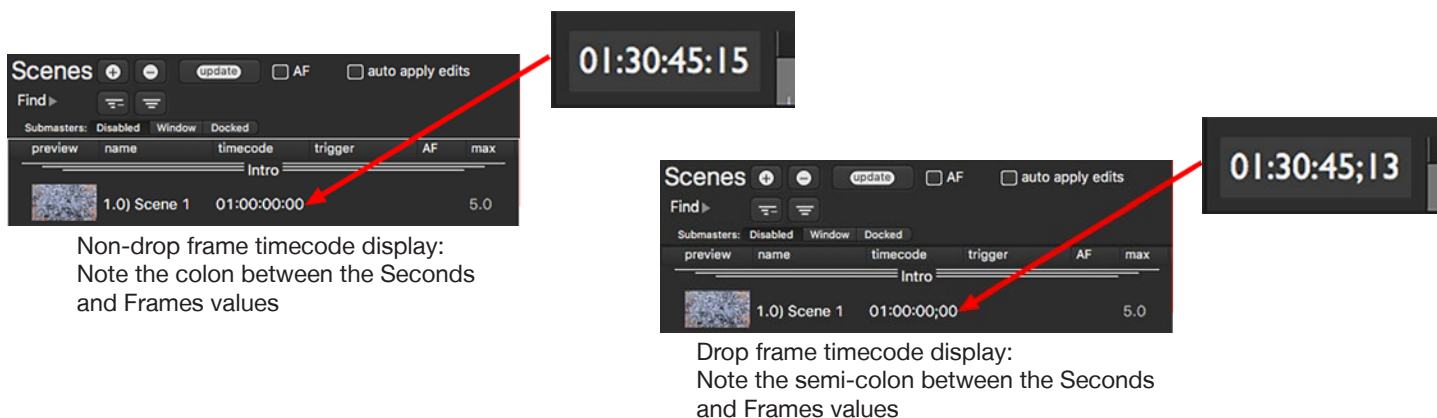
Director does not require that the displayed timecode values match the format of the timecode source. For example, Director allows a show to be programmed using timecode values for a 29.97 drop frame format (and to show the appropriate frame number values in the timeline and scene list) but to receive 25 non-drop timecode to trigger scenes. Director automatically detects the format of incoming timecode and even if the timecode is not the same format that was used when programming the show, the high-precision storage format allows each scene to be recalled at the correct time no matter the format.

The Display FPS setting can be changed in order to display accurate time values in the scene list and the timeline, and for that value to be converted into any other format if desired. If there are already scenes with timecode value on the timeline and the Display FPS setting is changed, some scenes will have their time adjusted to the new display format in the timeline and scene list.

CAUTION! Director does not compensate for timecode formats that are non-standard. This includes 29.97 non-drop frame and 30 drop frame. These two timecode formats can be used, but since there is compensation they will not run at the correct speed. If the show is programmed using this timecode and always run using the same timecode this should be fine. But changing timecode input formats will result in scenes being triggered at a slightly different time.

PRG strongly recommends AGAINST using 29.97ndf or 30df timecode with Mbox Director.

To change the Display FPS setting, open the Preferences window and click on the Display FPS pop-up.



To play scenes using timecode:

- Step 1. Enter timecode values for all required scenes, using the format: <Hours>:<Minutes>:<Seconds>:<Frames>
- Step 2. In the Preferences window, select the desired Timecode Source option, choosing an input device and channel as required. Refer to "General Preferences" on page 20 for more information.
- Step 3. If using SMPTE or MIDI timecode, connect external timecode source to the computer. Confirm that the external source is transmitting timecode.
- Step 4. Click the timeline Play button [▶] or press the spacebar to have Director start listening to timecode. Scenes will be recalled when the playhead reaches their specified times.
- Step 5. Use Pause button [⏸] or spacebar to stop listening to timecode and to pause playback.

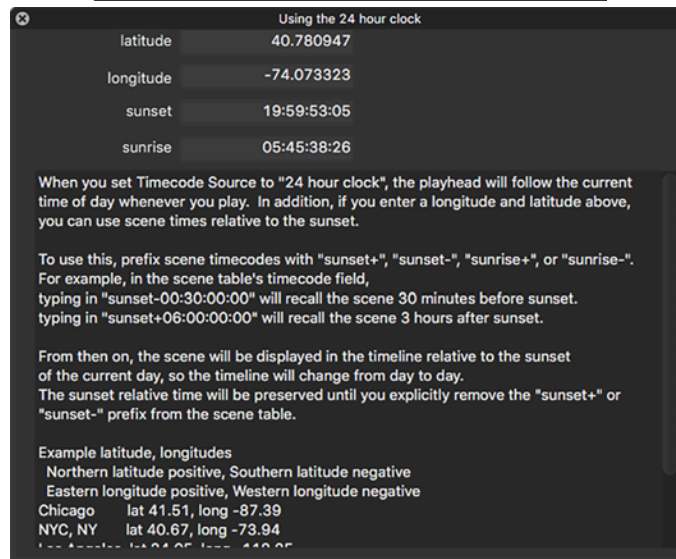
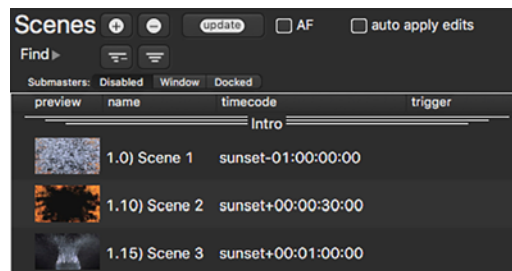
24-Hour Clock

Scenes can be recalled using the computer's 24-hour clock. In this case, the Director's timeline playhead will always follow the current time of day during playback. If values for longitude and latitude are entered, scene times can also be entered relative to the local sunrise and sunset.

To enable the 24-Hour Clock, it must be selected as the Timecode Source on Director's General Preferences window. (Refer to **"General Preferences"** on page 20.) When the 24-Hour clock is first enabled, a separate window will also open to allow the local latitude and longitude to be entered. Thereafter, this window can be reopened by pressing the button labeled "sunset" to the right of the Timecode Source pop-up.

To configure scene recall times relative to the local sunrise/sunset a "sunrise" or "sunset" prefix can be added to the timecode entry. For example:

- + "sunset-00:30:00:00" will recall the scene 30 minutes before sunset.
- + "sunset+06:00:00:00" will recall the scene 6 hours after sunset.



To enable 24-hour clock with sunrise/sunset:

- Step 1. Open the Preferences window and select General tab. (Refer to **"General Preferences"** on page 20.)
- Step 2. Click on the Timecode Source pop-up and select "24 hour clock."
- Step 3. In the new window that opens, enter local latitude and longitude values.
- Step 4. In the scene list, click on the timecode field for a scene.
- Step 5. Type in one of the following: sunset+ sunset- sunrise+ sunrise-
- Step 6. Enter the desired offset from sunrise/sunset using the typical HH:MM:SS:FF format.

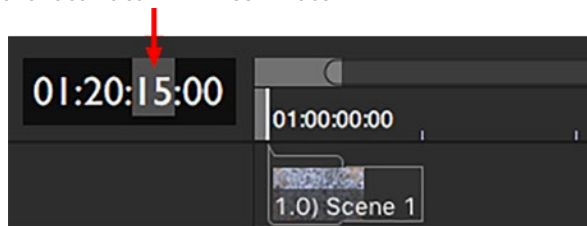
Scrub

When timecode is not actively being received (i.e. the timeline clock isn't running), the current position of the timeline can be changed by entering a new time in the clock field or "scrubbed" using the scrub feature.

To jump to a new timecode position:

- + The value shown by the clock can be edited by clicking on one of its four fields (H, M, S, or F). The colon, semi-colon, spacebar, or period keys can be used to move from field to field. Edits made to the clock value will affect the position of the playhead as soon as either the [tab] or [return] key is pressed, at which point the playhead will jump to that new position. After pressing [tab] or [return], press [esc] to stop editing the clock value.

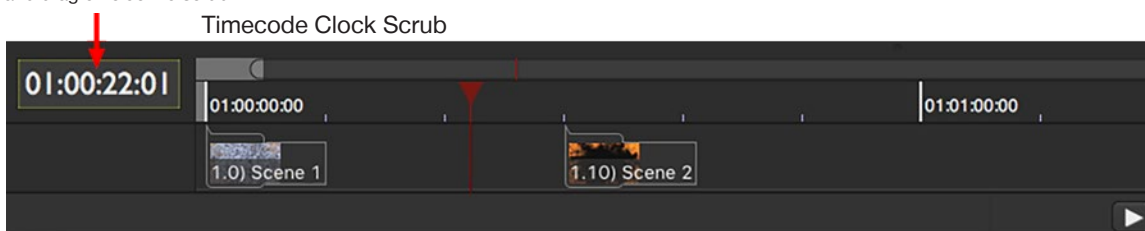
Click on clock to edit HH:MM:SS:FF fields



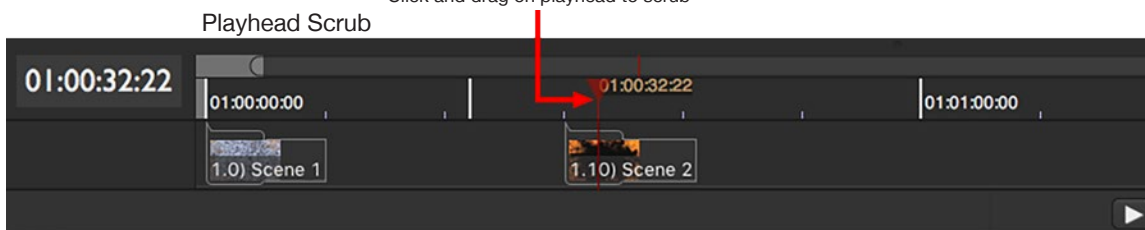
To scrub in the timeline:

- + Click and drag anywhere on the timeline clock; dragging the mouse right or left to scrub forward/backward in the timeline. When scrubbing, hold down [shift] to speed up the scrub or [option] to slow it down. To stop scrubbing, release the mouse button.
- + Another method of scrubbing is to click on the playhead and drag it to the left or right.

Click and drag on clock to scrub



Click and drag on playhead to scrub



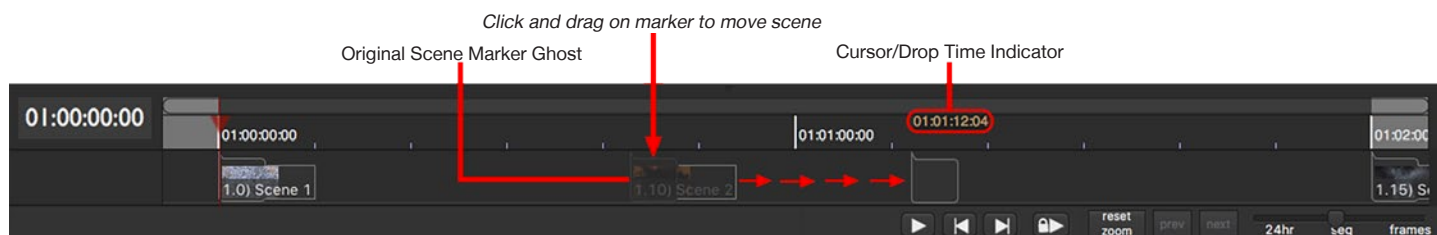
Timecode Editing

Timecode entries can be edited at any time by changing the values in the scene list or by dragging the markers in the timeline.

To edit timecode using the timeline:

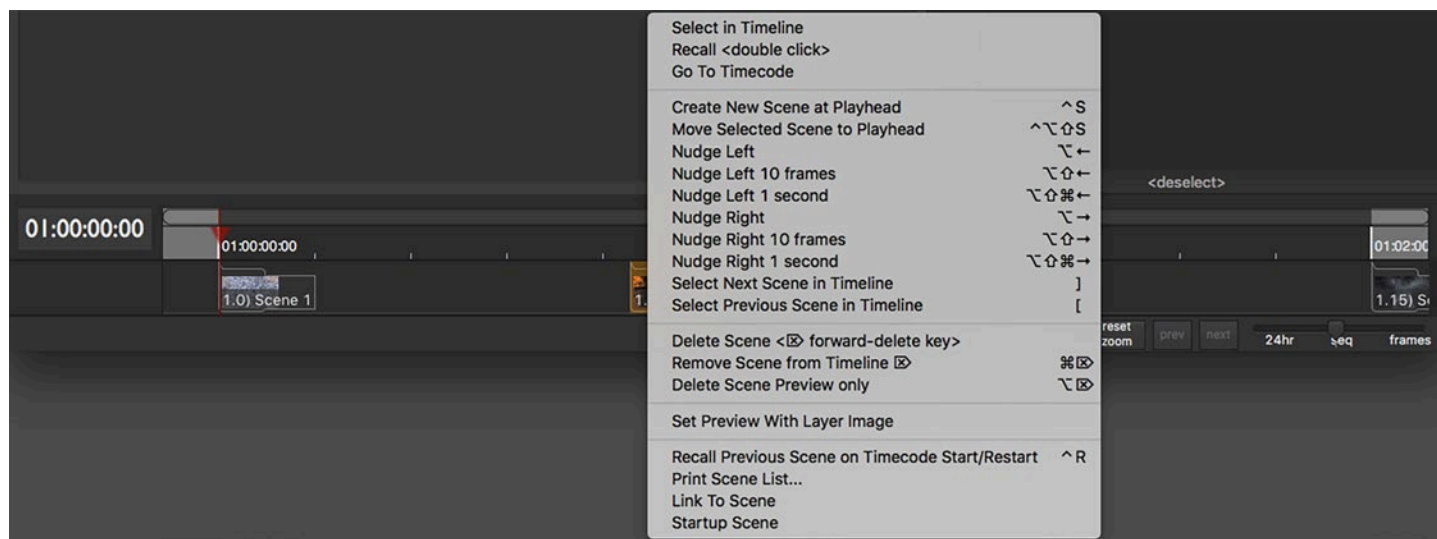
- Step 1. Be sure the Director is not actively listening for timecode. Press the Pause or Unlock & Stop button if necessary to stop listening for timecode.
- Step 2. At timeline, click and drag on a scene marker to move the scene to a new position (i.e. give it a new timecode value). Changes will be reflected in the scene list timecode fields. Double-clicking on a scene marker will recall the scene and also move the timeline playhead to the time associated with that scene.

Note: While dragging a scene marking, the scene marker is ghosted and the mouse cursor's precise position in time will be shown in the timeline ruler area. The time shown represents where the scene will be placed when the mouse button is released.



Timeline Contextual Menu

The timeline's contextual menu offers various timeline controls. This contextual menu can be accessed by right-clicking on any scene in either the timeline or in the scene list. Note that many of the items in this contextual menu have keyboard shortcut equivalents that will work when a scene is selected in either the scene list or on the timeline.



Options for the contextual menus are as follows:

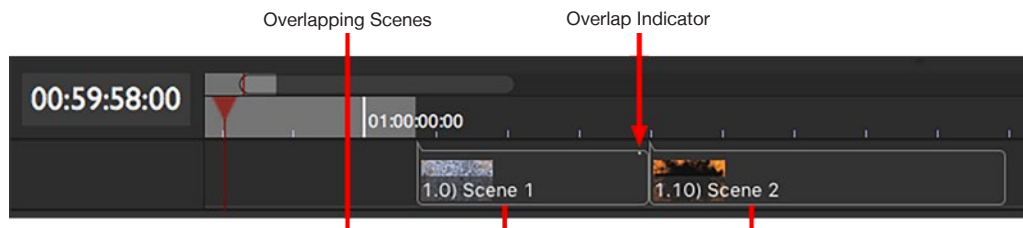
- + **Select in Timeline** - This is best used when the pop-up menu is accessed at the scene list table (right-click in the scene list). When "Select in Timeline" is chosen, the timeline will scroll to reveal the scene in the timeline and the selected scene will be selected.
- + **Recall** - Recalls the scene and selects it in the scene list.
- + **Go To Timecode** - Moves the playhead to the timecode position of the selected scene (also triggering recall of that scene).
- + **Create New Scene at Playhead** - Creates a new scene at the current playhead position. The scene will receive the timecode value equivalent to the current playhead time and all current parameter values will be stored in the scene.
- + **Move Selected Scene to Playhead** - Moves the scene to the current playhead position.
- + **Nudge Left/Right** - Nudges the scene by one (1) frame to the left or right. If the keyboard shift [⇧] key is held down, it will nudge by increments of ten (10) frames.
- + **Select Next/Previous Scene in Timeline** - Selects the next or previous scene in time.
- + **Delete Scene** - Deletes the selected scene.
- + **Remove Scene from Timeline** - Removes the scene's timecode value thereby removing it from the timeline, but does not delete the scene from the scene list.
- + **Delete Scene Preview** - Removes preview thumbnail.
- + **Set Preview With Layer Image** - Sets preview thumbnail using the selected layer's image rather than the default image from the Global Surface. This can be useful for creating a more meaningful preview image when the Global surface is very large.
- + **Link To Scene** - Allows scenes to be linked together.

Note: The timeline and scene list contextual menus and the menu bar Scene menu are similar but some options may not be available depending on whether the scene has a timecode value or not.

Note: The concept of the "selected scene" depends on which menu is used and where the scene was last selected. The scene selected in the scene list can be different than the scene selected in the timeline. The selected scene in the scene list is given a red background. The selected scene in the timeline receives an orange highlight in the timeline and has an orange outline in the scene list.

Overlapping Scenes

It is possible to have overlapping scenes on the timeline when a following scene will be recalled before the total fade time of one scene has completed. This situation will be indicated on the earlier scene's scene marker by a small white dot.



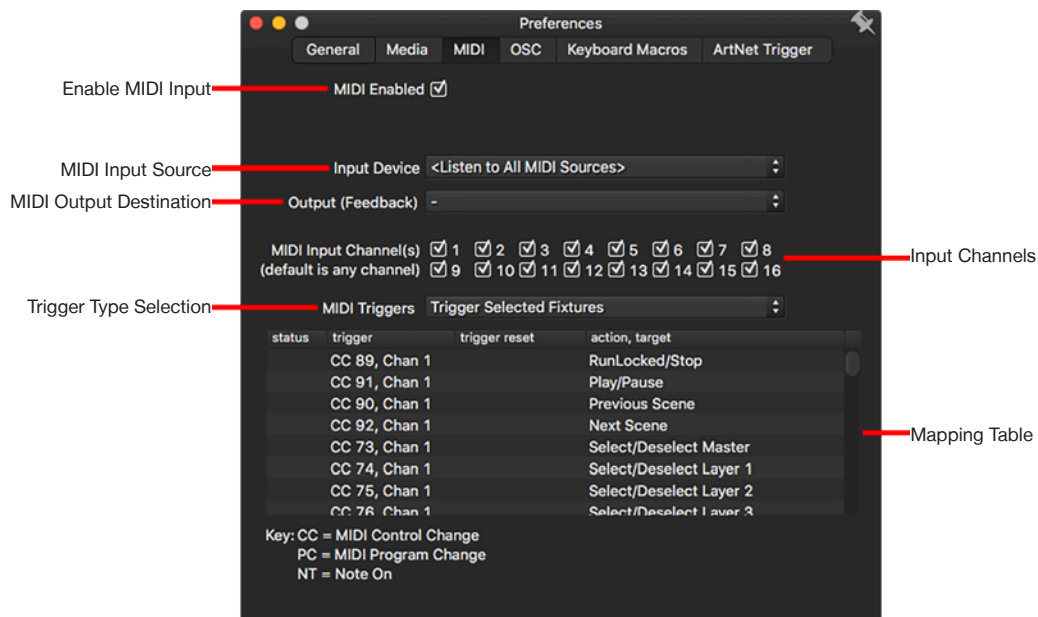
An easy way to have one scene "butt up" against another scene is to select one of the two scenes, then hold [option] while pressing the left/right arrows until the white indicator disappears.

MIDI OPERATION

In addition to using MTC, Mbox Director is capable of receiving other MIDI commands to either recall scenes or modify the values of certain control parameters for connected Mbox servers. Director can receive MIDI Show Control (MSC) commands, MIDI notes (NT), Control Changes (CC), and Program Changes (PC).

Setting MIDI Preferences

To enable external MIDI input for the purposes of scene recall or parameter value control, enable MIDI input on the MIDI preferences tab:



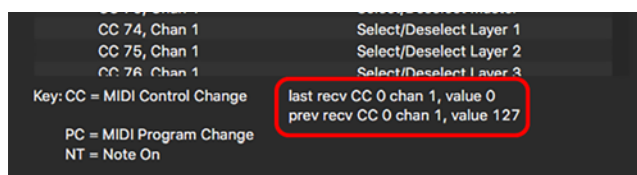
Note: MIDI does not need to be enabled on the MIDI preferences tab when receiving MTC.

Preferences for MIDI input are visible once MIDI input has been enabled:

- + **MIDI Enabled** - Allows the MIDI features (triggers and MTC) to be enabled or disabled.
- + **Input Device** - Selects a MIDI source. This preference should normally be set to "All MIDI Sources," but a specific device may be chosen if the external inputs need to be limited.
- + **Output (Feedback)** - Selects a destination device for MIDI feedback. MIDI feedback will work with any devices that support feedback - e.g. MIDI controllers with motorized faders or LED indicators.
- + **MIDI Input Channels** - Allows specific MIDI input channels to be enabled or disabled.
- + **MIDI Triggers** - Specifies which trigger option to use. The default setting, "Scene Table Triggers only," only enables Director to recall scenes using MIDI triggers. (Refer to ["Recalling Scenes Using MIDI Triggers"](#) on page 65) The "Trigger Selected Fixtures" and "Trigger Specific Fixtures" options allow for the modification of control parameters (using mapping defined by the MIDI Mapping Table) as well as for scene recall. "Trigger Selected Fixtures" allows a MIDI command to modify the mapped parameter value for *all selected* fixtures. "Trigger Specific Fixtures" allows a MIDI command to modify the mapped parameter value of one *specific* fixture. (Refer to ["Controlling Director with External MIDI Controllers"](#) on page 67 for information about modifying parameter values with MIDI)
- + **Mapping Table** - The table is a listing of the mapping of MIDI commands to control parameters for the server when using the "Trigger Selected Fixtures" and "Trigger Specific Fixtures" options.

Important Guidelines:

- + Scene triggers can be any MIDI Note, Control Change, or Program Changes.
- + While Director supports the use of MIDI Channels 1 through 16 for commands used with the Trigger Selected/Specific Fixture options, Scene triggers can only use MIDI Channel 1.
- + When using the Trigger Selected/Specific Fixture options, it is possible to configure Director in such a way that scene triggers and individual parameter controls both respond to the same MIDI Control or Program Change commands. Therefore, it is not recommended to trigger scenes with Control or Program Changes when using either the Trigger Selected or Specific Fixture options, use MIDI notes instead.
 - For example, when the Trigger Selected Fixtures option selected and Scene 1 configured to be recalled by CC 1 - if CC1 Chan 1 is sent from a MIDI device, Scene 1 will be recalled and the selected layer/master audio volume would also change.
- + The MIDI Preferences tab will show the last received MIDI Control Change below the Mapping Table. This can be useful for confirming that MIDI is being received correctly.

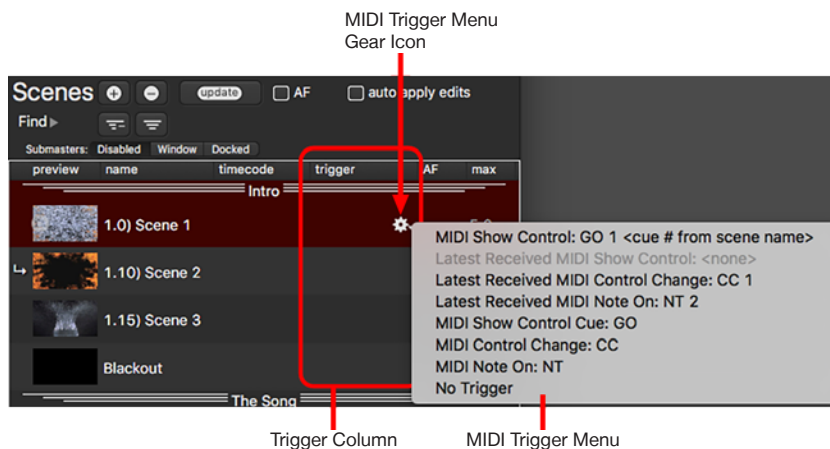


Recalling Scenes Using MIDI Triggers

Scenes can be recalled using MIDI triggers. Director allows three basic MIDI trigger types:

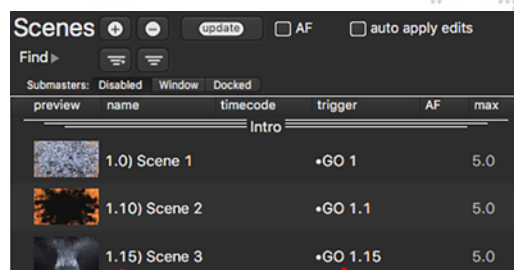
- + MIDI Show Control (GO)
- + MIDI Control Change (CC)
- + MIDI Note (NT)

A drop-down menu, available by clicking on the gear icon in the trigger column of the scene list, provides options for recalling scenes using MIDI triggers.



Options:

- + **MIDI Show Control: GO <cue # from scene name>** - If the scene has a number at the start of its name, then this option can be used to automatically create a MIDI Show Control GO trigger using the scene's numerical prefix. For example, if the scene is named "1.0) Start Blackout," then the command "GO 1" will be entered into the trigger field.



preview	name	timecode	trigger	AF	max
Intro					
	1.0) Scene 1		+GO 1		5.0
	1.10) Scene 2		+GO 1.1		5.0
	1.15) Scene 3		+GO 1.15		5.0

Scene Numbers

Corresponding MSC Go commands

- + **Latest Received MIDI Show Control** - If a show control GO cue # command has been received, then this option will be available in the menu. (If not, the option will be grayed out by default.) When selected, this will initiate a GO command for the last received cue number.
- + **Latest Received MIDI Control Change** - Same as the above option, except this will initiate a control change command for the last received control change number.
- + **Latest Received MIDI Note On** - Same as the above two options, except this will initiate a MIDI note command for the last received note number.
- + **MIDI Show Control Cue: GO** - Allows for an arbitrary show control command. When selected, GO will be entered into the trigger column. Using the keyboard, enter the desired cue number after the GO prefix. Director supports the following cue number format: #####.## or [1-9999].[01-99]. (This format is the same as the PRG Vx76 console.) For example, "GO 2.5."
- + **MIDI Control Change: CC** - Allows for an arbitrary control change command to trigger the scene. When selected, CC will be entered into the trigger column. Using the keyboard, enter the desired control change number after the CC prefix. Director supports entries from 0-124. For example, "CC 52."
- + **MIDI Note On: NT** - Allows for an arbitrary note command. When selected, NT will be entered into the trigger column. Using the keyboard, enter the desired note number after the NT prefix. Director supports entries from 0-127. For example, "NT 101."
- + **No Trigger** - Clears the scene's trigger field.

Note: The Latest Received MSC/CC/Note options can also be used to confirm that Director is receiving MIDI correctly.

Note: When outputting MSC Go commands, some consoles support cue numbers having more than two digits after the decimal point. Director only supports two digits and will ignore any digits after the second. For example, if a console sends "GO 14.257," Director would interpret this and then trigger scene 14.25.



External MIDI Control Setup

Controlling Director with External MIDI Controllers

In order to use MIDI triggers from an external controller, the correct output settings must be configured on the external controller and the computer used for Mbox Director must have a configured MIDI input device. Because the Mac OS supports MIDI natively, it is often sufficient to simply connect a USB/MIDI interface to the computer, though some devices may require drivers to be installed before they work.

Guidelines:

- + In order to send MSC from a lighting console to Mbox Director, the console must be configured to output MIDI. If the console requires a MIDI ID to be set, in most cases an ID of 0 will work.
- + Consoles and other MIDI devices can send and receive MIDI on multiple channels. Make sure that Director has enabled the MIDI channel that the device is sending on.
- + The scene list's trigger contextual menu and the MIDI tab of Director's Preferences window can be used to confirm that MIDI commands are being received correctly.
- + The Trigger Selected/Specific Fixture options in Director use pre-set MIDI commands for each parameter value and/or function. These commands are not user-editable. Therefore, it will be necessary to configure the external MIDI controller to output the correct commands. Most MIDI controllers can be configured in this way or can learn commands when connected to a device with MIDI feedback (e.g. Mbox Director).
 - The pre-set MIDI commands in Director are based on using a Behringer BCF2000 MIDI controller, in default patch configuration with preset 1 selected. If the unit has been custom configured, then it may need to be reset.
- + Director can work with MIDI sent over Ethernet or USB as long as the appropriate "bridge" software is being used.
- + Director sends MIDI feedback to controllers that support it. Just as adjusting a parameter value from an external controller will affect the parameter in Director, adjusting a parameter value in Director will cause that value to be output as feedback to the selected output device.
- + Standard MIDI (as used by Director) is limited to 7-bit control. MIDI commands can only range from a value of 0 to 127. Therefore, parameter values sent via MIDI have to be scaled to become the 8/16-bit parameter values that Director uses. This can mean that MIDI commands are not the most precise manner of external control.
 - Art-Net/sACN and/or OSC are much better choices for precision parameter control in Mbox Director. Refer to "[Appendix A: OSC Reference](#)" on page 105 and "[Combined Control with an External Console \(Passthrough\)](#)" on page 91 for further information on these features.

PARAMETER STORE AND RECALL

Presets

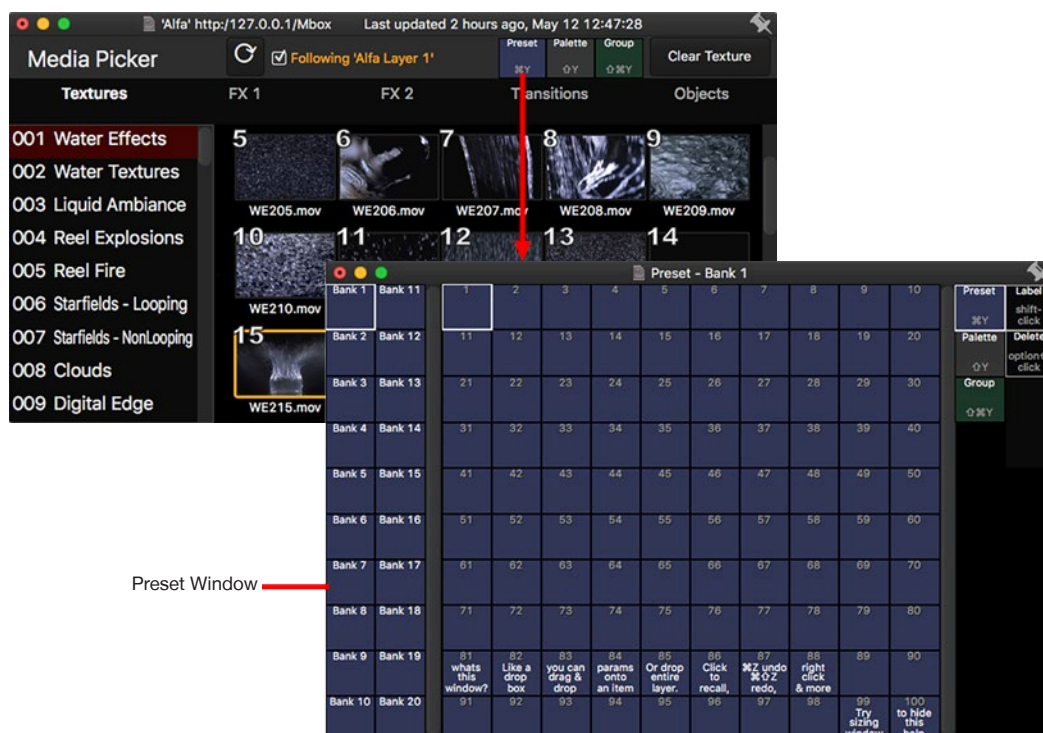
The Presets feature is used to store specific parameters for the purpose of building "scenes." (Refer to **"Creating and Editing Scenes"** on page 38). The most important aspect of presets is that they are referenced by the scenes. This can be used to save time during the initial programming of a show and for quickly updating parameters throughout all scenes if something on stage changes. For example, the layers' Scale, X-Position, and Y-Position parameters could be stored into a preset which is then used to build scenes. If a new scale and/or position is required due to a change of projector equipment on stage, the preset could easily be updated and all the scenes built using those presets would automatically reflect the change (rather than having to individually change the scale/position parameters in every scene).

A Preset window, accessed from the Media Picker window, contains 20 banks of 100 presets (for a total of 2000 presets). Parameter values can be stored into these individual presets for later recall. They can also be deleted or edited at any time.

Guidelines:

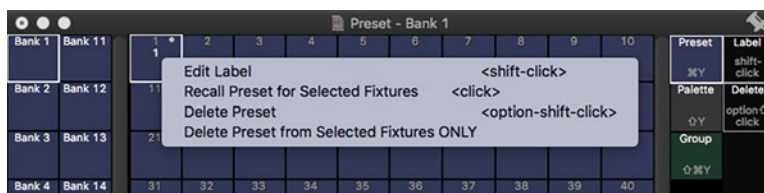
- + A preset can contain any collection of parameter values for any number of fixtures.
- + When a preset is used to build a scene, the scene stores a reference to the preset for the affected parameters rather than actual values. Parameter value data from the preset is linked to the scene such that whenever the scene is recalled, it uses the parameter values stored in the preset.
- + Preset parameter values are stored for specific fixtures (those selected when the preset is recorded).
- + Presets do not store or recall any timing data. (The only exceptions are the texture and object crossfade times, which aren't actually real timing data, but parameters for Mbox.)

To open the Preset window, press the Preset button on the Media Picker window or press [⌘Y]:



Guidelines:

- + The Preset window is scalable by dragging on any of its sides or corners.
- + To "pin" the Preset window so that it stays in front of other Director windows, click on the pin icon in the upper-right corner.
- + The quick-buttons located on the right side of the window (Label and Delete), can be used in combination with the preset buttons to perform specific actions. A contextual menu is also available by right-clicking on a preset button.



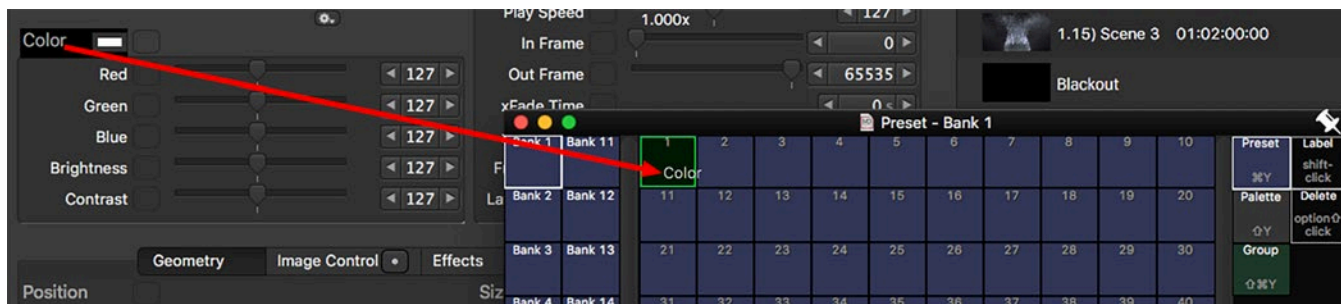
Store and Recall

The following section provides basic instructions for storing and recalling presets.

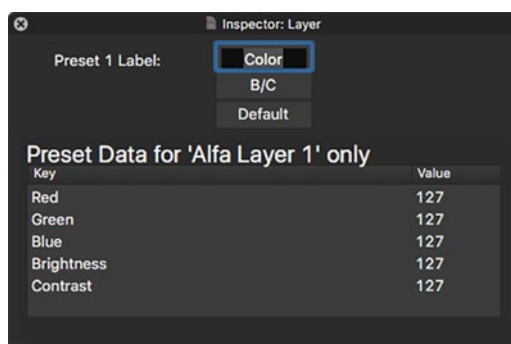
To store a preset:

- Step 1. Open Preset window. If desired, pin window to keep it visible when clicking on the main Director window.
- Step 2. On the main Director window, click and drag a parameter, parameter group, or an entire fixture's values, dropping it onto a preset button.

For example, drag and drop the Color parameter group onto Preset 1 as shown below:



- Step 3. Shift-click on the preset button to open an inspector window where the preset's name (but not its parameter values) can be edited. Shift-clicking on the preset allows the name to be edited without recalling the preset. Double-clicking on the preset button opens the same window, but will recall the preset, which may be undesirable depending on the situation.



- Step 4. Click on the close button to close the inspector window.

Notes:

- + When dragging parameter values onto a preset button, the drop location will show a green ring to indicate where the data will be dropped. Pressing [esc] will cancel the drag.
- + If parameters are dragged onto an existing preset, a merge is performed, adding values for parameters with no existing values, and replacing existing values when parameters already have a value stored in the preset.

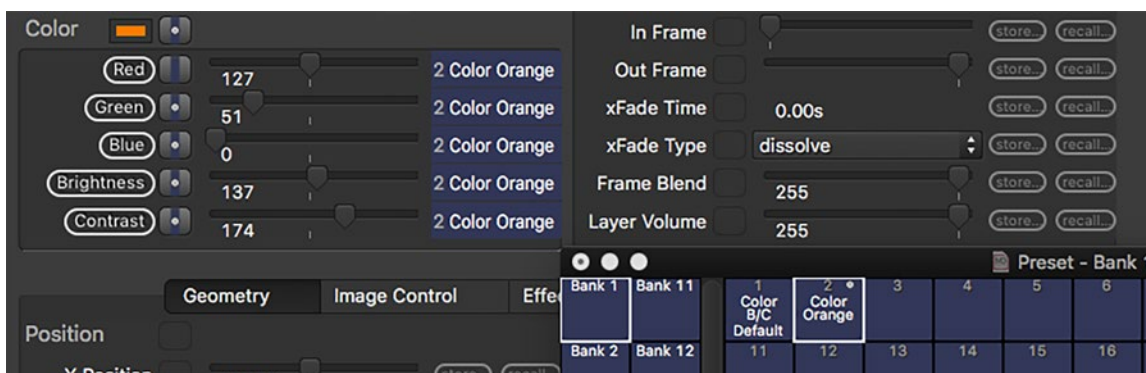
To recall a preset:

- Step 1. Select fixture(s) to which preset will be applied.
- Step 2. Open Preset window.
- Step 3. Click on the desired preset. It will be applied to selected fixture(s). Remember that preset data will only be applied to parameters and fixtures that were in the selected set when the Preset was stored!

Note: When shift-clicking on a preset button, the inspector window will show the parameter values only for the primary selected fixture (the one with the brightest highlight in the fixture browser strip) stored in the preset. While the Preset data window is open, click on different fixtures in the browser, one at a time, to see the parameter values stored in the preset for that specific fixture.

Editing Presets

For expanded preset editing options, press [⌘Y] to enter the Preset View Mode for the main parameter editing window. Similar to the view modes that show timing, delay, fan, or relative parameter values, the Preset View Mode shows parameter value information and information specific to the mode (preset name information in this case). The parameter value is shown in white below the parameter's slider or on the parameter's pop-up. The preset name and number is shown to the right of the slider in place of the parameter value and bumper buttons seen in other view modes.



Note: The Preset window can remain open and be used to store and recall presets without having the Preset View Mode enabled. By not using the Preset View Mode, it will be more difficult to determine which preset a parameter is using, although a blue stripe on the parameter's reset button will indicate that the parameter is using preset data.

While in Preset View Mode, all parameters of the selected fixture that are using preset data will show the preset name/number. Parameters not using preset data will show two buttons: "store" and "recall." These buttons allow the current parameter value to be stored into a specific preset (by number or from a list by pressing F5), or to be set to a value from a specific preset (again, by number or from a list).

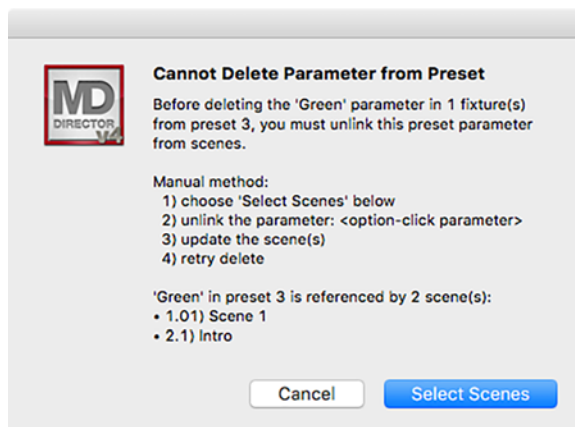
Parameter values can also be dragged and dropped onto a preset button to store their values into the preset.

As noted above, if a parameter is already set to use preset data, the preset name/number will be shown. However, the store and recall buttons can be revealed by hovering the mouse cursor over the preset name.

- + **Unlink** - If [option] is held down, the store and recall buttons will be replaced by the "unlink" button. Pressing this button allows a parameter to be unlinked from the preset data while still keeping its current parameter value.

Note: After unlinking parameter values from preset data, the scene Update button must be pressed if the "auto apply edits" box is not checked. (Refer to "**Creating and Editing Scenes**" on page 38)

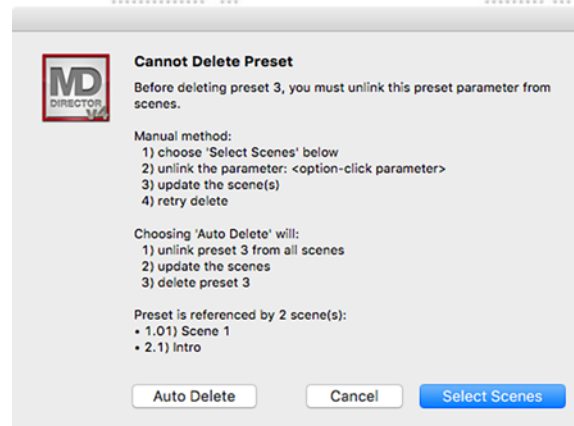
- + **Reveal** - If [command + option] are held down, the store and recall buttons will be replaced by the "reveal" button. Pressing this button will reveal the linked preset in the Preset window (if there is one), jumping to the preset's bank and highlighting the preset.
- + **Delete** - If [shift + option] are held down, the store and recall buttons to the right of the parameter slider will be replaced by the "delete" button. Pressing the delete button will attempt to immediately delete the data for that parameter on that fixture(s) from the preset. However, preset data for a fixture's parameter cannot be immediately deleted if that preset data is being used by the same parameter in any scene in the show. If this is the case, a window will open with an explanation and a list of scenes where the preset data is used.



- Press the Cancel button to return to the main editing window and manually remove (unlink) preset data from each of the affected scenes. Manual unlinking and updating is recommended in cases where the preset is complex and holds data for more than one fixture or for non-similar parameter types. After unlinking the data, attempt to perform the delete action again.
 - Press the Select Scenes button to select all scenes where the preset reference is used in order to unlink all of them at one time. It will then be necessary to update the affected scenes and perform the delete action again.
- + **Delete Preset from Selected Fixtures Only** - It is possible to attempt to delete all preset data from selected fixture(s) in a specific preset by right-clicking on a preset button in the Preset window and selecting the "Delete Preset from Selected Fixtures ONLY" option. Similar to the conditions noted above, an explanation window will open if the preset data cannot be deleted for the selected fixture(s). The explanation window will allow the selection of the scenes the data is used in, so the scenes can be edited and updated. It is then possible to go back and perform the action to remove the selected fixture's data from the preset.

Edit Label	<shift-click>
Recall Preset for Selected Fixtures	<click>
Delete Preset	<option-shift-click>
Delete Preset from Selected Fixtures ONLY	

- + **Delete Preset** - An entire preset can be deleted by [shift + option]-clicking on the preset in the Preset window. As when deleting a preset reference from a parameter, a warning message will appear when the preset's data is being used in one or more scenes.



- Press the Cancel button to cancel the action.
- Press the Select Scenes button to select all scenes where the reference is used, then manually unlink the affected parameters, update the scenes, and then return to delete the preset.
- Press the Auto Delete button to have Mbox Director perform the actions. Using auto delete is not recommended in cases when presets are complex, multiple parameter types across multiple fixtures as the result could affect a large portion of the show data. In such cases, it may be best to manually unlink parameters to ensure critical references are not lost.

Unlinking vs. Deleting

There is a difference between removing a preset data reference from a fixture parameter in a scene (unlinking) and deleting a fixture's parameter data from the preset.

- 1) In the case of unlinking, it is not changing the data stored in the preset, it is choosing not to use it for that parameter on that fixture in that scene.
- 2) In the case of deleting, it is changing the data in the preset so it no longer holds data for that parameter on that fixture.

Likewise, deleting an entire fixture's parameter data from a preset is not the same as deleting the entire preset.

- 3) In the first case, it is removing all the data for all of that fixture's parameters from the preset.
- 4) In the second case, it is deleting all data from the preset (for all parameters on all fixtures) and deleting the preset entirely.

Deleting data from presets or deleting entire presets should be done carefully and would be used when the data in the preset is no longer correct or the entire preset is no longer needed. *It's not necessary (or correct) to perform a delete action if the only intention is to stop using the preset reference data in a particular scene.*

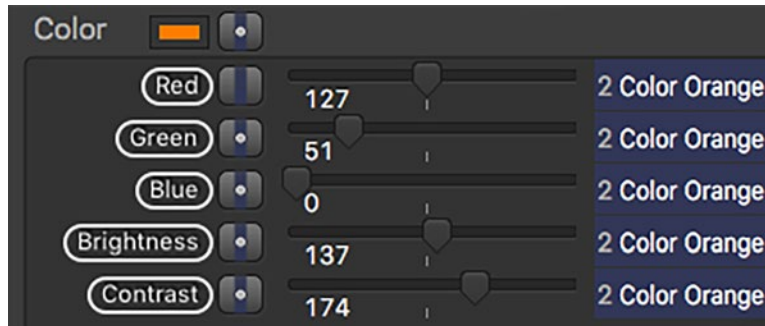
Generally, if the intention is to stop using preset reference data for a parameter, either use the Unlink button or change the parameter value manually. (In both cases, it will then be necessary to update the scene if auto updates are disabled.)



If preset data is accidentally deleted, the undo function can be used to restore the data.

Window Indicators

- + When dragging parameter values onto a preset button, the drop location will show a green ring to indicate where the data will be dropped. Pressing [esc] will cancel the drag.
- + If parameters are dragged onto an existing preset, a merge is performed, adding values for parameters with no existing values, and replacing existing values when parameters already have a value stored in the preset.
- + The color-coded indicators on the parameter reset buttons indicate if a parameter is currently using a preset reference. A vertical blue stripe is used to indicate this condition. Clicking the Reset button removes the preset reference from that parameter in addition to removing other parameter adjustments like timing, delay, etc.



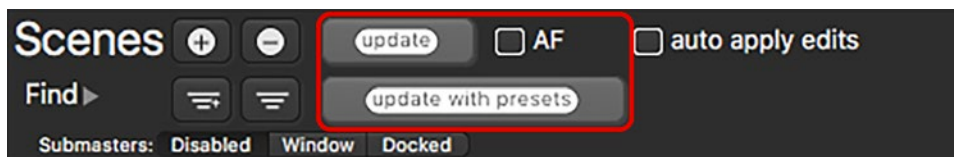
- + The preset recall buttons have a white ring around them to show which one was last clicked or when the reveal function is used. When manually recalling a preset reference value for a parameter (by clicking the Recall button) or storing a preset reference (by clicking the Store button), the pre-existing presets which have that parameter for that fixture stored in them will be ringed in yellow. (These are the same presets that can be shown by opening the F5 menu when storing or revealing presets.)
- + The preset recall buttons will show a gray dot at their top-left to indicate that the preset holds data for at least one of the fixtures in the current selection. Narrow down the list by selecting one fixture at a time and noting what fixture is selected when the dot appears.

Updating Scenes with Presets

The real power of presets lies in updating existing presets and having those updates automatically be applied to any scenes using the preset data. If preset data is edited and the modified values stored into the preset (using the store button or by drag and drop) any scenes using that preset data will receive those changes. When presets are used in scenes, values can be edited and then updated while the scene is active.

Editing preset values and updating the scene and preset:

- Step 1. Recall a scene that uses the preset, then select the fixture using the preset values to be edited.
- Step 2. Edit parameter values as desired. Two different update buttons will appear at the top of the scene list.



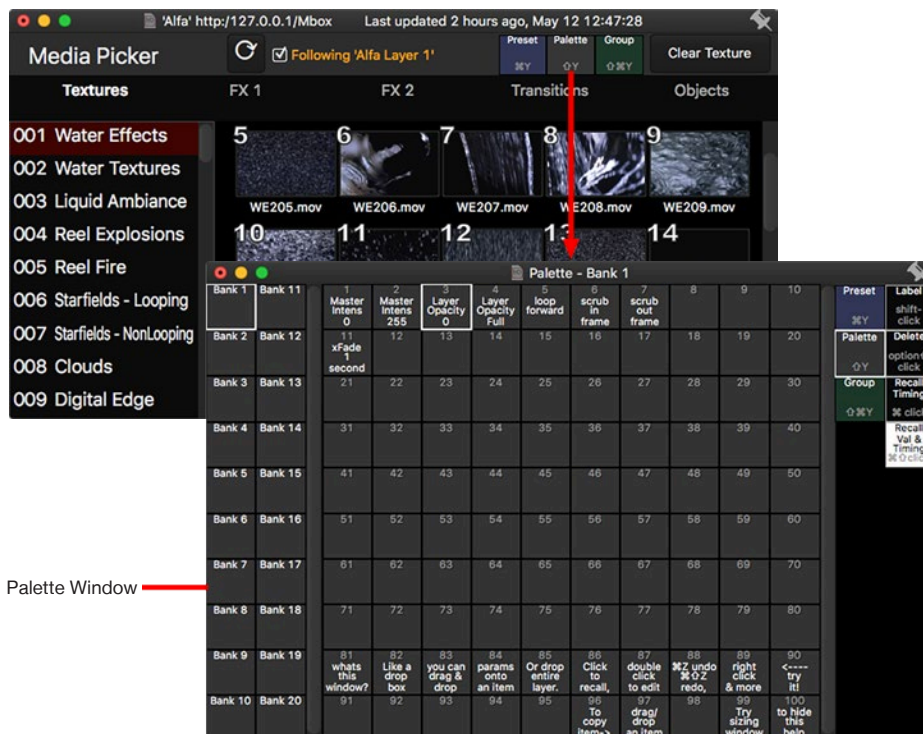
- Step 3. Do one of the following:
- To update the scene and unlink any modified parameter values from the preset, press the Update button.
 - To update both the preset and the scene, keeping the preset links in the scene, press the Update with presets button.

Palettes

Parameter values (or groups of parameter values) can be stored and recalled using the Palettes feature. A Palette window, available from the Media Picker, contains 20 banks of 100 palettes (for a total of 2000 palettes). Parameter value (either complete "looks" or frequently used values) can be stored into these individual palettes for later recall. Palettes can be deleted or edited at any time. Unlike presets, palettes are not referential.

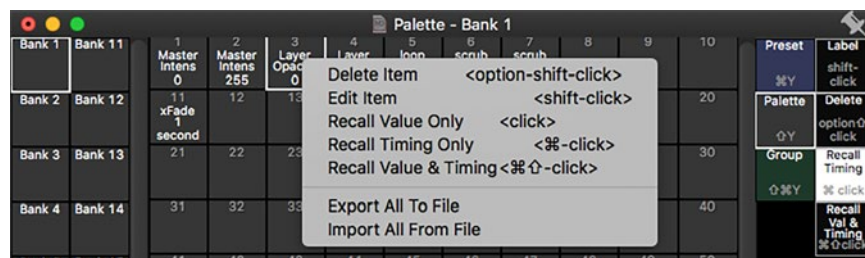
Once stored, palette data can be exported and imported into other Mbox Director files.

To open the Palette window, press the Palette button on the Media Picker, or use keyboard [⇧Y]:



Guidelines:

- + The Palette window is scalable by dragging on any of its sides or corners.
- + To "pin" the Palette window so that it stays in front of other Director windows, click on the pin icon in the upper-right corner.
- + The quick-buttons located on the right side of the window (Label, Delete, Recall Timing, and Recall Value and Timing), can be used in combination with the palette buttons to perform specific actions. A contextual menu is also available by right-clicking on a palette button.

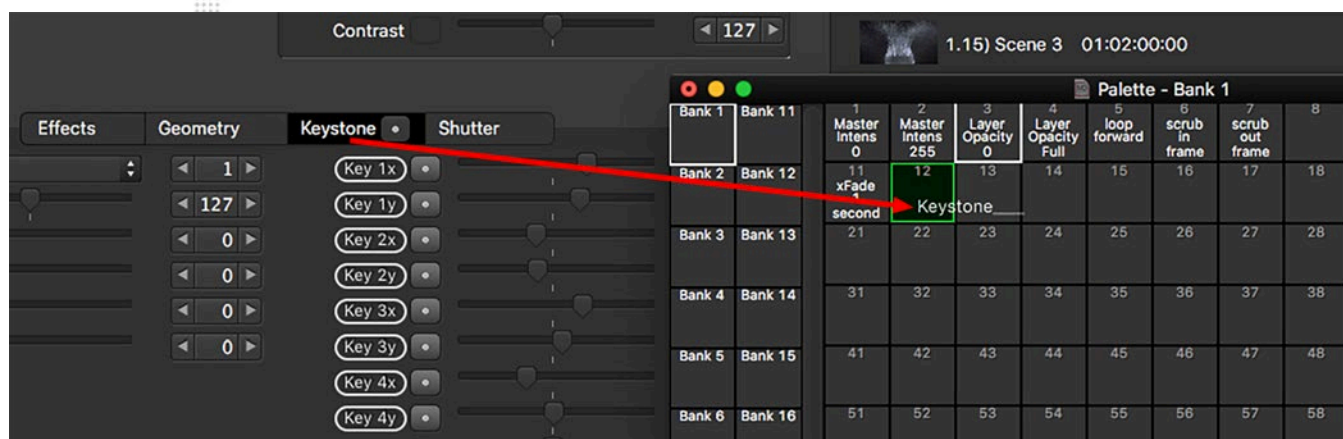


To store into a palette:

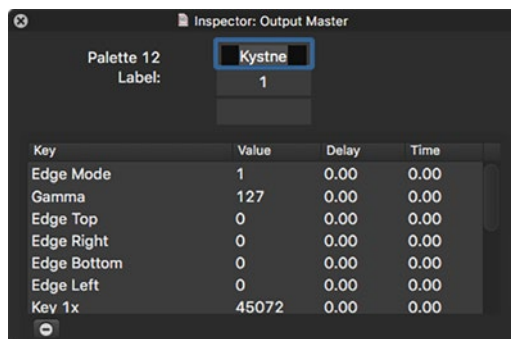
Step 1. Open Palette window. If desired, pin window to keep it visible when clicking on the main Director window.

Step 2. On the main Director window, click and drag a parameter, parameter group, or an entire fixture's values, dropping it onto a palette button.

For example, drag the Keystone tab to Palette 12 as shown below:

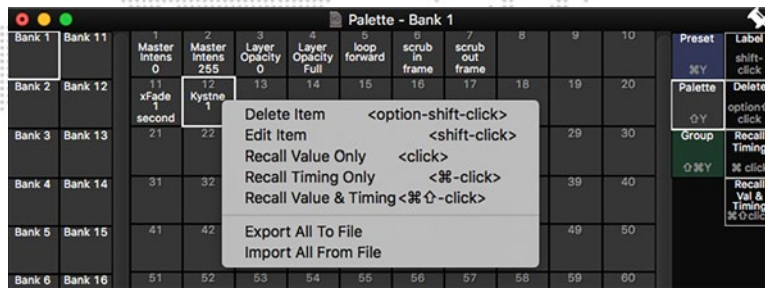


Step 3. Shift-click on the palette button to open an inspector window where the preset's name, plus the parameter values and timing, can be edited. In the Inspector window, edit name and label as required. Shift-clicking on the palette button allows the name and values to be edited without applying the preset. Double-clicking on the preset button opens the same window, but will apply the palette, which may be undesirable depending on the situation.



Step 4. Click on the close button to close the inspector window.

Step 5. At any point in time, the same inspector window can be opened in a similar fashion, and the parameter values and timing can be edited.



To recall a palette:

Step 1. Open the Palette window.

Step 2. Do one of the following:

- Right-click on a palette recall button and choose a Recall option: Value Only, Timing Only, or Timing & Value.
- Choose Recall Timing or Recall Value & Timing by clicking on the appropriate button at the right side of window. Then click a palette button.
- To recall a palette's parameter values only, simply click on the palette button. Alternately, hold down [command] and click to recall timing values only, or hold down [command + shift] and click to recall parameter values and timing.

To delete a palette:

Step 1. Open the Palette window.

Step 2. Do one of the following:

- Right-click on the palette recall button and select Delete Item.
- Click on the Delete button at right side of window, then click on required palette button.
- Hold down [option + shift] and click on the palette button.

To export/import palette info:

Step 1. Open the Palette window.

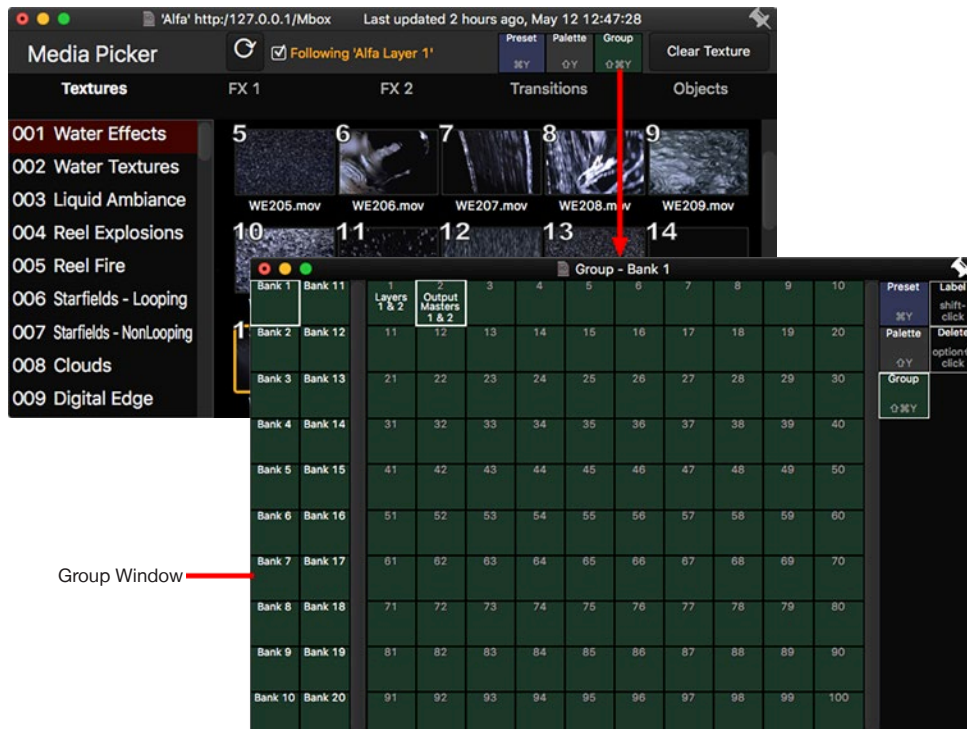
Step 2. Right-click on the palette button with data to be exported/imported.

Step 3. Select Export or Import options.

Groups

Groups of fixtures can be stored and recalled using the Groups feature. The Groups feature provides a quick way to repeatedly select multiple elements for editing. A Group window, available from the Media Picker, contains 20 banks of 100 groups (for a total of 2000 groups). Custom combinations of layers, output masters, and global masters can be stored into these individual groups for later recall. Groups can be deleted or edited at any time.

To open the Group window, press the Group button on the Media Picker, or use keyboard [⇧⌘Y]:



Guidelines:

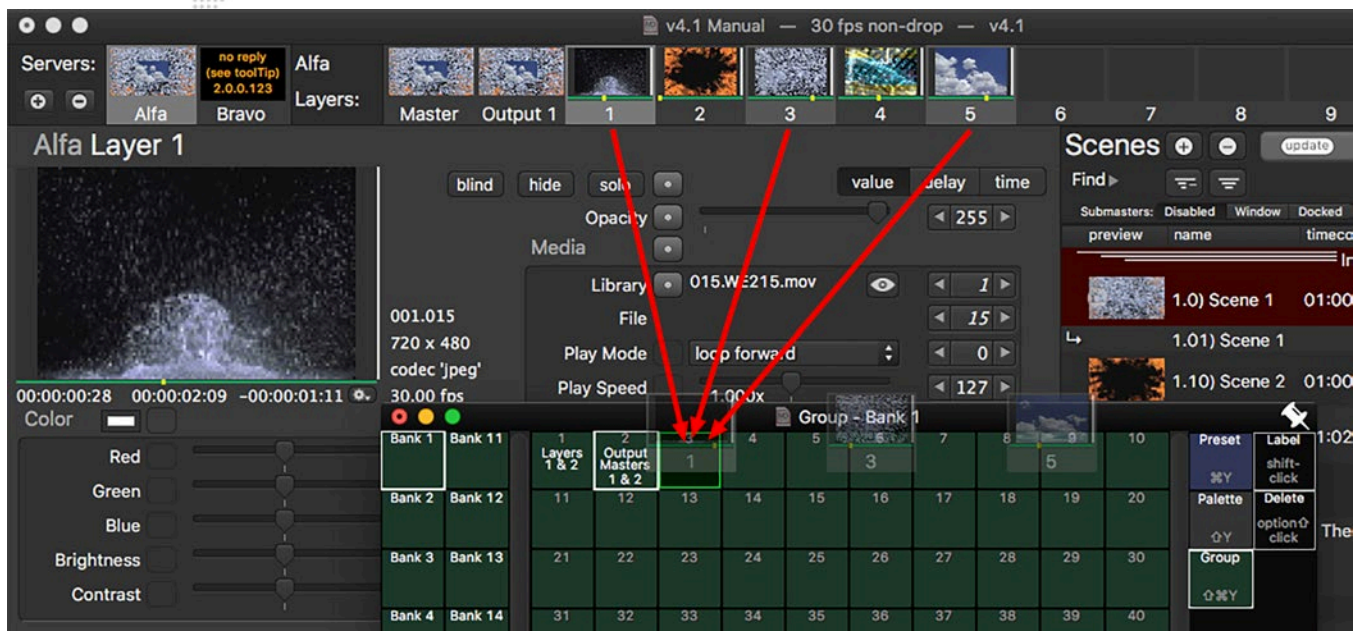
- + The Group window is scalable by dragging on any of its sides or corners.
- + To "pin" the Groups window so that it stays in front of other Director windows, click on the pin icon in the upper-right corner.
- + The quick-buttons located on the right side of the window (Label and Delete), can be used in combination with the group recall button to perform specific actions.

To store a Group:

Step 1. Open Group window. (Pin window on top by pressing its pin icon.)

Step 2. At main Director window, select multiple layers and drag to a group button.

For example, select odd layers (1, 3, and 5) then click on any of the selected layers and drag and drop onto Group 1 as shown below:



Note: Fixtures can be added to existing groups by dragging and dropping them onto an existing group button.

To label a group:

Step 1. Open the Group window.

Step 2. Do one of the following:

- Click on the Label button at right side of window, then click on required group button.
- Shift-click on the group button.

Step 3. In the inspector window that opens, edit the group's label.

To recall a group:

Step 1. Open the Group window.

Step 2. Click on the desired group button.

To delete a group:

Step 1. Open Group window.

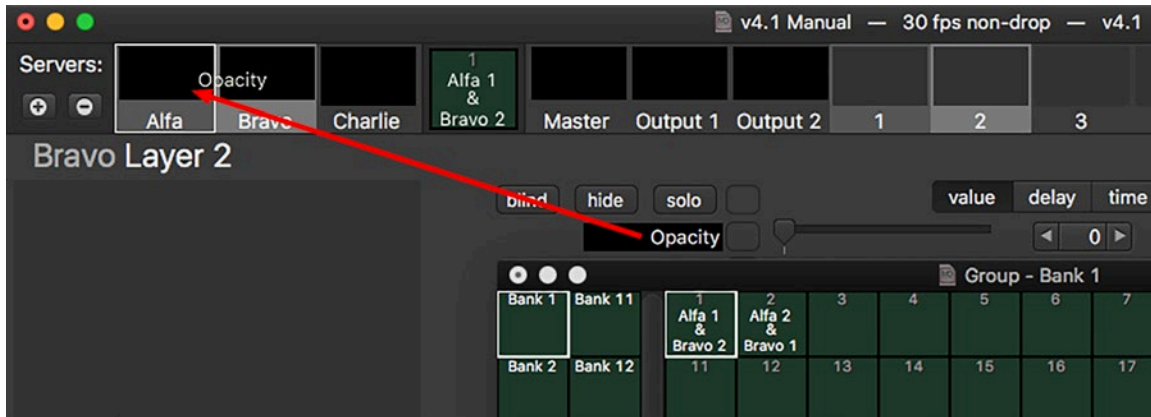
Step 2. Do one of the following:

- Click on the Delete button at right side of window, then click on a group button.
- Hold down [option + shift] and click on the group button.

Motley Selection Drag and Drop

When a Group selection contains two or more layers, where the selected layers do not belong to the same server and also do not have the same layer number, it is called a "Motley Selection." When dragging parameter values from one member of a Group having a "motley" selection and dropping them onto another server, Director will filter the drop based on the current Group selection and where the values are dropped. If values are dropped onto scenes or presets, then the parameter value for all members will be stored.

In the example below, a motley selection has been made and Opacity is being dragged onto the Alfa server:



There are two scenarios to consider in this case:

Scenario 1

Motley selection is Alfa 1 + Bravo 2.

Bravo 2 is the current shown layer.

Drag Opacity and drop it onto Server Alfa.

Opacity will not be copied since Alfa layer 2 is not selected.

Note: nothing was copied to 'Alfa' because no matching layers on 'Bravo' were selected!

Scenario 2

Motley selection is Alfa 1 + Bravo 2.

Bravo 2 is the current shown layer.

Drag Opacity and drop into onto Server Charlie.

Charlie is not in the selection at all.

Opacity for Bravo layer 2 will be copied to Charlie layer 2

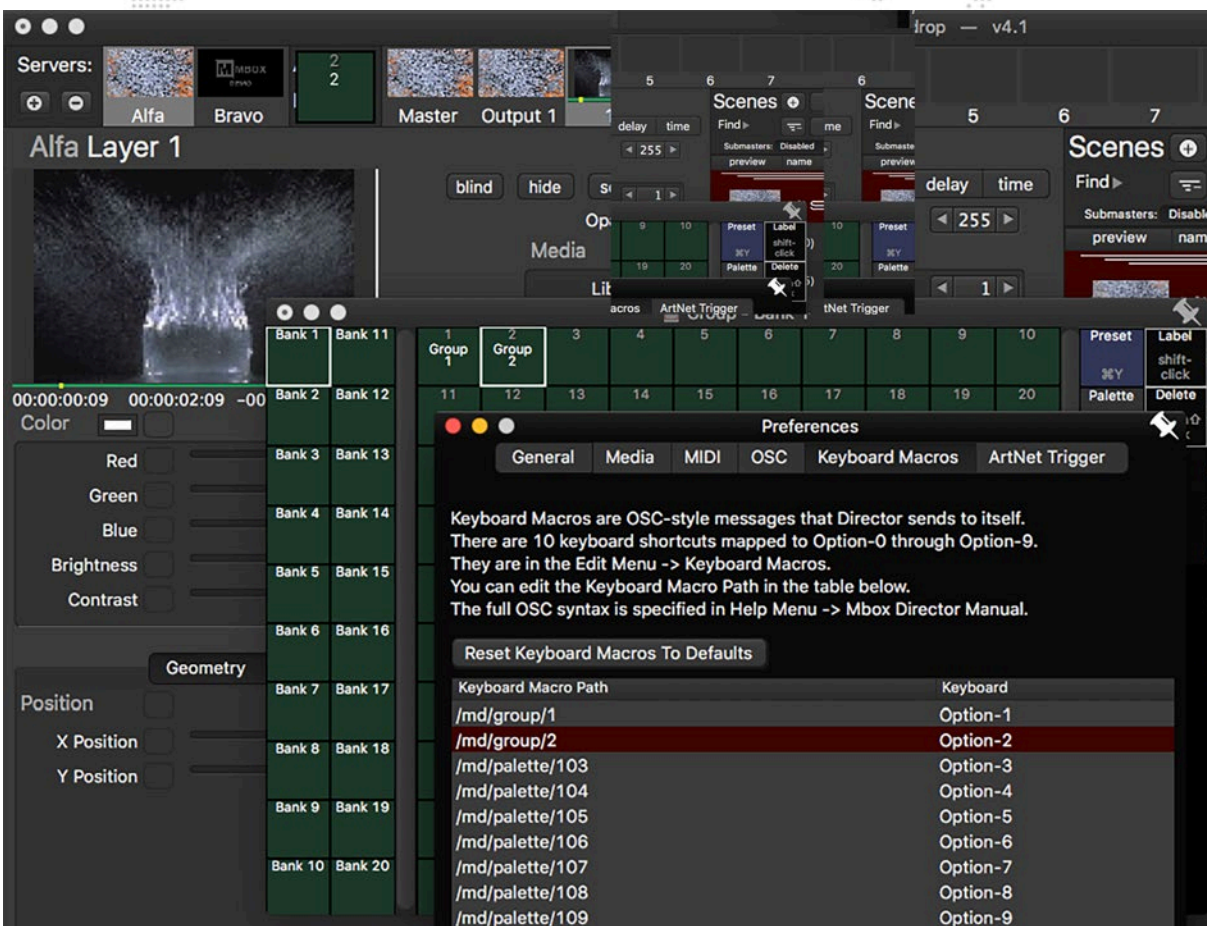
Charlie layer 1 will not receive any copy since Bravo layer 1 is not selected.

**Note: copied 1 of 2 selected fixtures.
Copied from Bravo to Charlie.**

Group Hotkeys

Director's Keyboard Macro feature can be used to create hotkeys for quickly recalling groups.

To setup hotkeys, open the Preferences window and select the Keyboard Macros tab. Edit one or more of the macros to specify a group to be recalled by keyboard commands as shown in the example below:



Note: Keyboard Macros can be any OSC command that Director responds to. Refer to ["Appendix A: OSC Reference"](#) on page 105 for more information on available OSC commands.

ADVANCED FEATURES

Value vs. Delay vs. Time

The layer parameters can be displayed in the Mbox Director window by Value, Delay, or Time. These are defined as follows:

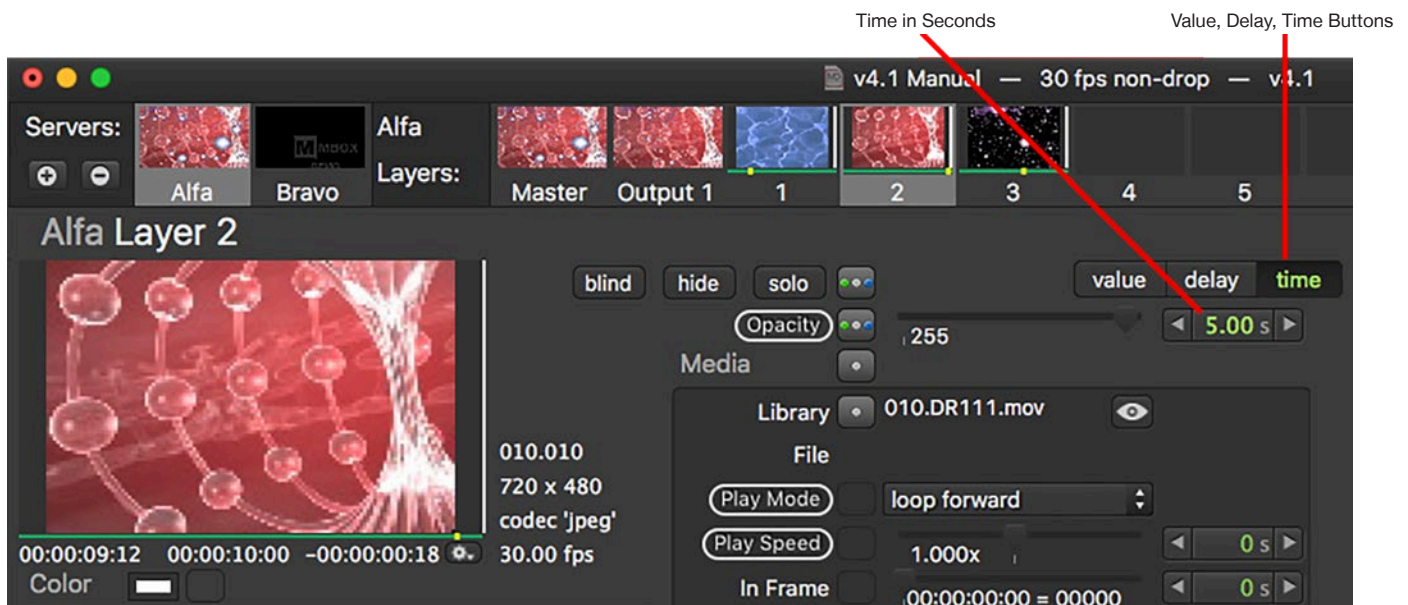
- + **Value** - Specifies a parameter's value setting, which may be an 8 or 16-bit number. For example, opacity can range from 0 (transparent) to 255 (fully opaque). The number from 0 to 255 would be considered the "value" of opacity.
- + **Delay** - Specifies the time delay (in seconds) between when a scene is triggered and when the delayed parameter begins to transition/crossfade to its stored value for the scene.
- + **Time** - Specifies how long it will take (in seconds) for a parameter to transition/crossfade from its state in the previous scene to its state in the new scene.

By default, the window displays 8/16-bit parameter values using a white colored text for the value. This can be changed by clicking the Delay or Time buttons, or by pressing [⌘T] for time or [⌘D] for delay.

Delay values are shown in number of seconds and displayed in a blue colored text.

Time values are shown in number of seconds and displayed in a green colored text.

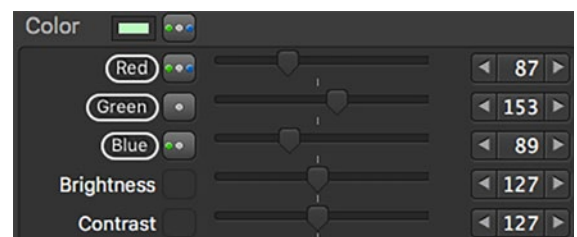
Adjust parameter values using sliders, arrow buttons, and/or numeric fields. Adjust delay and time values using the arrow buttons or numeric field only.



Resetting Parameter Values, Delays, and Times

A WHITE dot on the reset button for a parameter or group tab indicates a change from the default parameter value. A BLUE dot indicates a change from the default delay time of 0 seconds. A GREEN dot indicates a change from the default transition time.

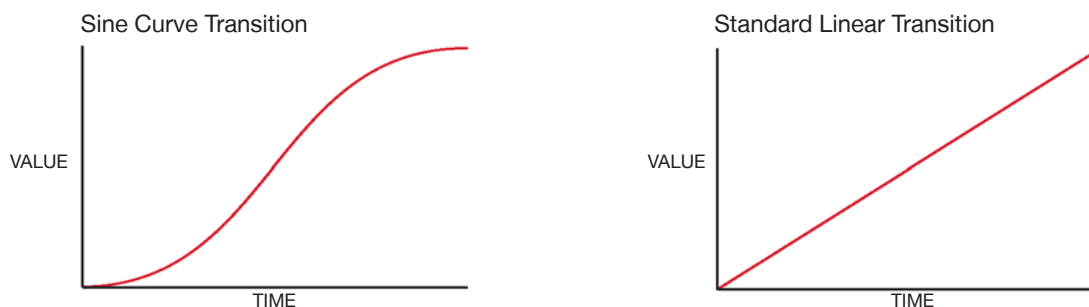
- + Click dot to return to default value and zero (0) time/delay.
- + Press and hold [⌘] while clicking dot to reset time/delay only.
- + Press and hold [⇧] while clicking dot to reset value only.



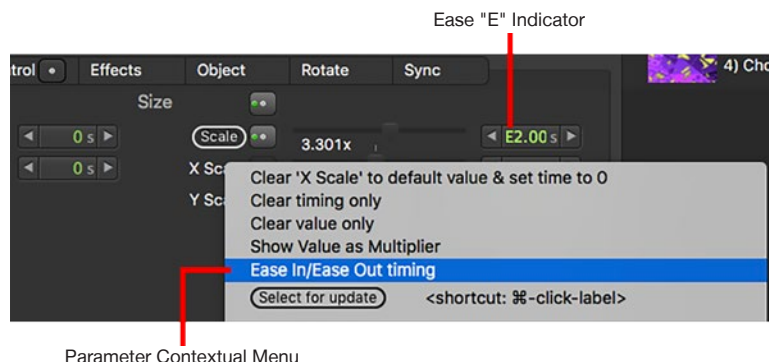
Ease In/Out

The Ease In/Ease Out timing option provides a method for applying a sine curve to a parameter transition, as opposed to the default linear transition. This option can be toggled on or off in the right-click contextual menu for any parameter that can have a timing value, or can be entered by typing in "E#.##" into the parameter's value field, (where #.## is the length of the transition in seconds).

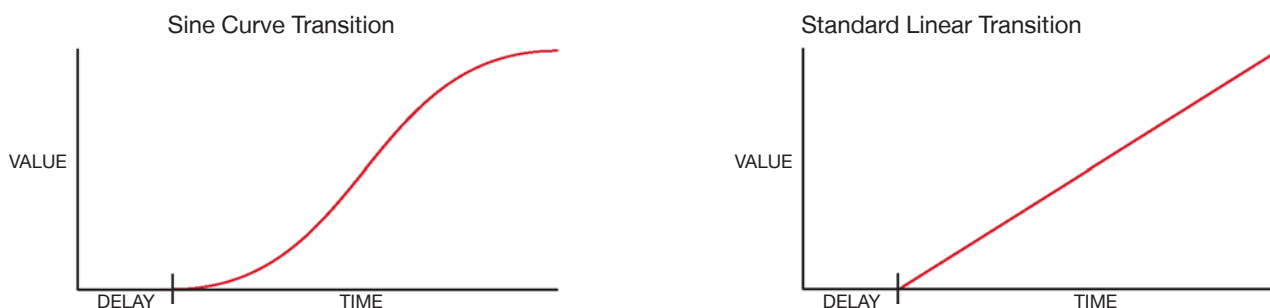
The following diagram illustrates the concept of the Ease In/Out sine curve:



When the Ease In/Out option is enabled, it will be indicated by an "E" next to the parameter's time value.



The following diagram illustrates the concept of the Ease In/Out sine curve with a delay added:



Note: For more information about the Parameter contextual menus, refer to "Parameter Contextual Menus" on page 90.

Submasters

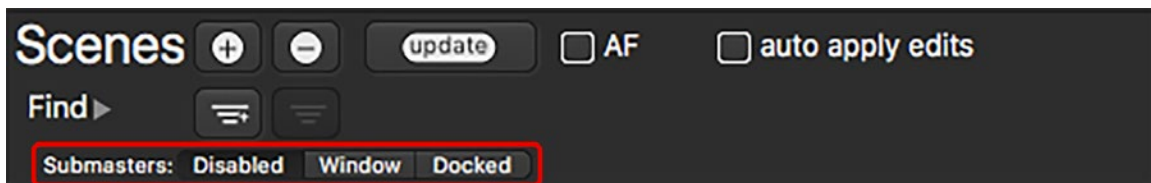
In normal operation, Director's scene list does not allow for one scene to be overlaid on top of another in a manner similar to using multiple playback faders on a console. Instead, it works like a single LTP cue stack. Director v4.1 adds the ability to recall more than one scene at a time using Submasters. Director's Submasters are similar in function and operation to those found on PRG's Vx76 series of lighting controllers. Director still retains the single scene list where all scenes are stored, but in addition to recall in this main list (which is considered to be Submaster 1), there are four additional submasters (2 - 5) that can have scenes loaded into them for recall.

In normal operation, using only the scene list, scenes are executed in a latest takes precedence fashion, with the most recently recalled scene completely replacing all parameter values from the previously active scene. Submasters may be used to load additional scenes from the scene list and execute them with a higher priority than scenes in the scene list. Submasters also have a filter to allow only a subset of parameters from their loaded scene to be recalled.

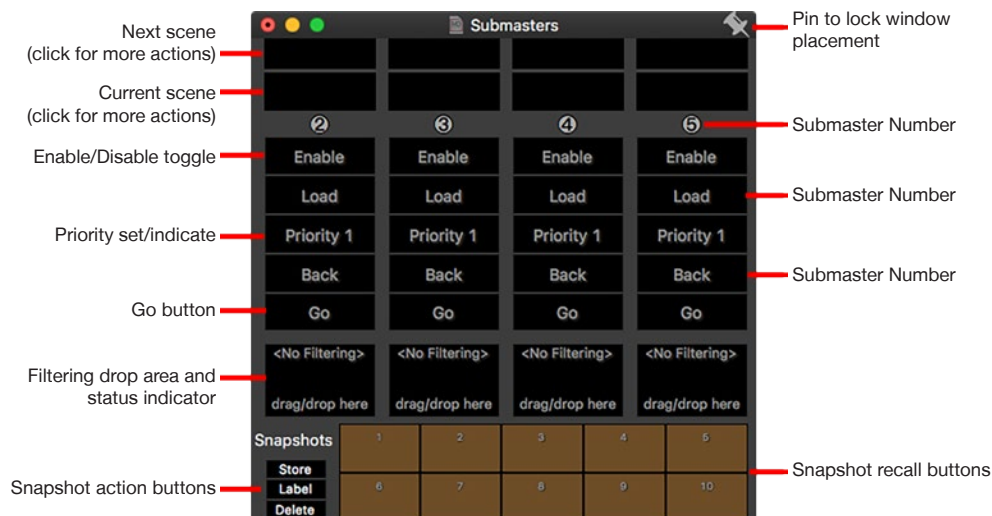
In combination, submaster priorities and filters allow a scene recalled on a submaster to either completely replace or add onto the scene that was recalled using the scene list. All scenes are created in the normal fashion, and are stored in the scene list. All scenes are available for execution from the scene list whether using manual triggering, OSC/MIDI/Art-Net/sACN triggering, or timecode.

Enabling Submasters

Submasters are hidden by default, and can be viewed below the main scene list in the main Director window, or in a separate window. Click on the either the Docked or Window button to show the submasters in the desired location. Click on the Disabled button to hide the submasters.



The scene list is always submaster ① and is permanently assigned the lowest priority value of 0 with no parameter filtering. The four additional submasters, numbered ② through ⑤, are visible in the submaster window. These submasters are available for recalling additional scenes with adjustable priority and filtering.



Recalling a Scene On A Submaster

To recall a scene on a submaster:

- Step 1. Select a scene in the scene list. Click the submaster's Load button to load the selected scene into the submaster's next scene slot. Alternately, drag a scene from the scene list and drop it onto the submaster's Load button.
- Step 2. The scene will be shown in the submaster's Next Scene slot.
- Step 3. Click the Enable button to enable the submaster - i.e. to turn it on, so its scenes will be active.
- Step 4. Click the submaster's Go button to execute the scene in the next scene slot. This will load the next consecutive scene from the scene list into the submaster's next scene slot.

Additional Guidelines:

- + As an alternate to dragging and dropping a scene from the main scene list to a submaster's Load button, scenes can be dropped directly onto the Go button to both load and immediately recall the scene. Note that this does not automatically enable the submaster, it must still be enabled for the scene to be active.
- + The 'Back' button can be pressed to step backwards to the previous scene in each submaster. This will be the scene from the scene list that is prior to the current scene in the submaster.
- + Auto-follows will execute when used in a submaster. Therefore, take care when using auto-follows so they will not cause the wrong scene to be executed.
- + To disable (i.e. make it so the scene is no longer active) the submaster, press the 'Enable' button so that the button is no longer highlighted. Also, see the section below regarding smart fade out of submasters when they are disabled.
- + To clear a submaster completely, left-click on the submaster's next or current scene slot, or right-click on the Enable button. On the contextual menu that appears, select 'Clear Submaster Scene' to clear the submaster of scenes. The 'Reset Submaster' option will clear the submaster of scenes and also reset its priority and filter.

CAUTION! Because all scenes can be recalled from the main scene list, it is possible to step from a scene intended for the main list into another scene that is intended to be used in a prioritized and/or filtered submaster. It is recommended that scenes intended for submasters be kept separate in the scene list, either before all of the "main" scenes or after them. The use of separators in the scene list can help with organization.

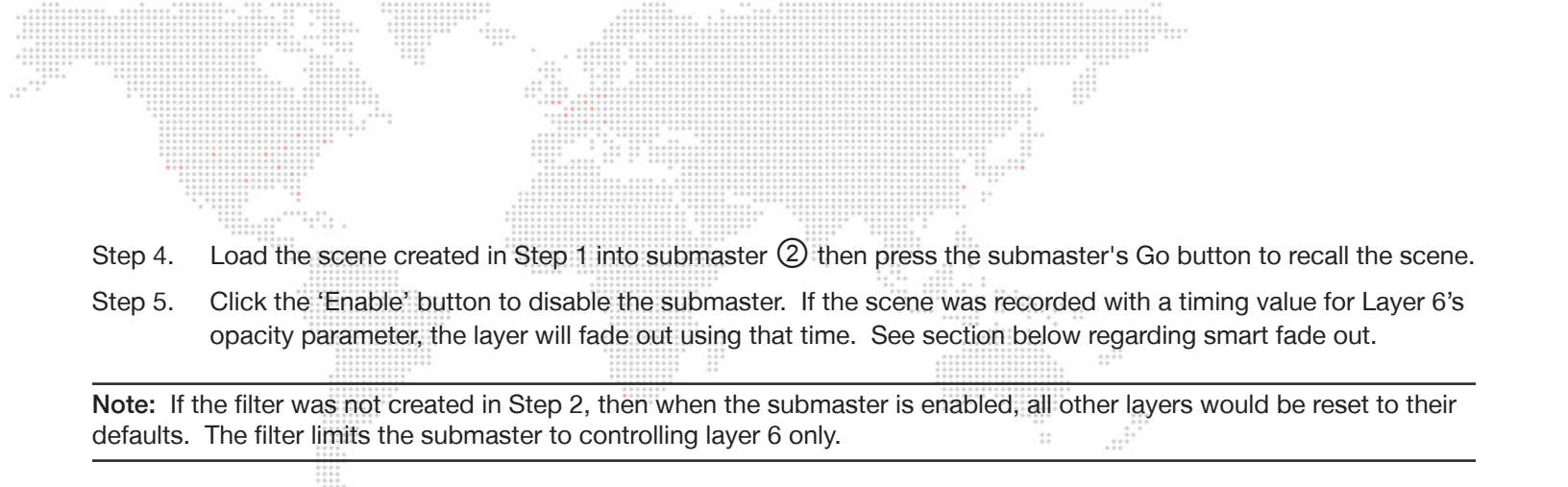
Filtering Specific Layers and Parameters

The real power of a submaster is in its ability to recall a scene and apply a subset of that scene's parameter values at a higher priority than the main scene list. Scenes always store all parameter values for all fixtures. And because submasters have higher priority than the scene list, parameter values from scene on a submaster will always replace values from the scene that is active on the scene list.

However, submaster Filters allow for the selection of only selected parameters to be replaced, rather than all parameters. This means that a submaster can be used to add either full layer overlays to a base look or to perform temporary changes to just a few parameters without affecting others.

Example - Fade-in layer 6, overlaid on top of any scene in the scene list, and then fade-out layer 6:

- Step 1. Create a scene at the bottom of the scene list that plays a movie on Layer 6. Make sure that Layer 6's opacity is at full in this scene. Make sure that all other layers have all parameters set to default values.
- Step 2. Drag Layer 6 from the Layer browser and drop it onto the Filter button of submaster ②. This creates a filter for the submaster that includes only layer 6.
- Step 3. Enable submaster ②.

- 
- Step 4. Load the scene created in Step 1 into submaster ② then press the submaster's Go button to recall the scene.
- Step 5. Click the 'Enable' button to disable the submaster. If the scene was recorded with a timing value for Layer 6's opacity parameter, the layer will fade out using that time. See section below regarding smart fade out.

Note: If the filter was not created in Step 2, then when the submaster is enabled, all other layers would be reset to their defaults. The filter limits the submaster to controlling layer 6 only.

Submaster Priority

The Priority feature allows each submaster to have a Priority Level between 0-10. The scene list (i.e. Submaster ①) always has the lowest priority of 0.

Pile-On / Pile-Off Behavior when using priorities:

- + Enabling a submaster with a higher priority value overrides all non-filtered parameter values on the scene list and submasters with lower priority value, disabling the submaster returns affected parameters to their state in the scene with lower priority value.
- + Enabling a submaster with an equal priority value will replace parameter values on the scene list or other submasters having that same priority value. This works in a latest-takes-precedence (LTP) fashion.

Example of Submaster Priority Interaction:

- Step 1. Submaster ② is assigned a priority value of 1. Scene 100 is loaded, and active. The submaster is enabled.
- Step 2. Submaster ⑤ is assigned a priority value of 2. Scene 101 is loaded and active, but the submaster is not yet enabled.
- Step 3. When Submaster ⑤ is enabled, its parameter values will override those from Submaster ②.
- Step 4. When Submaster ⑤ is disabled, Scene 100's parameter values will be restored.

Smart Fade Out

A common use for a submaster is to enable the submaster to fade in a look on top of existing layers, and then disable the submaster to fade out the look. The smart fade out feature can be used when enabling/disabling a submaster.

- + To enable the smart fade out feature, click on a submaster's next or current scene slot. On the menu that appears, confirm the 'Smart Fade Out' item is checked.

When smart fade out is enabled, disabling a submaster that controls opacity for a layer, where the layer's opacity will be fading to zero, the layer will first fade out using the current submaster scene's opacity time, and will wait until the opacity fade out is done before releasing the other parameters controlled by the submaster.

Timecode

Submasters ignore timecode. All scenes in the scene list can have timecode values, but they would be recalled in the scene list with a priority of 0 and no filtering, rather than in a submaster.

OSC/MIDI

Submasters ignore OSC and MIDI commands. Only scenes in the scene list can be triggered using OSC or MIDI.

Hotkeys

Show Submasters Window: use keyboard command + shift + B [⌘⇧B]

Blind Mode

Blind mode allows changes (edits) to be made in Director without them being output to Mbox. This feature is similar to Blind or Preview modes on lighting consoles, where edits to a show can be made on-the-fly without those changes being immediately reflected on the stage. These changes can be saved or abandoned as desired.

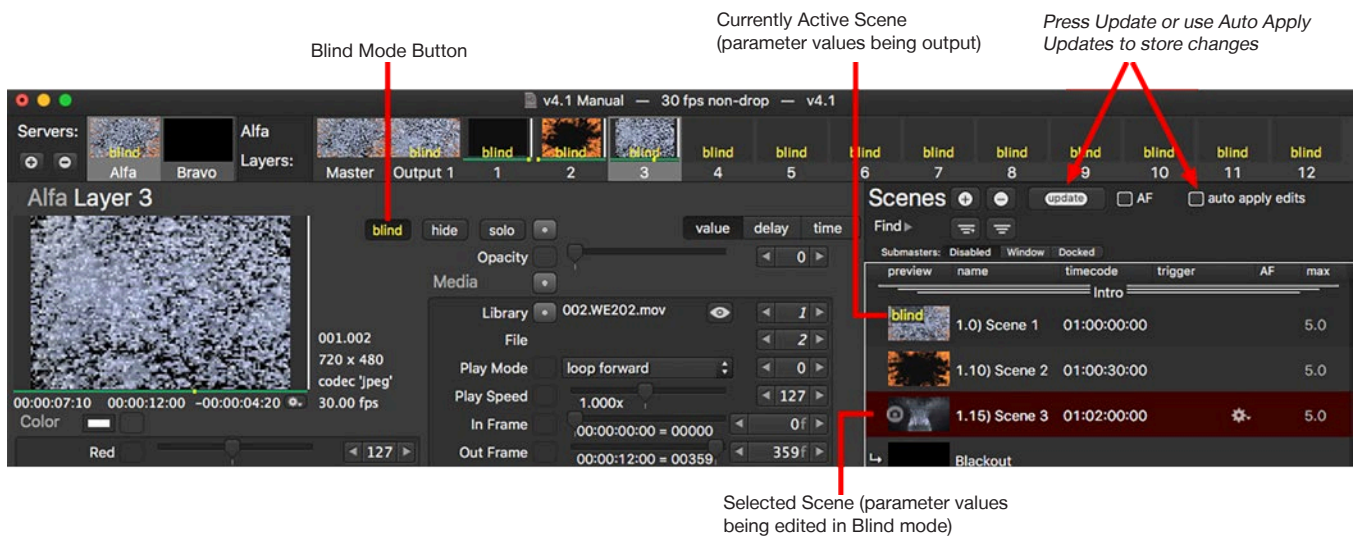
To enter Blind mode, click on the Blind button on the main window. Press again to exit the mode. (The button has an on/off toggle action.)

Guidelines:

- + When Blind mode is activated, the currently active scene's parameter values will continue to be output until Blind mode is deactivated. i.e. Once Blind mode is entered, other scenes can be selected and edited without affecting the current output.
- + When Blind mode is deactivated, the currently selected scene (i.e. the scene with the red highlight) will be recalled and its parameter values output.

CAUTION! Deactivating Blind mode will cause the active scene to change if scene other than the active scene is selected! Therefore it is important to reselect the active scene before exiting Blind mode.

- + In the scene list, the scene with the yellow "blind" text next to it is the scene that is currently active (i.e. its parameter values are being output) while edits are being made in Blind mode.
- + While in Blind mode, changes to parameter values must be saved (i.e. the scene must be updated automatically or manually) for them to be retained.
- + If Blind mode is exited before the edits are saved (updated), Director will recall currently selected scene and all changes will be lost.
- + Pressing Undo (⌘Z) will revert any changes to the scene if they are stored.



Hide and Solo Functions

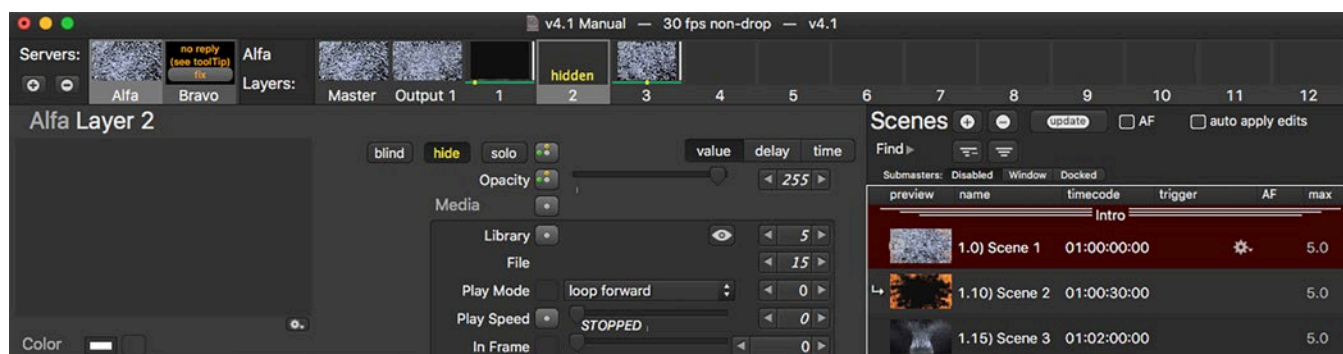
When a large number of layers are playing content, it is often difficult to determine what content is being generated by which layer. The Hide and Solo buttons provide a way to isolate or turn off different layers.

- + **Hide** - Sets the output opacity of the selected layer to zero.
- + **Solo** - Hides all layers except for the selected layer.

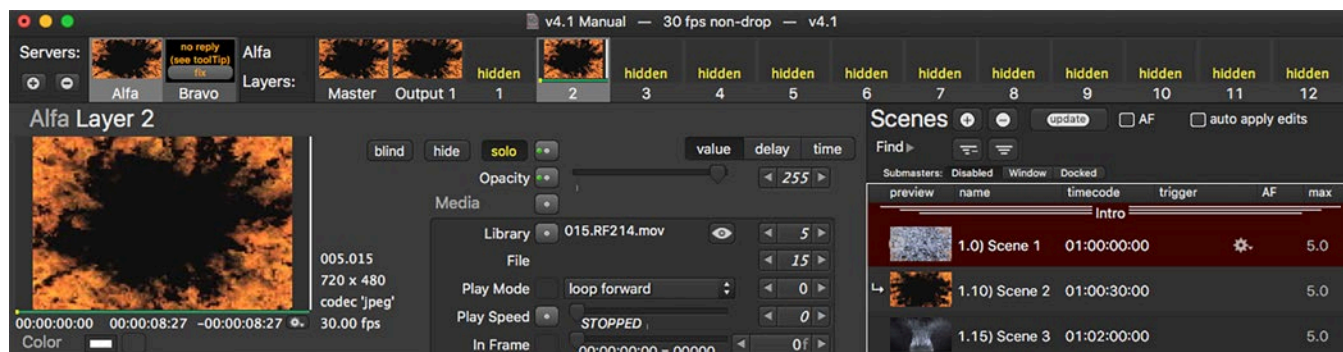
When a layer is in hide or solo mode and a scene is stored, it will store the "unhidden" opacity values.

 An easy way to reset all hides and/or solos is to click the Solo button on and then off.

Hide enabled:



Solo enabled:

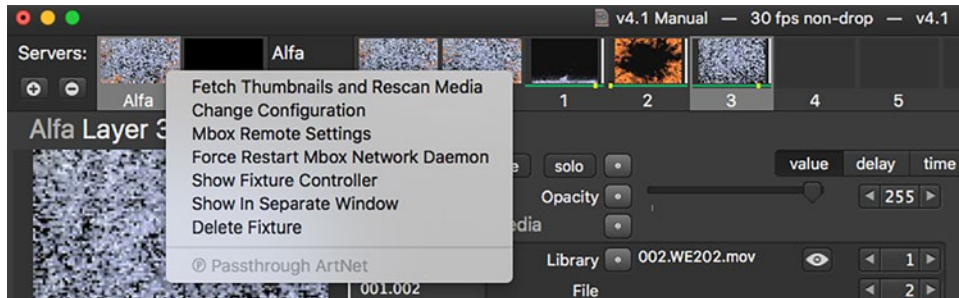


Contextual Menus

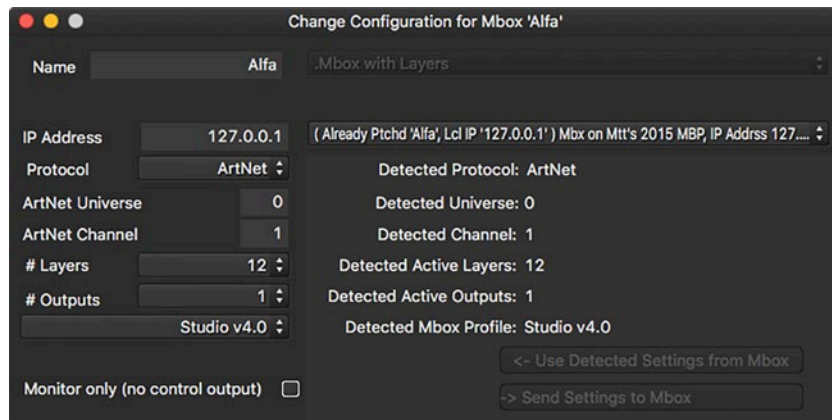
Special contextual menus can be accessed by right-clicking in different areas of the main screen. These menus contain various options depending on the area clicked.

Server Contextual Menu

To access the server contextual menu, right-click on a fixture's preview tile.



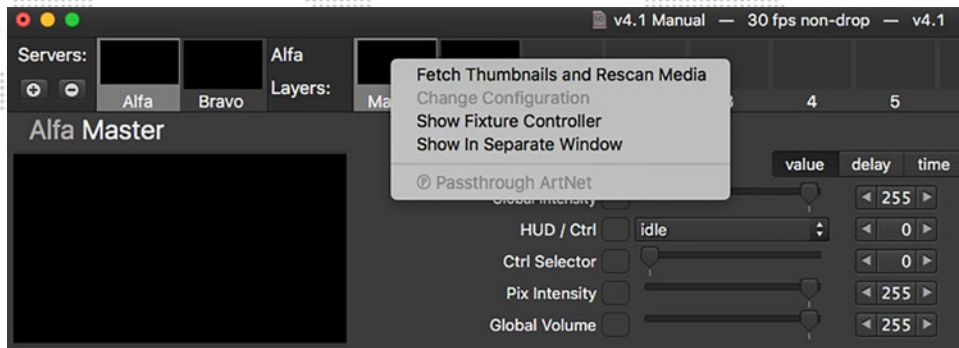
- + **Fetch Thumbnails and Rescan Media** - This option rescans the media content files and generates the corresponding thumbnails.
- + **Change Configuration** - This option brings up a Change Configuration window for the selected server. (Refer to "**Changing Server Configuration**" on page 12 for more information.)



- + **Mbox Remote Settings** - This option allows the settings of the Mbox application to be changed remotely.
- + **Force Restart Mbox Network Daemon** - This option restarts the Mbox Daemon application. (Refer to "**Network Configuration**" on page 5 for more information about the Mbox Daemon.)
- + **Show Fixture Controller** - This option brings up the fixture's parameter settings in the main window.
- + **Show In Separate Window** - This option opens the fixture in a new window. (This can be useful to compare information on two screens at the same time.)
- + **Delete Fixture** - This option deletes the currently selected fixture.
- + **Passthrough** - Enables Passthrough Art-Net or sACN control. (Refer to "**Combined Control with an External Console (Passthrough)**" on page 91 for more information about this feature.)

Master Contextual Menu

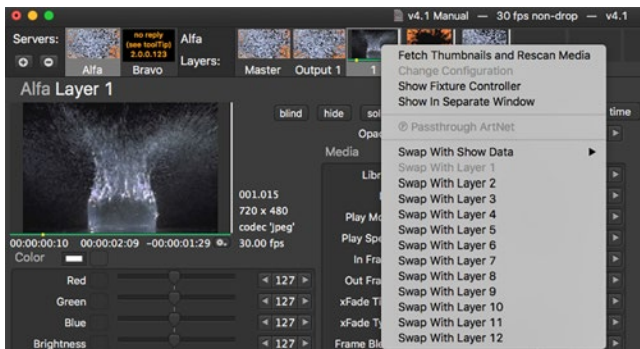
To access the master contextual menu, right-click on any Global/Output Master preview tile. This menu has similar options to the Server Menu (see previous).



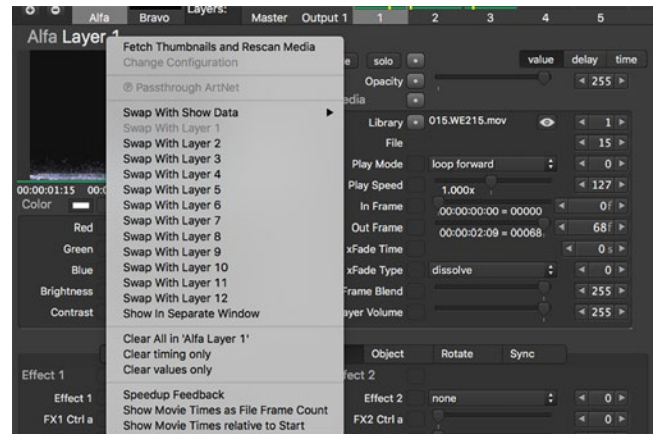
Layer Contextual Menus

The layer contextual menus have some of the same options available found in the Master menu (see previous). The main difference being that they apply to the layer instead of the master. They also offer swap options as follows:

- + **Swap With Layer #** - Swaps the current values with the chosen layer.
- + **Swap With Show Data** - Swaps the stored scene data with the chosen layer.



To access the first layer contextual menu, right-click on a layer's preview tile.



To access the second layer contextual menu, right-click in the layer preview area of the main window. This menu has many of the same options as the layer's preview tile contextual menu, but add options for: clearing timing, values, or all data; speeding up feedback framerate; displaying movie times in alternate formats.

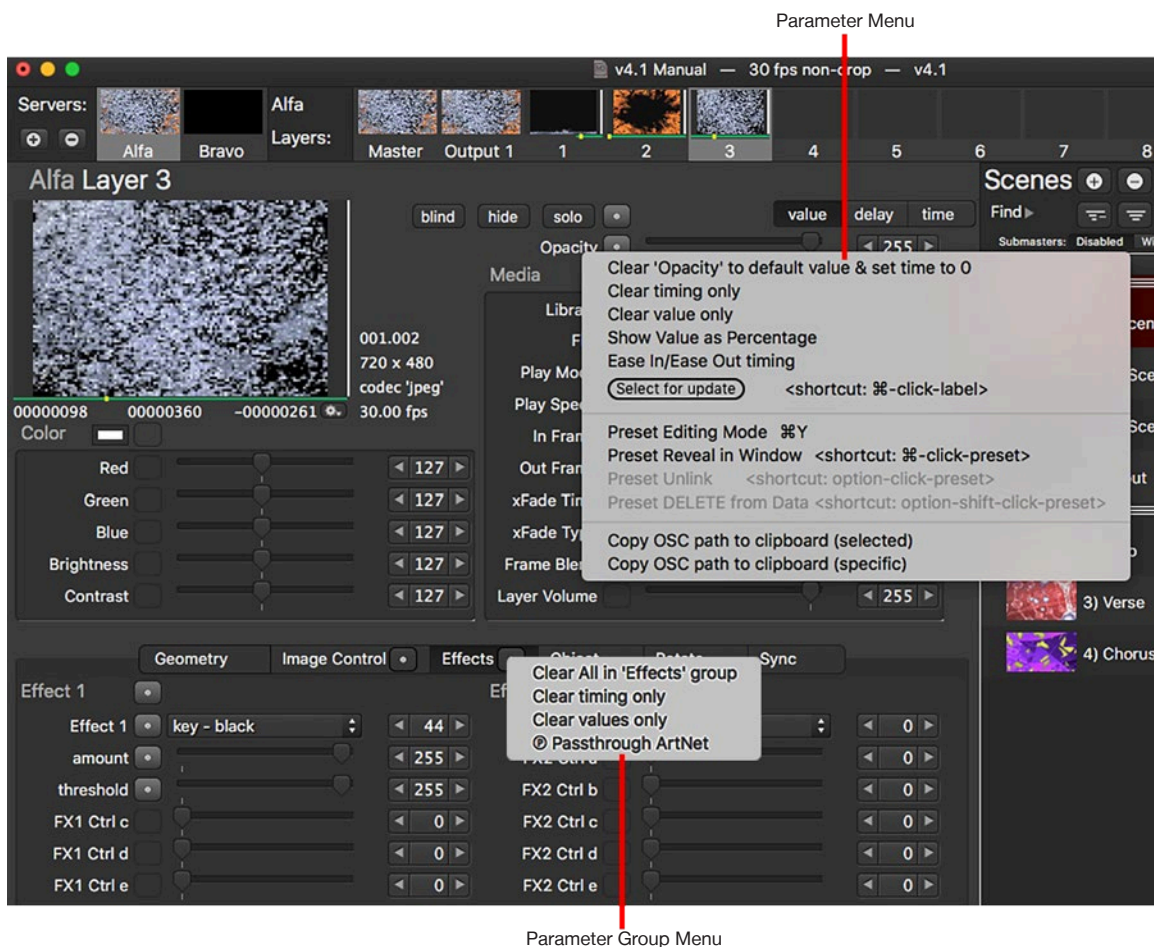
- + Selecting any of the clear options will return the layer to the defaults for that specific item (such as the default timing).
- + Selecting the Speedup Feedback option will cause the connected Mbox to output a higher frequency of streaming feedback images, making the feedback stream smoother.
- + Selecting the Show Movie Times as File Frame Count option will show the playback position counter as frame numbers rather than as time.
- + Selecting the Show Movie Times relative to Start option will show the playback position relative to the first frame of the movie, rather than to the current in frame.

Parameter Contextual Menus

Contextual menus for the various parameters, and groups of parameters, can be accessed by right-clicking on the parameter titles or parameter group tabs in the main window. For example, click on Opacity to bring up the Opacity menu. Click on the Effects tab to bring up Effects Group menu.

Guidelines:

- + Selecting any of the clear options will return the parameter or entire parameter group's value(s) to their default.
- + Some parameters, such as X-Y-Z Rotate, offer an option to display the value in degrees. (The default value is raw 8/16-bit value.)
- + The Copy OSC Path options are used with the Open Sound Control feature. (Refer to "[OSC Preferences](#)" on page 22)
- + The Ease In/Ease Out timing option provides a method for applying a sine curve to a timed parameter value transition. (Refer to "[Ease In/Out](#)" on page 82)



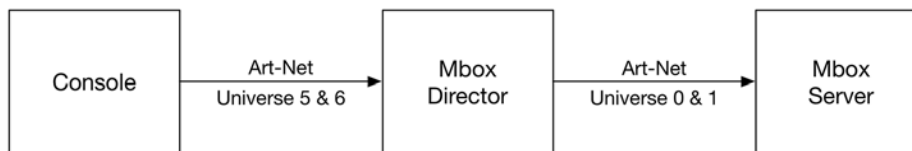
Note: The clear options in the menu are the same as clicking on the parameter's reset button. Refer to "[Resetting Parameter Values, Delays, and Times](#)" on page 81 for more information.

EXTERNAL CONTROL

Combined Control with an External Console (Passthrough)

The Passthrough feature allows Mbox Director to use Art-Net or sACN value from an external console to replace its own output. Once the feature is enabled, contextual menus are used to enable Passthrough control of specific parameters, parameters groups, or entire layers. Enabling Passthrough for a parameter causes Director to replace its internal parameter value with that from the Passthrough Universe. Remaining parameters (i.e. those not using Passthrough) will be output as normal using Director's internal values.

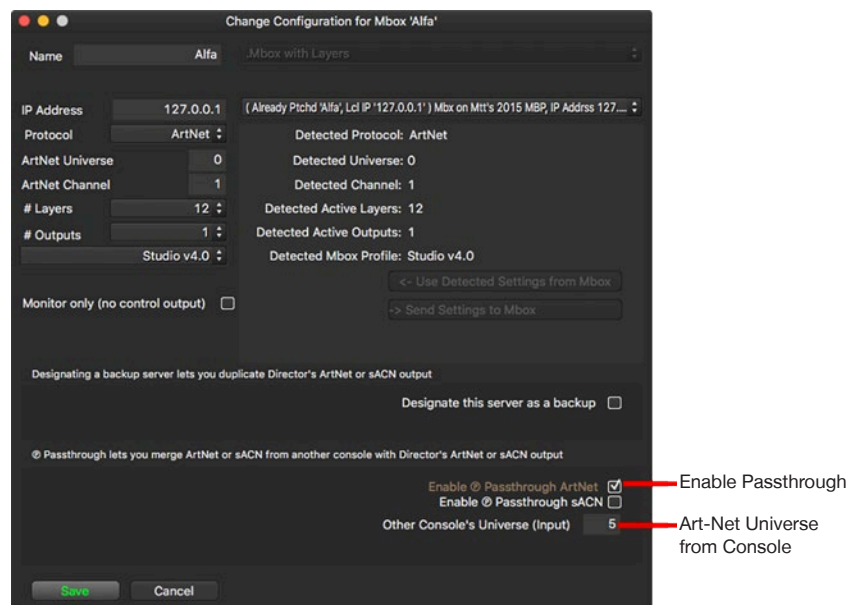
When using Passthrough, a control console would need to be patched to control the Mbox server and Mbox Director would also be configured to control the same server. The incoming Passthrough control universe(s) from the console cannot be the same universes that Director is using for control of the Mbox. The following diagram illustrates a Passthrough Art-Net configuration using example universe values:



Note: If the Passthrough Universe has not been received, then no parameters will be overridden.

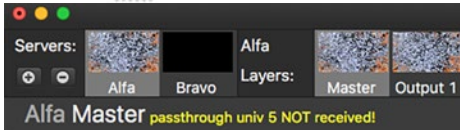
To setup a Passthrough:

- Step 1. On the Add Fixture or Change Configuration window, click either the "Enable Passthrough Art-Net" or "Enable Passthrough sACN" checkbox.
- Step 2. In the "Other Console's Universe (Input)" field, enter Art-Net/sACN universe that console will be sending data on for that server. Note that to control all features of an Mbox server, the console may need to send more than one universe.
- Step 3. Click the Save button.



Step 4. When Passthrough is enabled, Director's main window provides status information on the Passthrough universes. This information is based on which fixtures are currently selected and which universe they use for Passthrough data. Brown colored text indicates that the pertinent universe is being received, while yellow text indicates that the universe is not being received, or was received at some point, but has since disappeared (i.e. "stale").

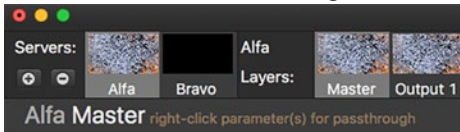
Master selected, universe not received



Layer selected, universe not received



Master selected, universe being received



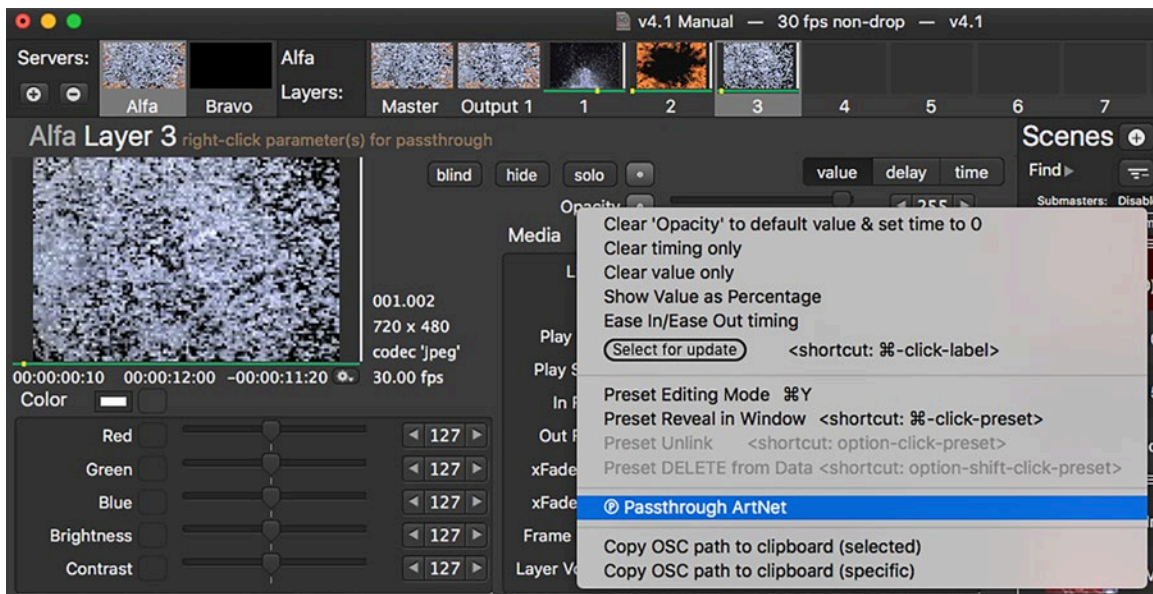
Master selected, universe no longer received



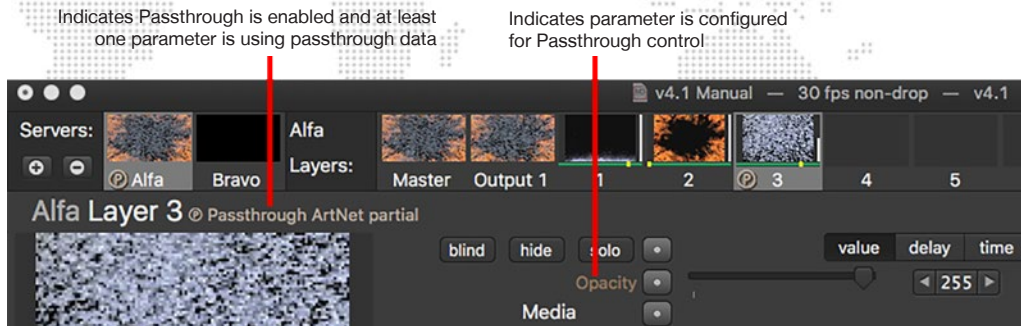
Note: Director will continue to output the prior Passthrough values even if a Passthrough universe becomes stale.

Step 5. On the main Director window, right-click on parameter names, parameter group tabs, and layer preview tiles to bring up the contextual menu. On the menu, select Passthrough Art-Net/sACN to enable Passthrough control for that parameter/group/layer.

For example, right-click on Opacity as shown below:

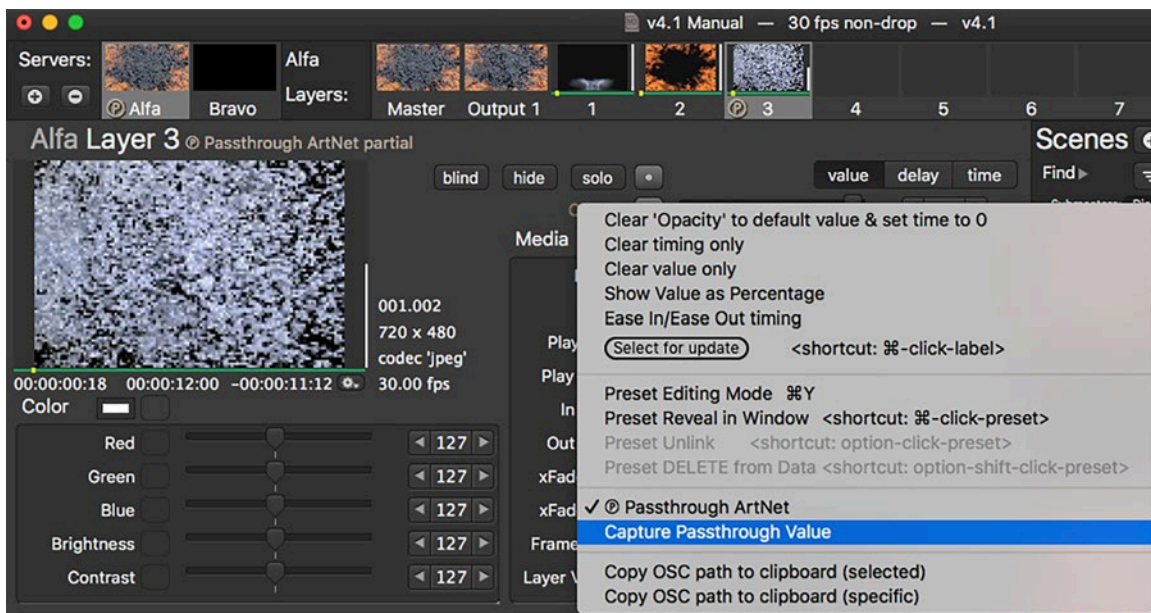


Step 6. Once an item is set for Passthrough its name will be displayed using a brown color. Any parameter value changes made at the console would then be passed through to the Mbox by Director.



Note: Director does not display the actual passthrough parameter values. Rather, it continues to show its internal parameter values. To display passthrough values, they must first be captured - see Step 7 below.

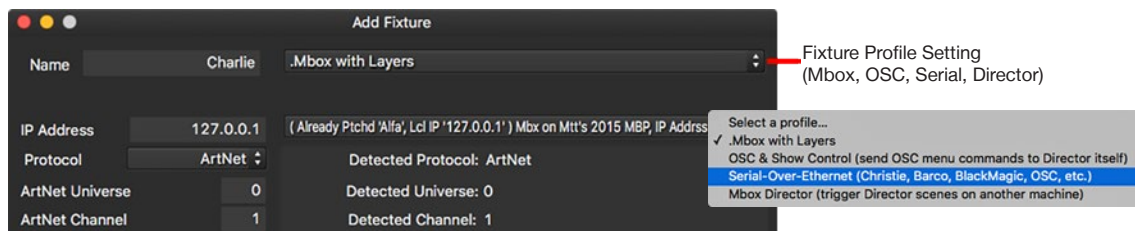
Step 7. Director can capture and save passthrough values on a per-item basis. This makes it possible to use the passthrough data to create or modify scenes in Director. To capture passthrough values, right-click on a parameter name, group tab, or layer preview time and select Capture Passthrough Value from the menu.



Serial-Over-Ethernet Control

In addition to controlling Mbox servers, Director can also output commands to other compatible devices. Compatible devices include projectors, scan converters, or video routers that can receive serial-over-Ethernet commands. Serial-over-Ethernet communications between Director and the external device requires a network connection and an understanding of the protocol configuration and command syntax for the external device.

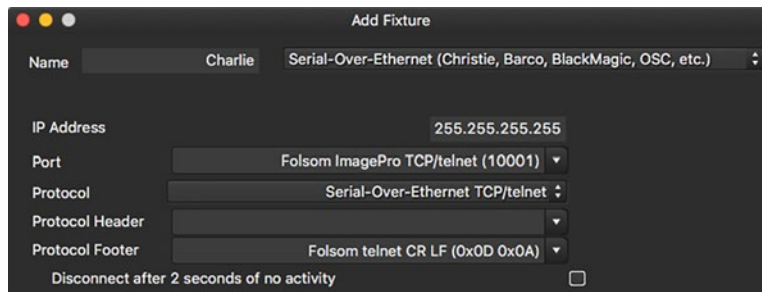
Configuring Director to control devices using serial-over-Ethernet requires patching a fixture that corresponds to the external device. The Profile setting available in Director's Add Fixture window allows a serial-over-Ethernet fixture to be added to the patch and configured.



To add Serial-Over-Ethernet fixture:

Step 1. Open the Add Fixture window. (Refer to ["Adding Fixtures"](#) on page 10 for more information)

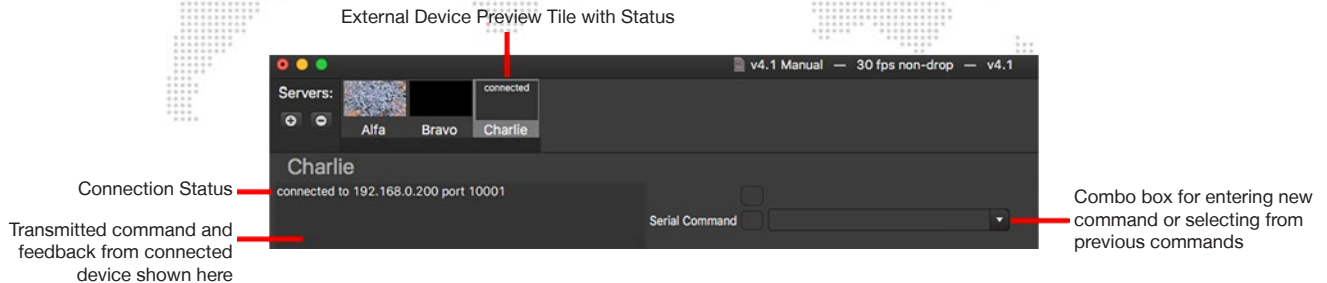
Step 2. Click on Profile setting at top-right of window. Select the Serial-Over-Ethernet option. The Add Fixture window will now display Serial-Over-Ethernet options.



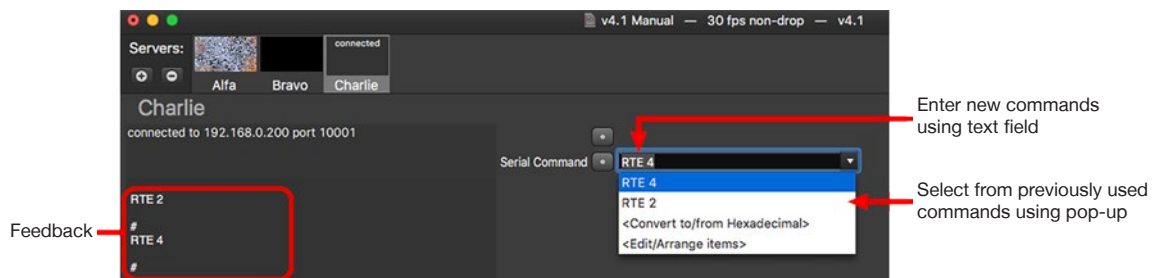
Step 3. Enter custom name, IP address, and other parameters specific to the device being controlled.

- + **IP Address** - Enter the correct IP address here. The IP address must match the IP address of the external device.
- + **Port** - Director provides some build-in options for common devices, but any port number can be entered here.
- + **Protocol** - Director provides options for UDP, TCP/Telnet, and OSC. (Refer to ["Appendix A: OSC Reference"](#) on page 105 for more information on external OSC control)
- + **Header and/or Footer** - Different devices may require specific header or footer commands. These can be selected from the built-in options or manually entered here. Header and Footer commands can be entered as plain (ASCII) text or Hexadecimal values. Individual hex values must be preceded by "0x" and separated by a space.
- + **Disconnect after 2 seconds of no activity** - Some devices do not like to maintain a constant connection over Ethernet. This setting allows Director to close the connection automatically after sending a command, and then reopen the connection before sending the next command.

- Step 4. Once the serial-over-Ethernet fixture has been configured, press the Add & Save button at the bottom of the window. The fixture will now appear as a selectable item in the browser area of Director's main window. The fixture's preview tile will show connection status, and the area below will show the status, feedback, and command entry areas.



- Step 5. Click on the Serial Command combo box to enter a new command to be sent to the device. Press the [return] key to send the command. Feedback (including acknowledgment and/or errors) from the external device will be shown to the left each time a command is sent. When a command is sent, that command will be saved in the combo box so it can be quickly used again without having to retype it.



Note: It is not possible to remove previous commands from the combo box.

When serial-over-Ethernet are entered into the Serial Command combo box and the [return] key is pressed, or when a previous command is selected from the menu, that command will be send immediately. After the command is sent, it will remain in the combo box.

Serial-over-Ethernet commands can be stored into scenes just like parameter values for Mbox servers. When the appropriate command is shown in the combo box, pressing the update or new scene buttons will store that data into the scene, along with all parameter values for other fixtures.

To remove a serial-over-Ethernet command stored into an existing scene:

- Step 1. Recall the scene.
- Step 2. Press the reset button to the left of the Serial Command combo box.
- Step 3. If the auto apply edits checkbox is not checked, press the update button.

Serial-over-Ethernet commands can be dragged and dropped onto other scenes in the scene list. Click on the "Serial Command" label and drag to a scene.

Note: Refer to "[Serial-Over-Ethernet Errors](#)" on page 103 for information on troubleshooting serial-over-Ethernet connections.

OSC Output

As discussed in "[OSC Preferences](#)" on page 22, Mbox Director can receive OSC commands from external devices and send feedback to those devices. In addition to that functionality, Director can send OSC commands both to itself and to external devices.

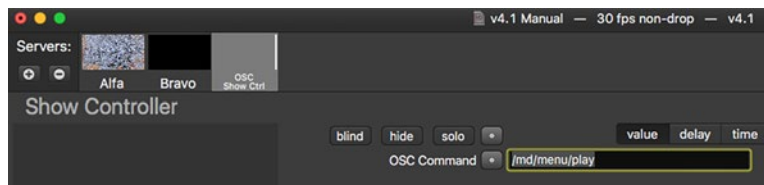
When sending OSC commands to external devices the configuration is very similar to that for serial-over-Ethernet commands. However, rather than selecting one of the serial-over-Ethernet protocol options, the OSC option should be selected. As with serial-over-Ethernet commands, OSC output to external devices requires the receiving device's IP address and port to be entered. Once configured, the OSC commands are entered in the Serial Command combo box using the appropriate syntax for the receiving device.

Director can send OSC commands to itself for the purposes of automating various actions of the software. e.g. starting and stopping the internal timecode clock, loading submasters, etc. When sending OSC commands to itself, the configuration is different from the serial-over-Ethernet setup described earlier.

- Step 1. Click the [+] button to add a new fixture to Director.
- Step 2. On the Add Fixture window, click on the profile pop-up and select the OSC & Show Control option.
- Step 3. Press the Add & Save button at the bottom of the window.

No further configuration is required because these commands are internally routed and do not require an IP address or port number.

The patched OSC & Show Control fixture will have a preview tile in the browser area. The tile will be labeled "OSC Show Ctrl". When the fixture is selected the OSC Command text field will allow OSC commands to be entered. However,



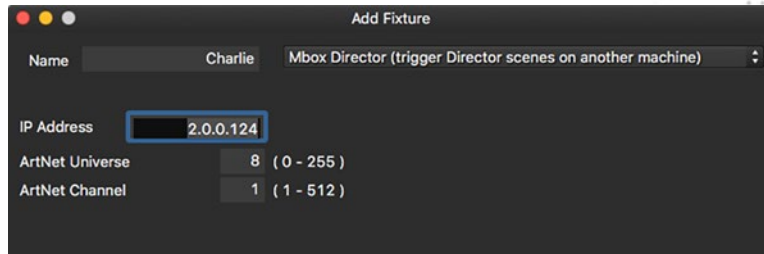
unlike the Serial Command combo box, the OSC Command field does not save previous commands for later recall.

Enter the appropriate OSC command in the field and press [return] to send it. As with serial-over-Ethernet commands, OSC commands can be stored into scenes. By recalling a scene that includes an OSC command, the command can be edited or removed and the scene then updated.

Like serial-over-Ethernet commands, OSC commands can be dragged and dropped onto other scenes in the scene list.

Mbox Director Trigger Output

In addition to being able to receive five channels of Art-Net or sACN to trigger numbered scenes (Refer to "[Art-Net/sACN Trigger Preferences](#)" on page 26), Mbox Director is also able to output these five channels of data to trigger another instance of Director.



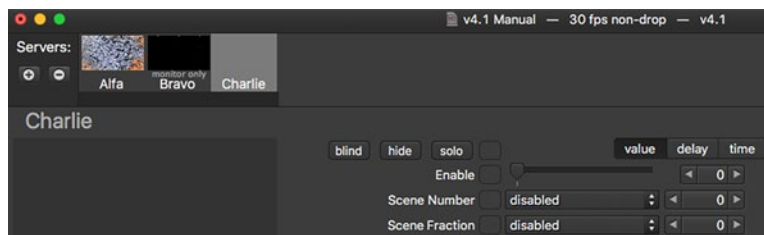
Guidelines:

- + Director should not be configured to trigger itself, it should always trigger a separate instance on another computer.
- + Trigger output data uses five-channel formatting identical to that for Art-Net/sACN trigger input data, as detailed on page 26.

Adding a Director Trigger is similar to adding a serial-over-Ethernet or OSC fixture:

- Step 1. Open the Add Fixture window. (Refer to "[Adding Fixtures](#)" on page 10 for more information)
- Step 2. Click on Profile setting at top-right of window. Select the Mbox Director option. The Add Fixture window will now display Mbox Trigger options.
- Step 3. Enter custom name, IP address, protocol, universe, and address specific to the instance of Director being controlled on the other computer. [Note that the IP address must be a static IP, rather than a broadcast or subnet broadcast address.]
- Step 4. Press the Add & Save button.
- Step 5. On the instance of Director that will be receiving the triggers, make sure that Art-Net/sACN triggers are enabled and that the protocol, universe, and address match those that were entered in Step 3.

Once the Director Trigger fixture has been added, it will have a preview tile in the browser area of Director's main window. When the fixture is selected, the three triggering parameters will be shown: Enable, Scene Number (value before the decimal point), and Scene Fraction (value after the decimal point).

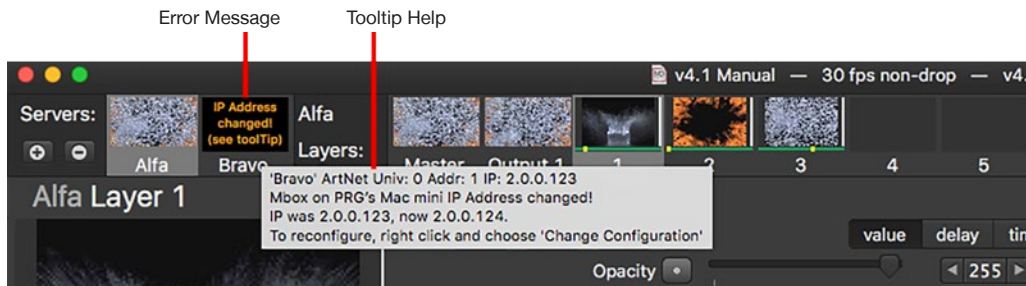


These three parameters can be adjusted and stored into scenes for recall just like any other fixture parameters. Alternately they can be used in a live fashion. Remember to set the Enable parameter to a value of 0 when adjusting the other two parameters. Refer to "[Art-Net/sACN Trigger Preferences](#)" on page 26 for more information about the controls for Art-Net/sACN Triggers, and the number formatting after the decimal point.

TROUBLESHOOTING

Network Configuration Errors

The majority of errors that cause Mbox Director to not work at all are network configuration errors; either on the computer running Director, or on the Mbox server. Director will provide troubleshooting assistance if problems are found with the network configuration. In these cases, an short explanation of the error will be displayed in the server's preview tile. When an error is shown on a preview tile, hovering the mouse cursor over the tile will cause a tooltip to appear. The tooltip will provide additional information about the error and possible resolutions.

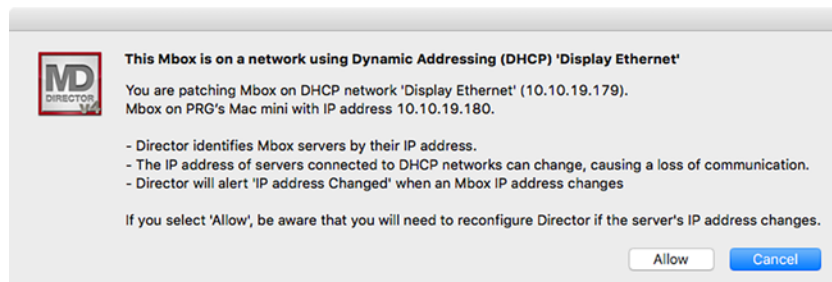


Helpful Tips!

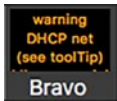
- + Be sure your Ethernet cables are not plugged into the wrong interface on the computer. If a computer (for Director or Mbox) has more than one Ethernet interface, they will typically have different configurations. i.e. They will be on different subnets.
- + The Director computer and any connected Mboxes must use Ethernet interfaces that are on the same subnet. [Note: Serial-over-Ethernet and external OSC devices can be on a different subnet, but this will require an additional Ethernet interface on the Director computer.]
- + Most network issues/warnings are caused by cables connected to the wrong interface or by incorrect subnet configuration on one or both computers.
- + It is not recommended to run any Mbox server in DHCP mode or to use Mbox(es) on a network that has this functionality. It is best to use static IP addressing on an unmanaged network.
- + Refer to "[Appendix B. Mbox Networking Guidelines](#)" on page 113 for more information about Mbox networks and subnet setup.

DHCP Networks

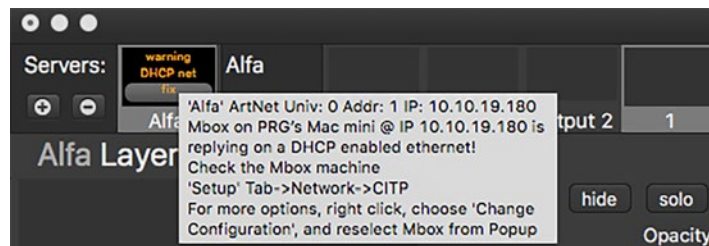
If an Mbox server is plugged into a network that has an active DHCP server running (i.e. computers connected to the network receive automatic IP address and subnet mask settings), then Mbox Director will provide a warning with the "Dynamic Addressing" alert. You can choose to allow the DHCP network, but the recommended action would be to press the Cancel button, reconfigure the network and servers to use static IP addressing, then patch the server. DHCP networks can be problematic because IP addressing can change at any time.



If the Allow button is pressed to accept the use of the DHCP network, this does not mean that Director will be unable to control the Mbox server. Unless the IP address of the Director computer or Mbox server changes, the communications will work without issue. However, if the IP address of the Mbox server changes then Director will no longer be able to control it. Mbox Director uses specific IP addresses to communicate with Mbox servers, if those IP addresses change then the communications will fail.



If the network configuration of the Director computer is changed to use DHCP or if the Director application is launched when connected to an Mbox server on a DHCP network, then a "warning DHCP net" message will be displayed on the server's preview tile. Hovering the mouse cursor over the preview tile will reveal a tooltip. Follow the tooltip suggestions for troubleshooting and resolution.



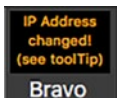
To correct temporarily:

- Step 1. Click on the gray "fix" button or right-click on the server's preview tile to open the Change Configuration window.
- Step 2. Use "Choose from detected Mboxes" pop-up menu to reselect the server, then press the Save button. The DHCP alert will appear, warning about the use of DHCP networks (see previous page). Click the Allow button to continue the use of the DHCP network

To correct permanently:

- Step 1. Disable DHCP network addressing on the network, or use a different physical network.
- Step 2. Assign static IP addresses and subnet masks to the Director computer and all Mbox servers.

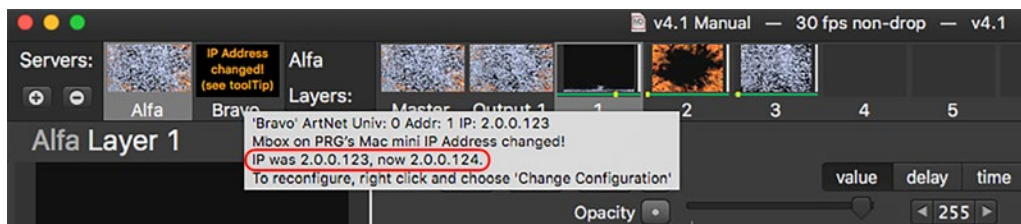
IP Address Changed



If the "IP Address changed!" error is displayed in the server preview tile, it means that although the Mbox server is visible on the network, its IP address has changed. This could be because a network cable has been plugged into the wrong interface on the Mbox or because the network configuration has been changed.

To correct:

- Step 1. Make sure all Ethernet cables are connected to the correct interface.
- Step 2. View the tooltip help and note the new IP address that is displayed.

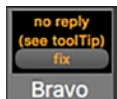
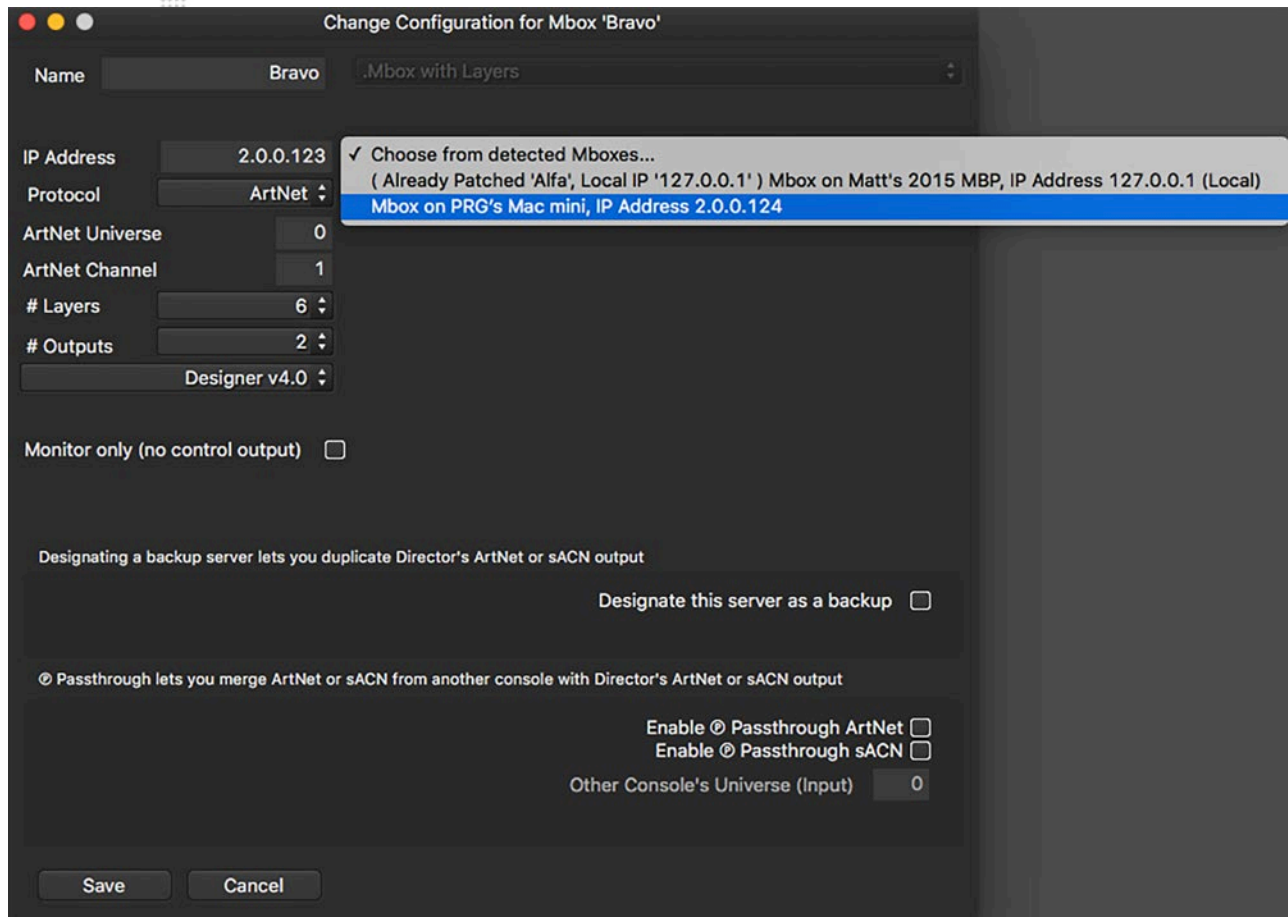


- Step 3. Click on the gray "fix" button on the server's preview tile to open the Change Configuration window.

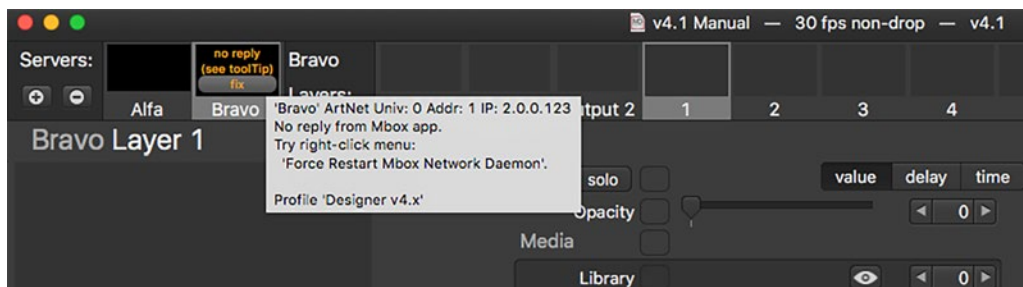
Step 4. Use the "Choose from detected Mboxes" pop-up menu to select the server that has the new IP address (noted in Step 2 above) and press Save. The error message should clear from the server's preview tile.

No Reply

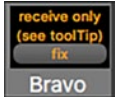
If "no reply" is displayed in the server preview tile, it means there is no network connection to that Mbox server. For example, a cable may be unplugged or your network configuration is invalid. First check to be sure your Ethernet cables are not connected to the wrong interface, then follow tooltip suggestions for troubleshooting.



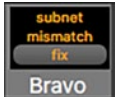
Because Director and Mbox use the Mbox Daemon application for communications with each other, this error may also be caused by the Daemon application being misconfigured or because the Daemon application is not running. Confirm that Daemon is running and that the Management network interface in Mbox is configured to use the correct interface.



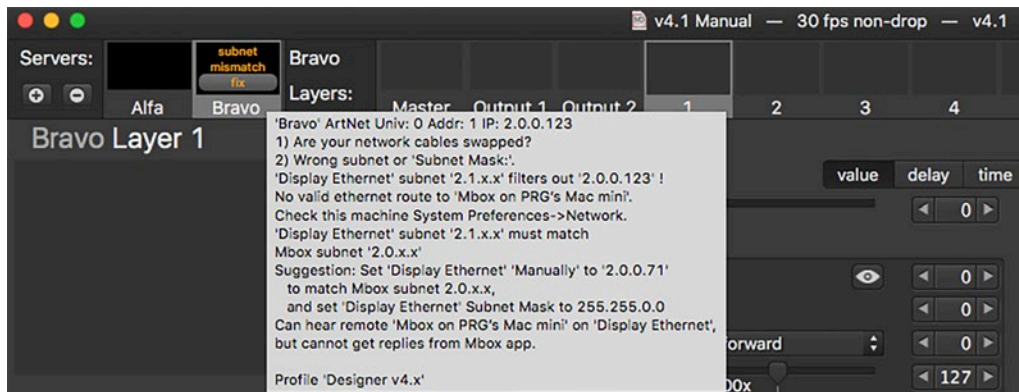
Receive Only and Subnet Mismatch



If either "receive only" or "subnet mismatch" are displayed in the server preview tile, this means that Mbox Director can "hear" the Mbox server over the network, but has no way to reply because of the network settings.



To fix this, first make sure your Ethernet cables are not plugged into the wrong interface, then make sure that both Mbox Director and the Mbox server are on the same subnet. Bring up the tooltip help for suggestions.



There are several suggested Ethernet configurations for Director and Mbox servers:

- + **2.0.##/8** - On the Director computer configure the interface's IP address to start with "2." On the Mbox server, set the interface's IP address to also start with "2." The last three octets of the IP address on both computers can be anything as long as they are unique on the network. On both computers, the subnet mask should be set to the same value: either "255.0.0.0."
- + **192.168.##/16** - On the Director computer configure the interface's IP address to start with "192.168." On the Mbox server, set the interface's IP address to also start with "192.168." The last two octets of the IP address on both computers can be anything as long as they are unique on the network. On both computers, the subnet mask should be set to the same value: "255.255.0.0."
- + **10.##.##/8** - On the Director computer configure the interface's IP address to start with "10." On the Mbox server, set the interface's IP address to also start with "10." The last two octets of the IP address on both computers can be anything as long as they are unique on the network. On both computers, the subnet mask should be set to the same value: "255.0.0.0."

Refer to **"Appendix B: Mbox Networking Guidelines"** on page 113 for more information on subnetting for use with Mbox.

Passthrough Errors

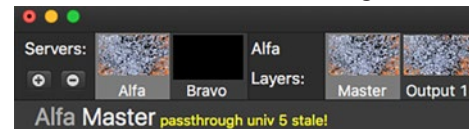
Passthrough universe # not received / Passthrough universe # stale

If Art-Net /sACN is not received while in Passthrough mode, an error will be displayed on the main screen. The "universe not received" error indicates that Director has never received that universe of control data from the external device. The "universe stale" error indicates that while Director was receiving that universe previously, it has since stopped receiving that universe.

Layer selected, universe not received



Master selected, universe no longer received



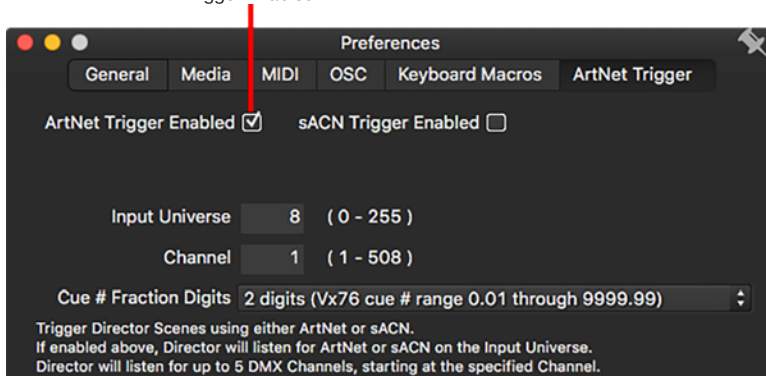
While the "universe stale" error is shown, Director will continue to output the last received data for that universe. This functionality is the same as "hold last look" on lighting fixtures when they lose control input.

This condition is typically the result of an incorrect universe number or disconnected cables. Be sure the correct universe is specified in the Fixture's Change Configuration screen. Refer to ["Combined Control with an External Console \(Passthrough\)"](#) on page 91 for information about configuring the Passthrough feature.

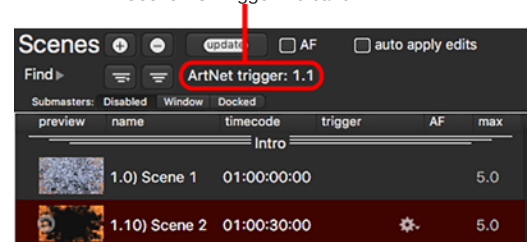
Art-Net/sACN Trigger Errors

When the Art-Net/sACN Trigger is enabled at the preferences window, an indication will be displayed in the scene list. If errors are encountered, these will be displayed as warnings. Be sure all settings are correct. Refer to ["Art-Net/sACN Trigger Preferences"](#) on page 26.

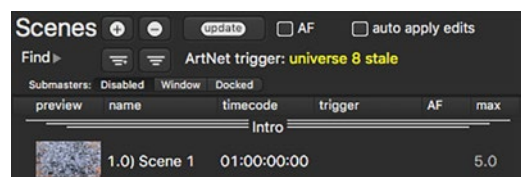
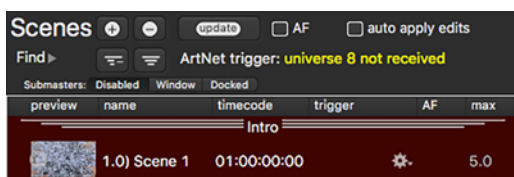
Trigger Enabled



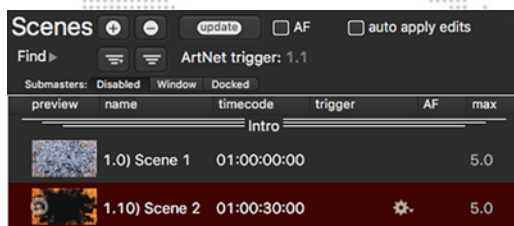
Scene List Trigger Indication



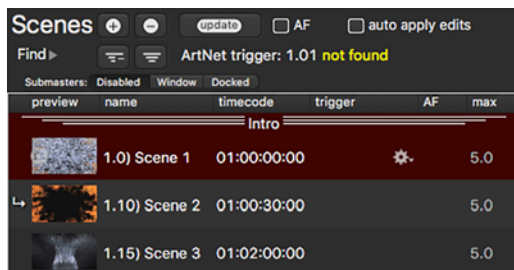
If the triggering universe has never been received or has gone stale (i.e. was received previously, but is no longer being received), this will be indicated using yellow text at the top of the scene list:



If the first DMX Channel is set to 0 (meaning that the trigger is disabled), the scene trigger number will be grayed out in the scene list:



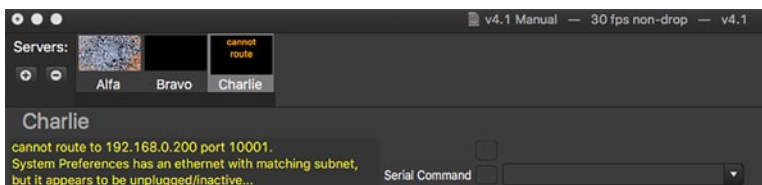
If a scene name with the trigger number is not found, the indicator will show 'not found' in yellow text:



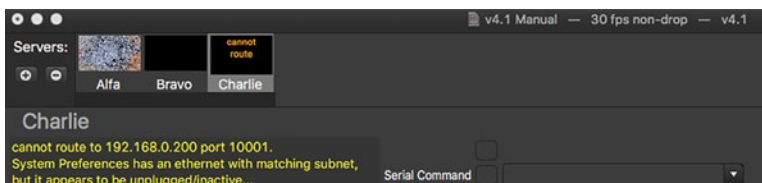
Serial-Over-Ethernet Errors

When using Mbox Director's Serial-Over-Ethernet control feature, there are several possible errors that may be indicated on the fixture's preview tile. Additional information will be shown in yellow text below the browser area. These errors are usually related to incorrect network configuration:

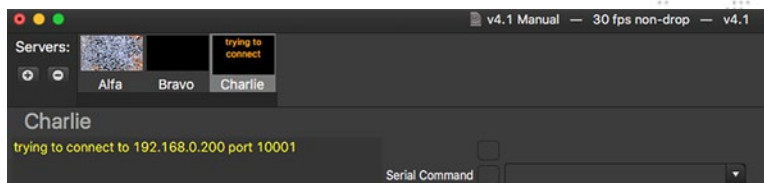
- + **Cannot Route, no interface** - This error will be displayed if Director cannot find an active Ethernet interface on the computer that is configured to use the same subnet as the receiving serial-over-Ethernet device. To resolve this issue, make sure that one of the computer's Ethernet interface's is configured with the correct IP address and subnet mask such that it can communicate with the serial-over-Ethernet device. Remember that both devices must be on the same subnet!



- + **Cannot Route, interface inactive** - This error will be displayed if Director has found an Ethernet interface that is configured to use the same subnet as the receiving serial-over-Ethernet device, but that interface is either inactive or has no cable plugged into it. To resolve this issue, make sure that all Ethernet cables are connected to the correct interface on both the Director computer and the receiving device.



- + **Trying to Connect** - This error will be displayed if Director has found an Ethernet interface that is correctly configured and active, but when an attempt is made to communicate with the serial-over-Ethernet device, it is unable to establish a connection. To resolve this issue, make sure that the IP address and port number for the serial-over-Ethernet device have been entered correctly in the fixture configuration window. Also, confirm that the correct protocol (UDP or TCP/telnet) has been selected. If necessary, right-click on the fixture's preview tile and choose "Change Configuration" to correct the issue.



It should be noted that even if the configuration of the serial-over-Ethernet fixture in Director is correct, and the network configuration is also correct, the commands that are being sent to the external device may still not work. In this case the feedback area may show some information (e.g. Unknown command received) from the receiving device. If this is that case, confirm that the command(s) being sent use the correct formatting/syntax.

APPENDIX A. OSC REFERENCE

OSC Syntax Examples

Guidelines:

- + All commands must be prefaced with `"/md/"`.
- + Command words and values must be separated with a `"/"`.
- + For commands that have a value, the value is placed at the end of the command.
- + Value ranges with a single value of 1.0 are used for selecting one fixture, and will deselect all other fixtures.
- + Value ranges with a pair of values (0.0 or 1.0) are used for adding or removing fixtures from the current selection.
- + All master and layer parameters can use ranges of 0.0 to 1.0 if the `"/dmx"` suffix is removed. However because Mbox uses many parameters that require accurate 8 or 16-bit values for control, it is always best to use the raw DMX values.
- + The examples shown below only include server 1, output master 1, and layer 1. Substitute the correct server, output master, or layer number as necessary.

General Concepts:

Path	Value Range	Description
<code>/md</code>	(no value)	resend feedback for all OSC parameters
<code>/md/menu/layer1</code>	1.0	select only layer 1
<code>/md/menu/layer1+-</code>	0.0 or 1.0	toggle selection of layer 1
<code>/md/menu/server1</code>	1.0	select only server 1
<code>/md/menu/server1+-</code>	0.0 or 1.0	toggle selection of server 1
<code>/md/menu/outputmaster1</code>	1.0	select only output master 1
<code>/md/menu/outputmaster1+-</code>	0.0 or 1.0	toggle selection of output master1 1
<code>/md/selected/opacity</code>	0.0 to 1.0	set opacity for selected layer
<code>/md/server1/layer1/opacity</code>	0.0 to 1.0	set opacity for server 1, layer 1
<code>/md/server1/master/intensity</code>	0.0 to 1.0	set intensity for server 1, global master
<code>/md/server1/outputmaster1/intensity</code>	0.0 to 1.0	set intensity for server 1, output master 1
<code>/md/menu/nextscene</code>	(no value)	recall next scene in scene table
<code>/md/scene/2.1</code>	(no value)	recall scene with name beginning with '2.1'
<code>/md/palette/1</code>	(no value)	recall palette 1
<code>/md/palette/1/time</code>	(no value)	recall palette 1 with timing
<code>/md/palette/1/timeonly</code>	(no value)	recall palette 1 (timing only, not values)
<code>/md/preset/1</code>	(no value)	recall preset 1
<code>/md/group/1</code>	(no value)	recall group 1

To receive the name of the current effect as feedback:

Path	Value Range	Description
<code>/md/selected/effect1/label</code>	string	returns name if current effect on effect 1

All Server 1 Layer 1 Parameters:

Path	Value Range
/md/server1/layer1/effect1/dmx	0 to 255
/md/server1/layer1/fx1ctrla/dmx	0 to 255
/md/server1/layer1/fx1ctrlb/dmx	0 to 255
/md/server1/layer1/fx1ctrlc/dmx	0 to 255
/md/server1/layer1/fx1ctrld/dmx	0 to 255
/md/server1/layer1/fx1ctrlle/dmx	0 to 255
/md/server1/layer1/effect2/dmx	0 to 255
/md/server1/layer1/fx2ctrla/dmx	0 to 255
/md/server1/layer1/fx2ctrlb/dmx	0 to 255
/md/server1/layer1/fx2ctrlc/dmx	0 to 255
/md/server1/layer1/fx2ctrld/dmx	0 to 255
/md/server1/layer1/fx2ctrlle/dmx	0 to 255
/md/server1/layer1/effect3/dmx	0 to 255
/md/server1/layer1/fx3ctrla/dmx	0 to 255
/md/server1/layer1/fx3ctrlb/dmx	0 to 255
/md/server1/layer1/fx3ctrlc/dmx	0 to 255
/md/server1/layer1/fx3ctrld/dmx	0 to 255
/md/server1/layer1/fx3ctrlle/dmx	0 to 255
/md/server1/layer1/effect4/dmx	0 to 255
/md/server1/layer1/fx4ctrla/dmx	0 to 255
/md/server1/layer1/fx4ctrlb/dmx	0 to 255
/md/server1/layer1/fx4ctrlc/dmx	0 to 255
/md/server1/layer1/fx4ctrld/dmx	0 to 255
/md/server1/layer1/fx4ctrlle/dmx	0 to 255
/md/server1/layer1/opacity/dmx	0 to 255
/md/server1/layer1/red/dmx	0 to 255
/md/server1/layer1/green/dmx	0 to 255
/md/server1/layer1/blue/dmx	0 to 255
/md/server1/layer1/brightness/dmx	0 to 255
/md/server1/layer1/contrast/dmx	0 to 255
/md/server1/layer1/library/dmx	0 to 255
/md/server1/layer1/file/dmx	0 to 255
/md/server1/layer1/playmode/dmx	0 to 255
/md/server1/layer1/playspeed/dmx	0 to 255
/md/server1/layer1/inframe/dmx	0 to 65535
/md/server1/layer1/outframe/dmx	0 to 65535
/md/server1/layer1/syncstream/dmx	0 to 255
/md/server1/layer1/syncoffset/dmx	0 to 255
/md/server1/layer1/aspect/dmx	0 to 255
/md/server1/layer1/frameblend/dmx	0 to 255
/md/server1/layer1/xfadetype/dmx	0 to 255



Path	Value Range
/md/server1/layer1/xfadetime/dmx	0 to 255
/md/server1/layer1/xposition/dmx	0 to 65535
/md/server1/layer1/yposition/dmx	0 to 65535
/md/server1/layer1/zposition/dmx	0 to 65535
/md/server1/layer1/scale/dmx	0 to 65535
/md/server1/layer1/xscale/dmx	0 to 65535
/md/server1/layer1/yscale/dmx	0 to 65535
/md/server1/layer1/zscale/dmx	0 to 65535
/md/server1/layer1/xrotation/dmx	0 to 65535
/md/server1/layer1/yrotation/dmx	0 to 65535
/md/server1/layer1/zrotation/dmx	0 to 65535
/md/server1/layer1/xspin/dmx	0 to 255
/md/server1/layer1/yspin/dmx	0 to 255
/md/server1/layer1/zspin/dmx	0 to 255
/md/server1/layer1/objectlibrary/dmx	0 to 255
/md/server1/layer1/object/dmx	0 to 255
/md/server1/layer1/drawmode/dmx	0 to 255
/md/server1/layer1/blendmode/dmx	0 to 255
/md/server1/layer1/mixselect/dmx	0 to 255
/md/server1/layer1/mixmode/dmx	0 to 255
/md/server1/layer1/imageremap/dmx	0 to 255
/md/server1/layer1/layervolume/dmx	0 to 255
/md/server1/layer1/hours/dmx	0 to 255
/md/server1/layer1/minutes/dmx	0 to 255
/md/server1/layer1/seconds/dmx	0 to 255
/md/server1/layer1/frames/dmx	0 to 255

All Server 1 Global Master Parameters:

Path	Value Range
/md/server1/master/intensity/dmx	0 to 255
/md/server1/master/hudcontrol/dmx	0 to 255
/md/server1/master/controlselector/dmx	0 to 255
/md/server1/master/pixintensity/dmx	0 to 255
/md/server1/master/globalvolume/dmx	0 to 255
/md/server1/master/lightingprolightints/dmx	0 to 255
/md/server1/master/lightingprolightred/dmx	0 to 255
/md/server1/master/lightingprolightgreen/dmx	0 to 255
/md/server1/master/lightingprolightblue/dmx	0 to 255
/md/server1/master/lightingprolightambience/dmx	0 to 255
/md/server1/master/lightingprolightbearing/dmx	0 to 65535
/md/server1/master/lightingprolightvbearing/dmx	0 to 65535



Path	Value Range
/md/server1/master/lightingprolight2ints/dmx	0 to 255
/md/server1/master/lightingprolight2red/dmx	0 to 255
/md/server1/master/lightingprolight2green/dmx	0 to 255
/md/server1/master/lightingprolight2blue/dmx	0 to 255
/md/server1/master/lightingprolight2ambience/dmx	0 to 255
/md/server1/master/lightingprolight2hbearing/dmx	0 to 65535
/md/server1/master/lightingprolight2vbearing/dmx	0 to 65535
/md/server1/master/lightingprolight3ints/dmx	0 to 255
/md/server1/master/lightingprolight3red/dmx	0 to 255
/md/server1/master/lightingprolight3green/dmx	0 to 255
/md/server1/master/lightingprolight3blue/dmx	0 to 255
/md/server1/master/lightingprolight3ambience/dmx	0 to 255
/md/server1/master/lightingprolight3hbearing/dmx	0 to 65535
/md/server1/master/lightingprolight3vbearing/dmx	0 to 65535
/md/server1/master/lightingprolight4ints/dmx	0 to 255
/md/server1/master/lightingprolight4red/dmx	0 to 255
/md/server1/master/lightingprolight4green/dmx	0 to 255
/md/server1/master/lightingprolight4blue/dmx	0 to 255
/md/server1/master/lightingprolight4ambience/dmx	0 to 255
/md/server1/master/lightingprolight4hbearing/dmx	0 to 65535
/md/server1/master/lightingprolight4vbearing/dmx	0 to 65535
/md/server1/master/lightingprolight5ints/dmx	0 to 255
/md/server1/master/lightingprolight5red/dmx	0 to 255
/md/server1/master/lightingprolight5green/dmx	0 to 255
/md/server1/master/lightingprolight5blue/dmx	0 to 255
/md/server1/master/lightingprolight5ambience/dmx	0 to 255
/md/server1/master/lightingprolight5hbearing/dmx	0 to 65535
/md/server1/master/lightingprolight5vbearing/dmx	0 to 65535

All Server 1 Output Master 1 Parameters:

Path	Value Range
/md/server1/outputmaster1/intensity/dmx	0 to 255
/md/server1/outputmaster1/red/dmx	0 to 255
/md/server1/outputmaster1/green/dmx	0 to 255
/md/server1/outputmaster1/blue/dmx	0 to 255
/md/server1/outputmaster1/brightness/dmx	0 to 255
/md/server1/outputmaster1/contrast/dmx	0 to 255
/md/server1/outputmaster1/effect1/dmx	0 to 255
/md/server1/outputmaster1/fx1ctrla/dmx	0 to 255
/md/server1/outputmaster1/fx1ctrlb/dmx	0 to 255
/md/server1/outputmaster1/fx1ctrlc/dmx	0 to 255
/md/server1/outputmaster1/fx1ctrld/dmx	0 to 255



Path	Value Range
/md/server1/outputmaster1/fx1ctrl/dmx	0 to 255
/md/server1/outputmaster1/effect2/dmx	0 to 255
/md/server1/outputmaster1/fx2ctrla/dmx	0 to 255
/md/server1/outputmaster1/fx2ctrlb/dmx	0 to 255
/md/server1/outputmaster1/fx2ctrlc/dmx	0 to 255
/md/server1/outputmaster1/fx2ctrld/dmx	0 to 255
/md/server1/outputmaster1/fx2ctrlf/dmx	0 to 255
/md/server1/outputmaster1/shuttershape/dmx	0 to 255
/md/server1/outputmaster1/shutterred/dmx	0 to 255
/md/server1/outputmaster1/shuttergreen/dmx	0 to 255
/md/server1/outputmaster1/shutterblue/dmx	0 to 255
/md/server1/outputmaster1/shutteredge/dmx	0 to 255
/md/server1/outputmaster1/shutter1a/dmx	0 to 255
/md/server1/outputmaster1/shutter1b/dmx	0 to 255
/md/server1/outputmaster1/shutter2a/dmx	0 to 255
/md/server1/outputmaster1/shutter2b/dmx	0 to 255
/md/server1/outputmaster1/shutter3a/dmx	0 to 255
/md/server1/outputmaster1/shutter3b/dmx	0 to 255
/md/server1/outputmaster1/shutter4a/dmx	0 to 255
/md/server1/outputmaster1/shutter4b/dmx	0 to 255
/md/server1/outputmaster1/shuttershutterx/dmx	0 to 65535
/md/server1/outputmaster1/shuttershuttery/dmx	0 to 65535
/md/server1/outputmaster1/shutterscale/dmx	0 to 65535
/md/server1/outputmaster1/shuttershutterrotation/dmx	0 to 255
/md/server1/outputmaster1/shuttershutterdamp/dmx	0 to 255
/md/server1/outputmaster1/curve/dmx	0 to 255
/md/server1/outputmaster1/gamma/dmx	0 to 255
/md/server1/outputmaster1/edgetop/dmx	0 to 255
/md/server1/outputmaster1/edgeright/dmx	0 to 255
/md/server1/outputmaster1/edgebottom/dmx	0 to 255
/md/server1/outputmaster1/edgeleft/dmx	0 to 255
/md/server1/outputmaster1/key1x/dmx	0 to 65535
/md/server1/outputmaster1/key1y/dmx	0 to 65535
/md/server1/outputmaster1/key2x/dmx	0 to 65535
/md/server1/outputmaster1/key2y/dmx	0 to 65535
/md/server1/outputmaster1/key3x/dmx	0 to 65535
/md/server1/outputmaster1/key3y/dmx	0 to 65535
/md/server1/outputmaster1/key4x/dmx	0 to 65535
/md/server1/outputmaster1/key4y/dmx	0 to 65535
/md/server1/outputmaster1/linearityx/dmx	0 to 65535
/md/server1/outputmaster1/linearityy/dmx	0 to 65535
/md/server1/outputmaster1/outputposnx/dmx	0 to 65535

Path	Value Range
/md/server1/outputmaster1/outputposny/dmx	0 to 65535
/md/server1/outputmaster1/outputscale/dmx	0 to 65535
/md/server1/outputmaster1/outputrotation/dmx	0 to 65535
/md/server1/outputmaster1/outputmixoffsetx/dmx	0 to 65535
/md/server1/outputmaster1/outputmixoffsety/dmx	0 to 65535
/md/server1/outputmaster1/useprojcamera/dmx	0 to 255
/md/server1/outputmaster1/positionx/dmx	0 to 65535
/md/server1/outputmaster1/positiony/dmx	0 to 65535
/md/server1/outputmaster1/positionz/dmx	0 to 65535
/md/server1/outputmaster1/lookatx/dmx	0 to 65535
/md/server1/outputmaster1/lookaty/dmx	0 to 65535
/md/server1/outputmaster1/lookatz/dmx	0 to 65535
/md/server1/outputmaster1/fieldofview/dmx	0 to 255
/md/server1/outputmaster1/roll/dmx	0 to 65535

Mbox Director Menu:

/md/menu/preferences
/md/menu/hidemboxdirector
/md/menu/hideothers
/md/menu/quitmboxdirector

File Menu:

/md/menu/openshow
/md/menu/saveshow
/md/menu/saveshowas
/md/menu/showhidemedialibrary
/md/menu/followupdatesinmedialibrary
/md/menu/showlogfile

Keyboard Macros Menu (defaults):

/md/menu/mdpalette101
/md/menu/mdpalette102
/md/menu/mdpalette103
/md/menu/mdpalette104
/md/menu/mdpalette105
/md/menu/mdpalette106
/md/menu/mdpalette107
/md/menu/mdpalette108
/md/menu/mdpalette109
/md/menu/mdpalette110
/md/menu/emojisymbols

Edit Menu:

/md/menu/undo
/md/menu/redo
/md/menu/cut
/md/menu/copy
/md/menu/paste
/md/menu/selectall
/md/menu/find
/md/menu/fadetimeeditingmode
/md/menu/fadedelayeditingmode
/md/menu/presetreferenceeditingmode
/md/menu/showpalette
/md/menu/showgrouppalette
/md/menu/relativemovesholdvkey
/md/menu/fanmovesholdfkey
/md/menu/blindediting
/md/menu/togglehidelayer
/md/menu/togglesololayer
/md/menu/resentallmidioscfedback

Layer - Select Layer Menu:

/md/menu/alllayers+master
/md/menu/nextlayer
/md/menu/previouslayer
/md/menu/layer1
/md/menu/layer1+-
/md/menu/layer2
/md/menu/layer2+-
/md/menu/layer3
/md/menu/layer3+-
/md/menu/layer4
/md/menu/layer4+-
/md/menu/layer5
/md/menu/layer5+-
/md/menu/layer6
/md/menu/layer6+-
/md/menu/layer7
/md/menu/layer7+-
/md/menu/layer8
/md/menu/layer8+-
/md/menu/layer9
/md/menu/layer9+-
...and so on up to layer 24
/md/menu/master
/md/menu/master+-

Layer - Select Server Menu:

/md/menu/nextserver
/md/menu/previousserver
/md/menu/server1
/md/menu/server1+-
/md/menu/server2
/md/menu/server2+-
/md/menu/server3
/md/menu/server3+-
/md/menu/server4
/md/menu/server4+-
/md/menu/server5
/md/menu/server5+-
/md/menu/server6
/md/menu/server6+-
/md/menu/server7
/md/menu/server7+-
/md/menu/server8
/md/menu/server8+-
/md/menu/server9
/md/menu/server9+-

Layer - Select Output Master Menu:

/md/menu/nextoutputmaster
/md/menu/previousoutputmaster
/md/menu/outputmaster1
/md/menu/outputmaster1+-
/md/menu/outputmaster2
/md/menu/outputmaster2+-
/md/menu/outputmaster3
/md/menu/outputmaster3+-
/md/menu/outputmaster4
/md/menu/outputmaster4+-
/md/menu/outputmaster5
/md/menu/outputmaster5+-
/md/menu/outputmaster6
/md/menu/outputmaster6+-
/md/menu/outputmaster7
/md/menu/outputmaster7+-
/md/menu/outputmaster8
/md/menu/outputmaster8+-
/md/menu/outputmaster9
/md/menu/outputmaster9+-

Layer - Show Menu:

/md/menu/showintensityoropacity
/md/menu/fullintensityoropacity
/md/menu/outintensityoropacity
/md/menu/showcolor
/md/menu/showeffects
/md/menu/showeffects
/md/menu/showmedia
/md/menu/showgeometry
/md/menu/showobject
/md/menu/showanimation
/md/menu/showrotate
/md/menu/showspin
/md/menu/showsync
/md/menu/showkeystone
/md/menu/showkeystone
/md/menu/showshutter
/md/menu/showpixel
/md/menu/showlighting
/md/menu/showlighting
/md/menu/showcamera

Playback Menu:

/md/menu/play
/md/menu/play
/md/menu/runlock
/md/menu/unlockstop
/md/menu/rewindhomekey
/md/menu/forwardtoend
/md/menu/nextframe
/md/menu/forward10frames
/md/menu/forward1second
/md/menu/previousframe
/md/menu/backward10frames
/md/menu/backward1second
/md/menu/gotoselectedscenekeyframe
/md/menu/viewplayhead
/md/menu/addmarkeratplayhead
/md/menu/zoomin
/md/menu/zoomout
/md/menu/zoomintoframes
/md/menu/resetzoom
/md/menu/showsubmasters

Scene Menu:

/md/menu/previousscene
/md/menu/nextscene
/md/menu/nextsceneafterendofloop
/md/menu/createneuwsce
/md/menu/updateselectedsce
/md/menu/updateselectedsce
/md/menu/createneuwsceatplayhead
/md/menu/moveselectedsce
/md/menu/nudgeleft
/md/menu/nudgeleft10frames
/md/menu/nudgeleft1second
/md/menu/nudgeright
/md/menu/nudgeright10frames
/md/menu/nudgeright1second
/md/menu/selectnextsceneintimeline
/md/menu/selectprevioussceneintimeline
/md/menu/removescenefromtimeline
/md/menu/deletescenepreviewonly
/md/menu/recallprevioussceneontimecodestartrestart

Sequence Menu:

/md/menu/nextkeyframe
/md/menu/previouskeyframe
/md/menu/nudgeright1frame
/md/menu/nudgeright10frames
/md/menu/nudgeright1second
/md/menu/nudgeleft1frame
/md/menu/nudgeleft10frames
/md/menu/nudgeleft1second

Window Menu:

/md/menu/minimize
/md/menu/cyclemousecursortonextscreen

Help Menu:

/md/menu/mboxdirectormanual



APPENDIX B: MBOX NETWORKING GUIDELINES

Concepts

The majority of communications to and from Mbox use Ethernet protocols. This means that Ethernet networks route the data into the Mbox server and from the server to other connected devices. Because all of these protocols need to live in harmony, steps need to be taken to avoid interference between protocols, and to maximize the available network bandwidth/speed. Due to these requirements, it is recommended that the computer used as an Mbox server have more than one network interface. For more complex setups, three or four network interfaces may be preferable.

While all the network interfaces on a computer could be connected to the same network to gain some amount of additional bandwidth, doing so would bypass the desire to keep certain protocols separate. Therefore, it is much more useful if each network interface on the computer is configured for and connected to a separate physical Ethernet network. If multiple interfaces must be connected to the same physical network, then the network should have a system of VLANs enabled to help segregate different protocols.

Connecting more than one network interface to different networks is only the first step. Each interface needs to have its IP Address and subnet mask set correctly for the network that it is being connected to. Getting the IP Address and subnet mask correct ensures that communications to and from the computer will leave the computer through the correct interface and arrive at the intended destination without any ambiguity or loss of data.

Concept definitions:

- + **Network Interface** - the physical Ethernet connection (typically RJ-45) on the computer that a cable is connected to in order to connect the computer to a physical network.
- + **Network** - a group of devices connected to each other that can potentially communicate using Ethernet IP protocols. The word “network” describes not just the physical connection of multiple devices, but also the “web” of electronic communication between them.
- + **Subnet (subnetwork)** - a logical subdivision of a network such that multiple interfaces can be connected to the same physical network, but are placed on different subdivisions of that network for the purposes of routing or for keeping some communications separate. (Note: a subnet is not the same as a VLAN.)
- + **IP Address** - an interface property using the dot-decimal (e.g., 2.0.0.123) notation, where each of the four numbers separated by decimal points is referred to as an octet (because each is an 8-bit number). In combination with the interface’s subnet mask, the octets in the IP address designate either the device’s sub-network or the device’s unique identifier on that subnet.
- + **Subnet Mask** - a second interface property, also using dot-decimal notation (e.g., 255.0.0.0). The value of each octet in the subnet mask determines which of the octets in the device’s IP address specify the sub-network and which specify the interface’s unique identifier on that sub-network. The subnet is specified by setting one or more of the octets in the subnet mask to a value other than 0.

Subnet Masking Basics

For pretty much all communication to and from Mbox, each octet in an interface's subnet mask will be set to either 0 or 255. Values other than 0 or 255 can be used for more complicated subnetting, but are typically not needed with Mbox and won't be discussed here.

In order to understand how an interface's subnet mask works, it needs to be viewed together with the interface's IP address. If an octet in the subnet mask has a value of 255, then the corresponding octet in the interface's IP address is used to designate the subnet that the interface belongs to. If an octet in the subnet mask has a value of 0, the corresponding octet in the IP address is used as part of the interface's unique identifier on that subnet. Within the structure of sub-networks and unique identifiers, it is possible to have multiple interfaces on the same subnet, each being uniquely identifiable. Data can be sent to all interfaces in the subnet by broadcasting, to groups by multicasting, or to individual members by unicasting.

How the IP Address and Subnet Mask Work Together

For a device with the IP address of 192.168.0.123 and a subnet mask of 255.255.0.0, the first two octets of the IP address "192.168" are used to specify the sub-network, and the last two octets "0.123" specify the device's unique identifier within that network.

	Network		Unique ID	
Subnet Mask:	255	255	000	000
IP Address:	192	168	000	123

Depending on the number of octets with a value of 255 in the subnet mask, different descriptions may be given to the interface. A subnet mask of 255.0.0.0 leads to a description of "/8" for the interface. Combined with the interface's IP address, this information would be written as "192.168.0.123/8". A subnet mask of 255.255.0.0 gets a description of "/16" and 255.255.255.0 a description of "/24".

Note: There is no such thing as a /32 subnet mask, as the last octet in an interface's IP address must always be used as a unique identifier.

Routing Ethernet Communications

- + **Full Broadcast** - data packets that are sent to the full broadcast destination IP address (255.255.255.255) will be received by all devices on the physical network provided the packets are not blocked by a switch or router between devices. Full broadcast is akin to shouting in a crowded room. Everyone can hear the yelling, but must decide whether to listen or not. Full broadcast is simple and guarantees for the most part that every device on the network can get the data. However, it places a lot of data onto the network, thus using up more of the available bandwidth. Another downside is that receiving devices may need to spend more time than is desirable to filter out data that they don't need to listen to.
- + **Subnet Broadcast** - packets that use a subnet broadcast IP address (x.255.255.255, x.x.255.255, or x.x.x.255) will only be received by interfaces on the matching subnet - i.e., those with a subnet mask that places them into the same subnet. This is one step down from shouting, as subnet filtering allows receiving devices to immediately discard any subnet broadcast data that isn't destined for their subnet.

To obtain the subnet broadcast address for a particular subnet:

- Step 1. Take the IP address for a device on that subnet and the subnet mask for that device.
- Step 2. Line the address and subnet mask up one above the other, in four columns with each octet being a column.
- Step 3. In columns where the subnet mask has a value of 255, write down the value from the IP address' octet.
- Step 4. In columns where the subnet mask a value of 0, write down a value of 255.

IP Address:	192	168	000	123
Subnet Mask:	255	255	000	000
Subnet Broadcast Address:	192	168	255	255

- + **Unicast** - packets using a specific, unique destination IP address. This is most comparable to two people having a single face-to-face conversation without anyone else able to hear them. Interfaces can have more than one unicast communication at a time. Unicasting cuts down on network overhead as it places the minimum amount of data on the network and because packets are addressed specifically, it eliminates the requirements that a device filter out data it doesn't need to listen to.
- + **Multicast** - packets that are sent to an IP address belonging to a predetermined range of IP addresses. Interface's may join a multicast group to be able to send and receive packets within the group. This is comparable to a group of listeners who all choose to listen to one speaker, or to other members of the group who take on the role as speaker. The conversation doesn't leave the group.

It is possible for interfaces to send packets to or receive packets sent to a multicast address without joining the corresponding multicast group. But unless the interfaces join the multicast group, switches between the devices may not forward the multicast packets correctly.

Most of the time a /8 subnet mask (255.0.0.0) can be used with Mbox. When using multiple interfaces on the same computer, with each having a /8 subnet mask, a general rule is to make sure that each interface has a different first octet. Otherwise there may be ambiguity when trying to determine which interface to use for various communications. While all interfaces on a computer may receive packets from any source, packets sent by the computer almost always should leave through only one interface. If that interface is not on the correct subnet (or indeed the correct physical network) then the packets will never get to the intended destination.

CAUTION! IP addresses starting with 2 and 192 and having a subnet mask of 255.0.0.0 are actually publicly routable IP addresses. Therefore, if the computer has an interface connected to a router (e.g. connecting to the Internet), and also has an interface with a 2./8 or 192./8 then there may be some connection issues with certain websites.

For example, if two interfaces are configured with IP addresses of 2.0.0.1 and 2.1.0.1 and both have a subnet mask of 255.0.0.0. -> Both interfaces are on the same sub-network (i.e. 2.x.x.x), but have unique IDs on that network. Because this is a valid IP scheme, the computer will allow this; but using this setup will cause issues with Mbox software. One or both of these interfaces should use a /16 subnet mask instead of the /8 subnet mask, thereby placing the two interfaces onto different subnets. -> 2.1.x.x and 2.0.x.x

With all protocols, especially those detailed below, it's best that one and only one interface on the computer be on the same subnet as the destination devices. When the computer is told to output data to a specific destination device it avoids confusion if only one interface can "talk" to that device.



Standard Control Protocols

Art-Net

Art-Net packets can be fully broadcast (i.e., not restricted to a particular subnet) which makes a device's subnet inconsequential. Some Art-Net devices use full-broadcast to transmit their data, potentially flooding the network with data.

To reduce overhead, most Art-Net devices use a subnet mask of 255.0.0.0 and generally use either 002 or 010 as the first octet in their IP address. This places these devices into a specific subnet and they only talk to other Art-Net devices on the same subnet. Art-Net data would be sent to the subnet broadcast IP address - either 2.255.255.255 or 10.255.255.255. While this cuts down on some bandwidth usage vs. a full broadcast, it should be noted that subnet broadcasts still aren't the most efficient use of bandwidth.

For the best efficiency possible, Art-Net can be unicast from device to device. This cuts down on overhead, but means that the IP address for each device must be known in advance and the precise destination for every piece of data must be specified. This can make the hardware configuration and software setup more complex. Additionally, the device to be unicast to must still be on the same subnet as an interface on the Mbox computer, otherwise the packets won't be received at all.

sACN

sACN packets are typically multicast, which sidesteps the restrictions of subnets and subnet masks, meaning that any interface can send or receive data for any multicast group it joins. Of course, the interface must still be on the correct physical network for the multicast group. Joining a multicast group is most important when receiving data. Switches can monitor multicast data on the network, and then filter out data that a connected interface has not elected to receive (i.e. for a multicast group the interface has not joined).

Any interface on the computer can be used for multicast, but as noted earlier, the interface has to be specifically identified and registered as a member of the appropriate multicast group. sACN uses predetermined multicast groups, one for each sACN universe, with each group having a preset IP address. Without registering as a member of all of the necessary multicast groups (for transmitting or receiving), Mbox will not be able to send or receive sACN data. For the purposes of receiving multicast data, it is possible to have all the interfaces on a computer join a multicast group, so that the data is received no matter what interface it arrives on. But for the purposes of outputting multicast data, only one interface should join the group.

sACN does allow for broadcast or unicast but this functionality is not widely used.

KiNET

KiNET is intended to be unicast only. Therefore all packets are addressed to specific IP addresses. This is efficient, but as with Art-Net unicast, the user must know all of the IP addresses of the connected devices that they want to communicate with in advance. And as always, the Mbox computer must still have a interface that is on the same physical network and subnet as the receiving device.