

GRAPHITE

Graphite User Manual

v7.0

Thank You For Choosing Ross

You've made a great choice. We expect you will be very happy with your purchase of Ross Technology.

Our mission is to:

1. Provide a Superior Customer Experience
 - offer the best product quality and support
2. Make Cool Practical Technology
 - develop great products that customers love

Ross has become well known for the Ross Video Code of Ethics. It guides our interactions and empowers our employees. I hope you enjoy reading it below.

If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at solutions@rossvideo.com.



David Ross
CEO, Ross Video
david.ross@rossvideo.com

Ross Video Code of Ethics

Any company is the sum total of the people that make things happen. At Ross, our employees are a special group. Our employees truly care about doing a great job and delivering a high quality customer experience every day. This code of ethics hangs on the wall of all Ross Video locations to guide our behavior:

1. We will always act in our customers' best interest.
2. We will do our best to understand our customers' requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it's our fault.
6. We will keep our promises.
7. We will treat the competition with respect.

8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. *If there's no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)*

Document Information

- Ross Part Number: **4850DR-110-07.0**
- Release Date: January, 2026. Printed in Canada

The information contained in this document is subject to change without notice or obligation.

Copyright

©2026 Ross Video Limited, Ross[®], MiniME[™], Graphite, and any related marks are trademarks or registered trademarks of Ross Video Limited. All other trademarks are the property of their respective companies. PATENTS ISSUED and PENDING. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, mechanical, photocopying, recording or otherwise, without the prior written permission of Ross Video. While every precaution has been taken in the preparation of this document, Ross Video assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

Microsoft[®], Windows[®], and Windows XP[®] are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Macintosh[®], and OS X[®] are trademarks of Apple Inc., registered in the U.S. and other countries.

Google Chrome[™], Google[®], and the Google logo are registered trademarks of Google Inc.

NVIDIA[®] and GeForce[®] are trademarks and/or registered trademarks of NVIDIA Corporation in the U.S. and/or other countries.

MIDI and MMA are trademarks of the MIDI Manufacturers Association.

Audinate[®], Dante[®], and Dante Via[™] are trademarks or registered trademarks of Audinate Pty Ltd.

NDI[®] is a registered trademark of Vizrt NDI AB.

ASUS Trademark is either a US registered trademark or trademark of ASUSTeK Computer Inc. in the United States and/or other countries.

Reference to any ASUS products, services, processes, or other information and/or use of ASUS Trademarks does not constitute or imply

endorsement, sponsorship, or recommendation thereof by ASUS.

Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; US D752,530 S; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

Software Licenses

This product may use one or more software components subject to licenses. Refer to [Third-party Licenses](#) on page 211 for a complete list of licenses that apply to this product.

Important Regulatory and Safety Notices to Service Personnel

Before using this product and any associated equipment, refer to the “**Important Safety Instructions**” listed in the front of this manual to avoid personnel injury and to prevent product damage.

Product may require specific equipment, and/or installation procedures to be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings



Protective Earth: This symbol identifies a Protective Earth (PE) terminal, which is provided for connection of the supply system's protective earth (green or green/yellow) conductor.



Important: This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.



Warning: The symbol with the word “Warning” within the equipment manual indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION: The symbol with the word “Caution” within the equipment manual indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.



Warning Hazardous Voltages: This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.



ESD Susceptibility: This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.

Important Safety Instructions

-  **Warning:** Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Clean only with a dry cloth.
- Do not block any ventilation openings. Install in accordance with manufacturer's instructions.
- Do not install near heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- Do not expose this apparatus to dripping or splashing, and ensure that no objects filled with liquids, such as vases, are placed on the apparatus.
- To completely disconnect this apparatus from the AC Mains, disconnect the power supply cord plug from the AC receptacle.
- The mains plug of the power supply cord shall remain readily operable.
-  **Warning:** Indoor Use: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
- The safe operation of this product requires that a protective earth connection be provided. A grounding conductor in the equipment's supply cord provides this protective earth. To reduce the risk of electrical shock to the operator and service personnel, this ground conductor must be connected to an earthed ground.
-  **Warning:** This apparatus, when equipped with multiple power supplies, can generate high leakage currents. To reduce the risk of electric shock, ensure that each individual supply cord is connected to its own separate branch circuit with an earth connection.
-  **CAUTION:** These service instructions are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.
- Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after servicing.
- Certain parts of this equipment still present a safety hazard with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cords from the chassis' rear appliance connectors before servicing.
- This product contains safety critical parts, which, if incorrectly replaced, may present a risk of fire or electrical shock. Components contained within the product's power supplies and power supply area are not intended to be customer-serviced and should be returned to the factory for repair.

24. To reduce the risk of fire, replacement fuses must be the same type and rating.
25. Use only power cords specified for this product and certified for the country of use.
26. The safe operation of this equipment requires that the user heed and adhere to all installation and servicing instruction contained within the equipment's Setup Manuals.

27.  **Warning:** This product includes an “ Ethernet Port ” which allows this product to be connected to a local area network (LAN). Only connect to networks that remain inside the building. Do not connect to networks that go outside the building.

28.  **CAUTION:** This apparatus contains a Lithium battery, which if replaced incorrectly, or with an incorrect type, may cause an explosion. Replace only with a CR2032 coin type lithium battery. Dispose of used batteries according to the manufacturer's instruction by qualified service personnel.

29.  **CAUTION: Phantom Power** can damage equipment if not supported. Ensure that **Phantom Power** is turned **off** for the Analog Input unless you are connecting a microphone that requires phantom power. Connecting the line out from an audio device to the analog input with phantom power on could damage the audio device and/or the 1RU Audio Breakout Module. For added safety, a TRS phone connector should be used for line in audio sources.

30. For use at altitude 2000m or lower.
31. For use in non-tropical locations.

32.  **CAUTION:** Do not make mechanical or electrical modifications to the equipment or add metallic items, such as metallic foil labels, to the printed circuit boards. Modifications can impair regulatory compliance, or performance and may void your warranty.

33.  **CAUTION:** Wear an ESD grounding strap connected to one of the chassis thumb screws at the back of the unit before servicing the rear of the unit when power is on.

EMC Notices

United States of America — FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable

protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



Important: Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user's authority to operate this equipment.

Canada

This Class “A” digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe “A” est conforme a la norme NMB-003 du Canada.

Korea — Class A Statement

이 기기는 업무용 환경에서 사용할 목적으로 적합성 평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

This device has been evaluated for conformity for use in a business environment. When used in a home environment, there is a danger of interference.

Europe

This equipment is in compliance with the essential requirements and other relevant provisions of **CE Directive 93/68/EEC**.

International

This equipment has been tested to **CISPR 22:1997** along with amendments **A1:2000** and **A2:2002**, and found to comply with the limits for a Class A Digital device.



Important: This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.

General Handling Guidelines

- Careful handling, using proper ESD precautions, must be observed.
- Power down the system before PCB removal.

A Word About Static Discharge

Throughout the many procedures in this manual, please observe all static discharge precautions.



CAUTION: Avoid handling the switcher circuit boards in high static environments such as carpeted areas, and when synthetic fiber clothing is worn. Touch the frame to dissipate static charge before removing boards from the frame, and exercise proper grounding precautions when working on circuit boards. Exercise proper grounding precautions when working on circuit boards.

XPression Audio

The XPression products are professional broadcast equipment. KN 35 Annex G does not apply to XPression equipment because their audio outputs do not connect to loudspeakers or on-ear devices directly. They are for a professional broadcast studio and other equipment processes the audio for television before the audible sound is generated.

Warranty and Repair Policy

Ross Video Limited (Ross) warrants its switchers and related options, to be free from defects under normal use and service for a period of ONE YEAR from the date of shipment. Fader handle assemblies are warranted for the life of the product. If an item becomes defective within the warranty period Ross will repair or replace the defective item, as determined solely by Ross.

Warranty repairs will be conducted at Ross, with all shipping FOB Ross dock. If repairs are conducted at the customer site, reasonable out-of-pocket charges will apply. At the discretion of Ross, and on a temporary loan basis, plug in circuit boards or other replacement parts may be supplied free of charge while defective items undergo repair. Return packing, shipping, and special handling costs are the responsibility of the customer.

Software upgrades for switchers may occur from time to time, and are determined by Ross Video. The upgrades are posted on the Ross Video website, and are free of charge for the life of the switcher.

This warranty is void if products are subjected to misuse, neglect, accident, improper installation or application, or unauthorized modification.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profit). Implied warranties, including that of merchantability and fitness for a particular purpose, are expressly limited to the duration of this warranty.

This warranty is TRANSFERABLE to subsequent owners, subject to Ross Video's notification of change of ownership.

Environmental Information

Waste Electrical and Electronic Equipment Directive (WEEE Directive)

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performances of our products.

Use of Hazardous Substances in Electrical and Electronic Products (China RoHS)

Ross Video Limited has reviewed all components and processes for compliance to:

“ Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products ” also known as China RoHS.

The “ Environmentally Friendly Use Period ” (EFUP) and Hazardous Substance Tables have been established for all products. We are currently updating all of our Product Manuals.

The Hazardous substances tables are available on our website at: <http://www.rossvideo.com/about-ross/company-profile/green-practices/china-rohs.html>

电器电子产品中有毒物质的使用

Ross Video Limited 按照以下的标准对所有组件和流程进行了审查:

"电器电子产品有害物质限制使用管理办法" 也被称为中国RoHS。

所有产品都具有 "环保使用期限" (EFUP) 和有害物质表。目前, 我们正在 更新我们所有的产品手册。

有害物质表在我们的网站:

<http://www.rossvideo.com/about-ross/company-profile/green-practices/china-rohs.html>

Company Address

Ross Video Limited — 8 John Street Iroquois, Ontario, Canada, K0E 1K0

Ross Video Incorporated — P.O. Box 880, Ogdensburg, New York, USA, 13669-0880

General Business Office: (+1)613-652-4886

Fax: (+1)613-652-4425

Toll Free Technical Support (North America): 1-844-652-0645

Toll Free Technical Support (International): +800 1005 0100

Technical Support: (+1)613-652-4886

After Hours Emergency: (+1)613-349-0006

E-Mail (Support): techsupport@rossvideo.com

E-Mail (General): solutions@rossvideo.com

Website: www.rossvideo.com

Technical Support

At Ross Video, we take pride in the quality of our products, but if a problem does occur, help is as close as the nearest telephone.

Our 24-Hour Hot Line service ensures you have access to technical expertise around the clock. After-sales service and technical support are provided directly by Ross Video personnel. During business hours (eastern standard time), technical support personnel are available by telephone. Outside of normal business hours and on weekends, a direct emergency technical support phone line is available. If the technical support personnel who is on call does not answer this line immediately, a voice message can be left and the call will be returned shortly. Our Technical support staff are available to react to any problem and to do whatever is necessary to ensure customer satisfaction.

Supporting Documentation

Ross Video provides a wide variety of helpful documentation for the setup and support of your equipment. Most of this documentation can be found either on the Product Resources disk that came with your equipment, on the Ross Video website (www.rossvideo.com), or on the Ross Video Community site (discussions.rossvideo.com/)

- **Carbonite Online Help for Graphite** — visit help.rossvideo.com/graphite
- **Operation Manual (4850DR-110)** — operational instructions for the Carbonite switcher subsystem
- **Setup Manual (4850DR-120)** — setup and configuration instructions for the Carbonite subsystem
- **Graphite QuickStart Poster (4850DR-200)** — setup information and specifications for Graphite
- **Upgrade Notes (4850DR-500)** — upgrade instructions, new features, and known issues for a given software version
- **Control Panel Desk Mounting (4802DR-302)** — desk mounting instructions for Carbonite control panel
- **SideBox Installation (4802DR-304)** — installation and mounting instruction for SideBox module
- **Auxiliary Control Panel Installation (4802DR-305)** — installation and mounting instruction for remote aux panel (CPS-AUX-053B)
- **RossTalk Commands (4802DR-403)** — supported commands using RossTalk protocol

-
- **Device Setup Sheets (4802DR-6xx)** — setup information for controlling external devices from the switcher
 - **Robotic Camera Control (4802DR-131)** — overview of the operational interface when controlling a robotic camera from the switcher
 - **Audio Mixer Control (4802DR-132)** — overview of the operational interface when controlling an audio mixer from the switcher
 - **Video Server Control (4802DR-133)** — overview of the operational interface when controlling a video server from the switcher
 - **CarboNET Installation (4805DR-100)** — installation instructions for the Carbonite PMC translator.

Contents

Features.....14

RAVE Audio Mixer.....	14
Clean Feed Output.....	14
Custom Controls.....	14
Sequencer.....	14
Device Control.....	14
DVE (Fly Key).....	14
Effects Dissolve.....	14
General Purpose Interface (GPI).....	15
LiveEDL.....	15
Matte/Wash Generator.....	15
ME Effect System.....	15
Media-Store.....	15
MediaManager.....	15
MediaWipe.....	15
MemoryAI Recall Mode.....	15
Memory System.....	16
MiniME™.....	16
MultiScreen.....	16
MultiViewer.....	16
ViewControl.....	16
Pattern and Matte/Wash Generators.....	16
Tally Outputs.....	17
UltraChrome.....	17

DashBoard.....18

Switcher Status in DashBoard.....	18
Configuration.....	18
Devices.....	18
Live Assist.....	18
PanelINK.....	19
To Assign a Page to a Custom Page Button.....	19
Custom Controls.....	19
ViewControl.....	19
MediaManager.....	19
Personality.....	20
Help.....	20
Audio Mixer.....	20

Role Based Access Control.....21

To Turn on Role Based Access Control for Ross Platform Manager.....	21
--	----

SoftPanel.....22

Menu Area.....	22
User Area.....	22
Control Area.....	22
Bus Area.....	23

Ultritouch.....24

Audio and Video Processing.....25

Video Processing and Flow.....	25
Audio Processing and Flow.....	25

Video Sources.....26

To Select a Source on a Bus from DashBoard.....	26
---	----

Video Layering.....27

Re-Entry.....	27
Re-Entry Timing.....	27
To Re-Enter an ME.....	27
FlexiClean Clean Feed.....	28

Video Preview.....29

MultiViewer.....	29
------------------	----

Matte Source.....30

To Set Up a Matte Color.....	30
To Set Up a Wash.....	30

Copying.....31

ME Copy.....	31
To Copy an ME.....	31
Key Copy.....	31
To Copy a Key.....	31
Bus Copy.....	31
To Copy a Bus.....	31
Key Swap.....	32
To Perform a Key Swap.....	32

Transitions.....33

Performing Transitions.....	33
To Perform a Transition.....	33
To Perform a Transition on TouchDrive (Memory Area).....	35
To Perform a Transition on TouchDrive (No Memory Area).....	36
To Perform a Transition on Carbonite Black.....	37
Cut Transitions.....	38
Dissolve Transitions.....	38
To Set Up a Dissolve.....	38
WhiteFlash.....	38
To Set Up a WhiteFlash.....	38
Wipe Transitions.....	39
To Set Up a Wipe.....	39
DVE Transitions.....	39
To Set Up a DVE Transition.....	39
MediaWipe Transitions.....	40

To Set Up a MediaWipe.....	40	Compressor / Limiter.....	64
		To Configure a Compressor/Limiter.....	64
Keying.....	42	Windows® Audio.....	65
Self Keys.....	42	Dante® Audio Networking.....	65
To Set Up a Self Key.....	42	To Connect Dante® Sources to RAVE PC	
Auto Select Keys.....	42	Inputs.....	65
To Set Up an Auto Select Key.....	43	RAVE AutoMix.....	66
UltraChrome Chroma Key.....	43	RAVE AutoMix Weight Explained.....	67
Chroma Key Modes.....	43	RAVE AutoMix Interface.....	67
Chroma Key Basic Mode.....	43	To Configure a RAVE AutoMix.....	68
Chroma Key Advanced Mode.....	45		
MiniME™ Chroma Key Output.....	47	Switcher Sets.....	70
DVE Keys.....	47	To Store a Set.....	70
To Set Up a DVE Key.....	48	To Load a Set.....	70
To Apply a DVE to a Key (Fly Key).....	48	Exporting the Working Set for Ultra and Ultrix	
To Apply a Border/Edge Softness to a DVE		Carbonite.....	71
Key.....	49	To Export the Working Set for Ultra and	
Show Alpha.....	49	Ultrix Carbonite.....	71
Masks.....	49		
To Pattern Mask a Key.....	49	Media-Store.....	73
To Box Mask a Key.....	50	Working With Media-Store Animations.....	73
Split Keys.....	50	Working With Media-Store Audio.....	73
To Set Up a Split Key.....	50	Media-Store File Specifications.....	74
		Media-Store Cache Manager.....	74
Memory Functions.....	51	Loading Stills or Animations.....	74
Storing Memories.....	51	To Load a Media Item.....	74
To Store a Memory.....	51	Deleting a Media Item.....	75
Recalling Memories.....	51	To Delete A Media Item.....	75
Memory Attribute Color Coding.....	52	MediaManager Channel Control.....	75
To Recall a Memory.....	52	Media-Store Attributes.....	75
Memory Attributes.....	53	Media-Store Capture.....	76
To Set the Memory Attributes.....	53	To Capture a Still.....	76
Deleting a Memory.....	54		
To Delete a Memory.....	54	Custom Controls.....	78
Memory Names and Mnemonics (TouchDrive		Recording/Editing Custom Controls.....	78
only).....	54	To Record a Custom Control.....	78
To Assign a Name to a Memory.....	54	To Edit a Custom Control.....	78
		Custom Control Pause Mode.....	79
		To Set the CC Pause Mode.....	79
Audio Mixer.....	55	Running a Custom Control.....	79
Sample Rate Conversion.....	55	To Run a Custom Control.....	80
Audio Mixer Interface.....	55	Naming Custom Controls.....	80
Audio Mixer Setup.....	56	To Name a Custom Control.....	80
To Set the Number of Configurable Audio		Deleting Custom Controls.....	80
Faders (Channel).....	56	To Delete a Custom Control.....	81
To Set Up Audio Faders.....	57	Copying and Pasting Custom Controls.....	81
To Assign Audio Channels to Mix		To Copy and Paste a Custom Control.....	81
Layers.....	58		
To Configure the Analog Inputs.....	59	Sequencer.....	82
To Configure the ABU Input Audio		Creating/Editing Sequences.....	82
Delay.....	59	To Create/Edit a Sequence.....	82
To Configure Audio Outputs.....	59	Loading and Running a Sequence.....	83
To Configure ABU Audio Outputs.....	60	To Load a Sequence.....	83
Noise Gate.....	60	To Run a Sequence.....	83
To Configure a Noise Gate.....	61	Sequence Names and Mnemonics.....	83
Ducking and Talkback.....	61	To Name a Sequence.....	83
Ducking.....	61	Deleting a Sequence.....	84
Talkback.....	62		
Audio Equalization.....	63		
To Configure an Equalizer.....	63		

To Delete a Sequence.....	84	Substitution Table.....	98
Copying and Pasting a Sequence.....	84	To Set Up a Pre-Tiled Source.....	99
To Copy and Paste a Sequence.....	84		
XPression Setup.....	85		
		Video Outputs.....	100
Network Setup.....	86	Video Output Setup.....	100
Network Options.....	86	To Set up an External Video Output.....	100
Looping Option.....	86	To Set up an Internal Video Output.....	101
Network Switch Option.....	86	Ancillary Data.....	102
Switcher Network Settings.....	87	To Strip or Pass Ancillary Data.....	103
To Configure the Switcher Network Settings		FlexiClean Clean Feed.....	103
from the Server.....	87	To Set Up Clean Feed.....	103
To Change the IP Address.....	87	External Layer Mode.....	103
DashBoard Network Settings.....	88	To Set Up Layer Mode.....	104
To Connect DashBoard to the Switcher.....	88	ME Follows.....	104
DashBoard Proxy Server Minimum		To Set Up an ME Follow.....	104
Requirements.....	88	On-Air Setting.....	104
FTP/SFTP Connection.....	88	To Set the On-Air Status for an Output.....	104
To Create an FTP/SFTP Connection.....	89		
		MultiViewer.....	105
System Access.....	90	MultiViewer Output Formats.....	105
To Enable/Disable a System Access Method.....	90	To Set Up a MultiViewer.....	105
		MultiViewer Clock.....	106
Video Reference.....	91	To Set Up a MultiViewer Timecode	
Supported Reference Formats.....	91	Clock.....	107
Reference and Video Mode Setup.....	91	To Set Up a MultiViewer System Clock.....	107
To Set a Video Mode.....	91	To Set Up a MultiViewer Countdown	
Switching Field.....	92	Timer.....	107
To Set the Switching Field.....	92		
		MultiScreen / MiniME™.....	109
Video Inputs.....	93	MiniME™ Assignment.....	109
HDMI™ Inputs.....	93	To Set Up a MultiScreen.....	109
Supported HDMI Formats.....	93		
Video Input Setup.....	93	Frame Sync and Format Conversion.....	111
To Set up an External Video Input.....	93	Supported FSFC Video Formats.....	111
To Set up an Internal Video Input.....	94	To Set Up an Input FSFC.....	112
Source Names.....	94	Aspect Ratio Conversion.....	112
To Set Up a Source Name.....	94	Full.....	112
To Assign a TSL ID to a Video Input.....	94	Zoom.....	112
Mnemonics.....	95	Letterbox.....	112
To Customize Mnemonics for		Pillarbox.....	113
TouchDrive.....	95		
To Customize Mnemonics for Carbonite		Frame Delays.....	114
Black.....	95	To Enable Input 6 Frame Delay.....	114
Auto Key Setup.....	96	To Apply a Frame Delay to an Input.....	114
To Set Up an Auto Key Association.....	96		
GPI Device Control.....	96	Audio Breakout Module Setup.....	115
To Assign a GPI to a Video Source.....	96	To Set Up Multiple 1RU Audio Breakout Units.....	115
Tallies Setup.....	97		
To Assign a Tally to an Input.....	97	Personality.....	116
Custom Page Auto Follow.....	97	Personality Settings.....	116
To Assign a Page to a Custom Page		General Settings.....	116
Button.....	98	Transition Settings.....	117
To Assign a Custom Page to Follow an		Color Schemes.....	118
Input.....	98		

To Select a Color Scheme.....	118
To Create a Custom Color Scheme.....	118
Bus Maps.....	118
To Create a Bus Map.....	119
User Buttons.....	119
To Set A User Button.....	119
GPI Control.....	120
GPI Trigger Types.....	120
GPI Setup.....	120
To Set Up a GPI Input.....	120
To Set Up a GPI Output.....	121
GPI Output Triggers.....	121
To Assign a GPI Output to a Video Source.....	122
Live Edit Decision Lists (LiveEDL).....	123
LiveEDL Setup.....	123
To Set the LiveEDL Behavior.....	123
Timecode Setup.....	123
To Confirm External LTC Signal.....	123
To Set Up Communications with a TSC-9902.....	123
To Set the LTC Timecode Source.....	124
LiveEDL Data Capture.....	124
To Start Capturing EDL Data.....	124
To Stop Capturing and Save EDL Data.....	124
ViewControl (HD Only).....	126
ViewControl Overview.....	126
Custom Control Buttons.....	126
Bus Selection Buttons.....	126
Keyer Transition Buttons.....	126
Transition Buttons.....	126
Custom Control Button Setup.....	127
To Set up the Custom Control Buttons.....	127
ViewControl Setup.....	127
Connecting ViewControl over HDMI™.....	127
Connecting ViewControl over NDI®/Webcam.....	128
MultiPanel.....	131
To Set Up MultiPanel Permissions.....	131
MIDI Controller.....	132
To Connect a MIDI Controller to DashBoard.....	132
To Configure the MIDI Controller Interface.....	132
To Map MIDI Controller Buttons to Functions.....	133
X-TOUCH Configuration.....	133
To Configure the Button Layers on the X-TOUCH.....	133
To Map Buttons to Functions.....	133
Default X-TOUCH COMPACT Mapping.....	133
Default X-TOUCH MINI Mapping.....	134
Custom Mapping.....	134

Frame Simulator.....137

To Install the Frame Simulator.....	137
To Run the Frame Simulator.....	138

Diagnostics.....139

Switcher Status.....	139
Switcher Logs.....	139
To Copy Logs To a USB.....	140
Diagnostic Tests.....	140
Switcher Restart.....	140
To Run the Control Panel Test.....	140
To Run the LED Test.....	140
To Run the Display Test.....	141
Error Messages.....	141
Switcher Reset.....	141
Custom Reset Settings (RState).....	141
Factory Default Settings.....	142

Specifications.....143

Specifications.....	143
Switcher Resources.....	143
Hardware Weights.....	144
Video Input Specifications.....	144
Video Output Specifications.....	144
Bypass Relay Loop.....	144
ABU Analog Audio Input Specifications.....	144
ABU Analog Audio Output Specifications.....	144
Jitter.....	144
System Timing.....	145
Network Ports.....	145
Power Consumption — Frame.....	145
Embedded Audio Assignment.....	145
Ports.....	146
GPI Port.....	146
Tally Port.....	146

Custom Control Events.....148

Operations Custom Controls.....	148
MultiScreen (BKGD DVE).....	148
Custom Control Events.....	149
Keyer.....	150
Media-Store.....	159
Matte.....	162
Sequencer.....	163
Special.....	164
Switcher Operation.....	164
Transitions.....	165
Personality Custom Controls.....	173
Personality.....	173
Installation Custom Controls.....	174
Switcher Installation.....	174
MultiViewer.....	180
RAVE Audio Mixer Custom Controls.....	186
Audio Mixer (RAVE).....	186
Device Custom Controls.....	199

Audio Mixer (Device).....	199
Camera.....	200
GPI.....	200
PBus II.....	201
RossTalk.....	202
Video Server.....	206

MIDI Device OID List.....208

Third-party Licenses.....211

Apache License.....	212
ARV-LIBC.....	214
Boost.....	215
BSD License.....	216
BZIP2.....	216
Dmalloc - Debug Malloc Library.....	217
Dropbear.....	217
FreeType font driver for BDF fonts.....	218
FreeType font driver for PCF fonts.....	219
GNU General Public License Version 2.....	219
GNU General Public License Version 3.....	222
GNU Lesser Public License Version 2.1.....	230
GNU Lesser General Public License Version 3.....	235
GNU Library General Public License Version 2.....	237
IJG.....	242
IMLIB2.....	243
LIBPCAP.....	244
LIBPNG.....	244
LIBXML2.....	245
LUA.....	246
MIT.....	246
NcFTP.....	246
NCURSES.....	248
NETPERF.....	248
NGREP.....	249
NTP (Network Time Protocol Version 4.2.8p2 Distribution).....	249
PCRE2 LICENCE.....	250
POPT.....	251
SNTP.....	252
STRACE.....	252
TCPDUMP.....	252
USBMOUNT.....	253
UBI-UTILS.....	253
UUID.....	253
Whetstone.....	254
ZLIB DATA COMPRESSION LIBRARY.....	254

Glossary.....255

Index.....258

Features

Thank you for buying a Ross Video Graphite Integrated Production System. The Graphite builds on the Ross Video reputation for designing compact switchers, computer graphics systems, and audio production equipment for every production environment.

RAVE Audio Mixer

RAVE (Ross Audio Video Engine) breaks the mold of uninspired audio capability in all-in-one production systems. RAVE includes internal audio routing and output channel shuffling, together with a hardware-based 24-bit digital audio production mixer. The audio production capabilities of Graphite are matched only by independent audio production systems, but adds the benefit of host PC access for additional audio input and monitoring.

The number of audio inputs and outputs depends on the model and options you have. All audio streams are 24-bit at 48kHz and can be controlled from Dashboard.

Note: XPression only supports 16-bit audio.

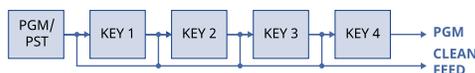
The 1RU Audio Breakout Unit (ABU) provides a number of analog and AES input and output ports. The analog inputs have direct control over gain, phantom power on/off, and 20dB pad on/off. These audio inputs and outputs are fed back and forth to the production system as embedded audio in the SDI-Audio Loop.



Clean Feed Output

Clean feed is typically used for bilingual and live-to-tape productions. It provides a second Program output that is derived from a different location than the standard program output. A frequent application is the recording of shows for later airing without call-in phone numbers inserted.

The clean feed output can come from before or between the keys.



Custom Controls

This feature brings the power of macros to the switcher operator. Button presses, menu selections, event commands, or even the switcher state can be recorded to a custom control with pauses or holds between the events. A simple button press can play these events back again. Step through complex show openings as easily as pressing Custom Control buttons 1, 2, then 3.

Sequencer

The switcher has 5 Sequencers that allow you to create a playlist or rundown of custom events, much like custom controls. Each Sequencers can be run independently or linked to other Sequencers so that they all advance together. The Sequencer uses sequences to store the rundown of events. These sequence files can be loaded into one or multiple Sequencers.

Tip: You can link multiple Sequencers together so that as you advance though one, the other Sequencers will advance.

Device Control

The switcher can control a number of external devices, such as video servers and robotic cameras. For a complete list of supported devices, and information on how to set up and control these devices, visit the Ross Video website

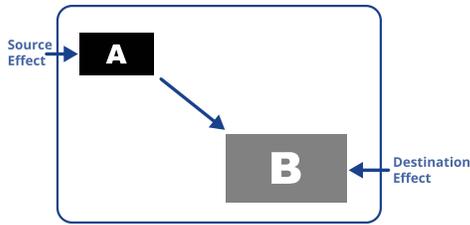
(rossvideo.com/production-switchers/carbonite/interface-list).

DVE (Fly Key)

The advanced 2D DVE comes standard with each switcher, and can be used for performing over the shoulder, or picture in picture shots. This allows all key types to be zoomed, cropped, and repositioned horizontally and vertically to create the look you want, or you can use one of the useful pre-built 2D effects to perform 2D background transitions.

Effects Dissolve

The Effects Dissolve feature allows you to interpolate from one memory to another using a memory recall. The switcher will interpolate from the starting memory to the destination memory, creating a smooth, two key frame effect.



Only elements such as clip level and pattern position can be interpolated in the effects dissolve. Other elements, such as crosspoint selection, pattern, and next transition data are recalled first, and then the switcher will slew to the recalled memory.

An effects dissolve can be performed on as many elements and MEs as required, based on the memory that is being recalled.

General Purpose Interface (GPI)

The switcher is equipped with 24 GPI I/Os on the 1RU Audio Breakout Unit that can be assigned as either an input or output independently.

The GPI inputs allow the switcher to interface with peripheral equipment such as editors. Each GPI input can be used to perform simple editing and switcher functions such as fade to black or an auto transition.

LiveEDL

Edit Decision Lists (EDL) are files used by non-linear editing (NLE) suites to aid in post-production. Your switcher can capture EDL data in a file that you load into your NLE suite.

For information on using the LiveEDL feature, visit the Ross Video Website (rossvideo.com).

Matte/Wash Generator

A matte generator and complex wash generator per ME, capable of multi-color washes comes standard. Any one of the color generators can be assigned to MATTE, or wipe pattern edges. An additional simple color generator is available for an Aux Bus.

ME Effect System

The ME (Multi-level Effect) systems are standard. The number of MEs depends on the chosen switcher model.

Each ME provides 4 keyers supporting pattern mask, box mask, self-key, linear key, DVE, and

an UltraChrome advanced chroma key for each ME and is available to each keyer.

Media-Store

Up to 4 independent channels of still/animations are available switcher-wide, allowing for thousands of full screen stills and logos that can be cached and used on the switcher.

Media-Store provides 2 GB of cache. The number of images cached increases considerably when smaller, non-full screen images like logos are used.

MediaManager

The MediaManager allows you to easily manage stills and animations on the switcher in a graphics interface.

MediaWipe

A MediaWipe allows you to use an animation from the Media-Store to play over a background or key transition. When the transition starts, the switcher plays the selected animation over top of the background and keys that are being transitioned. A cut, dissolve, wipe, or DVE wipe is then performed layered under the animation to bring up the next shot when the animation ends.

MemoryAI Recall Mode

We take the guessing out of memory recalls by ensuring that a memory recall will not affect what is currently on-air. MemoryAI uses the content of the memory to configure the Next Transition area and Preview bus for the background and keyers so that the next transition takes the same sources on-air that were on-air in the memory.

For example, store a memory that has a key on-air with CAM1 and CAM2 selected on the background. When this memory is recalled normally, it pops the same key on-air with CAM1 and CAM2 on the background. When the memory is recalled with MemoryAI turned on, CAM1 is selected on the preset bus, and CAM2 is selected on a key that is not on-air. The transition area is then set up for a background transition to bring CAM2 onto the background, take any on-air keys off, and take a key on-air with CAM1.

Memory System

Storage for 100 complete switcher snapshots per ME, MiniME™, and MultiScreen comes standard with all switchers. All of these memories can be stored to a USB media drive, providing custom tailored memories for every operator and every show.

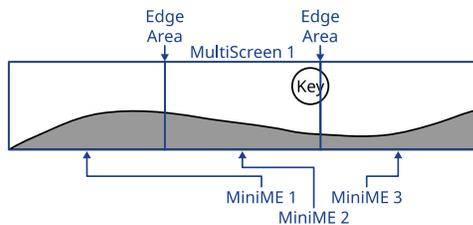
MiniME™

The MiniME™ is an additional ME that is provided with the switcher to perform basic dissolves and cuts. Each MiniME™ has 2 keys, background, and preset buses. Unlike a full ME, the MiniME™ only supports dissolves and cuts, restricts key 1 to DVE keys only, and has no preview output. Key 2 on a MiniME™ is the same as an ME keyer. The MiniME™ shares all the same sources as the ME.

MultiScreen

The MultiScreen is made up of a number of MultiScreen generators. Each MultiScreen breaks the scene up into separate outputs (MiniME™ outputs) that can be sent to independent projectors or displays to make a unified picture.

Each screen in the MultiScreen output uses a MiniME™ to create the background and keys of the output.



MultiViewer

Each MultiViewer allows you to view up to 16 video sources (32 with Shift), in 47 different layouts, from a single output BNC. Any video source on the switcher, including ME Program, Preview, and Media-Store channels, can be routed to any box on the MultiViewer. All boxes on the MultiViewer output include mnemonic source names and red and green tallies.

There are 2 broadcast-quality integrated MultiViewer generators in the switcher subsystem. The MultiViewer outputs are only available on out BNCs 5 and 6, and the HDMI outputs.

Each MultiViewer head supports an integrated clock that can display time of day, timecode, or a countdown timer. The position, size, and color of the clock can be adjust.



Figure 1: HD Layouts

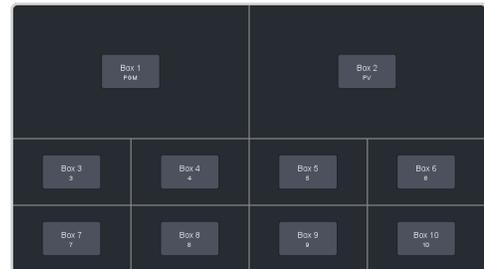


Figure 2: MultiViewer Grid

ViewControl

The ViewControl touchscreen interface through DashBoard allows you to select sources on switcher buses, perform transitions, and run custom controls to recall memories or control external devices. The MultiViewer Shift function allows you to assign sources to a shifted set of MultiViewer boxes, expanding the number of sources available on ViewControl from 16 to 32.

Tip: It is recommended that the large Preview and Program boxes not be assigned shifted sources as they will follow the bus selecting.

ViewControl takes the MultiViewer output of the switcher and overlays the DashBoard interface over it. Bringing the MultiViewer output into DashBoard is accomplished either by using multiple SDI/HDMI™ converters or a single SDI to NDI® converter.

Pattern and Matte/Wash Generators

A single pattern generator dedicated to wipes comes standard, and is equipped with 10 classic wipes. Most wipes can be rotated, bordered, multiplied, aspectized, and repositioned.

Tally Outputs

The switcher has 16 assignable tally relays located in the 1RU Audio Breakout Unit. Each tally can be assigned to any number of combinations of input and output or bus.

UltraChrome

The UltraChrome chroma keyers uses advanced video processing technology to provide exceptional blue spill reduction and clean edges, even with difficult source material. Glass, smoke, translucent materials, and natural shadows are handled superbly.

There are 2 floating Chroma Keys that are available across all MEs.

DashBoard

DashBoard provides the main menu system to the switcher.

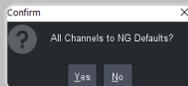
Download and install the latest version of DashBoard from <http://www.opengear.tv/>. Review the documentation that comes with DashBoard for information on installing and launching DashBoard.



Important: Do not run real-time or on access file scanning programs on Graphite, TouchDrive or other supporting systems. Ross Video does not support any type of real-time or on access file scanning programs running on Graphite, TouchDrive or other supporting systems. Real-time or on access file scanning can cause lagging, disconnects, and timeouts between the Graphite, TouchDrive and other supporting systems.

Note: Graphite requires DashBoard v9.1, or higher.

Tip: When a confirmation popup is shown in DashBoard the keyboard shortcut is `alt y` or `alt n`.



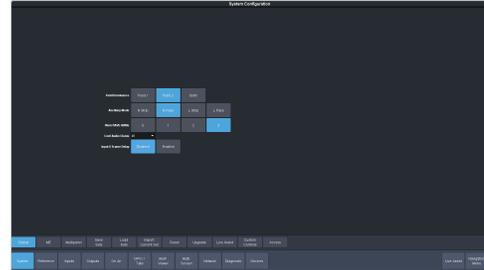
Switcher Status in DashBoard

The DashBoard control system allows you to connect to the switcher and view status information for various components.



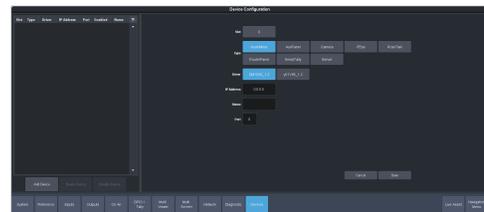
Configuration

The Configuration node provides access to switcher settings such as Reference, Inputs, Outputs, and MultiViewer. You can switch between the different configurations by selecting the pages at the bottom of the DashBoard window.



Devices

The Devices page on the Configuration node allows you to configure external devices to be controlled by the switcher.

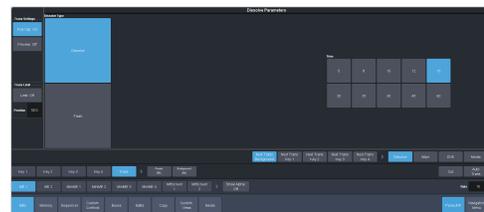


Tip: Click **Disable Device** to disable the selected device (does not apply to Audio Mixers).

Tip: You can apply a custom name to each device in the **Name** field. This name appears on the menus and allows you to quickly differentiate different devices of the same type, like cameras.

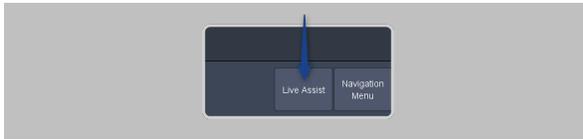
Live Assist

The Live Assist node provides access to operational functions such as keying, transition, and memory settings of the switcher. You can switch between the different settings by selecting the tabs at the bottom of the DashBoard window.



Tip: The **Custom View** button on the **Live Assist** page opens a separate page where you can set up custom DashBoard pages. These custom pages can also be set to auto follow specific video sources. This allows you to have Live Assist show a specific custom page when a video source is selected.

Tip: You can quickly jump to Live Assist from any other page using the **Live Assist** button next to the **Navigation Menu** button at the bottom right corner of all non-Live Assist pages.



PanelINK

Panelink allows Live Assist to follow the button presses on the control panel and display the relevant tabs. For example, with **PanelINK** turned on, press **SEL** for any keyer and Live Assist shows the settings for that keyer. Press the **WIPE** buttons and Live Assist shows the transitions settings for a wipe. With **PanelINK** turned off, Live Assist does not switch between tabs.



Note: Panelink only works on the Live Assist page.

To Assign a Page to a Custom Page Button

The custom page buttons on the Live Assist page can be assigned any custom page or node in DashBoard. This allows you to quickly access controls from another device on DashBoard from Live Assist on your current device.

1. Click **Navigation Menu > Configuration > System > Live Assist**.



2. Click on the **Address** drop-down list for the custom page button you want to assign to a page.
3. Select the connection or custom panel that you want to assign to the custom page button.
 - **All Connections** — expand the list and select the device and node that you want to assign to the custom page button. Some older DashBoard nodes from plug-ins may not display properly on the Live Assist buttons.

Note: Do not assign the Live Assist page to a custom page on the same machine.

- **Open Panels** — expand the list and select the open custom panel you want to assign

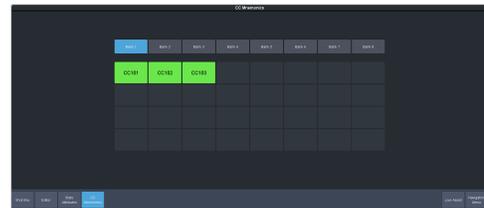
to the list. You must have the custom panel running on DashBoard for it to appear in the list.

Tip: Click **Clear** to remove the custom page and name assigned to that button.

4. Click on the name field for the custom page button you are assigning a page to and enter a descriptive name for the custom page. The name appears on the button in Live Assist.

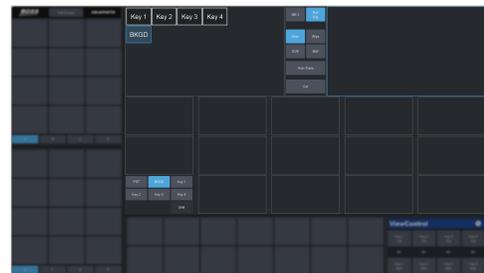
Custom Controls

The Custom Control provides access to recording, editing, and running custom controls, as well as setting up the mnemonics for custom control on the TouchDrive control panel.



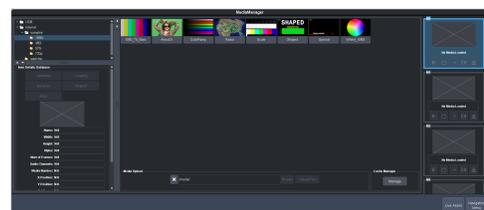
ViewControl

The ViewControl interface through DashBoard allows you to coordinate the control over the switcher through a touchscreen interface. Through ViewControl you can select sources, perform transitions, and run custom controls.



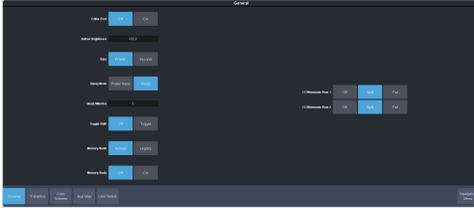
MediaManager

The MediaManager node allows you to control the Media-Store of the switcher. Upload media items, load media to channels, and set database elements..



Personality

The Personality node provides the switcher personality settings.



Help

The help node in DashBoard launches the integrated help system with full search capability.

Audio Mixer

The audio mixer node in DashBoard provides access to the RAVE audio mixer. An audio channel must be routed to the switcher subsystem to be controllable by the audio mixer interface. Audio sources can come from the embedded audio on an input BNC, through the 1RU Audio Breakout Module, from the Media-Store, or from the Windows® sound mixer.



Role Based Access Control

The Ross Platform Manager allows for user authentication and role based access through DashBoard. Once set up in DashBoard, Ross Platform Manager allows for control over who can control Graphite based on the roles individual users are assigned to.

Note: Ross Platform Manager does not apply to operation of the switcher from a control panel.

Tip: For information on setting up a Ross Platform Manager server and creating user accounts, refer to the documentation that came with your Ross Platform Manager.

- **Authorization not Required** — RBAC is applied to the switcher, but not enforced. Anyone can control the switcher through DashBoard.
- **Authorization Required** — RBAC is applied to the switcher and enforced. Only users with permission can control the switcher through DashBoard.

4. Click **OK** to reboot the switcher using RBAC permissions from Ross Platform Manager.

Tip: You may have to close and re-launch DashBoard to apply the access control.

To Turn on Role Based Access Control for Ross Platform Manager

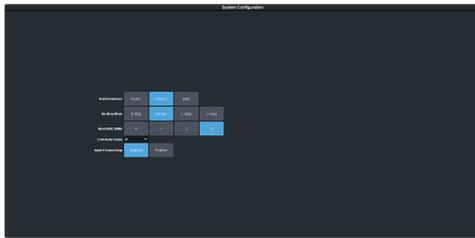
From DashBoard you can select whether the Role Based Access Control (RBAC) of Ross Platform Manager is applied to Graphite.



Important: Changing the RBAC mode may restrict access to the switcher if your account is not assigned to a role that has the required permission.

Note: RBAC settings are not stored in switcher sets or changed with a factory default.

1. Click **Navigation Menu > Configuration > System > Global**



2. Click the **Pre-Authorized Connections** button and enter the IP address of any trusted DashBoard systems that you want to allow access to the switcher without RBAC permissions.

Tip: A common trusted system would be a TouchDrive control panel. This allows the control panel with a DashBoard interface to continue to control the switcher without the need for a user to log in.



3. Click a **Role Based Access Control** button to apply access control to the switcher.

SoftPanel

SoftPanel provides you with a graphical interface to the menu system and control surfaces of the switcher. This allows you to setup and control the switcher without a control panel.



Important: *SoftPanel is a separate panel connection to the frame. Refer to [MultiPanel](#) on page 131 for information on setting up SoftPanel.*

The screen can be broken up into several different functional areas. Each of these areas allows you to interact with different aspects of the switcher interface.

Menu Area

The menu area provides a graphic representation of the menu system on a Carbonite Black control panel. The **Select**, **Up**, and **Down** buttons represent the actions of turning and pressing the knobs on the panel. The buttons in the top right corner allow you to navigate around in the menu tree, and the stylized mnemonic buttons at the bottom allow you to access different menus.



User Area

The user area can be assigned to ME/Key, Aux, or the Positioner. Press the **ME/Key**, **Aux Bus**, or **Positioner** button to select how the user area appears.

ME/Key

The **ME/Key** button allows you to select what the bus area is assigned to. Click **ME X**, **MiniME X**, or **MultSc X** to assign the panel bus area to that output. Click one of the **Key X Sel** buttons to assign the key bus in the panel bus area to that key.

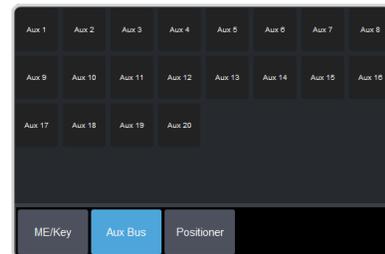
Tip: Tap **Full Screen** to have the SoftPanel interface fill the entire screen.



Aux Bus

The **Aux Bus** button allows you to select one of the aux buses that the key bus row in the bus area is assigned to.

Note: *The selection of one of the aux bus or key select buttons indicated what the key bus in the bus area is assigned to. You may have to switch between the **ME/Key** and **Aux Bus** buttons to see where the bus is assigned.*



Positioner

The **Positioner** button provides a virtual interface to the positioner. The positioner is used in device control, or to move keys or masks around. Click and hold the positioner and move it around to emulate moving the positioner around. The slider to the right of the positioner emulated twisting the positioner knob on the panel. The button to the left of the positioner emulates the button on the top of the positioner knob on the panel.



Control Area

The control area (the upper right of the screen) contains the main Dashboard interface to the switcher. Click **Navigation Menu** and select the menu you want to navigate to. When the **Live**

Assist menu is selected, the sub-menus will follow actions in the bus area when **PanelINK** is on.

Bus Area

The bus area provides a graphic representation of the panel row on the switcher. Use the user area buttons to assign the bus area to an ME, key, and aux bus. Sources are then selected on the key, program, and preset buses, and transitions are set up and performed with the transition buttons to the right of the source selection buttons.

*Tip: Use the **Hold On** or **2Press** buttons to emulate a press and hold of a button. This allows you to press and hold one button and then press another.*



Ultritouch

The 2RU rack mountable Ultritouch adaptable system control panel allows you to control some aspects of switcher operation using a DashBoard interface.

The DashBoard interface on Ultritouch provides status, buses, and custom control tabs. You must connect to the switcher from Ultritouch to be able to control the switcher functions. Refer to the Ultritouch documentation for information on navigating the Ultritouch menu and manually connecting to a device.

Once you are connected to the switcher, tap the **Connected Devices** button and select the switcher you want to control from the list and tap **Carbonite**. The available tabs for the switcher are listed. Tap one of the available tabs to open it.

Navigation Menu

Status

This tab allows you to view status information for various switcher components. These tabs are the same as the **Switcher Status** tab from a DashBoard computer.

Buses

This tab allows you to select sources on any bus on the switcher. This tab is this same as the **Bus Assignments** page from a DashBoard computer.

1. Tap the area and bus that you want to select a source on.
2. Tap the source that you want to select or tap **Exit** to close the popup.

Tip: The currently selected bus is shown at the upper left of the popup.

Custom Control

This tab allows you to run custom controls on the switcher. This tab is this same as the **Custom Control ShotBox** tab from a DashBoard computer. You cannot edit a custom control from this tab.

1. Tap the bank for the custom control you want to run.
2. Tap the custom control on the selected bank that you want to run.

Audio and Video Processing

Video and audio signals are processed and passed through the switcher in different ways, depending on how the switcher is being used or is set up. A better understanding of how the switcher is processing these signals help you to achieve the production you want.

Video Processing and Flow

Video is processed in a number of blocks in the switcher. After video comes into the switcher, the frame synchronizers / format converters are applied (depending on the frame you have). At this point any required color correction is also applied. After input the video signal is routed through the crosspoint. The crosspoint can route any input to any output for straight switching, or to the video processor and DVE and back for video manipulation. Just before the video signal is sent to the output, the processing of the ancillary data is performed.

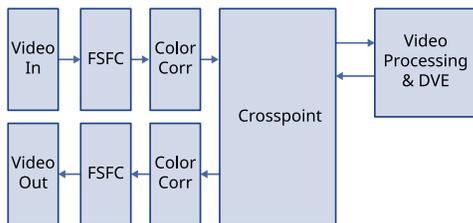


Figure 3: Video Flow Through the Switcher

Audio Processing and Flow

An audio signal is embedded into the ancillary data of a video signal before it comes into the switcher. This includes both standard embedded audio that comes from external sources and the audio sources from the 1RU Audio Breakout Unit. These audio sources are then brought into the audio mixer where they can be mixed and re-embedded on an output video signal.

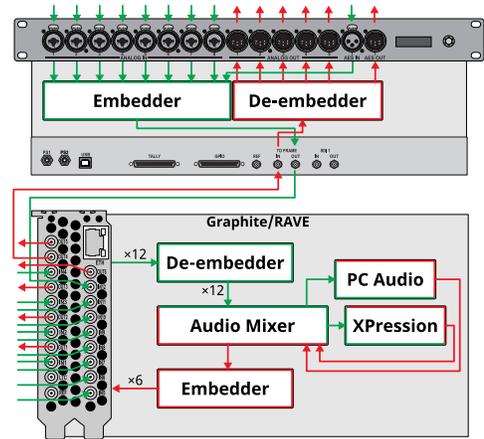


Figure 4: Analog Audio Flow Through the Switcher

As the embedded audio signal comes into the switcher and is manipulated, you must ensure not to perform an operation that will force the ancillary data to be stripped. Once an audio signal is in the switcher sub-system the audio mixer is able to manipulate and re-embed it in the video signal. Pass-through embedded audio can be stripped from the ancillary data if the video source is manipulated.

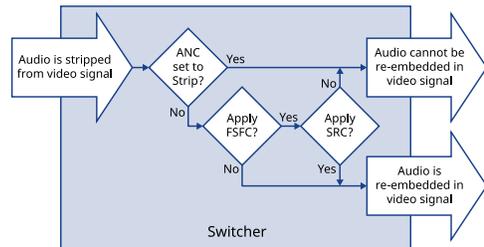


Figure 5: Embedded Audio Flow Through the Switcher

The following restrictions apply to ancillary data being included in the output:

- All ME program buses pass ancillary (ANC) data from the background source.
- MultiViewer outputs do not include any ancillary data.
- MiniME™ and MultiScreen outputs do not include any ancillary data unless an ME with ancillary data is re-entered onto the background bus.
- ME Preview does not include ancillary data unless the background is not selected as part of the next transition.
- A MiniME™ or MultiScreen can include ancillary data if an ME is re-entered onto the background.
- Any format conversion on the input video signal.
- Setting ancillary data to be stripped.

Video Sources

The switcher has access to three basic types of video sources; external, internal, and follows.

All video sources can be assigned to video source buttons. By pressing a video source button on a bus, the video source assigned to that button is selected on that bus.

- **External** — External video sources come from cameras, video servers, character generators, or other external devices into the switcher.
- **Internal** — Internal video sources come from internally generated video, such as Media-Store channels, matte color, and black.
- **Follows** — Follow video sources allow you to have one bus follow what is selected on another bus. For example, you can assign an Aux Bus to follow ME 1 Background so that a source selected on the background bus of ME 1 is also selected on the Aux Bus.

To Select a Source on a Bus from Dashboard

To select a video source on a bus, you must identify the ME, MiniME™, Aux, MultiScreen, or chroma key and bus you want to assign a video source to, and then press the source button you want to select on that bus.

1. Click **Navigation Menu > Live Assist > Buses**.



2. Click **ME Bus** or **Aux Bus** to select the area that you want to select a source on. As you select different areas, the buses for that area are listed on the row above.
3. Click **MEX**, **MiniMEX**, **MultiScreenX**, or **AuxX** to select the specific bus or area you want to select a source on. With an ME, MiniME™, or MultiScreen there is an additional selection of the keyer, background, or preset bus that you want to select a source on. The aux buses do not have these selections.

4. Select the background, preset, or keyer bus that you want to select a source on. (ME, MiniME™, and MultiScreen only)

Note: Ensure that the source selected on the bus you want to enter onto the ME, MiniME™, MultiScreen, aux, or keyer is valid for that destination. If the source is not valid, you will not be able to select the bus on the ME, MiniME™, Aux, or keyer.

5. Select the type of source you want to assign to the bus and then select the source.

- **Physical** — the sources on the physical input BNCs.

Tip: If a source has a TSL name assigned to it, both the TSL name and input number are shown on the button.

- **Internal** — internally generated sources, including re-entries.
- **Aux Follows** — use the source that is active on selected aux bus.
- **ME Follows** — use the source that is active on selected ME bus.
- **MiniME Follows** — use the source that is active on selected MiniME™ bus.
- **MultiScreen Follows** — use the source that is active on selected MultiScreen bus.

Video Layering

How video is layered in the output of the switcher depends on how an ME is re-entered onto the other, and what keyers are on-air for the ME.

If we assume that each ME has all keyers on-air and that ME 1 is re-entered into ME 2, the layering will start with ME 1 Background and progress to the highest ME and keyer.

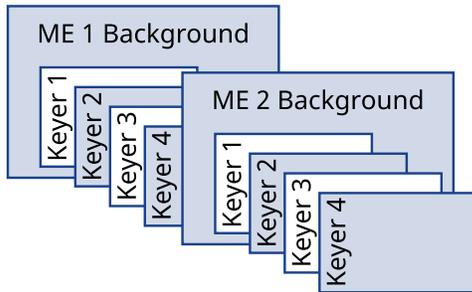


Figure 6: Video Layering

Tip: You can select a MiniME™ on an ME or different MiniME™ to re-enter it. Up to two MiniME™ re-entries, including an ME is allowed.

Re-Entry

Re-entry is the term used to describe the process of selecting another ME on an ME. For example, if you select ME 1 on ME 2, ME 1 is said to be re-entered onto ME 2. Re-entry takes the output of an ME and uses it as the background or key on the other ME. If you select an ME on the background bus, the ME becomes background video source of the other ME. If you select an ME on a Key Bus, the ME becomes the key source of the other ME.

Keep the following in mind:

Keep the following in mind when working with re-entries:

- You cannot re-enter ME 2 into ME 1.
- You cannot re-enter an ME, or the Clean Feed of an ME, into itself.

Re-Entry Timing

Any ME or MiniME™ can go in any timing slot. MEs can only be re-entered in order from highest ME to ME P/P.

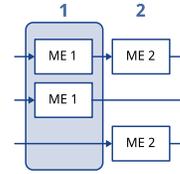


Figure 7: ME Timing Windows

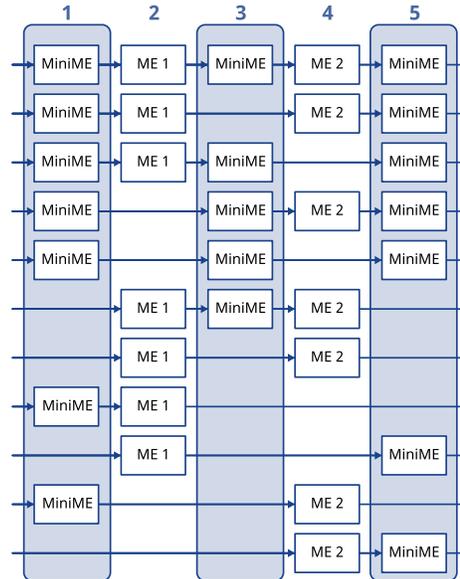


Figure 8: MiniME™ Timing Windows

To Re-Enter an ME

The process to re-enter any bus onto another is the same as re-entering an ME onto another ME.

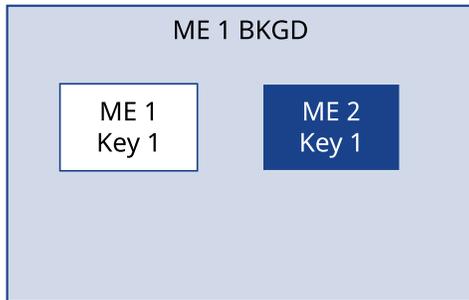
1. Set up ME 1 with a background and a key.



2. Set up ME 2 with a key.



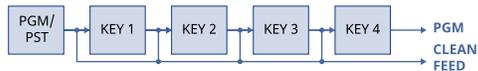
-
3. Select ME 1 as a source on the Background Bus of ME 2. Notice that the output of ME 1 is now being used as the background of ME 2.



FlexiClean Clean Feed

FlexiClean provides a second program output that is derived from a different location than the standard program output. A frequent application is the recording of shows for later airing without call-in phone numbers inserted.

The clean feed output can come from before or between the keyers.



Video Preview

Video preview allows you to use an additional monitor to preview what the next shot is going to be.

The preview for an ME shows what is selected for the next transition on that ME. This includes the keys and background video sources that will be on-air after the next transition.

MultiViewer

Each MultiViewer allows you to view up to 16 video sources (32 with Shift), in 47 different layouts, from a single output BNC. Any video source on the switcher, including ME Program, Preview, and Media-Store channels, can be routed to any box on the MultiViewer. All boxes on the MultiViewer output include mnemonic source names and red and green tallies.

There are 2 broadcast-quality integrated MultiViewer generators in the switcher subsystem. The MultiViewer outputs are only available on out BNCs 5 and 6, and the HDMI outputs.

Each MultiViewer head supports an integrated clock that can display time of day, timecode, or a countdown timer. The position, size, and color of the clock can be adjust.

Matte Source

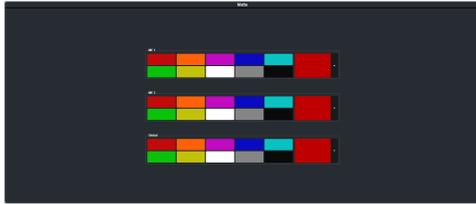
Matte color backgrounds (**BG**) are color signals that can be applied to backgrounds and keys. Color selection is done either by picking a preset color, or by adjusted hue, saturation, and luminance to create a custom color.

Select the matte generator (**BG**) on a background or key bus. The full region of the background or key is filled with the selected color.

Note: A color background can be a solid color, or a wash of two colors.

To Set Up a Matte Color

1. Click **Navigation Menu > Live Assist > Matte**.



2. Select the matte generator that you want to set the color for.
 - **ME X** — set the color for the color background source on the selected ME.
 - **Global** — set the color for the global matte generator.
3. Click one of the preset colors to assign that color to the selected matte generator.

*Tip: You can select a custom color by clicking the color box to the right of the preset colors and selecting a new custom color. Toggle **Live** on to show the color changes live on the matte generator source.*

To Set Up a Wash

A wash applies colors to a pattern selected for a matte. The first color is preset to the matte color, but both are selectable. Selecting the source button again, or **KEY SEL** button returns to this menu. Refer to the sections on mattes and patterns for information on setting them up. You can load a preset color instead of creating the first custom color.



Important: A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used. The position of items on the menus on the SoftPanel may not match those of a physical panel.

1. Use the **Hue 1** knob to adjust the hue of the first custom color.
2. Use the **Sat 1** knob to adjust the saturation of the first custom color.
3. Use the **Lum 1** knob to adjust the luminance of the first custom color.
4. Press **NEXT**.
5. Use the **Wash** knob to select **On**.
6. Press **NEXT**.
7. Use the **Size** knob to select the size of the wash pattern.
8. Press **NEXT > NEXT > NEXT > NEXT**.
9. Use the **Hue 2** knob to adjust the hue of the second custom color.
10. Use the **Sat 2** knob to adjust the saturation of the second custom color.
11. Use the **Lum 2** knob to adjust the luminance of the second custom color.

Copying

You can copy the content of an ME or keyer to another ME or keyer.

ME Copy

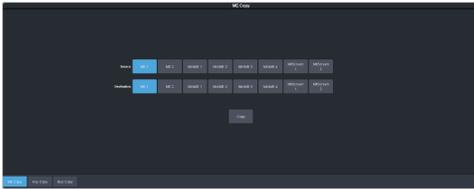
You can copy the entire contents of an ME, MiniME™, or MultiScreen to another ME, MiniME™, or MultiScreen. The entire contents of the destination is replaced with the contents of the source.

When you copy an ME, the switcher tries to assign resources to the destination ME to match the source ME. If these resources are not available, the switcher may need to steal resources.

To Copy an ME

Copy the contents of an ME to another.

1. Click **Navigation Menu > Live Assist > Copy > ME Copy.**



2. Click a **Destination** button to select the destination that you want to copy to.
3. Click a **Source** button to select the source you want to copy.
4. Click **Copy.**

Key Copy

You can copy the entire contents of a keyer to another keyer in the same, or a different ME. The entire contents of the destination keyer are replaced with the contents of the source keyer.

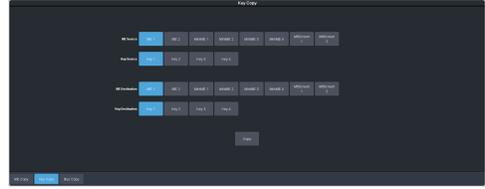
When you copy a key, the switcher tries to assign resources to the destination key to match the source key. If these resources are not available, the switcher steals resources in the following order:

1. From off-air keys that are not the source key.
2. From the source key, if it is not on-air.
3. From on-air keys that are not the source key.
4. From the source key, even if it is on-air.

To Copy a Key

Copy the contents of a keyer to another.

1. Click **Navigation Menu > Live Assist > Copy > Key Copy.**



2. Click an **ME Destination** and **Key Destination** button to select the destination that you want to copy to.
3. Click an **ME Source** and **Key Source** button to select the source you want to copy.
4. Click **Copy.**

Bus Copy

You can copy the entire contents of an background or key bus to another bus. The entire contents of the destination is replaced with the contents of the source.

When you copy a bus, the switcher tries to assign resources to the destination bus to match the source bus. If these resources are not available, the switcher may need to steal resources.

To Copy a Bus

Copy the contents of a bus to another.

1. Click **Navigation Menu > Live Assist > Copy > Bus Copy.**



2. Click an **ME Source** button to select the ME, MiniME™, or MultiScreen that contains the bus you want to copy.
3. Click a **Bus/Keyer Source** button to select the bus you want to copy from.
4. Click an **ME Destination** button to select the ME, MiniME™, or MultiScreen that contains the bus you want to copy to.
5. Click a **Bus/Keyer Dest.** button to select the bus you want to copy to.
6. Click **Copy.**

Key Swap

You can swap the entire contents of any two keyers in the same, or different MEs. The video source, position, and key type are all swapped between keyers. This allows you to change the apparent key priority, or layering, of the keys in the video output. For example, key 3 appears over key 2. If you perform a swap between key 3 and key 2, it appears as if key 2 is now over key 3.

Keep the following in mind:

Keep the following in mind when performing a key swap:

- Key swap does not change the on-air status of a keyer.
- If a DVE key is set to freeze, it will be unfrozen by the swap.
- A key swap can be recorded as part of a custom control.

To Perform a Key Swap

This procedure swaps the contents of Key 2 and Key 3 as an example. Use the same procedure for any key combination.



***Important:** A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used. The position of items on the menus on the SoftPanel may not match those of a physical panel.*

1. Press and hold the **KEY 2 SEL** button.
2. Press the **KEY 3** button in the transition area.

Transitions

Transitions are used to change the background video and take keys on and off-air. A transition can include any combinations of background and keyers for an ME, MiniME™, or MultiScreen. The background and each keyer can be transitioned independently.

Performing Transitions

What you can include in the transition, and the type of transition you can perform, depend on the number of resources you have, and if you are performing a background and keyer transition at the same time.

Keep the following in mind:

Keep the following in mind when performing transitions:

- If any of the sources going on-air have an assigned GPI output, the GPI output is triggered and the switcher then waits the configured pre-delay interval before performing the transition. If you perform a transition with the fader handle, the GPI output is triggered but the pre-delay interval is ignored.
- If any of the sources going on-air are assigned to a video server, you can have the video server play when the source is taken on-air by toggling **Roll Clip** on.
- If any of the sources going on-air are assigned to a video server, the switcher waits for the configured pre-delay interval before performing the transition. If you perform a transition with the fader handle, the pre-delay interval is ignored.
- If the fader is moved during an auto transition, control of the transition is passed to the fader. You must complete the transition with the fader. This allows you to override any auto transition in progress with the fader.
- The **Cut** and **Auto** buttons can be used to transition keys independently.
- You can pause an auto transition by pressing the **Auto Trans** button during the transition. Press the button again to continue the transition.
- If you turn the Transition Limit off when the transition has stopped at the transition limit point, the next transition starts from the

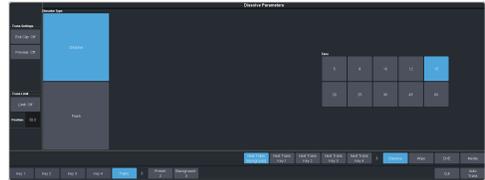
transition limit point and goes forward to complete the transition, instead of going back to the start.

- On a MiniME™, Background and key 2 only support Dissolve and Cut transitions.

To Perform a Transition

All transitions, with the exception of cuts on the background or key bus, have the same basic setup. The touchscreen menu system offers the touchscreen interface to setup and perform the transition.

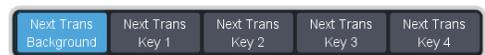
1. Click **Navigation Menu > Live Assist > MEs.**



2. Click the **ME X, MiniME X, or MultiScreen X** for the area you want to perform the transition on.
3. Select the video sources you want to take on-air on each bus. Background and keys are set up slightly differently but can be performed with the same transition.
 - **Background** — click **Trans > Preset** and select the new background source.
 - **Key On-Air** — click the **Key X > Key Fill** button for the key you want to take on-air and select the new source. Repeat this for each key you want to take on-air.
 - **Key Off-Air** — you don't need to select the keys at this point.

Tip: Refer to [To Select a Source on a Bus from Dashboard](#) on page 26 for information on selecting sources.

4. Click **Trans.**
5. In the Next Transition area, select the elements (Background and Keys) you want to include in the next transition. You can include any combination of background and keys, but at least one element must be selected.

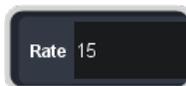


6. In the **Rate** field, enter the rate that you want the transition performed at. This is the speed, in frames, that it takes for the transition to complete. A Cut or manual

fader transitions do not use the transition rate.

- **Background** — enter a new ME transition rate, in frames, in the **Trans Rate** field.
- **Key Only** — enter a new key transition rate, in frames, in the **Key X Rate** for the key you want to transition.

Note: The key rate is only used for key only transitions. Keys included in with the background are transitioned at the ME Rate.



7. In the Transition area, select the type of auto transition you want to perform. If you want to perform a cut you do not need to select a transition type and can move to the next step.



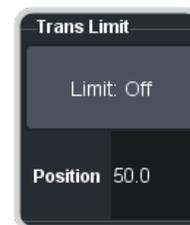
- **Dissolve** — perform a dissolve or WhiteFlash auto transition. Refer to [To Set Up a Dissolve](#) on page 38 or [To Set Up a WhiteFlash](#) on page 38 for more information.
- **Wipe** — perform a wipe auto transition. Refer to [To Set Up a Wipe](#) on page 39 for more information.
- **DVE** — perform a DVE auto transition. Refer to [To Set Up a DVE Transition](#) on page 39 for more information.
- **Media** — perform a MediaWipe auto transition. Refer to [To Set Up a MediaWipe](#) on page 40 for more information.

8. Click a **Trans Settings** button to turn the setting on or off. The options available depend on the type of transition selected.



- **Roll Clip** — select whether you want any video server clips assigned to a source being taken on-air to play with the transition (**On**), or not (**Off**).
- **Preview** — preview the transition on the preview output **On**. You cannot preview the independent key-only transitions or a MiniME™ transition.
- **Flip Flop** — select whether the wipe runs forward during the first transition and then reverse during the second (**On**), or if it always runs in the same direction (**Off**).
- **Direction** — select the direction that the wipe travels.

9. Click **Limit** to turn trans limit **On** or **Off**. Enter a value for the trans limit in the **Position** field to set the point in a transition where an auto transition stops. When active, the point in the transition where the auto transition will stop is indicated by a flashing segment on the transition progress bar next to the fader handle on the control panel. The auto transition proceeds to this point and stops. The second auto transition starts from the transition limit point and goes back to where the first transition started.



Tip: The Limit Position is a percentage with 0 being the starting point of the transition and 100 being the ending point of the transition.

10. Perform the transition.



Important: The Cut and Auto buttons trigger a transition on what has been selected. If Trans is selected a normal background transition is performed. If one of the keys is selected (Key X) a key-only transition is performed on the selected key.



- **Auto Trans** — click **Auto Trans**
- **Cut** — click **Cut**

Tip: During an auto trans, press Auto Trans again to hold the transition at the current position or press Cut to abort the transition and return to the original source.

- If a pre-delay has been set, and **Roll Clip** is active, the switcher will apply the pre-delay interval before performing the transition.

To Perform a Transition on TouchDrive (Memory Area)

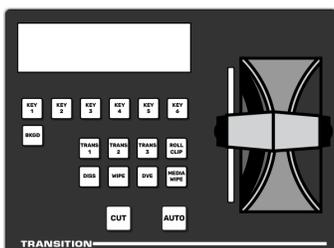
All transitions, with the exception of cuts on the background or key bus, have the same basic setup. The control panel offers physical buttons and mnemonics to setup and perform the transition. Some panels have a memory area that can be used to set the transition rates.

- Select the preset or key sources that you want to transition to on the buses.

Tip: You can perform a quick, or hot, cut on the background bus by simply selecting a different source.

- In the **Transition** area, select the elements you want to include with the transition. If you are including multiple elements, press and hold the first button and press the other buttons to include them in the same transition.

*Note: A key should be included in the transition if it is going on-air or off-air. The transition changes the on-air state of the keyer. If a key is on-air, a red indicator is visible on the display just above the key and the **CUT** button for that key is red in the **Keyer** area.*



- In the **Transition** area, select the type of auto transition you want to perform. Refer to the manual that came with your switcher for information on setting up these transitions.

- DISS** — perform a dissolve or WhiteFlash transition
- WIPE** — perform a wipe transition
- DVE** — perform a DVE transition
- MEDIA WIPE** — perform a MediaWipe transition

*Note: The **TRANS X** buttons are configurable and can be assigned different functions.*

*Tip: Press and hold **DISS** and press **Flash** on the row control menu to select a WhiteFlash transition.*

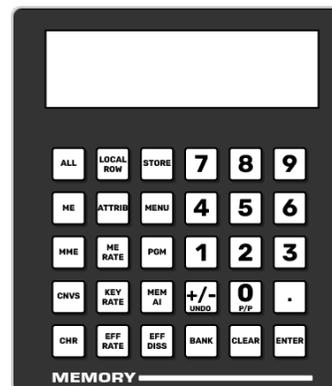
- The display in the **Transition** area shows the current setting for the transition type. Tap one of these settings to show additional options.

Tip: Live Assist follows the transition type selection and shows the settings for that transition type.



- Left** — the left button shows the current pattern for the wipe or DVE transition. Tap the button and swipe left or right on the display to select a different pattern. For a MediaWipe the button shows the name of the media item being used for the transition.
- Center** — the center button shows the current direction for the wipe, DVE, or MediaWipe transition. Tap the button and select a different direction for the transition to be performed in.
- Right** — the right button shows the current position of the pattern for the wipe transition or the settings for the MediaWipe transition. Tap the button to have the 3-knob display show the position setting of the pattern and use the positioner to move the pattern around.

- In the **Memory** area, enter the rate that you want the transition performed at. This is the speed, in frames, that it takes for the transition to complete. A Cut or manual fader transition does not use the transition rate.



- Background** — press **ME RATE** and use the keypad to enter a new rate, in frames,

and press **ENTER**. The rate is shown on the display on the **Transition** area.

- **Key Only** — press **KEY RATE** and use the keypad to enter a new rate, in frames, and press **ENTER**. The rate is shown on the **Keyer** area for each individual key.

Note: The **KEY RATE** is only used for key only transitions. Keys included in with the background are transitioned a the **ME Rate**.

6. Perform the transition.
 - **Auto Transition** — press **AUTO**. The transition is performed at the set transition rate.
 - **Cut** — press **CUT**.
 - **Fader** — move the fader from one limit to the other. The rate at which you push the fader determines the speed of the transition.
7. If a pre-delay has been set, and the **ROLL CLIP** button is active, the switcher will apply the pre-delay interval before performing the transition.

To Perform a Transition on TouchDrive (No Memory Area)

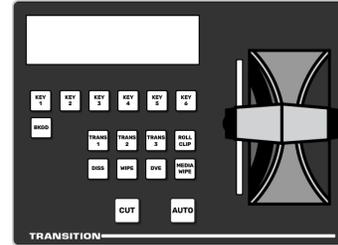
All transitions, with the exception of cuts on the background or key bus, have the same basic setup. The control panel offers physical buttons and mnemonics to setup and perform the transition.

1. Select the preset or key sources that you want to transition to on the buses.

Tip: You can perform a quick, or hot, cut on the background bus by simply selecting a different source.

2. In the **Transition** area, select the elements you want to include with the transition. If you are including multiple elements, press and hold the first button and press the other buttons to include them in the same transition.

Note: A key should be included in the transition if it is going on-air or off-air. The transition changes the on-air state of the keyer. If a key is on-air, a red indicator is visible on the display just above the key and the **CUT** button for that key is red in the **Keyer** area.



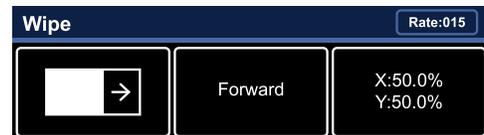
3. In the **Transition** area, select the type of auto transition you want to perform. Refer to the manual that came with your switcher for information on setting up these transitions.
 - **DISS** — perform a dissolve or WhiteFlash transition
 - **WIPE** — perform a wipe transition
 - **DVE** — perform a DVE transition
 - **MEDIA WIPE** — perform a MediaWipe transition

Note: The **TRANS X** buttons are configurable and can be assigned different functions.

Tip: Press and hold **DISS** and press **Flash** on the row control menu to select a WhiteFlash transition.

4. The display in the **Transition** area shows the current setting for the transition type. Tap one of these settings to show additional options.

Tip: Live Assist follows the transition type selection and shows the settings for that transition type.



- **Left** — the left button shows the current pattern for the wipe or DVE transition. Tap the button and swipe left or right on the display to select a different pattern. For a MediaWipe the button shows the name of the media item being used for the transition.
- **Center** — the center button shows the current direction for the wipe, DVE, or MediaWipe transition. Tap the button and select a different direction for the transition to be performed in.
- **Right** — the right button shows the current position of the pattern for the wipe transition or the settings for the MediaWipe transition. Tap the button to have the 3-knob display show the

position setting of the pattern and use the positioner to move the pattern around.

- Set the rate for the transition you want to perform.

- Background**

- On the Transition area tap **Rate** and use the 3-knob menu to enter the new rate.



- Key Only**

Note: The KEY RATE is only used for key only transitions. Keys included in with the background are transitioned a the ME Rate.

- On the Keyer area tap the key you want to set the rate for.



- Tap **Rate** and use the 3-knob menu to enter the new rate.

- Perform the transition.

- Auto Transition** — press **AUTO**. The transition is performed at the set transition rate.
- Cut** — press **CUT**.
- Fader** — move the fader from one limit to the other. The rate at which you push the fader determines the speed of the transition.

- If a pre-delay has been set, and the **ROLL CLIP** button is active, the switcher will apply the pre-delay interval before performing the transition.

To Perform a Transition on Carbonite Black

All transitions, with the exception of cuts on the background or key bus, have the same basic setup. The control panel offers physical buttons and mnemonics to setup and perform the transition.

- Select the preset or key sources that you want to transition to on the buses.

Tip: You can perform a quick, or hot, cut on the background bus by simply selecting a different source.

- In the **Transition** area, select the elements you want to include with the transition. If you are including multiple elements, press and hold the first button and press the other buttons to include them in the same transition.

*Note: A key should be included in the transition if it is going on-air or off-air. The transition changes the on-air state of the keyer. If a key is on-air, a red indicator is visible just above the include button for that key and the **CUT** button for that key is red in the **Keyer** area.*

- In the **Transition** area, select the type of auto transition you want to perform. Refer to the manual that came with your switcher for information on setting up these transitions.

- DISS** — perform a dissolve or WhiteFlash transition
- WIPE** — perform a wipe transition
- DVE** — perform a DVE transition
- MEDIA WIPE** — perform a MediaWipe transition

*Note: The **USER** button is configurable and can be assigned different functions.*

- In the **Memory** area, enter the rate that you want the transition performed at. This is the speed, in frames, that it takes for the transition to complete. A Cut or manual fader transition does not use the transition rate.

*Note: If your control panel does not have a memory area, you can use the **Time** knob on the 3-knob menu, or **DashBoard**, to set the background transition rate.*

- Background** — press **ME RATE** and use the keypad to enter a new rate, in frames, and press **ENTER**.
- Key Only** — press **KEY RATE** and use the keypad to enter a new rate, in frames, and press **ENTER**.

Note: The KEY RATE is only used for key only transitions. Keys included in with the background are transitioned a the ME Rate.

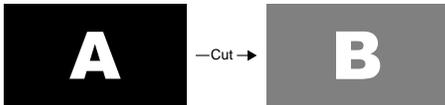
- Perform the transition.

- Auto Transition** — press **AUTO**. The transition is performed at the set transition rate.
- Cut** — press **CUT**.

- **Fader** — move the fader from one limit to the other. The rate at which you push the fader determines the speed of the transition.
6. If a pre-delay has been set, and the **ROLL CLIP** button is active, the switcher will apply the pre-delay interval before performing the transition.

Cut Transitions

A Cut is an instantaneous transition between video sources. Unlike all the other transition types, there are no intermediate steps between the video source that is on-air, and the video source you are transitioning to.



A cut is performed either by selecting different sources on a background or key bus, or by pressing a **Cut** button.

Dissolve Transitions

A Dissolve is a gradual fade between video sources. For a Background transition, the video signal on the Background bus and the video signal on the Preset bus are mixed together until the Preset bus video signal completely replaces the Background bus video signal.



To Set Up a Dissolve

A dissolve transition requires that you set a background and key transition rate for the auto transition. A fader transition does not use the transition rate.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME that you want to perform the transition on.

Tip:

2. Click **Trans > Dissolve**, or press **DISS** in the **Transition** area on the control panel.



Tip: Click one of the **Transition Rate** buttons to quickly select the rate for the transition.

WhiteFlash

Perform a two-step transition where a dissolve to and from white, or other selected color, is performed in the middle of the transition. The video signal on the Background bus is transitioned to a color background of the selected WhiteFlash color. The color background is then transitioned to the preset bus. WhiteFlash consumes a pattern generator for the transition.

Each ME has a separate WhiteFlash generator.

To Set Up a WhiteFlash

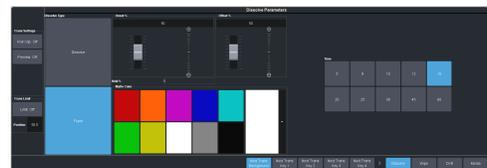
A WhiteFlash transition is performed just like a normal dissolve except that you must set the color for the flash and the rates for the onset, hold, and fade.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME that you want to perform the transition on.

Note: A WhiteFlash can only be performed on an ME.

2. Click **Trans > Dissolve**, or press **DISS** in the **Transition** area on the control panel.
3. Click **Flash**.

Tip: The **DISS** button on the control panel flashes indicating a WhiteFlash transition has been selected.



4. Use the **Onset %** and **Offset %** sliders to select the percentage of the transition that each phase of the WhiteFlash takes.
 - **Onset** — duration of the dissolve to the WhiteFlash color.
 - **Offset** — duration of the dissolve to the preset video source.
 - **Hold** — duration of the dissolve that the WhiteFlash color is held. This value is the residual of entire duration minus the onset and offset.
5. Select a default or custom color for the WhiteFlash.

- **Default** — click one of the preset matte colors.
- **Custom** — click the arrow to the right of the **Matte Color** area and use the **Hue**, **Saturation**, and **Lightness** sliders to select your own color. Click **OK** to apply the color or **Live** to apply it in real-time.

Wipe Transitions

A Wipe is a gradual transition where one video signal is replaced with another according to a wipe pattern. In the example below, a line wipe is being used.



For Key transitions, the key is wiped on or off-air with the transition and the background remains untouched. The duration of a wipe transition depends on either the transition rate for the ME, or the rate at which the fader is moved.

To Set Up a Wipe

A wipe transition requires that you select a wipe pattern, set the direction and number/size of wipe pattern, as well as set a background and key transition rate for the auto transition. A fader transition does not use the transition rate.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME that you want to perform the transition on.

Note: A wipe can only be performed on an ME.

2. Click **Trans > Wipe**, or press **WIPE** in the **Transition** area on the control panel.



3. In the **Wipe Pattern** area, select the pattern that you want to use for the wipe.
4. Set up the wipe pattern as required.
 - **Wipe Aspect** — adjust the aspect ratio of the wipe pattern. Not all patterns can be adjusted.
 - **H-Multiply** — multiply the pattern horizontally.
 - **V-Multiply** — multiply the pattern vertically.

- **X-Position** — position the pattern on the x-axis.
- **Y-Position** — position the pattern on the y-axis.
- **Rotation** — rotate the pattern. Not all pattern can be rotated.
- **Border Size** — apply a border to the pattern and adjust the size. At size 0 the border is off.
- **Border Softness** — apply softness to the border.
- **Border Color** — select a color for the border. You can choose between the predefined colors or use the color picker to select a custom color.

DVE Transitions

A DVE transition is a gradual transition where one video signal is replaced with another according to a 2D DVE pattern.

Keep the following in mind:

Keep the following in mind when performing DVE transitions:

- You must include the background when performing a DVE transition on a Chroma Key, Self Key, or Auto-Select Key. If you do not include the background, a dissolve transition is performed.
- Performing a DVE transition on a DVE Key without including the background scales the transition effect to the size of the DVE Key. This transition does not consume an additional DVE resource.
- Performing a DVE transition on a DVE Key with the background included does not scale the transition effect. This transition consumes the second DVE resource.
- You cannot perform a DVE transition on a MultiScreen.
- You can only perform a DVE transition on a DVE key on a MiniME™. If the transition includes the Background, or a keyer that is not set as a DVE, the transition is switched to a dissolve.

To Set Up a DVE Transition

A DVE transition requires that you select the DVE pattern and duration for the transition.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME that you want to perform the transition on.
2. Click **Trans > DVE**, or press **DVE** in the **Transition** area on the control panel.



3. Click a **DVE Pattern** button to select the DVE wipe pattern you want to use.

MediaWipe Transitions

A MediaWipe allows you to use an animation to cover a transition. When the transition starts, the switcher plays the selected animation over top of the background and keys that are being transitioned. A MediaWipe can be used to cover a cut, dissolve, wipe, or DVE transition.

For a cut MediaWipe, the transition is performed when the cut point is reached. It is important to use a full-screen image in the animation at the cut point so that the cut is not visible on-air.

Keep the following in mind:

Keep the following in mind when performing MediaWipe:

- Although you can select a still image for a media transition, it is not recommended.
- Only Auto Transition should be used for Media transitions. Using the fader to perform the transition manually could result in jumps in the animation.
- The duration of the transition (Time) is set by the length of the animation and the play speed of the animation.
- The audio associated with a MediaWipe is only available on the AES outputs.
- You cannot perform a MediaWipe transition on a MiniME™ or MultiScreen.
- Only Media-Store channels 1 and 2 can be used for a MediaWipe.
- The MediaWipe can be set to occur between any of the keys or the background. When you set the layer to a specific key, the MediaWipe animation will cover that key, even if the key is not part of the transition. The animation plays over the key, but the key remains after the animation is finished. Any keys above

the MediaWipe layer remain on top of the animation.

To Set Up a MediaWipe

A MediaWipe requires that you select the animation you want to use and then set up how you want the transition performed under the animation. This information is stored with the media item when you press save.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME that you want to perform the transition on.
2. Click **Trans > Media**, or press **MEDIA** in the **Transition** area on the control panel.



3. In the **Media Status** area, click a **Media X** button to select the channel you want to assign an animation to.
4. In the **Media Selection** area, click the thumbnail box for the animation you want to assign to the Media-Store channel.

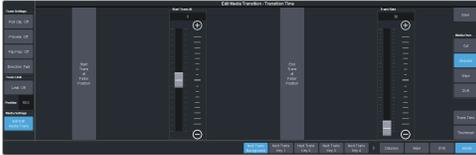
Tip: Enter the media item number for a media item in the field below the thumbnail button assign that button to the media item.

5. In the **Trans Layer** area, select where the MediaWipe will occur.
 - **Auto** — MediaWipe occurs over highest number key in the transition.
 - **Bkgd** — MediaWipe occurs over the background, but under all keys.
 - **Key1** — MediaWipe occurs over the background and key 1, but under remaining keys.
 - **Key2** — MediaWipe occurs over the background and key 1 and 2, but under remaining keys.
 - **Key3** — MediaWipe occurs over the background and keys 1-3, but under key 4.
 - **Key4** — MediaWipe occurs over the background and keys 1-4, but under key 5.
 - **Key5** — MediaWipe occurs over the background and keys 1-5, but under key 6.
 - **Key6** — MediaWipe occurs over the background and all keys.



Important: If a key is above the MediaWipe layer and included in the MediaWipe transition, it will cut off-air with the transition. This is normally covered by the animation when the layer is above the key.

6. Click **Edit Media Trans.**



7. In the **Media Over** area, select the type of transition you want to use under the MediaWipe. This also allows you to set up the transition parameters for wipes and DVE transitions.

8. Click **Trans Time** and use the slider or fader in the **Transition** area on the control panel to set the start and end of the transition under the MediaWipe.

- (Cut only) Use the **Cut Frame** slider to select the point for the cut, or move the fader to the point in the animation where you want the cut to happen and click **Cut at Fader Position**.
- Use the **Start Trans At** slider to select the point where the transition starts, or move the fader to the point in the animation where you want the transition to start and click **Start Trans at Fader Position**.
- Use the **Trans Rate** slider to select the duration of the dissolve, or move the fader to the point where you want the transition to end and click **End Trans at Fader Position**.

Tip: If you select a negative start point for the transition, the transition will start first and then the animation will play after the start point duration has passed.

9. Click **Thumbnail** and use the **Thumbnail** slider to select a point in the animation that you want to use as a thumbnail for the MediaWipe. You can also use the fader to select the position and click **Generate Thumbnail at Fader Position**.

10. Click **Save** to save the new setting to the selected media item.

11. Click **Exit Edit Media Trans.**

Keying

Keying is the term used to describe when you insert (or electronically cut) portions of one scene into another, or place titles over background images. Keys are made up of two basic components, an alpha, that cuts the hole in the background video, and a fill, that fills the hole with different video.

Keys, like MEs, are layered onto the background video signal from the lowest numbered key to the highest on an ME.

Note: DashBoard Live Assist will not notify you of error messages or if a confirmation is required. For example, if there are no available resources for the DVE Key, or Chroma Key, you are trying to create, the switcher will not create the key and no notification will be shown.



Important: If you are using a MiniME™, key 1 only supports a DVE key type, and key 2 only supports the Self Key, Auto Select, and Chroma Key types. Key priority on a MiniME™ is the same as on an ME.

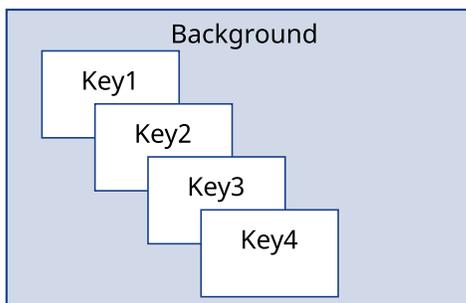


Figure 9: Key Priority

Tip: The Key Preview (**KEY PV**) button allows you to temporarily force the program output of the selected keyer to the preview output of the switcher. The ME remains in the key preview state for as long as you hold the **KEY PV** button, and returns to normal as soon as you release the button. You can also double-press the **KEY PV** button to latch the ME in the key preview state until the button is pressed again.

Self Keys

A Self Key is a key in which the luminance, or brightness, values of the key source are used as the alpha for the key.

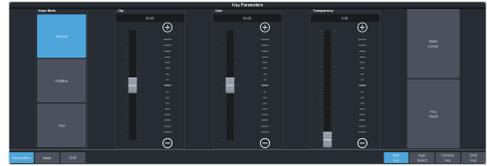
To Set Up a Self Key

A self key is set up by selecting the keyer and video source you want to use, and adjusting the key parameters.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

- 2.
3. Click **Self Key**.



Tip: Click **Show Alpha** to have the preview output of the current ME switch to the alpha signal that is being used by the selected keyer. Show alpha is not available for MiniME™ outputs.

Tip: Click **Key Preview** to force the program output of the selected keyer to the preview output of the switcher.

Tip: Click **Make Linear** to return the clip and gain values to the default settings.

4. Use the **Clip** slider to remove lower-saturated colors from the video image.
5. Use the **Gain** slider to adjust the transition between the video image and the parts of the video image that are removed.
6. Use the **Transparency** knob to adjust the transparency of the key from opaque (**0**) to fully transparent (**100**).
7. Click **Key Invert** to reverse the polarity of the key alpha so that the holes in the background are cut by dark areas of the key alpha instead of bright areas.
8. Click a **Keyer Mode** button to override the shaped setting for the key.
 - **Normal** — set to a linear keyer for an unshaped source.
 - **Additive** — set to an additive keyer for a shaped source. The **Key Invert** function is disabled in this mode.
 - **Full** — set the alpha to fully opaque (white). The **Clip**, **Gain**, **Make Linear**, and **Key Invert** functions are disabled in this mode.
9. Click **Mask** to apply a mask to the key.

Auto Select Keys

An Auto Select key is a key in which two video signals are required to make the key. The alpha is used to cut the hole in the video and the fill is used to fill the hole. These signals often originate from external devices such as

character generators, external still stores, or other graphics systems.

To Set Up an Auto Select Key

An auto select key is set up by selecting the keyer and video source you want to use, and adjusting the key parameters. The pairing of the video and alpha video signals is done when configuring video inputs. Refer to the Setup Manual that came with your switcher for information on setting up Auto Keys.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

- 2.
3. Click **Auto Select**.



Tip: Click **Show Alpha** to have the preview output of the current ME switch to the alpha signal that is being used by the selected keyer. Show alpha is not available for MiniME™ outputs.

Tip: Click **Key Preview** to force the program output of the selected keyer to the preview output of the switcher.

Tip: Click **Make Linear** to return the clip and gain values to the default settings.

4. Use the **Clip** slider to remove lower-saturated colors from the video image.
5. Use the **Gain** slider to adjust the transition between the video image and the parts of the video image that are removed.
6. Use the **Transparency** knob to adjust the transparency of the key from opaque (**0**) to fully transparent (**100**).
7. Click **Key Invert** to reverse the polarity of the key alpha so that the holes in the background are cut by dark areas of the key alpha instead of bright areas.
8. Click a **Keyer Mode** button to override the shaped setting for the key.
 - **Normal** — set to a linear keyer for an unshaped source.

- **Additive** — set to an additive keyer for a shaped source. The **Key Invert** function is disabled in this mode.
- **Full** — set the alpha to fully opaque (white). The **Clip**, **Gain**, **Make Linear**, and **Key Invert** functions are disabled in this mode.

9. Click **Mask** to apply a mask to the key.

UltraChrome Chroma Key

An UltraChrome Chroma Key is a key in which the hole is cut based on a color value, or hue, rather than a luminance value or alpha signal. The color is removed and replaced with background video from another source. The default color is blue.

Chroma Key adjustments are persistent and are not affected by a soft reset or switcher reboot. However, initializing the Chroma Key or performing a factory reset returns all adjustments to default values.

Chroma Key Modes

The UltraChrome Chroma Key operates in one of two modes, Basic or Advanced, depending on the complexity of the Chroma Key you are setting up.

- **Basic Mode** — In basic mode, UltraChrome provides a simple background/foreground chroma key with adjustment for background spill and edge softness.
- **Advanced Mode** — In advanced mode, UltraChrome provides advanced background shadow and translucency control, as well as control over background/foreground transition areas.

Although it is possible to switch back and forth between advanced and basic mode, the additional image correction of the advanced mode is only applied in the advanced mode. For example, if you use the basic mode to set up the Chroma Key and then switch to the advanced mode, the entire image may change as the image correctors provided by the advanced mode are applied at their default settings.

Chroma Key Basic Mode

The following chroma key parameters can be adjusted in Basic Mode:

- **Background Gain** — Allows you to modify the range of colors that are considered

background and are masked out of the Chroma Key.

- **Edge Softness** — Allows you to adjust the amount of edge softening applied to the foreground. This helps blend the foreground into the new background.
- **Foreground Clip/Hue/Reject** — Allows you to modify the range of colors that are considered foreground and are not masked.
- **Spill Range** — Allows you to remove background color casts that may spill into the foreground image (green color cast on the foreground from a green-screen for example).

To Set Up a Chroma Key in Basic Mode

The UltraChrome chroma key tries to automatically adjust for the scene you are trying to chroma key. For the best results, initialize the key first, and then identify the areas where you need to adjust the key.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

- 2.
3. Click **Chroma Key**.

Tip: Click **Show Alpha** to have the preview output of the current ME switch to the alpha signal that is being used by the selected keyer. Show alpha is not available for MiniME™ outputs.

4. Click **Basic**.



5. Click the **Color** button for the color you want to key out.
6. Click **Init** to initialize the chroma key. Every time the key is initialized, the switcher resets all the Chroma Key parameters to their default settings.
7. Click an **Additive Keying** button to turn it on or off.
 - **Off** — Reduces the level of detail in the edges of the chroma key as well as the overall noise in the key image that can be the result of certain lighting conditions

or high detail camera settings. This is the default setting.

- **On** — Include the maximum detail in the edges of the chroma key.

8. Use the **Background Gain** slider to adjust the background gain.
 - Increasing the gain value causes the background to appear more opaque. This results in less of the background color being removed.
 - Decreasing the gain value causes the background to appear more transparent. This results in more of the background color being removed.
9. Use the **Edge Softness** slider to add or remove edge softening of the foreground image and alpha channel.
 - Increasing the softness value increases the amount of softness applied to the foreground edges and alpha channel.
 - Decreasing the softness value decreases the amount of softness applied to the foreground edges and alpha channel.
10. Use the **Foreground Clip** slider to adjust the foreground clipping.
 - Increasing the clip value removes lower-saturated colors from the foreground image.
 - Decreasing the clip value includes lower-saturated colors in the foreground image.
11. Use the **Foreground Hue** slider to select the central (base) color for the foreground.
 - Increasing the hue value moves counter-clockwise around the color wheel to select a base color.
 - Decreasing the hue value moves clockwise around the color wheel to select a base color.
12. Use the **Foreground Reject** slider to include or reject hues adjacent to the base color.
 - Increasing the Reject value decreases the amount of adjacent hues that are included in the foreground.
 - Decreasing the Reject value increases the amount of adjacent hues that are included in the foreground.
13. Use the **Spill Range** slider to remove any color cast onto the foreground.

- Increasing the range value causes more of the foreground colors to be corrected for background color spill.
- Decreasing the range value causes fewer of the foreground colors to be corrected for background color spill.

14. Click **Mask** to apply a mask to the key.

Chroma Key Advanced Mode

An UltraChrome chroma key, in advanced mode, breaks the image into five elements which determine, or partially determine, which part of the image is keyed out, or removed.

- **Background** — Background elements are those pixels in the source video that are the same color as the one you chose to key out. Note that the Shadow and translucent areas (see below) are completely contained within the Background area.
- **Shadow** — Shadow elements are those pixels in the source video with colors that are within the Background range, but with lower luminance values, depending on the shadow range. You modify the Shadow range to cover darker areas of the background (e.g. where the foreground is casting a shadow on the background screen).
- **Translucency** — Translucent elements are those pixels in the source video that are in the Background range, but with higher luminance values than the Shadow range. You can control the upper-end of the Translucency range by setting a wider hue-range to constrain the area. You can also control the transparency of the Translucent area.
- **Transition** — Transition elements are those pixels in the source video with colors that are not within any of the previous three ranges and are also not considered part of the Foreground area. These are typically the pixels near the edge of the foreground, where it blends into the background.
- **Foreground** — Foreground elements are those pixels that are not within the Background, Shadow, Translucency, or Transition ranges. This is the area with colors that will not be keyed out and will remain solid.
- **Spill Suppress** — Spill Suppression elements are those pixels in the Foreground that have a noticeable tint of the Background color. This typically occurs around the edge of the

foreground subject as glow from the background blue-screen or green-screen “spills” onto them.

- **Edge Softness** — Edge Softness lets you apply varying degrees of softening to the Foreground edges to help it blend in with the underlying background image that it is being keyed over.
- **Luminance** — Luminance allows you to control the overall brightness of Shadow, Translucency, and Transition areas as well as partial reflections to more closely match the Foreground brightness.

To Set Up a Chroma Key in Advanced Mode

The UltraChrome chroma key tries to automatically adjust for the scene you are trying to chroma key. For the best results, initialize the key first, and then identify the areas where you need to adjust the key.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

- 2.
3. Click **Chroma Key**.

Tip: Click **Show Alpha** to have the preview output of the current ME switch to the alpha signal that is being used by the selected keyer. Show alpha is not available for MiniME™ outputs.

4. Click **Advanced**.



5. Click the **Color** button for the color you want to key out.
6. Click **Init** to initialize the chroma key. Every time the key is initialized, the switcher resets all the Chroma Key parameters to their default settings.
7. Click an **Additive Keying** button to turn it on or off.
 - **Off** — Reduces the level of detail in the edges of the chroma key as well as the overall noise in the key image that can be the result of certain lighting conditions

-
- or high detail camera settings. This is the default setting.
- **On** — Include the maximum detail in the edges of the chroma key.
8. Use the **Background Neg Hue** slider to adjust the range of hues that are included in the Background, expanding counter-clockwise around the color wheel.
 9. Use the **Background Pos Hue** slider to adjust the range of hues that are included in the Background, expanding clockwise around the color wheel.
 10. Use the **Background Sat** slider to adjust the saturation range of the background color.
 - Increasing the saturation range value includes a wider range of saturation values to be included in the background.
 - Decreasing the saturation range value includes a narrower range of saturation values to be included in the background.
 11. Use the **Edge Softness** slider to add or remove edge softening of the foreground image and alpha channel.
 - Increasing the softness value increases the amount of softness applied to the foreground edges and alpha channel.
 - Decreasing the softness value decreases the amount of softness applied to the foreground edges and alpha channel.
 12. Use the **Foreground Clip** slider to adjust the foreground clipping.
 - Increasing the clip value removes lower-saturated colors from the Foreground image.
 - Decreasing the clip value includes lower-saturated colors in the Foreground image.
 13. Use the **Foreground Hue** slider to select the central (base) color for the foreground.
 - Increasing the hue value moves counter-clockwise around the color wheel to select a base color.
 - Decreasing the hue value moves clockwise around the color wheel to select a base color.
 14. Use the **Foreground Reject** slider to include or reject hues adjacent to the base color.
 - Increasing the reject value decreases the amount of adjacent hues that are included in the foreground.
 - Decreasing the reject value increases the amount of adjacent hues that are included in the foreground.
 15. Use the **Background Suppress** slider to change the overall brightness of Shadow, Translucent, and Transition areas.
 - Increasing the background suppress value increases the brightness of Background, Translucent, and Transition areas.
 - Decreasing the background suppress value decreases the brightness of Background, Translucent, and Transition areas.
 16. Use the **Luminance Reflection** slider to change the brightness of semi-transparent reflections (like reflections from glasses).
 - Increasing the reflections value increases the brightness of semi-transparent reflections.
 - Decreasing the reflections value decreases the brightness of semi-transparent reflections.
 17. Use the **Shadow Gain** slider to adjust the shadow appearance.
 - Increasing the gain value creates darker shadows.
 - Decreasing the gain value creates lighter shadows.
 18. Use the **Shadow Range** slider to adjust the range of the shadow colors.
 - Increasing the range value widens the shadow area by including lower-luminance background colors. The increased range comes as a result of colors moving from the translucent area to the shadow area.
 - Decreasing the range value narrows the shadow area by excluding high-luminance colors. These excluded colors move back into the translucent area.
 19. Use the **Spill Clip** slider to adjust spill suppress clipping.
-

- Increasing the clip value removes higher-saturated colors from spill suppress correction.
 - Decreasing the clip value includes higher-saturated colors in spill suppress correction. If your foreground image contains bright-colored areas that are suffering from background spill, decrease the clip value to have it corrected.
20. Use the **Spill Hue** slider to select the central, or base, color for spill suppress correction. If the color spill does not appear to be the same color as the background, use this control to adjust which hue is considered to be "spilled" into the foreground.
 - Increasing the hue value moves counter-clockwise around the color wheel while selecting a base color.
 - Decreasing the hue value moves clockwise around the color wheel while selecting a base color.
 21. Use the **Spill Reject** slider to include or reject adjacent hues to the base.
 - Increasing the reject value increases the amount of adjacent hues that are included in spill correction.
 - Decreasing the reject value decreases the amount of adjacent hues that are included in spill correction.
 22. Use the **Transition Gain** slider to adjust the appearance of the Transition colors.
 - Increasing the gain value makes the transition area pixels more opaque.
 - Decreasing the gain value makes the transition area pixels more transparent.
 23. Use the **Translucency Gain** slider to adjust the appearance of the translucent colors.
 - Increasing the gain value causes the translucent colors to appear more opaque.
 - Decreasing the gain value causes the translucent colors to appear more transparent.
 24. Use the **Translucency Range** slider to adjust the range of the translucent colors.
 - Increasing the range value widens the translucent area by including more hues from the background range (the

lower-end of the range is defined by the shadow range you just set).

- Decreasing the range value narrows the translucent area by excluding hues.

25. Click **Mask** to apply a mask to the key.

MiniME™ Chroma Key Output

You can use a MiniME™ to output a chroma key fill and alpha. This allows you to use the switcher as a chroma key generator for a virtual set environment.

Keep the following in mind:

Keep the following in mind when setting up an external chroma key output.

- Only Key 2 from a MiniME™ can be used to output the video/fill of the chroma key. Key 1 must be set to black and off-air.
- All ancillary data is stripped from the video source.

To Set Up a MiniME™ Chroma Key Output

The fill of the chroma key is fed out of the MiniME™ keyer and the alpha is fed out of the selected output.

Note: This procedure uses MiniME™ 4 for the chroma key output, but you can use any MiniME™.

1. Click **Navigation Menu > Live Assist > MEs > MiniME 4.**
2. Click **Key 1.**
3. Click **Key Fill:** and select **Black.**
4. Click **Key 2.**
5. Click **Key Fill** and select the video source that you want to chroma key.
6. Click **Chroma Key** and initialize the key as normal.
7. Click **Navigation Menu > Configuration > Outputs.**
8. Click the **Source** button for the output that you want to feed the chroma key fill from and click **MiniME4.**
9. Click the **Source** button for the output that you want to feed the chroma key alpha from and click **MMCKA4.**

DVE Keys

The DVE key allows you to apply digital video effects, such as scale, crop, aspect ratio, position, and border to a video image or another key type.

When the DVE is applied to another key type, it is said to be flying (Fly Key).

Tip: You can see where DVE channels are allocated from the *Status* page in DashBoard.

Keep the following in mind:

Keep the following in mind when working with a Fly Key:

- The Fly Key feature consumes a single DVE channel for self keys and chroma keys, but two DVE channels for an auto select key.
- The Fly Key feature cannot be applied to a DVE key.
- The Key Invert feature is not available for a Fly Key.
- The self key Fly Key can be used with all MultiScreen layouts. The auto select key Fly Key can only be used with the Dual Vert or Dual Horiz MultiScreen layouts.
- A chroma key should be initialized and adjusted before the DVE (Fly Key) is applied to it.

To Set Up a DVE Key

The DVE engine allows you to apply digital video effects, such as scale, crop, aspect ratio, position, and border to a video image in 2D space.

The DVE resources for this key may not be available. Depending on how your switcher is configured, you may be asked to steal the resources from another element, or be prevented from using the resources.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

- 2.
3. Click **DVE Key > Parameters.**



Tip: Click **Show Alpha** to have the preview output of the current ME switch to the alpha signal that is being used by the selected keyer. Show alpha is not available for MiniME™ outputs.

Tip: Click **Key Preview** to force the program output of the selected keyer to the preview output of the switcher.

4. Use the **X-Position**, **Y-Position**, and **Size** sliders in the **Positioning** area to position and size the key.
5. Use the **Aspect** slider to adjust the aspect ratio of the key.
6. Use the **Left** and **Right** sliders to crop the left and right sides of the key.
7. Use the **Top** and **Bottom** sliders to crop the upper and lower sides of the key.
8. Click a **Freeze** button to freeze the video and appearance of the key (**On**). When a key is frozen, the DVE attributes are disabled and you can not move the key.
9. Click **Mask** to apply a mask to the key.

Refer to the section [To Apply a Border/Edge Softness to a DVE Key](#) on page 49 for information on applying a border to the key.

To Apply a DVE to a Key (Fly Key)

The Fly key is when the DVE engine is applied to another key type.

The DVE resources for this key may not be available. Depending on how your switcher is configured, you may be asked to steal the resources from another element, or be prevented from using the resources.

You should set up your key as you want it before applying the Fly Key.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.
2. Click **DVE** and click **On**.



3. Use the **X-Position**, **Y-Position**, and **Size** sliders in the **Positioning** area to position and size the key.
4. Use the **Aspect** slider to adjust the aspect ratio of the key.
5. Use the **Size** and **Softness** sliders in the **Edge Softness** area to apply softness to the edges of to the key.

Refer to the section [To Apply a Border/Edge Softness to a DVE Key](#) on page 49 for information.

- Use the **Left** and **Right** sliders to crop the left and right sides of the key.
- Use the **Top** and **Bottom** sliders to crop the upper and lower sides of the key.
- Click a **Freeze** button to freeze the video and appearance of the key (**On**). When a key is frozen, the DVE attributes are disabled and you can not move the key.

To Apply a Border/Edge Softness to a DVE Key

A DVE border or edge softness is applied to the edges of the DVE key and is manipulated as part of the key.

Note: You can only apply a border to a DVE key. Fly Keys, such as chroma keys or auto select keys with DVE applied to them cannot have a border applied to them. Instead, the selection is Edge Softness and is used to soften the edges of the key without any color.

- Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

- Click **DVE Key > Parameters**.



- Use the **Size** slider in the **Border** area to turn on the border and adjust the size of the border around the key.
- Use the **Softness** slider to adjust the softness of the border.
- Select a default or custom color for the border (borders only).
 - Default** — click one of the preset colors.
 - Custom** — click the arrow to the right of the **Border Color** area and use the **Hue**, **Saturation**, and **Lightness** sliders to select your own color. Click **OK** to apply the color or **Live** to apply it in real-time.

Show Alpha

You can route the processed alpha for the selected keyer to the preview output for the ME you are working on.

Show alpha is not available on a MiniME™ or MultiScreen.

- Select the keyer that you want to show the alpha for and press and hold the **SHOW ALPHA** button on the control panel. The preview output of the ME shows the processed alpha of the selected key until the button is released.
- Select the keyer that you want to show the alpha for and double-press the **SHOW ALPHA** button. The preview output of the ME shows the processed alpha of the selected key until the button is pressed again.
- Toggle the **Show Alpha** button on from Live Assist.

Masks

A Mask is a technique in which a pattern is combined with the key source to block out unwanted portions of the key source.

Two types of masks are available, Box masks and Pattern masks. All key types can be masked.

- Box Mask** — uses a simple box shape to mask out a portion of the key
- Pattern Mask** — uses a pattern from the pattern generator to mask out a portion of the key

To Pattern Mask a Key

Pattern masks can be adjusted for size, location, rotation, and multiplication.

- Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

- Click **Mask > Pattern**.



- Select the pattern you want to use for the mask.
- Click **Mask Force** to force the area inside the mask region to the foreground.
- Click **Mask Invert** to invert the masked area with the unmasked area.
- Set up the mask as required.

Parameter	Description
Size	Adjust the size of the mask region.

Parameter	Description
Softness	Apply softness to the edges of the mask region.
Border Size	Apply a border to the mask region and adjust the size. At size 0 the border is off.
Aspect	Adjust the aspect ratio of the mask. Not all patterns allow you to adjust the aspect.
Rotation	Rotate the mask pattern. Not all patterns can be rotated.
H-Multiply	Multiply the mask pattern horizontally.
V-Multiply	Multiply the mask pattern vertically.
X-Position	Position the mask on the x-axis.
Y-Position	Position the mask on the y-axis.

Tip: You can use the Positioner to adjust the size and position of the box mask.

To Box Mask a Key

Box masks can be adjusted for size, location, rotation, and multiplication.

1. Click **Navigation Menu > Live Assist > MEs** and select the ME and key that you want to set up.

Tip:

2. Click **Mask > Box**.



3. Click **Mask Force** to force the area inside the mask region to the foreground.
4. Click **Mask Invert** to invert the masked area with the unmasked area.
5. Set up the mask as required.

Parameter	Description
Size	Adjust the size of the mask region.
Left Edge	Adjust the position of the left edge of the mask region.
Right Edge	Adjust the position of the right edge of the mask region.
Top Edge	Adjust the position of the top edge of the mask region.
Bottom Edge	Adjust the position of the bottom edge of the mask region.

Parameter	Description
X-Position	Position the mask on the x-axis. This adjust both the left and right edges at the same time.
Y-Position	Position the mask on the y-axis. This adjusts both the top and bottom edges at the same time.
Edge Softness	Apply softness to the edges of the mask region.

Tip: You can use the Positioner to adjust the size and position of the box mask.

Split Keys

A Split key allows you to assign a different alpha source for a key than the fill/alpha associations that are set up during configuration, or to use a separate alpha source for a Self key.

A split key can be applied to an auto select, or self key.

To Set Up a Split Key

A split key works on an **Auto Select** or **Self Key** that has been set up and you want to apply a different alpha to.

1. Set up your key with the video source you want to use.
2. Click **Navigation Menu > Live Assist > MEs** and select the key you want split.

Tip: From the control panel, press and hold the **SELF** or **AUTO** (depending on the type of key you are splitting) and press the source button for the new alpha you want to use.

3. Click **Key Alpha** and select the new alpha you want to use.

Memory Functions

A memory register is a snapshot of the current state of the switcher that can include one or multiple ME, MiniME™, MultiScreen, or chroma key outputs. Up to 100 memory registers per ME, MiniME™, MultiScreen, or chroma key can be stored and recalled on the switcher. Each of these memory registers can store as little as the information of one ME, or as much as the current state of the entire switcher, including all ME, MiniME™, MultiScreen, chroma key outputs, Aux Buses, and DVE settings.

Storing Memories

When you store a memory, you are storing the complete state of that area. This includes the current state of all the components of the ME, including keyer settings, transition rates, wipe and pattern selections, and source selections. In addition, the current settings for the various keyers, such as chroma key settings, and clip and gain settings, are also stored.

To Store a Memory

How to store a memory.

1. Click **Navigation Menu > Live Assist > Memory > Store > General.**



2. In the **Inclusions** area, select the ME, MiniME™, and MultiScreen that you want to store the memory for. When you include an area in a memory, the current state of that area is stored in the memory and will be recalled with the memory.
3. In the **Memory Store** area, click the **Bank X** and **X:Mem** button for the bank and memory register that you want to store to.

*Tip: If a memory register contains a memory for the area(s) selected in the **Inclusions**, the button glows purple and the areas that the register contains a memory for are listed below the memory number. The currently selected memory register glows blue.*

4. Select the recall mode for the memory. This is the mode that is stored in the memory,

but can be overridden when the memory is recalled.

- **Program** — all elements are recalled as stored (default).
- **MemoryAI** — current on-air elements are unchanged and the transition area is configured to take the on-air elements of the memory on-air with the next transition.
- **Effects Dissolve** — on-air elements listed below are transitioned to the elements stored in the memory. The time it takes to go from the current elements to the elements in the memory is set in the **Effects Duration** field.
 - Matte colors (background, wash or borders)
 - Keyer settings like clip, gain, transparency
 - Mask position and size
 - Chroma key settings, except the background color
 - Pattern settings like size, position, aspect, border, softness, rotation
 - DVE settings like size, position, aspect, border, softness, cropping
 - Media-Store x/y position
 - Transition Progress

5. Set the memory attributes that you want recalled with the memory. Refer to [Memory Attributes](#) on page 53 for information on memory attributes.

Tip: All attributes are stored in the memory. Turning individual attributes on or off sets whether that item is included with the memory recall. Individual attributes can be turned on or off when the memory is recalled.

6. Click **Store** to store the memory.

Recalling Memories

When you recall a memory, the existing configuration of that ME is replaced with the settings stored in the memory.

Keep the following in mind:

Keep the following in mind when recalling memories:

- How a memory is recalled depends on the how the Memory Attributes are set.
- Recalling a memory that includes a new Media-Store image to be loaded from a USB

drive may result in the currently loaded image to be displayed for a few frames while the new image is loaded.

- Recalling a memory that includes a source assigned to a camera also recalls the shot stored in the memory for that camera if the **Camera** memory attribute is set to **Recall**. There is no delay in the memory recall so camera movement may be visible while the shot is recalled.
- You can override the video source stored in a memory by pressing and holding a source button and recalling the memory (Bus Hold). The held source button overrides the source that is recalled with the memory for that bus. The memory is not affected by a Bus Hold and will recall properly without the Bus Hold.
- Enabling Memory AI mode changes the way key elements are recalled. If a key is currently on-air, the element for that key is recalled in the next available off-air key. If there is no available off-air keys, the element is not recalled.
- If **Disable Audio Memories** is set to **On** (Click **Navigation Menu > Configuration > System > Global**) the audio memory attributes are disabled.

Related information

[Memory Attributes](#) on page 53

Memory Attribute Color Coding

For a memory recall you can set individual attributes to be recalled or not, regardless of how they were stored. How the attribute is recalled is indicated by the color of the attribute button.

Color	Description
	As Stored — the memory attribute is recalled exactly as it was stored in the memory.
	Recall — the memory attribute is recalled with the memory, even if the attribute was not set to be stored with the memory.
	No Recall — the memory attribute is not recalled with the memory, even if the attribute was set to be stored with the memory.

To Recall a Memory

How to recall a memory using DashBoard.

1. Click **Navigation Menu > Live Assist > Memory > Recall > General**.



2. In the **Inclusions** area, select the ME, MiniME™, and MultiScreen that you want to recall the memory for.
3. In the **Memory Recall** area, click the **Bank X** button for the bank that you want to recall from.



Important: Clicking a **X:Mem** button recalls that memory.

Tip: If a memory register contains a memory for the area(s) selected in the **Inclusions**, the button glows purple and the areas that the register contains a memory for are listed below the memory number.

4. Select the recall mode for the memory.

Note: Recall attributes are color-coded for how they are going to be recalled. Refer to [Memory Attribute Color Coding](#) on page 52 for information on the color meaning.

- **As Stored** — recall the memory with the same attributes that it was stored with.
- **Program** — all elements are recalled as stored (default).
- **MemoryAI** — current on-air elements are unchanged and the transition area is configured to take the on-air elements of the memory on-air with the next transition.
- **Effects Dissolve** — recall the memory with an effects dissolve to the new memory elements. The time it takes to go from the current elements to the elements in the memory is set in the **Effects Duration** field or using the **Effect Duration From Memory**.

5. Set the memory attributes that you want recalled with the memory. Refer to [Memory Attributes](#) on page 53 for information on memory attributes.

Note: All attributes are stored in the memory. Turning individual attributes on or off sets whether that item is included with the memory recall. Individual attributes can be turned on or off when the memory is recalled.

- Click the **X:Mem** button to recall the memory.

Tip: Click **Undo** to undo the last memory recall.

Memory Attributes

Memory Attributes allow you to specify what elements are recalled with a memory, as well as adding effects to memory recalls. These elements include the background/preset buses, keyer bus, Aux bus, Media-Store selections, and audio faders, as well as keyer on-air status, and transition selections.

In addition to setting which sources to recall with the memory, effects such as performing an auto transition after the memory recall or running a custom control after the memory recall, can also be included.

Memory attributes can be set both when the memory is stored, and when it is recalled. This allows you to store a set of attributes with a memory and then recall it as stored, or override the attributes stored in the memory and apply different ones when the memory is recalled. A memory attribute does not need to be stored in the memory to be recalled.

Tip: It is recommended that if you are new to working with memories, use the memory store attributes to set how you want a memory to be recalled and set the recall attributes to be **Memory**.

To Set the Memory Attributes

Memory attributes can be set when the memory is stored or when it is recalled. This procedure sets the store attributes, but the information applies to both.

- Click **Navigation Menu > Live Assist > Memory > Store**.
- Click **General** and set the attributes as required.



Note: For information on the recall mode (**Program/MemoryAI/Effects Dissolve**) refer to [To Store a Memory](#) on page 51.

- Roll Clip** — set whether a play command is triggered when a source that is assigned to a video server is recalled.

- Camera** — set whether camera shots are recalled.
- MediaX** — set whether Media-Store items and settings for the selected channel are recalled.

- Click **MES > ME X** for the ME you want to set the attributes for. The attributes for each ME are separate and must be set for each ME you want to include in the memory.



- Trans Area** — set how the next transition type and parameters are recalled.
- Next Trans** — set how the next transition area is recalled.
- Run Auto** — set whether a transition is performed after the memory is recalled. (Not available during Effects Dissolve transitions.)
- Background Bus** — set how the sources selected on the background bus are recalled.
- PST Bus** — set how the sources selected on the preset bus are recalled.
- Shared Pattern** — set whether the settings for the shared Key Mask/Wash pattern generator is recalled.
- Key X Bus** — set whether the source selected on the key bus is recalled.
- Key X Active** — set whether the on-air status of the key is recalled.
- Key X Type** — set whether the key type is recalled.
- Key X Mask** — set whether mask settings for the key are recalled.

- Click **MiniME X** for the MiniME™ you want to set the attributes for.



- Trans Area** — set how the next transition type and parameters are recalled.
- Next Trans** — set how the next transition area is recalled.
- Run Auto** — set whether a transition is performed after the memory is recalled. (Not available during Effects Dissolve transitions.)

- **Background Bus** — set how the sources selected on the background bus are recalled.
- **PST Bus** — set how the sources selected on the preset bus are recalled.
- **Key X Bus** — set whether the source selected on the key bus is recalled.
- **Key X Active** — set whether the on-air status of the key is recalled.
- **Key X Type** — set whether the key type is recalled.

5. Click **MultiScreen X** for the MultiScreen you want to set the attributes for.



- **Trans Area** — set how the next transition type and parameters are recalled.
- **Next Trans** — set how the next transition area is recalled.
- **Run Auto** — set whether a transition is performed after the memory is recalled. (Not available during Effects Dissolve transitions.)
- **Background Bus** — set how the sources selected on the background bus are recalled.
- **PST Bus** — set how the sources selected on the preset bus are recalled.
- **Key X Bus** — set whether the source selected on the key bus is recalled.
- **Key X Active** — set whether the on-air status of the key is recalled.
- **Key X Type** — set whether the key type is recalled.

6. Click **Auxes**.



- **Aux X** — set whether the source selected on the aux bus is recalled.

7. Click **Audio**.

Note: If **Disable Audio Memories** is set to **On** (Click **Navigation Menu** > **Configuration** > **System** > **Global**) the audio memory attributes are disabled.



- **Main** — set whether the configuration of the main audio mix is recalled.
- **Monitor** — set whether the configuration of the monitor audio mix is recalled.
- **Aux X** — set whether the configuration of the aux audio mix is recalled.

Deleting a Memory

You can delete the contents of a single memory. Only one memory can be cleared at a time, and you cannot undo the deletion.

Tip: You can clear all memories from the switcher from the control panel. (Press **MENU** > **Reset** > **NEXT** > **NEXT**.)

To Delete a Memory

Delete an individual memory or bank.

1. Click **Navigation Menu** > **Live Assist** > **Memory** > **Store**
2. In the **Memory Store** area, click the **Bank X** and **Mem X** button for the memory register that you want to delete.
3. Click **Delete Memory**.

Memory Names and Mnemonics (TouchDrive only)

Assign custom mnemonic colors and names to individual memories. These are only visible on the TouchDrive panel when the user select bus is assigned to a memory bank,

To Assign a Name to a Memory

Memories can have custom names and colors on the TouchDrive control panel.

1. Click **Navigation Menu** > **Live Assist** > **Memory** > **Memory Mnemonics**.
2. Click **Bank X** to select the bank that the memory you want to name is on.
3. Click the memory you want to name.

Setting	Description
Name	Enter a new name for the selected memory.
	Click a Foreground button to select the color you want to apply to the text on the mnemonic.
Background	Click a Background button to select the color you want to apply to the background on the mnemonic.

- **AFV (Main only)** — turn Audio Follow Video (AFV) on or off for this audio source. AFV is only available for audio that is associated with a video source, such as embedded audio on input BNCs and from the Media-Store. When AFV is on, the audio level is taken to the **AFV Set** level when the associated video source is taken on-air. The audio level is taken to **-infinity** when the video source is taken off-air.
- **AFV Set (Main only)** — the maximum level that you want the audio to rise to when the associated video source is taken on-air. To set the AFV level, move the slider to the level you want the audio to be at and click **AFV Set**. The **AFV Set** button turns on when the slider is at the AFV set level.
- **PFL** — turn Pre Fader Listen (PFL) on or off for this audio source. This is similar to solo in that it mutes all other sources, but the audio source is taken before the fader where solo takes the audio after the fader. PFL hears the raw audio level coming into the mixer and solo hears the audio at the level the fader is set to. When **PFL** is turned on for a source a warning light flashes red on the monitor strip.
- **Solo** — mute all other audio sources but the one(s) you turn solo on for. This allows you to quickly isolate a source without having to mute all the other sources. When **Solo** is turned on for a source a warning light flashes red on the main strip.

*Tip: You can move a fader at any time to bring up an audio source even if the associated audio source is not on-air. This audio source will remain at the selected level until it is brought down again manually or is included in a transition with **AFV** turned on.*

2. **Main Level Controls** — The Main and Monitor strips control the levels of the output audio for the mixer. If you select an Aux output this strip changes to control the level for that output.
 - **Effects** — click the **Compressor Limiter** button to jump directly to the corresponding setup pages for the effect you are applying to the output.
 - **Monitor Source (Monitor only)** — select the audio source for the monitor output.

Monitor can be set to automatically monitor the currently selected mix (**Auto Follow**), or a specific mix.

Tip: You can use the post fader audio of the Monitor output to monitor the output of an aux mix assigned as an automixer to test the audio levels.

- **Fader** — adjust the level of the audio output. You can either move the fader manually or enter a value in the text field at the bottom of the slider.
 - **PFL/Solo Clear (Monitor only)** — turn solo off for all sources on this audio layer.
3. **Layer Controls** — select the audio layer that you want to control. Each layer is assigned to an audio output.
 4. **Configuration** — open the audio mixer configuration page.
 5. **Effects** — open the effects page where you can apply a noise gate, equalizer, and compressor to the audio.
 6. **Included Channels** — select whether only the audio sources that have been assigned to each layer are shown (**Custom**), or whether all audio sources are shown (**All**).

Audio Mixer Setup

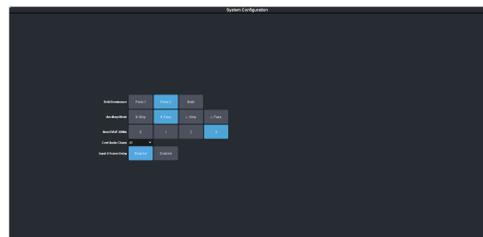
The audio mixer has up to 13 mixer layers that can be configured for which inputs are available to them and which physical outputs they are routed to.

The audio mixer supports up to 48 configurable faders. Each fader can be assigned any audio source in the mixer.

To Set the Number of Configurable Audio Faders (Channel)

Set the number of audio faders, or channels, that the mixer has.

1. Click **Navigation Menu > Configuration > System > Global**.

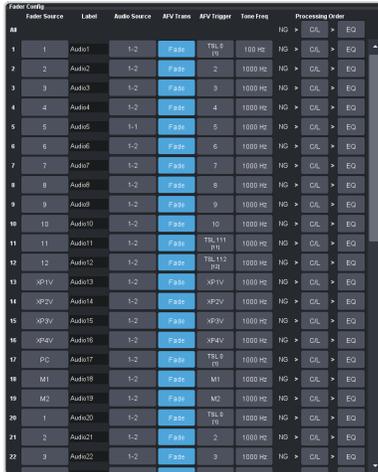


2. In the **Conf Audio Channels** field, select the number of configurable faders you want on the audio mixer.

To Set Up Audio Faders

Assign audio sources to each fader in the mixer.

1. Click **Navigation Menu > Audio Mixer > Config.**



2. In the **Fader Config** area, click the **Fader Source** button for the fader you want to assign an audio source.

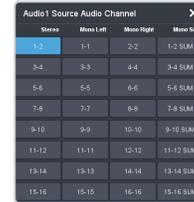


- **Input** — assign an audio source to the fader.
 - **XPX** — XPression audio sources
 - **PC** — PC audio sources
- Tip: Each PC audio channel appears as an audio playback device in Windows® Sound Control. The audio rate is fixed to 48kHz at 16 bits per sample.*
- **SDIX** — SDI audio sources
 - **ClipPlyr** — audio from clip player
 - **MediaX** — Media-Store audio sources
 - **AESX** — AES source from each ABU
 - **ABMX** — analog audio source from each ABU
 - **Mix** — assign the output of a mixer to the fader (loop back).
 - **Main** — output of main mix.
 - **AuxX** — output of a aux mix.

Assign an audio source to the fader or select **Off** to turn the audio fader off.

*Tip: You can rename a fader by entering a new name in the **Label** field.*

3. Click the **Audio Source** button and click the stream pair that you want to use.



- **Stereo** — select the stereo pair that you want to use.
- **Mono Left** — select the left mono pair you want to use. The left channel audio is put on both the left and right channels.
- **Mono Right** — select the right mono pair you want to use. The right channel audio is put on both the left and right channels.
- **Mono Sum** — select the stereo pair you want to use and have them added together into a single mono output.

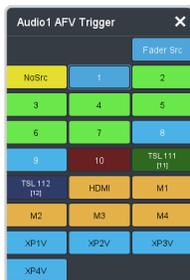
Note: Mono Sum can only be applied to up to 8 faders at a time.

4. Toggle the **AFV Trans** button to either have the audio sources fade in and out (**Fade**) or have a cut between the audio sources (**Cut**) when the associated video source is taken on or off-air.
 - **Fade** — the audio source level is taken down (going off-air) or up (going on-air) as the transition progresses. The rate of the audio fade is tied to the length of the video transition.
 - **Cut** — the audio source is cut on-air at the beginning of the transition (going on-air) or cut off-air at the end of the transition (going off-air).

Note: Each audio source is transitioned according to how the AFV transition is set. For example, if Audio 1 is set to Cut and Audio 2 is set to Fade and you perform a transition from Audio 1 to Audio 2, Audio 1 will remain on and cut off at the end of the transition and Audio 2 will fade in through the transition.

5. Click the **AFV Trigger** button and select the video source(s) that you want the audio transitions to follow. You can select multiple sources.

*Tip: Click **Fader Src** to have the **Fader Source** added as an AFV trigger.*



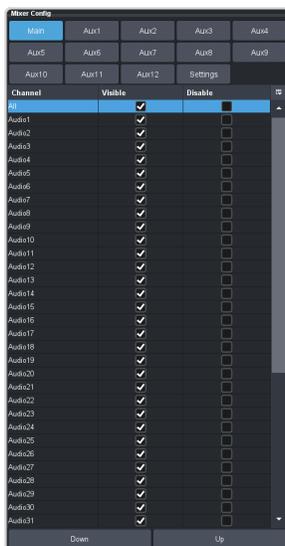
- Click the **Tone Freq** button and select the frequency you want to use for the test tone on this channel. The test tone can be turned on from the main audio mixer interface.
- Click a **Processing Order** button for an audio fader to select whether the equalizer (EQ) is applied first, or if the compressor/limiter (C/L) is applied first for that fader. The noise gate (NG) is always applied upstream.

Tip: You can use the **Processing Order** buttons for **All** to change the processing order for all audio faders.

To Assign Audio Channels to Mix Layers

Select which audio sources are visible on each mixer layer.

- Click **Navigation Menu > Audio Mixer > Config**.
- In the **Mixer Config** area, click the mixer layer tab (**Main**, **Aux X**) you want to show or hide audio faders on.



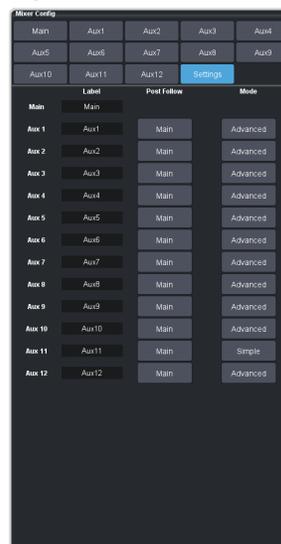
- Uncheck the **Visible** box to hide a fader on the selected layer.

Tip: Click **All** to have all faders selected or unselected.

- Check the **Disable** box to disable a fader on the selected layer. A disabled fader is still visible on the layer, but the gain is fixed to **-Infinity**. The fader shows **DISABLED** in the gain value.

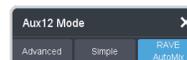
Tip: Click **All** to have all channels selected or unselected.

- Change the order of the audio faders on the mixer layer by moving an audio source **Up** (left) or **Down** (right) in the list.
- Click **Settings**.



Tip: To change the name of a mixer layer, enter a new name in the field for the mixer layer you want to change the name for. If you click **Settings** again you will see the new name applied to the mixer layer selection button.

- Click a **Mode** button to select how the aux mixer layer is used.



- Advanced** — standard mixer layer with full functionality.
- Simple** — simplified mixer layer where Pre/Post is unavailable and the faders are locked at 0db.
- RAVE AutoMixer** — the mix layer is configured as a RAVE AutoMix. Refer to [RAVE AutoMix](#) on page 66 for more information on the automixer.

- Click a **Post Follow** button to select the mix layer you want to use as the post-fader source on the selected aux layer.



To Configure the Analog Inputs

Each analog input on the ABU can be configured independently.

1. Click **Navigation Menu > Audio Mixer > Config.**
2. In the **ABM Input Config** area, click **Preamp.**



3. Click the **Gain** button for the analog input you want to configure.

Tip: When you have multiple ABUs, the analog inputs are labelled by the ABU and input they are on. For example, Analog 2:5 is analog input 5 on ABU 2.

4. Use the **Gain** slider to adjust the amount gain (loudness) that is applied to the input audio channel before the mixer.



5. Click a **Phantom (48V)** button to apply 48V to the analog input XLR jack (**On**) to power a microphone (condenser microphone). Click **Off** to not have phantom power applied to the analog input.



Important: Ensure Phantom Power is off when using line in from an audio device over XLR. Use phantom power for mic only.

6. Click a **Pad (-20dB)** button to apply -20dB of attenuation to the input signal (**On**) to prevent clipping of very loud signals.

To Configure the ABU Input Audio Delay

Each input on the ABU can have an audio delay applied to it.

1. Click **Navigation Menu > Audio Mixer > Config.**
2. In the **ABM Input Config** area, click **Delay.**



3. Click on the field next to the audio input that you want to apply a delay to and enter the delay, in frames. A maximum delay of 14 frames is supported.

Tip: When you have multiple ABUs, the inputs are labelled by the ABU and input they are on. For example, Analog 2:5 is analog input 5 on ABU 2.

To Configure Audio Outputs

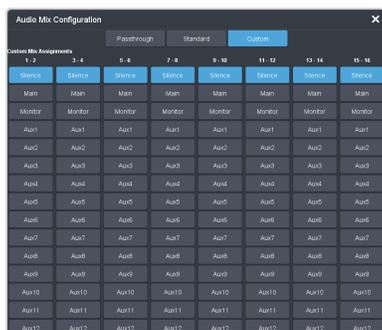
Audio signals can be embedded in video both internal and external video outputs.

1. Click **Navigation Menu > Configuration > Outputs** and click **Internal** or **External**, depending on the output you want to configure.



- In the **Video + Audio** section, click the **Audio Mix** button for the video output you want to assign an audio source to and select the audio source.

Tip: Assign audio channels to the SDI outputs used for the ABUs from the **ABM** page.



- **Passthrough** — embedded audio is passed through from the input source. Not available for MultiViewer outputs.
- **Standard** — embed all audio mixes from the internal audio mixer.
- **Custom** — select which audio source will be embedded on each stereo pair.
 - **Silence** — embed silence.
 - **Main** — embed the main audio mix from the internal audio mixer.
 - **Monitor** — embed the monitor mix from the internal audio mixer.
 - **Aux X** — embed the audio from Aux Bus X.

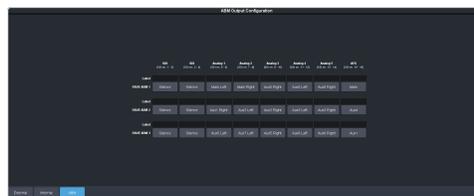
- Click **Internal** and then click the **Audio Mix PC Audio** button and select the audio source you want to assign to the PC Audio output.



To Configure ABU Audio Outputs

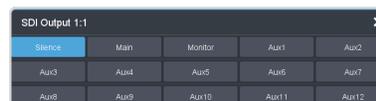
Audio signals are assigned to the outputs of each ABU as well as embedded in the video SDI-Audio loop.

- Click **Navigation Menu > Configuration > Outputs > ABM**.



- Click the **SDI, Analog, or AES** button for the ABU you want to assign a source to and select the audio source.

Note: If you only have a single ABU, the label **Audio Mix** is shown instead of the number of the ABU.



Note: The SDI and AES outputs support stereo outputs.

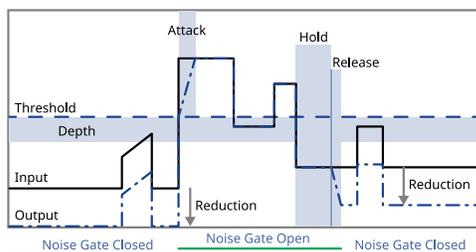
Tip: You can add a custom label to each output in the **Label** field

- **Silence** — embed silence.
- **Main** — embed the main audio mix from the internal audio mixer. For the analog outputs you can choose the left, right, or mono channel.
- **Monitor** — embed the monitor mix from the internal audio mixer. For the analog outputs you can choose the left, right, or mono channel.
- **Aux X** — embed the audio from Aux Bus X. For the analog outputs you can choose the left, right, or mono channel.

Noise Gate

The audio noise gate allows you to attenuate audio levels that are below a set threshold. These are often used to reduce background noise from the audio output signal. The noise gate does not remove the noise, but attenuates the entire signal when it is below the set threshold. When the input audio level is below the threshold the noise gate is closed and the attenuation is applied. When the input audio level passes above the threshold, the gate opens and the attenuation is removed. You can adjust how quickly the attenuation is removed once the threshold is surpassed as well as how quickly it is applied when the audio level drops below the threshold.

Note: The noise gate is the first audio processing that is applied to the signal.



To Configure a Noise Gate

Apply a noise gate to the audio level to prevent background noise.

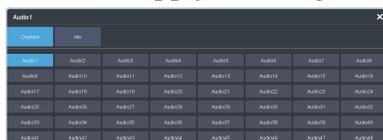
1. Click **Navigation Menu > Audio Mixer > Effects > Noise Gate.**



Note: If an audio source is included in the RAVE AutoMix, the safety threshold uses the noise gate to attenuate the levels for the automixer.

Tip: To the left of the controls is a gain meter for the current channel. You can use this to see how your adjustments are affecting the audio.

2. Click the audio source button at the bottom left of the page and select the audio channel that you want to apply a noise gate to.



Tip: Click **Default** and click **All Channels** to default the noise gate for all channels or **Current Channel** to default it for only the currently selected channel.

Tip: Click **Back to Mix** to return to the mixer page.

3. Click **Bypass** to turn bypass off and have the noise gate applied to the selected audio channel.

Tip: The **NG Closed** indicator warns you if noise gate is closed and the audio signal is being attenuated.

4. Set up the noise gate as required.

Parameter	Description
Threshold	Select the level (-dB) at which the noise gate opens.
Depth	Select the level that the audio signal must go below the threshold before the noise gate is triggered to close.

Parameter	Description
Reduction	Select the amount of attenuation/gain (dB) that you want to reduce the audio signal by when the noise gate is closed (below the threshold).
Attack	Select the amount of time (ms) you want to pass between when the noise gate is triggered to open (pass the threshold) and the attenuation being fully released.
Hold	Select the amount of time (s) between when the noise gate is triggered to close (level is below the Depth) and the Release is applied.
Release	Select the amount of time (ms) you want to pass after the Hold is applied and the gate is fully closed (full Reduction is applied).

Ducking and Talkback

The audio ducking and talkback use the noise gate to attenuate the background audio of a mix when a selected channel is active. This can be done automatically when a selected channel comes up above a threshold (Ducking), or manually (Talkback).

Ducking

Ducking is applied to the mix when the audio channel that ducking is set on rises above a threshold. Ducking is often used for voice-overs or announcement. The background mix is ducked when the announcer starts talking and returns to the previous level when the announcer stops talking. The settings for ducking are the same as for noise gate except that when the ducking channel passes the threshold the mix is ducked down by the reduction amount and the ducking channel is untouched.

When ducking is active for a channel, the **Mute** button is replaced with **Ducking**. When the **Ducking** button is off, the channel is muted and ducking is not applied. When the **Ducking** button is on, the channel is unmuted and the mix will be ducked when the ducking channel passes the threshold.



To Configure Ducking

Apply ducking to the channel that you want to use to duck the mix that the channel is used on.

1. Click **Navigation Menu > Audio Mixer > Effects > Noise Gate**.



2. Click the audio source button at the bottom left of the page and select the audio channel that you want to apply ducking to.



Tip: Click **Default** and click **All Channels** to default the ducking for all channels or **Current Channel** to default it for only the currently selected channel.

Tip: Click **Back to Mix** to return to the mixer page.

3. Click **Ducking Mode** to turn bypass off and have the ducking applied to the selected audio channel.
4. Set up ducking as required.

Parameter	Description
Threshold	Select the level (-dB) at which the ducking is applied to the mix.
Depth	Select the level that the audio signal must go below the threshold before the ducking is removed.
Mix Reduction	Select the amount of attenuation/gain (dB) that you want to reduce the mix by when the ducking is applied (above threshold).
Attack	Select the amount of time (ms) you want to pass between when ducking is triggered to apply (pass the threshold) and the attenuation being fully applied to the mix.

Parameter	Description
Hold	Select the amount of time (s) between when ducking is triggered to release (level is below the Depth) and the Release is applied.
Release	Select the amount of time (ms) you want to pass after the Hold is applied and the ducking is fully released (mix back to normal levels).

Talkback

Talkback is applied to the mix when an audio channel that is set to talkback is manually triggered. Talkback is often used in a studio for internal communications, the background mix is ducked when the talkback button is pressed so that talent can hear the director over the background. Setting for talkback are similar to ducking except there is no threshold or depth.

When talkback is active for a channel the **Mute** button is replaced with **Talkback**. When the **Talkback** button is off, the channel is muted and talkback is not applied. When the **Talkback** button is held, the channel is unmuted and the mix will be attenuated for as long as the button is held.



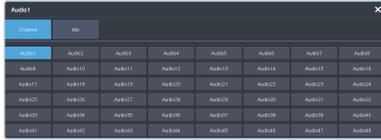
To Configure Talkback

Apply talkback to the channel that you want to use to manually duck the mix that the channel is used on.

1. Click **Navigation Menu > Audio Mixer > Effects > Noise Gate**.



2. Click the audio source button at the bottom left of the page and select the audio channel that you want to apply talkback to.



Tip: Click **Default** and click **All Channels** to default the talkback for all channels or **Current Channel** to default it for only the currently selected channel.

Tip: Click **Back to Mix** to return to the mixer page.

3. Click **Talkback Mode**.

Note: You must click **Bypass** on the Noise Gate to apply talkback to the channel.

4. Set up talkback as required.

Parameter	Description
Threshold	Not used by talkback.
Depth	Not used by talkback.
Mix Reduction	Select the amount of attenuation/gain (dB) that you want to reduce the mix by when the talkback is applied (Talkback button held).
Attack	Select the amount of time (ms) you want to pass between when talkback is triggered to apply and the attenuation being fully applied to the mix.
Hold	Select the amount of time (s) between when talkback is released (Talkback button is released) and the Release is applied.
Release	Select the amount of time (ms) you want to pass after the Hold is applied and the talkback is fully released (mix back to normal levels).

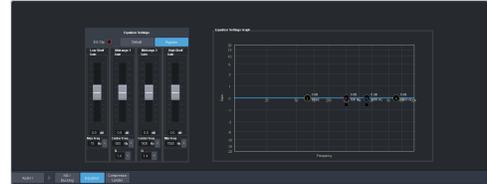
Audio Equalization

The audio equalizer (EQ) allows you to enhance the sound quality of audio sources. An independent stereo equalizer is available for every audio fader in the system and allows for adjustment in four bands (low-shelf, mid-range 1/2, high-shelf).

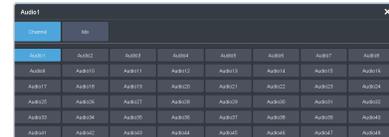
To Configure an Equalizer

A stereo equalizer is available for every audio source. You can only adjust a single equalizer at a time.

1. Click **Navigation Menu** > **Audio Mixer** > **Effects** > **Equalizer**.



2. Click the audio source button at the bottom left of the page and select the audio channel that you want to apply an equalizer to.



Tip: Click **Default** and click **All Channels** to default the equalizer for all channels or **Current Channel** to default it for only the currently selected channel.

Tip: Click **Back to Mix** to return to the mixer page.

3. Click **Bypass** to turn bypass off and have the equalizer applied to the selected audio channel.

Tip: The **EQ Clip** indicator warns you if clipping is occurring in the Equalizer stage for the selected audio source.

4. Set up the equalizer as required.

Parameter	Description
Low Shelf	Adjust the gain of the low frequency band. Tip: You can also move the L point around on the graph to adjust the low shelf values. <ul style="list-style-type: none"> Gain — set the audio level of the frequency band (-20dB to 20dB). Max Freq — click ^ and set the maximum frequency that you want the low shelf audio band limited to (20Hz to 1kHz).
Midrange 1	Adjust the gain of a midrange frequency band. Tip: You can also move the M1 point around on the graph to adjust the midrange 1 values. The dot below the M1 allows you to adjust the Q ratio. <ul style="list-style-type: none"> Gain — set the audio level of the frequency band (-20dB to 20dB). Center Freq — click ^ and set the middle frequency of the audio band (20Hz to 20kHz). Q — click ^ and set the Q ratio.

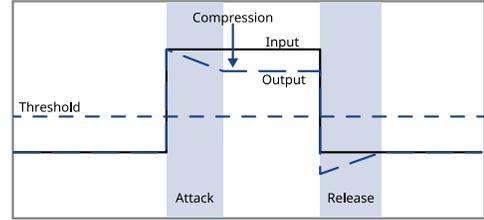
Parameter	Description
Midrange 2	<p>Adjust the gain of a midrange frequency band.</p> <p><i>Tip: You can also move the M2 point around on the graph to adjust the midrange 2 values. The dot below the M2 allows you to adjust the Q ratio.</i></p> <ul style="list-style-type: none"> • Gain — set the audio level of the frequency band (-20dB to 20dB). • Center Freq — click ^ and set the middle frequency of the audio band (20Hz to 20kHz). • Q — click ^ and set the Q ratio.
High Shelf	<p>Adjust the gain of the high frequency band.</p> <p><i>Tip: You can also move the H point around on the graph to adjust the high shelf values.</i></p> <ul style="list-style-type: none"> • Gain — set the audio level of the frequency band (-20dB to 20dB). • Min Freq — click ^ and set the minimum frequency that you want the high shelf audio band limited to (20kHz to 1kHz).

Compressor / Limiter

The audio compressor allows you to restrict audio levels from passing a threshold level. These are often used to prevent digital clipping of audio levels that are too high for output equipment. Once the threshold is reached, the compressor starts to reduce the gain at a specific ratio. The higher the compression ratio, the harsher the reduction in gain. The compression continues until the audio level falls below the threshold. You can adjust how quickly the compressor is applied once the threshold is surpassed as well as how long after the level drops below the threshold that the compressor is still applied.

Audio compression can be applied at the input or output stage of the mixer.

Tip: The compressor is said to be acting as a limiter when the compression ratio is set very high, or to infinity, and the attack time is set very low. This has the effect of causing a very abrupt flattening of the audio level once the threshold is reached.



To Configure a Compressor/Limiter

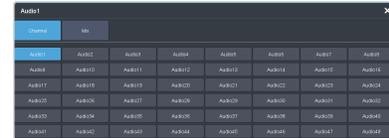
Apply compression to the audio level to prevent digital clipping.

1. Click **Navigation Menu > Audio Mixer > Effects > Compressor Limiter**.



*Tip: The **CL Clip** indicator warns you if clipping is occurring in the Compressor stage for the selected audio source.*

2. Click the source button at the bottom left of the page and select the **Channel** or **Mix** that you want to apply a compressor to.



*Tip: Click **Default** and click **All Channels** to default the compressor for all channels or **Current Channel** to default it for only the currently selected channel.*

*Tip: Click **Back to Mix** to return to the mixer page.*

3. Click **Bypass** to turn bypass off and have the compressor applied to the selected audio channel or mix.
4. Set up the compressor as required.

Parameter	Description
Threshold	Select the level (dB) at which the compressor is applied.
Compression	Select the ratio for the amount of compression you want to apply. The higher the ratio the more compression is applied to lower the level. At infinity the audio level is limited to the threshold.
Attack	Select the amount of time (ms) you want to pass between the level surpassing the threshold and the full compression ratio being applied.

Parameter	Description
Release	Select the amount of time (ms) you want to pass between the level falling below the threshold and the compression ratio returning to 1:1 (no compression applied).
Makeup	Increase the gain (dB) of the audio after compression.

*Tip: The **Gain Reduction Meter** shows how much gain is being reduced by the compressor. The **Src (Source)** meter to the left shows the gain before the compressor is applied.*

Windows® Audio

Windows® identifies and interacts with the audio going to and coming from the switcher subsystem in specific ways. Use the following information to help you set up Windows® audio.

- The Recording Device must be set to **Digital Audio Interface**.
- The Default Playback Device should be set to **Digital Audio Interface** to be able to send Windows® audio to the audio mixer.
- The **Listen to this device** option should be selected on the **Listen** tab on the **Digital Audio Interface Properties**.
- The **Speakers (High Definition Audio)** option should be selected on the **Play back through this device** list.

Keep the following in mind:

Keep the following in mind when using Windows® audio to work with the audio mixer:

- If **Listen to this device** is not selected you will have the Windows® audio in the **Main** output of the mixer, but not on the monitoring headphone jack.
- If **Listen to this device** is selected and **Speakers (High Definition Audio)** is not selected on the **Play back through this device** list there will be echo in the **Main** output of the mixer and no audio on the monitoring headphone jack.
- If **Listen to this device** is not selected and **Speakers (High Definition Audio)** is not selected on the **Play back through this device** list the **Main** output of the mixer will be normal, but there will be no audio on the monitoring headphone jack.
- If the Default Playback Device is set to **Speakers (High Definition Audio)**, and not

Digital Audio Interface, the audio will not be included in the **Main** output of the mixer, but there will be audio on the monitoring headphone jack, even if **Listen to this device** is not selected.

Dante® Audio Networking

The 8 PC audio inputs to the mixer can be configured to accept Audinate® Dante® network audio inputs. Audio sources from a Dante® network can then be input into the mixer from the Graphite PC.

To use audio sources from a Dante® network in the mixer, you must connect the audio sources to the network. Refer to the documentation that came with your Audinate® Dante® equipment for setup information.

Tip: The PC audio sources to the audio mixer appear as Windows® playback devices and are listed by the stereo pair.

To Connect Dante® Sources to RAVE PC Inputs

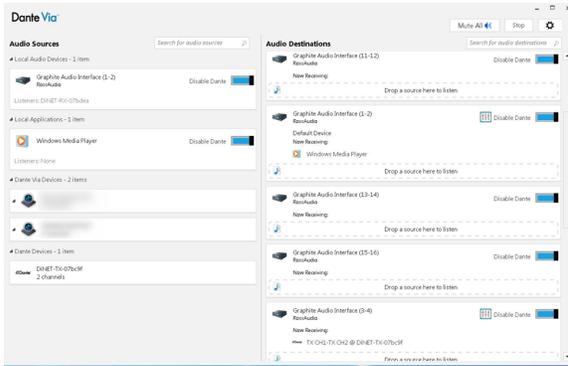
Download and install the Dante Via™ software on the Graphite PC. This software is needed to connect the audio sources on the Dante® network to the PC audio inputs on the mixer.

You will also need access to the computer running the Dante Controller application to assign sources to the PC audio destinations.

1. Launch the **Dante Via™** application.

The Dante Via™ window is split into **Audio Sources** and **Audio Destinations**.

- **Audio Sources** — all the Dante® sources detected on the PC and the network are listed. This will include the **PC Monitor** output of the mixer.
- **Audio Destinations** — all the PC audio inputs to the RAVE audio mixer, as well as any other Windows® playback devices are listed.



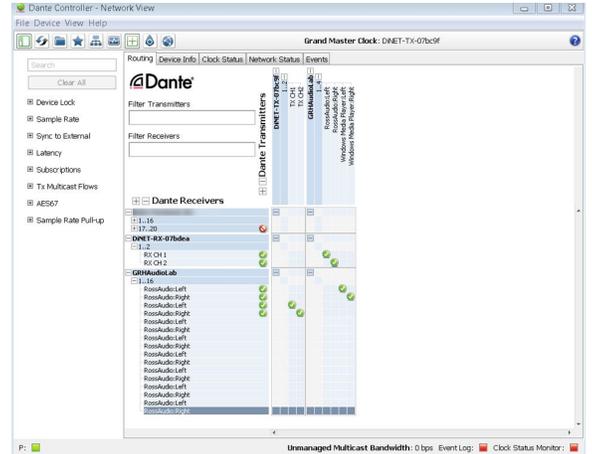
2. In the **Audio Sources** area, click **Enable Dante** for all the Dante® sources that you want to connect to the PC inputs of the RAVE audio mixer.
3. In the **Audio Destinations** area, click **Enable Dante** for each **Graphite Audio Interface (xx-xx)** starting with **Graphite Audio Interface (1-2)** and continuing in order to **Graphite Audio Interface (15-16)**.

Note: It is important to enable the destinations in order. The Dante Controller application lists the destinations in the order they were enabled and does not identify the stereo pair they belong to.

4. Launch the **Dante Controller** application and click on the **Routing** tab.

The Dante Controller window shows a matrix of **Dante Receivers** and **Dante Transmitters**.

- **Dante Receivers** — all the destinations on the Dante® network that you can route audio to. The 8 PC audio inputs to the RAVE audio mixer are listed under the network name for the Graphite PC and are in the order they were enabled.
- **Dante Transmitters** — all the sources on the Dante® network that you can route audio from.



5. On the matrix, select the audio source (Transmitter) that you want to route to the destination (Receiver) by clicking on the box where they intersect. A check-mark is shown to confirm that the routing has been made.

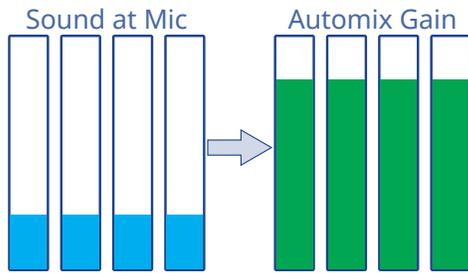
Tip: You can confirm the proper routing, or change the routing, on the Dante Via™ application. In the **Audio Destinations** area, the **Graphite Audio Interface (xx-xx)** that you routed too lists the audio source under **Now Receiving**.

The Dante® audio sources are now routed to the PC audio inputs of the mixer. Ensure that the PC sources are assigned to fader to be able to mix these inputs. Refer to [To Set Up Audio Faders](#) on page 57 for information on setting up audio faders.

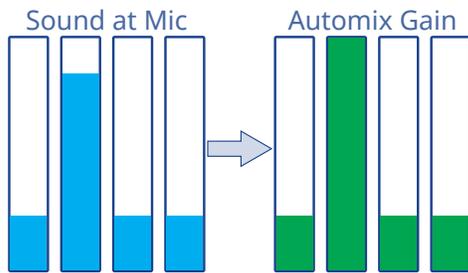
RAVE AutoMix

The RAVE AutoMix allows multiple mono audio channels to be gain-balanced in the mix so that the output level is stable and consistent. This is most often used with multiple microphones where the RAVE AutoMix balances the gain from each mic when one or all participants are speaking. The RAVE AutoMix will manage the gain for all the mics based who is talking to make the output sound like a single mic that is being passed around.

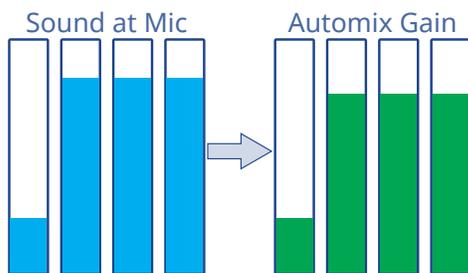
For example, when nobody is speaking, the automixer fades all the channels up to a gain that is the equivalent of a single mic at full gain.



If a single participant starts talking the RAVE AutoMix fades their mic up to full gain and fades all the other mics down. This repeats as each participant takes their turn talking. The RAVE AutoMix will fade the mic down for the participant that was talking and fades up the mic of the participant that is now talking.



If multiple participants start talking then the RAVE AutoMix fades all their mics up but the total gain is shared amongst those mics. No one mic gets full gain and so the output remains stable.



Keep the following in mind:

Keep the following in mind when using the RAVE AutoMix:

- Any aux layer can be assigned as a RAVE AutoMix.
- All input channels must be mono. Use the **Mono Sum** setting to sum stereo channels together or select a mono **Audio Source**.
- Only the audio feeds that you want processed by the RAVE AutoMix should be enabled for the layer assigned as an RAVE AutoMix.

- The levels for each mic should be adjusted before the RAVE AutoMix so that you can compensate for low or loud speakers.
- The RAVE AutoMix is not recommended for singing or instrumental sources. Some exception use cases may for a primary and backup mic (muted until needed) or if a performer uses two mics in a performance and monolog configuration.

RAVE AutoMix Weight Explained

Weight in the RAVE AutoMix sets the relative priority that is applied to the input. Weight is not gain and does not change the level of an input. If all mics are set to the same weight then they are prioritized equally by the RAVE AutoMix. If one participant starts speaking then their mic is faded to the maximum gain and the others are faded down. If more than one participant is speaking then their mics are faded up to share the maximum gain that a single mic would use. If one of the mics is given more weight, then it will be given more gain when that participant speaks. In practical terms, it makes the participant easier to be heard above the others.

RAVE AutoMix Interface

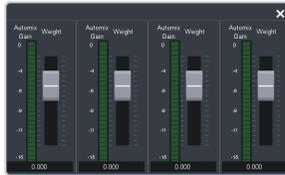
The RAVE AutoMix interface allows you to control the weight or priority given to each input, as well as set how the RAVE AutoMix is applied to an input.



1. **Effects Control** — the same effects controls that are found on the standard audio mixer.

Note: Effects are applied before the RAVE AutoMix and should only be applied in a very limited manner. The Compressor Limiter should not be applied here.

- Mute** — must the audio before it goes into the RAVE AutoMix.
- Weight Control** — shows the weight that is applied to the audio source in the RAVE AutoMix. The **Automix Gain** shows the amount of gain that is being applied by the RAVE AutoMix with the current weight settings. Click on the **Weight** setting to display the weight sliders and select the amount of weight you want to apply to each



- Auto** — turn **Auto** on to have the audio source added to the RAVE AutoMix. The RAVE AutoMix is controlling the **Auto Mix Gain** when active.
- Safety Threshold (THR)** — the minimum level for an audio source in the RAVE AutoMix. A noise gate is used to attenuate audio levels that are below the safety threshold. The color of the **THR** indicator shows what it is doing.
 - Green — level is above the safety threshold.
 - Red — level is below the safety threshold and is being attenuated.
- Gain Slider** — change the level of the audio source going into the RAVE AutoMix.
- PFL** — standard Pre-Fader Listen that allows you to listen to the selected input on the Monitor out before the input fader and RAVE AutoMix are applied.
- Mix Outputs** — control the output gain of the RAVE AutoMix or Monitor output.

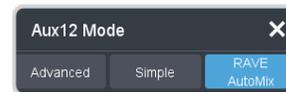
To Configure a RAVE AutoMix

Configure a mix layer as a RAVE AutoMix.

- Click **Navigation Menu > Audio Mixer > Config**.

M	Fader Source	Label	Audio Source	M/V Trans	M/V Trigger	Time Freq	HG	CL	EQ
1	Aud1	1-2	Fade	TR1	100 Hz	NG	CL	EQ	
2	Aud2	1-2	Fade	TR2	1000 Hz	NG	CL	EQ	
3	Aud3	1-2	Fade	TR3	1000 Hz	NG	CL	EQ	
4	Aud4	1-2	Fade	TR4	1000 Hz	NG	CL	EQ	
5	Aud5	1-1	Fade	TR5	1000 Hz	NG	CL	EQ	
6	Aud6	1-2	Fade	TR6	1000 Hz	NG	CL	EQ	
7	Aud7	1-2	Fade	TR7	1000 Hz	NG	CL	EQ	
8	Aud8	1-2	Fade	TR8	1000 Hz	NG	CL	EQ	
9	Aud9	1-2	Fade	TR9	1000 Hz	NG	CL	EQ	
10	Aud10	1-2	Fade	TR10	1000 Hz	NG	CL	EQ	
11	Aud11	1-2	Fade	TR11	1000 Hz	NG	CL	EQ	
12	Aud12	1-2	Fade	TR12	1000 Hz	NG	CL	EQ	
13	XP1V	Aud13	1-2	Fade	XP1V	1000 Hz	NG	CL	EQ
14	XP2V	Aud14	1-2	Fade	XP2V	1000 Hz	NG	CL	EQ
15	XP3V	Aud15	1-2	Fade	XP3V	1000 Hz	NG	CL	EQ
16	XP4V	Aud16	1-2	Fade	XP4V	1000 Hz	NG	CL	EQ
17	PC	Aud17	1-2	Fade	TR17	1000 Hz	NG	CL	EQ
18	M1	Aud18	1-2	Fade	M1	1000 Hz	NG	CL	EQ
19	M2	Aud19	1-2	Fade	M2	1000 Hz	NG	CL	EQ
20	Aud20	1-2	Fade	TR19	1000 Hz	NG	CL	EQ	
21	Aud21	1-2	Fade	TR20	1000 Hz	NG	CL	EQ	
22	Aud22	1-2	Fade	TR21	1000 Hz	NG	CL	EQ	

- In the **Fader Config** area, locate the audio sources for the mics you want to feed into the RAVE AutoMix. These must be configured as mono. This can be done either by selecting only the mono channel from the mic, or forcing a the source to mono.
 - Audio Source** — click the **Audio Source** button and select the **Mono Left** or **Mono Right** channel for the source of the mic.
 - Mono** — toggle **Mono** to **On** to force the stereo source from the mic to a left-right summed mono signal.
- In the **Mixer Config** area, click **Settings** .
- Click the **Mode** button for the mix layer you want to configure as an RAVE AutoMix and click **RAVE AutoMix**.



*Tip: To change the name of a mixer layer, enter a new name in the field for the mixer layer you want to change the name for. If you click **Settings** again you will see the new name applied to the mixer layer selection button.*

- Click the mixer layer tab for the layer you just set as an RAVE AutoMix.



6. Uncheck the **Visible** boxes to hide the source not being used for the RAVE AutoMix.
7. Uncheck the **Disable** boxes for source being used for the RAVE AutoMix.

Note: A source must be set to Mono for it to be enabled for the RAVE AutoMix.

Switcher Sets

The switcher stores configuration and operation data in a number of registers that contain the individual entries for items such as memories or personality settings. These registers can be stored as a single archive file, or as a register set that contains all the individual register of that type; all memories for example. These files are stored into Sets on a USB drive. Different Sets can be created for different shows or applications, allowing you to quickly locate and recall the switcher configurations.

The switcher stores information in the following registers:

- **Memory** — contains all the memories.
- **Custom Control** — contains all the custom control banks and macros.
- **Installation** — contains all the external device setup, and software settings for the switcher as well as audio mixer configurations (EQ, CL, NG).
- **Personality** — contains all the user interface settings, such as transition rates, that are stored under the **Personality** menu. Some personality settings are specific to the control panel and can be stored independently if you are working with a MultiPanel system.

To Store a Set

Switcher Sets can only be stored to a USB drive. The USB drive must be present before you try to store the Set.

Note: If you are updating an older setup file, you must perform a Recall All followed by a Store All. This updates the setup files the latest format. You can then make changes and store to individual registers if needed.

Tip: The switcher provides 10 empty sets by default. Additional sets can be created if you rename the sets on the USB from a separate computer.

1. Insert a USB drive into the USB Port on the frame. You must wait 5 seconds for the switcher to recognise the USB drive.

Note: The exFAT file system is not supported at this time.

Tip: If you do not have a USB drive, you can store the working set to temporary storage. This set will be lost when the switcher restarts, but can be exported to an external computer.

2. Click **Navigation Menu > Configuration > System > Save Sets**.

*Tip: Click **Refresh Sets** to update the list of available sets.*



3. Click a **Select Set** button for the set you want to store the switcher registers to.
4. Click a **Save** button to save that register to the selected set. If the button is shown in brown, that register already exists in the set and will be overwritten.
 - **All** — store all registers to the set.
 - **Memories** — store only the memory registers to the set.
 - **Customs** — store only the custom control registers to the set.
 - **Installation** — store only the installation registers to the set.
 - **Personality** — store only the personality registers to the set.
5. Click **Yes**.

The registers are stored to the set on the USB.

*Tip: You can export the switcher set to your local computer in the **Export Set From Frame** area. Click **Export As...** and navigate to the folder where you want to store the file and enter a name. Click **Save** and then **Export**.*

To Load a Set

Switcher Sets can only be loaded from a USB drive. The USB drive must be present before you try to load the settings.

Note: If you are updating an older setup file, you must perform a Recall All followed by a Store All. This updates the setup files the latest format. You can then make changes and store to individual registers if needed.

1. Insert your USB drive into the USB Port on the frame. You must wait 5 seconds for the switcher to recognise the USB drive.

Note: The exFAT file system is not supported at this time.

Tip: If you do not have a USB drive, you can recall the set from temporary storage. This set will be lost when the switcher restarts. Importing a set from an external computer will be stored in the temporary storage.

2. Click **Navigation Menu > Configuration > System > Load Sets**.

Tip: Click **Refresh Sets** to update the list of available sets on the USB.



Tip: You can import a switcher set from your local computer in the **Import Set to Frame** area. Click **Import From...** and navigate to the folder where the set is stored and click **Open**. Click **Import**.

3. Click an **Available Set** button to select the set you want to load the switcher register from. If there is only one set stored then these buttons will not be present.
4. Click a **Load** button to load that register. Only those registers that are present in the set are shown.
 - **All** — recall all registers from the set.
 - **Memories** — recall only the memory registers from the set.
 - **Customs** — recall only the custom control registers from the set.
 - **Installation** — recall only the installation registers from the set.
 - **Personality** — recall only the personality registers from the set.
5. Click **Yes**.

Exporting the Working Set for Ultra and Ultrix Carbonite

The working set can be exported to a format that is supported by Ultra and Ultrix Carbonite switchers. The working set is the current configuration of the switcher including all memories and custom controls that can be stored and recalled with a switcher set.

Keep the following in mind:

Keep the following in mind when exporting the working set for Ultra and Ultrix Carbonite:

- If you are exporting the working set, it must contain at least one memory register.
- Modified color schemes in Graphite cannot be imported into Ultra or Ultrix Carbonite.
- If a video source used in a set (custom control, bus map, or GPI) does not exist in the switcher it is imported to, black will be selected instead.

- When a set is imported to Ultra or Ultrix Carbonite from Graphite the ME numbering will be different. In Graphite the highest numbered ME is the program ME. In Ultra and Ultrix Carbonite ME P/P is the program ME. This applies to all switcher setting except memories.
 - ME 1 -> ME P/P
 - ME 2 -> ME 1
- When a Memory is imported to Ultra or Ultrix Carbonite from Graphite the ME numbering will be different. Only memories are mapping in this way.
 - ME 1 -> ME 2
 - ME 2 -> ME 1
- When a set is imported to Ultra or Ultrix Carbonite from Graphite some outputs (such as PGM, PRV, and CLN) are not available and must be re-assigned. For example, ME P/P replaces PGM.
- Custom controls imported to Ultra or Ultrix Carbonite from Graphite cannot have memory recall events. These custom controls will not be imported.
- When exporting memories or custom controls that load Media-Store media items, the media item IDs and attributes must match between the switchers you are exporting from and importing to. This information is not included in the sets. If the media items do not match, the memories and custom controls may load the wrong media items or with the wrong attributes.
- When loading exported memories or custom controls that load Media-Store media items with an alpha, the alpha will be loaded twice. Graphite uses one of the other Media-Store channels to load the alpha. Ultra or Ultrix Carbonite have dedicated alpha channels for each Media-Store channel. When the exported memory or custom control is loaded in Ultra or Ultrix Carbonite the alpha is loaded in the correct alpha channel as well as the channel that Graphite was using for the alpha.

To Export the Working Set for Ultra and Ultrix Carbonite

The working set can be exported into a format that is readable by Ultra or Ultrix Carbonite switchers.

-
1. Click **Navigation Menu > Configuration > System > Export Current Set.**



2. Click **Export As...** and navigate to the folder where you want to store the file and enter a name.
3. Click **Save.**

Media-Store

The MediaManager interface to the Media-Store allows you to load stills, animations, or audio files and make them available across all MEs.

*Tip: The legacy web version of MediaManager can still be accessed by using a Google Chrome™ web browser to navigate to the IP address of the frame. This feature can be disabled by setting **Web Media Manager** (Click **Navigation Menu** > **Configuration** > **System** > **Global**) to **Disable**. The switcher must be re-started for the change to be applied.*

Keep the following in mind:

Keep the following in mind when working with Media-Store:

- A still, animation, or audio can be loaded either by browsing the file system, or by entering the still number using the pattern buttons.
- You can clear a Media-Store channel by loading media number 000.
- If you are loading an Auto Key into a Media-Store channel, you must have another Media-Store channel associated with the current one to load the alpha into.
- An FTP connection using RossLinq can be created from an external device directly to a Media-Store channel on the switcher.
- If you delete a media item from the USB, you may have to load that media item into a Media-Store channel for the switcher to prompt you to delete the media item from the database.
- If you delete or rename a media item on the USB while it is still inserted into the switcher, you must attempt to load the old file to clear that entry from the database.
- The legacy web version of MediaManager still supports playlists.

Working With Media-Store Animations

Media-Store animations can be used for animated backgrounds, branding "bugs", or media transitions. You can set up an animation to loop, play automatically when taken on-air, play in reverse, or even play at different speeds.

*Tip: You can play an animation manually from a control panel by selecting the source button for the Media-Store channel with the animation you want to play, and pressing **Run** on the 3-knob menu. The knob changes to **Stop** as the animation is playing.*

Keep the following in mind:

Keep the following in mind when working with Media-Store animations:

- When you load an animation to an off-air Media-Store channel, or the animation goes off-air with a transition, the preview shows the cut point (**CutFr**) for that animation, and not the first frame of the video.
- You can manually cycle through frames by turning the **Run** knob while the animation is stopped.
- Double-pressing the **Run** knob stops playback and re-cues the animation to the first frame.
- You can shuttle forwards and backwards through the animation by turning the positioner clockwise or anti-clockwise when the animation is stopped, if your control panel has a positioner with a z-axis. Shuttle speed is increased and decreased by turning the positioner more or less in each direction.
- You can run or stop an animation by pressing the positioner button, if your control panel has a positioner with a button.

Working With Media-Store Audio

Audio can be added to the playout of a Media-Store channel either by loading the file directly, or by naming the audio file the same as the animation or still you want it to play out with. When you load the still or animation, the switcher will automatically load the audio file of the same name.

Keep the following in mind:

Keep the following in mind when working with Media-Store audio:

- Media-Store audio is available to the audio mixer and the AES outputs on the frame.
- Audio files must be 20-bit or 24-bit wav files at a 48kHz sample rate.
- Audio files must be in the same folder and have the same name as the still or animation they are to be associated with.
- An audio file does not need to be of the same length as the animation it is associated with.
- A still with audio or audio only have the Auto Play and Looping attributes. These apply to the audio playout.
- The looping time of an animation with audio is the length of the animation.

- A Media-Store channel can be loaded with Audio only.

Media-Store File Specifications

Media items can be in TGA, PNG, or JPG file formats. For animations, the files must be numbered to indicate the order they go in, and the name and the number must be separated with an underscore. For audio, 20-bit or 24-bit WAV files of the same name as the still or animation are used to associate audio with a still or animation.

For example, the following files are treated as a single animation named Anim that is 100 frames long:

- Anim_001.tga
- Anim_002.tga
- Anim_003.tga
- ...
- Anim_100.tga

Note: Media items must be created in the same color gamut and dynamic range that they are intended to be used in on the switcher. If a media item is created in one color space and the switcher is operating in another, the media item may not appear correctly.

Note: An animation must start with `_001` at the end of the name of the first frame.



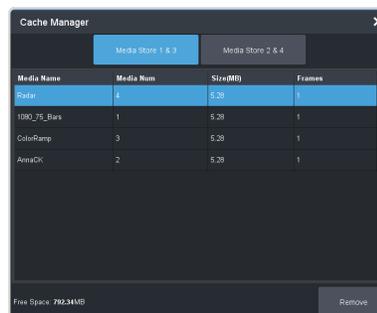
Important: Files names cannot contain symbols such as `! @ # & * () / , ? ' "` and cannot start with an underscore (`_`).

Media-Store Cache Manager

View all the media that is loaded into a Media-Store cache and remove unused items.

The cache manager allows you to review the media that is currently loaded into each cache, including name, id, size in cache, and frames, as well as remove items to free up space. The current amount of free space in the selected cache is shown at the bottom left.

Channels 1 and 3 share one cache and channels 2 and 4 share another. Click **Media Store X&Y** to switch between the caches.



Tip: To remove an item from the cache, select the item you want to remove and click **Remove**.

Note: A media item can only be removed from the cache if it is not currently loaded into a Media-Store channel.

Loading Stills or Animations

Stills or animations can be loaded into Media-Store channels by navigating to the file in MediaManager. MediaManager creates and maintains a database of the media items in the file directory, as well as the setting for each media item and a thumbnail.

Note: The internal cache is used for sample images only and cannot be used to store user stills or animations.

To Load a Media Item

Media items are loaded into a Media-Store channel from MediaManager

Note: Media items must be created in the same color gamut and dynamic range that they are intended to be used in on the switcher. If a media item is created in one color space and the switcher is operating in another, the media item may not appear correctly.

1. Insert your USB drive into the USB Port on the switcher. You must wait 5 seconds for the switcher to recognise the USB drive. If the files on your USB are new, it takes about 2 seconds per file for the switcher to generate the thumbnail for the MediaManager. Once all the thumbnails are generated, they are displayed in the MediaManager window.
2. Click **Navigation Menu > Media > MediaManager**

Tip: The MediaManager can also be accessed from Live Assist (Click **Navigation Menu > Live Assist > Media >**). The Live Assist version follows Media-Store source selections on the panel.



3. Navigate to the folder containing the media item you want to load into a Media-Store channel.

Note: The first time you navigate to a folder it may take a few moments for the Media-Store to scan the files and build the database entries.

Tip: You can upload a media item from your computer to the selected folder on the storage device. In the **Still Upload** area click **Browse** and navigate to the media item you want to upload. Click **Open** and then **Upload File**.

All the media items in that folder are shown in the center area of the page.

4. Drag the media item onto the Media-Store channel you want to load it in.

Tip: The film-strip symbol (🎞️) indicates that the media item is an animation, the key symbol (⌘) indicates that the media item has an alpha, and the speaker symbol (🔊) indicates that the media item has audio associated with it, or is audio only.

Tip: You can remove items from the Media-Store cache to free up space. Refer to [Media-Store Cache Manager](#) on page 74 for more information.

Deleting a Media Item

Delete media items to remove them from the storage device and database.

To Delete A Media Item

Delete a media item from the storage device. You can only delete a single item at a time and you cannot delete the internal sample items.

1. Click **Navigation Menu > Media > MediaManager**
2. Navigate to the folder on the storage device that has the item you want to delete and select the media item that you want to delete.
3. In the **Item Details** area, scroll to the bottom.



4. Click **Delete File** and **OK**.

MediaManager Channel Control

Once a media item is loaded into a channel you can control the playout for the media item from MediaManager.

Note: Playlists are not supported by MediaManager in DashBoard at this time.



Tip: The background of the channel areas tallies the on-air status of the Media-Store channel. Red for on-air and green for on-preview.

The label below the thumbnail of the media item shows the name of the file, the number of frames in the animation, and the media ID. In this example, the name of the media item is **Lobster**, it is **5** frames long, it is located on the USB (**U1**) and has a media ID of **001**.

The controls below the name allow you to set how the animation plays out as well as eject the current media item.

- **Play** — play the animation.
- **Loop** — set the animation to start playing again from the beginning when it reaches the last frame.
- **Play Direction** — set the animation to play in the forward or reverse direction.
- **Re-cue** — re-cue the animation to the first playout frame.
- **Eject** — eject the current media item from the channel.

Media-Store Attributes

Attributes are applied to the media item in the database and in each Media-Store channel.

Where the attributes are being applied is shown in the upper left corner of the area. If you adjust the attributes of the media item in one channel, these settings are not applied back to the database or to other channel if the same media item is loaded into more than one channel.



Tip: At the top of the **Item Details** frame the title indicates if the information shown applies to the media item loaded into the media channel (**MX**), or is from the media item in the database (**Database**).

Buttons:

- **Autoplay** — play the animation automatically when the Media-Store channel is taken on-air.
- **Reverse** — set the animation to play in the forward or reverse direction.
- **Mute** — mute the audio associated with the media item.
- **Looping** — set the animation to start playing again from the beginning when it reaches the last frame.
- **Shaped** — set the alpha to be shaped, or unshaped when not selected.

Fields:

- **Name** — the name of the media item as taken from the file name.
- **Width** — the width of the media item raster.
- **Height** — the height of the media item raster.
- **Alpha** — shows whether there is an associated alpha with the media item.
- **Number of Frames** — the number of frames in the animation.
- **Audio Channels** — the number of audio channels in the associated audio.
- **Media Number** — the media number of the media item.
- **X-Position** — set the horizontal position of the media item.
- **Y-Position** — set the vertical position of the media item.

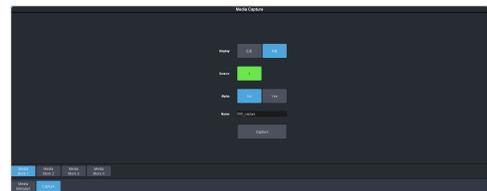
- **Cut Frame** — set the frame of the animation when used as part of a MediaWipe.
- **Thumb Frame** — set the frame of the animation that is used for the thumbnail.
- **Play Speed** — set the playout speed for the animation.

Media-Store Capture

Still images can be captured from any input BNC, as well as the program, preview, and clean feed from any ME.

To Capture a Still

1. Insert your USB drive into the USB Port on the switcher. You must wait 5 seconds for the switcher to recognise the USB drive.
2. Click **Navigation Menu > Live Assist > Media > Capture**.



3. Click a **Media Store X** button to select which Media-Store you want to use for the capture.

Note: Media-Store channels 3 and 4 cannot capture an alpha with the video. Media-Store channels 3 and 4 are used for the alpha of channels 1 and 2.

4. Click the **Display** button to select the mode you want the Media-Store in.
 - **E/E** — electronic-to-electronic, or record, mode allows you to capture a single frame media item.
 - **P/B** — playback mode allows you to review your single frame media item.
5. Click the **Source** button and select the video source you want to capture.
6. Click the **Alpha** button to select whether to include the alpha with the capture (**Yes**) or not (**No**). You must have an input BNC selected as the capture source to capture the alpha.
7. In the **Name** field, enter the name you want to give to the file. This will be the file name that the still is stored to on the USB.

Note: Files names cannot contain symbols such as **! @ # & * () / , ? ' " and cannot start with an underscore (_)**.

8. Click **Capture** to capture the still.

Note: Capture will overwrite any existing still with the same file name.

Custom Controls

Once programmed, a custom control (CC) can be played back by pressing a button. The custom control can be as simple as triggering an output GPI pulse, or as complex as recalling a specific memory register on an ME, performing a switcher transition, and selecting a group of keys.

You can record, edit, and run custom controls from the Custom Control node in DashBoard.

Refer to [Custom Control Events](#) on page 148 for information on available events.

Tip: For information on using the **State Attributes** tab, refer to [Custom Control Events](#) on page 149.

Recording/Editing Custom Controls

When you create a custom control, you record a series of events and special functions, that are played back when you run the custom control. The process for creating a new cc and editing an existing one are the same, except when editing you have the option to insert events at different points in the existing cc.

Almost any action or setting can be stored in a custom control, with the following exceptions:

- Diagnostic Functions
- Confirmation Dialogs
- Panel-Specific Functions

Note: It is recommended that you use a control panel for recording custom controls.

Keep the following in mind:

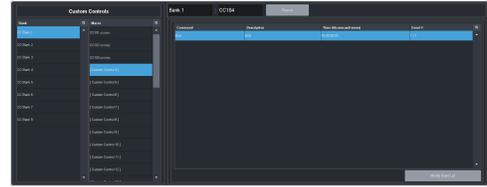
Keep the following in mind when recording custom controls:

- Some functions take time to perform and a pause should be added after the function to ensure that the command is completed before moving on to the next command.
- If you are recording a custom control from DashBoard, only new settings are recorded. If the current setting in DashBoard is the value you want to record, you need to select a different value and then select the value you want to use.

To Record a Custom Control

A basic custom control records a series of events that are played out in the same order they are recorded.

1. Click **Navigation Menu > Custom Control > Editor**.



2. Click a **Bank** button to select the bank that the custom control you want to record will be stored on.
3. Click a **Macro** button to select the custom control that you want to record to. If the custom control already has a macro recorded, the name of the custom control is shown in the list.

Tip: You can rename both the custom control and the bank by entering a new name in the field next to the record button.

4. Click **Record**.

Tip: The switcher can be set so that each command is automatically separated from the previous command by a pause equal to the real-time delay between you entering commands. Refer to [To Set the CC Pause Mode](#) on page 79 for more information.

The **CC/UP** button on the control panel, as well as the button assigned to the CC on the bus, flash red when the CC is recording.

5. Insert the events you want to record. Events can be entered from the menu or from actions directly on the control panel.

Each custom control can have a maximum of 998 events, plus the End event.

Note: When the switcher runs a custom control, it attempts to execute each event in the custom control as quickly as possible. If an event takes time to complete, the event may not be complete before the switcher attempts to execute the next event. For example, if your custom control has a memory recall followed by a transition, a pause should be added between the memory recall and the transition to ensure that the memory is fully recalled before the transition is performed. The same applies if you want to add events after a transition.

6. Click **Stop Recording** to finish recording.

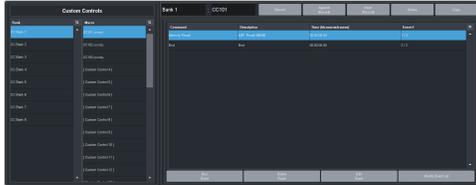
Tip: Click **Cancel** if you do not want to store your events to the custom control.

To Edit a Custom Control

When editing a custom control, you can delete and insert events at any point in the custom control, or append events to the end.

Tip: When editing a custom control, press **Run Event** to run the currently selected event. This can help you diagnose problems in a custom control.

1. Click **Navigation Menu > Custom Control > Editor**.



2. Click **BankX** to select the bank that the custom control you want to edit is on.
3. Click the custom control that you want to edit.
4. Click the event that you want to edit or insert an event before.

Note: The name of a custom control is highlighted in red if it contains events that are no longer supported. The unsupported events in the custom control are also highlighted in red.

Refer to [Custom Control Events](#) on page 148 for information on available events.

5. Edit the custom control or event.
 - **Append (Record)** — start inserting events to the end of the custom control
 - **Append** — insert the current event at the end of the custom control
 - **Copy** — copy the entire custom control
 - **Delete** — delete the entire custom control
 - **Delete Event** — delete the currently selected event
 - **Edit Event** — edit the parameters of the currently selected event
 - **Insert (Record)** — start insert events after the currently selected event
 - **Insert** — insert the current event after the currently selected event
 - **Record** — start recording a new custom control over the existing one
 - **Run Event** — run the currently selected event

Custom Control Pause Mode

The switcher can be set so that each command is automatically separated from the previous command by a pause equal to the real-time delay between events as you enter them.

When you are entering events into the custom control, the length of time between you entering the events is recorded as a pause between the events. This allows you to perform a set of actions as you normally would and have the custom control play those events back with the same pauses and 'rhythm' that you would normally have.

To Set the CC Pause Mode

The CC Pause Mode must be set before recording a custom control and does now change how a custom control plays out.

1. Click **Navigation Menu > Configuration > System > Custom Controls**.



2. Click a **Pause Mode** button to select how the switcher inserts pauses into a custom control.
 - **Manual Pause** — no pauses are added. You must manually add pauses to the custom control.
 - **Record Pause** — pauses are entered automatically as you enter events. For example, if you pause for 30 seconds between selecting a key and performing a transition, a 30 second pause is inserted between those events in the custom control.

Running a Custom Control

Once a custom control has been programmed, you can run that custom control by pressing the button that the custom control was recorded to.

Keep the following in mind:

Keep the following in mind when running custom controls:

- A custom control will continue to run until it reaches a hold event, is stopped by another custom control, you edit a custom control, or the custom control reaches the end.
- When a custom control is running, the button on the custom control bus is red.

- When a custom control is held (at a Hold event), the button on the custom control bus flashes white.
- You can run multiple custom controls at the same time. The number of running custom controls is shown on the display when in custom control mode.
- You can stop a running custom control by pressing the red custom control button on the custom control bank.
- You can stop all running custom controls by selecting a custom control with no events recorded to it.
- A maximum of 128 custom controls can be run at the same time.
- The name of a custom control is highlighted in red if it contains events that are no longer supported. The unsupported events in the custom control are also highlighted in red.

To Run a Custom Control

Once a custom control has been recorded, you can run that custom control at any time.

1. Click **Navigation Menu > Custom Control > Shot Box**.



Tip: You can also run a custom control directly from the control panel.

Tip: The number of custom controls that are currently running is shown at the bottom of the page.

2. Click **Bank X** to select the bank that the custom control you want to run is on.
3. Click a custom control button to run that specific custom control. The custom control starts to play immediately.

Naming Custom Controls

Each custom control can be given a unique name and mnemonic color. The name and color is shown on the custom control button.

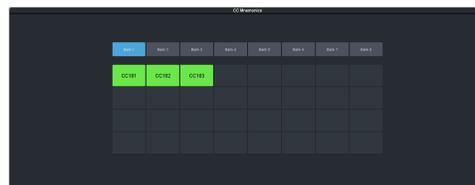
To Name a Custom Control

The procedure to name or rename a custom control is the same.

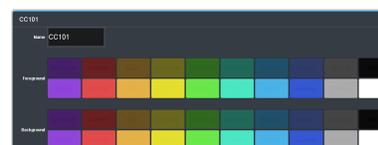
Tip: You can also name a custom control and bank from the Editor page.

Tip: Refer to [General Settings](#) on page 116 for information setting how the custom control names are shown on the control panel mnemonics.

1. Click **Navigation Menu > Custom Control > CC Mnemonics**.



2. Click **Bank X** to select the bank that the custom control you want to name is on.
3. Select how you want the mnemonics on each panel row to display the mnemonics for custom controls.
 - **Off** — the mnemonics don't change when the row is assigned to a custom control bank.
 - **Split** — the mnemonics are split (top to cc name and bottom to bus sources) when the row is assigned to a custom control bank.
 - **Full** — the mnemonics are show only the names of the custom controls when the row is assigned to a custom control bank.
4. Click the custom control that you want to name.



Setting	Description
Name	Enter a new name for the selected custom control.
Foreground	Click a Foreground button to select the color you want to apply to the text on the mnemonic.
Background	Click a Background button to select the color you want to apply to the background on the mnemonic.

Deleting Custom Controls

Any custom control on the switcher can be deleted to remove unused customs to free up space for new custom controls.

To Delete a Custom Control

Deleting a custom control from the switcher.

There is no undo for this delete function.

1. Click **Navigation Menu > Custom Control > Editor**.
2. Click **Bank X** to select the bank that the custom control you want to delete is on.
3. Click the custom control button that you want to delete.
4. Click **Delete**.
5. Click **Delete** to delete the custom control.

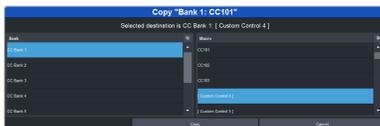
Copying and Pasting Custom Controls

The contents, or events, of a custom control can be copied from one custom control and pasted to another. Along with the events, the name and mnemonic settings are also copied.

To Copy and Paste a Custom Control

Copy the contents of a custom control from one button to another.

1. Click **Navigation Menu > Custom Control > Editor**.
2. Click **Bank X** to select the bank that the custom control you want to copy is on.
3. Click the custom control that you want to copy.
4. Click **Copy**.
5. Select the custom control that you want to paste into.



6. Click **Copy**.

Sequencer

The Sequencer allows you to create a playlist of custom control events.

The switcher supports 5 Sequencers, each with an independent rundown of events. The Sequencer uses sequences to store the rundown of events. These sequence files can be loaded into one or multiple Sequencers.

Tip: You can link multiple Sequencers together so that as you advance through one, the other Sequencers will advance.

Keep the following in mind:

Keep the following in mind when working with a Sequencer:

- Unlike a Custom Control, a Sequence only runs a single event at a time. You must advance to the next event in the sequence to run that event.
- If you run a Play CC event in a sequence, the Sequencer does not indicate when the CC event has completed.
- Only a subset of CC events can be run directly in the a sequence. You can use the Play CC event to run a custom control that contains any other events.
- If you edit a sequence that is already loaded into a Sequencer, you must **Reload** the sequence to update the event in the Sequencer.
- There is only one linked group. When **Linked** is toggled on for a Sequencer it is tied to all other Sequencers with **Linked** turned on.
- Linking only affects the operation of the **Next** button.
- Memories cannot be used to load a sequence into a Sequencer.

Creating/Editing Sequences

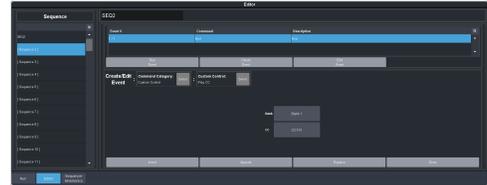
When you create a sequence, you record a series of events and special functions that are played back as you step through the sequence. The process for creating a new sequence and editing an existing one are the same, except when editing you have the option to insert events at different points in the existing sequence.

Tip: Remember that sequences run one event at a time. Use the Memory Recall or Transition Action events to perform complex actions.

To Create/Edit a Sequence

Editing a sequence is similar to creating or editing a custom control. A series of events are added to a list in the order you want the events to be run.

1. Click **Navigation Menu > Live Assist > Sequencer > Editor**.



2. Click a **Sequence** list item to select the sequence that you want to create or edit. If the sequence already has events, the name of the sequence is shown in the list and events are shown on the right.

Tip: You can rename the sequence by entering a new name in the field at the top.

3. Click **Modify Event List**.
4. Click the **Create/Edit Event** buttons to navigate to and select the event you want to add to the sequence. Refer to [Custom Control Events](#) on page 148 for information on the events.

Tip: The Sequencer only supports a subset of the possible CC events. If you want to run a custom control event that is not listed for the sequencer, you can create a CC with that event in it and then use the Play CC event in the sequence to run that custom control.

*Tip: If you want to edit an existing event, select the event you want to edit and click **Edit Event**.*

5. Add or edit an event in the sequence.
 - **Append** — insert the new event at the end of the sequence.
 - **Delete Event** — delete the currently selected event.
 - **Insert** — insert the new event before the currently selected event.
 - **Replace** — replace the currently selected even with the new event.
 - **Run Event** — run only the currently selected event.
6. Click **Done** when you are finished editing the sequence.

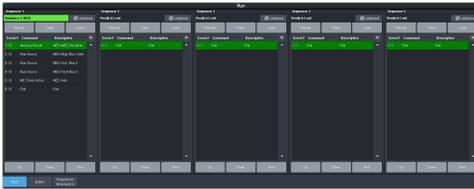
Loading and Running a Sequence

Once a sequence has been created, you can load that sequence into a Sequencer and run each event.

To Load a Sequence

A sequence must be loaded into the Sequencer before it can be run.

1. Click **Navigation Menu > Live Assist > Sequencer > Run.**



2. Click **Load** on the Sequencer you want to load a sequence into.



3. Click the **SEQ** button for the sequence you want to load.

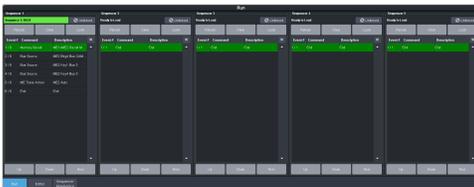
Tip: Click **Clear** to unload the sequence from the Sequencer.

Tip: Click **Reload** to load the sequence into the Sequencer again. This can be useful if you have edited the sequence.

To Run a Sequence

A sequence is run one event at a time. Events can be skipped over by selecting a different event in the sequence as the next event.

1. Click **Navigation Menu > Live Assist > Sequencer > Run.**



2. Use the **Up**, **Down**, and **Next** buttons to run through the sequence.



#	Function
1	The currently loaded sequence. This uses the mnemonic name and color.
2	Multiple Sequencers can be linked together. This only affects the Next button and allows clicking Next on any of the linked Sequencers to advance all the linked Sequencers. There is only one linked group.
3	The Reload , Clear , and Load buttons allow you to populate or clear the Sequencer. <ul style="list-style-type: none"> • Load — load a different sequence into the Sequencer. • Clear — unload the current sequence from the Sequencer. • Reload — reload or update the current sequence in the Sequencer.
4	The red highlight shows the last run (current) sequence event.
5	The green highlight shows the next event to be run. Click on a different event, or use the Up or Down buttons to select a different event to be run next.
6	The Up and Down buttons move the green (run next) highlight up and down in the sequence.
7	The Next button runs the event that is currently highlighted in green.

Sequence Names and Mnemonics

Each sequence can be given a unique name and mnemonic color. The name and color are shown on the Sequencer.

To Name a Sequence

Tip: You can also name a sequence from the **Editor** page.

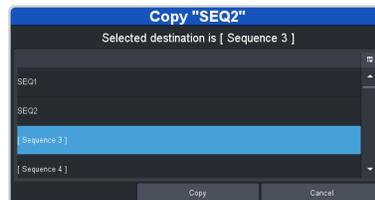
1. Click **Navigation Menu > Live Assist > Sequencer > Sequencer Mnemonics.**



2. Click the sequence that you want to name.



Setting	Description
Name	Enter a new name for the selected sequence.
Foreground	Click a Foreground button to select the color you want to apply to the text on the mnemonic.
Background	Click a Background button to select the color you want to apply to the background on the mnemonic.



5. Click **Copy**.

Deleting a Sequence

Any sequence can be deleted to remove unused sequences to free up space for new sequences.

To Delete a Sequence

There is no undo for this delete function.

1. Click **Navigation Menu > Live Assist > Sequencer > Editor**.
2. Click the sequence that you want to delete.
3. Click **Delete**.
4. Click **Delete** to delete the sequence.

Copying and Pasting a Sequence

The contents, or events, of a sequence can be copied from one sequence and pasted to another. Along with the events, the name and mnemonic settings are also copied.

To Copy and Paste a Sequence

1. Click **Navigation Menu > Live Assist > Sequencer > Editor**.
2. Click the sequence that you want to copy.
3. Click **Copy**.
4. Select the sequence that you want to paste into.

XPression Setup

Graphite CPC uses XPression as the main video engine for the switcher. Video inputs and output pass through XPression to be controlled by the switcher. XPression must be configured to offer the best performance for the switcher functionality.

Note: For detailed information on setting up XPression, refer to the documentation that came with XPression.

When configuring XPression to operate with the switcher there are a number of setting that impact how the system performs or what inputs or outputs are available.

- **2x MultiSampling** — The Hardware Renderer (**Edit > Preferences > Hardware Renderer**) should have the **Anti Alias** set to **2x MultiSampling**. A hardware adapter must be selected to set the Anti Aliasing.
- **Video Inputs** — Video inputs to the switcher are XPression Internal Framebuffer outputs or NDI® streams. Framebuffers and NDI® outputs are set up from the **Inputs/Outputs** tab on the **Hardware Setup** dialog (**Edit > Hardware Setup**). NDI® streams can also be assigned directly to switcher inputs.
- **Video Outputs** — Video outputs from the switcher are assigned to XPression Virtual outputs or NDI® outputs. Virtual and NDI® outputs are set up from the **Inputs/Outputs** tab on the **Hardware Setup** dialog (**Edit > Hardware Setup**).

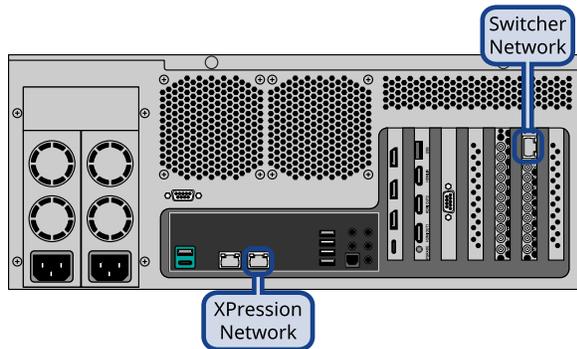
Network Setup

The network connection for the switcher sub-system in Graphite has an independent ethernet port that allows you to upload stills to the Media-Store channels, download switcher data files, connect to a physical panel, and control switcher functions using DashBoard. This network connection is separate from the Windows® configured one and must use a separate IP address.



Important: Do not run real-time or on access file scanning programs on Graphite, TouchDrive or other supporting systems. Ross Video does not support any type of real-time or on access file scanning programs running on Graphite, TouchDrive or other supporting systems. Real-time or on access file scanning can cause lagging, disconnects, and timeouts between the Graphite, TouchDrive and other supporting systems.

Note: XPression uses a separate network connection than the one being set up here. Refer to the XPression documentation for information on setting up its IP address.



The switcher uses the following network ports:

- DashBoard Main — 5253 (5258 NAT)
- DashBoard Sat 1 — 5255 (5259 NAT)
- DashBoard Sat 2 — 5256 (5260 NAT)
- DashBoard SoftPanel — 5257 (5261 NAT)
- FTP — 21
- SFTP — 2222
- GVG LUA — 2100
- RossTalk — 7788
- SLP — 427
- SSH — 22
- TFTP — 69
- TSL 3.1 (TCP, Carbonite) — 5727
- TSL 3.1 (TCP, Ultrix™) — 5727
- TSL 3.1 (UDP, Ultrix™) — 4490
- TSL 5.0 (TCP, Carbonite) — 5728
- TSL 5.0 (TCP, Ultrix™) — 5729

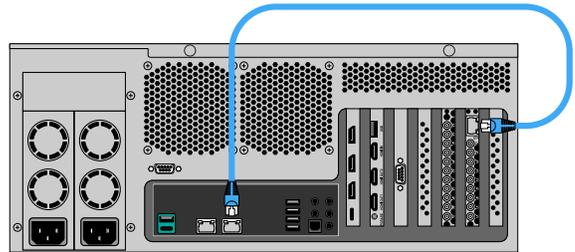
- TSL 5.0 (UDP, Ultrix™) — 4492
- Web Server 1 — 80
- SideShot-NG — 5255

Network Options

There are a couple of options for how to integrate Graphite into your network. These depend on whether you want to connect a physical Carbonite Black control panel, have DashBoard running on a separate PC, or want DashBoard running on the Graphite server.

Looping Option

In compact or portable installations, you can connect the ethernet port on the server directly to the ethernet port on the switcher sub-system and run DashBoard directly on the server.

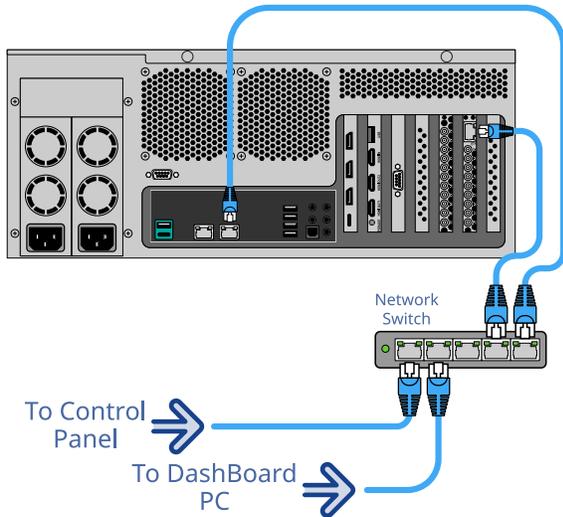


For this configuration you must change the network settings for the switcher sub-system to the default static IP address (192.168.0.123).

Note: You cannot use a control panel connected with the switcher in this configuration.

Network Switch Option

In installations where space is not an issue or where you need a control panel connected to the switcher, you can connect the ethernet ports on the server and switcher sub-system to a network switch or router.



Important: Both the control panel and DashBoard require the switcher sub-system to have a static or fixed IP address to be able to re-connect.

Switcher Network Settings

In Graphite, the switcher sub-system has an independent ethernet connection that is required to communicate with the switcher. By default, this ethernet port is set to DHCP and will try to obtain an IP address from your network router. You can configure the network settings either remotely from DashBoard or locally from the server.

Note: If you are using the direct loop option, you must set the switcher sub-system to a static IP address (192.168.0.123).

To Configure the Switcher Network Settings from the Server

There is an application installed on Graphite that allows you to configure the network settings of the switcher sub-system.

1. Launch Windows® **File Explorer** and navigate to C:\Program Files\Ross Video\Graphite\.
2. Launch the Graphite Control Panel application.
The **Graphite Control Panel** dialog box opens and shows the current network settings of the switcher sub-system.
3. Click **Edit**.
4. Click a **Connection Type** to select whether you enter IP address manually (**Static**), or your network assigns an IP address automatically (**DHCP**).



Important: Both the control panel and DashBoard require the switcher sub-system to have a static or fixed IP address to be able to re-connect.

5. For a static IP address, enter the IP address (**IP Address**), subnet mask (**Subnet Mask**), and gateway (**Gateway**) you want to use.

Tip: If you want to connect the switcher sub-system directly to the server in a loop, select **Static** and use the default IP address (192.168.0.123).

6. Click **Apply**.
7. Shutdown the server and power it back on again to apply the new settings to the switcher sub-system.

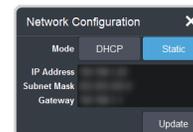
To Change the IP Address

Change the IP address of the frame from DashBoard.

1. Click **Navigation Menu > Configuration > Network**.



2. Enter a name in the **Switcher Name** field. This is the name that appears in the tree view in DashBoard.
3. Click an **Automatic Discovery** button to have the switcher automatically discoverable by DashBoard (**On**), or not (**Off**). Automatic Discovery allows you to automatically find this device from any DashBoard running on your subnet.
4. Click **Edit**.



5. Click a **Mode** button to use DHCP (**DHCP**), or a static IP address (**Static**).
6. For a static IP address, enter the IP address (**IP Address**), subnet mask (**Subnet Mask**), and gateway (**Gateway**) you want to use.
7. Click **Update**.

DashBoard Network Settings

DashBoard should automatically detect and connect to the switcher sub-system once it is connected to the same subnet. If you have trouble discovering the switcher sub-system, or it is located on another subnet, you can manually connect DashBoard to the switcher sub-system. Once connected, DashBoard will remember the connection until you remove it or the IP address changes.

Note: If you are using Caprica, or have multiple DashBoard connections to the switcher, you should use a DashBoard Proxy Server to manage the connection traffic to the switcher. Refer to the DashBoard documentation for information on setting up a Proxy Server.

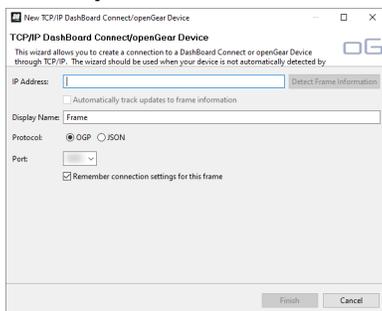
To Connect DashBoard to the Switcher

DashBoard connects to the frame as the main panel, or as a satellite panel. Connecting as a main or satellite panel is selected by the port used to connect to on the frame. All DashBoard connections and physical panels that connect on the same port mirror each other.

Note: The frame supports a maximum of 20 DashBoard connections at any one time. If there are already the maximum number of connections to a frame you will not be able to connect to it.

You need the IP address of the frame to connect to it from DashBoard.

1. Click **File > New > TCP/IP DashBoard Connect or openGear Device**.



2. In the **IP Address** field, enter the IP address of the frame. The default IP address is 192.168.0.123.

Note: If you are connecting through a Network Address Translator (NAT), the **Detect Frame Information** button may return the wrong IP address. We recommend to not use this function.

3. In the **Display Name** field, enter the name you want to use to identify the frame in DashBoard. This should be a unique name for the frame you are setting up.

4. Select **OGP**.
5. In the **Port** field, enter the port you want to connect to on the frame. The port you connect to assigns the relationship the DashBoard connection has to the frame.

Note: You can use a NAT gateway to connect to the switcher from a DashBoard computer on a different network. If you are connecting to the switcher through a NAT gateway, you must use the NAT ports instead of the regular ports.

Tip: Multiple DashBoard connections can use the same port, but they will mirror each other. For example, you can connect a control panel and a separate DashBoard computer to the Main Panel port to give control from the panel and DashBoard.

- **Main Panel** — 5253 (5258 NAT)
- **Satellite 1** — 5255 (5259 NAT)
- **Satellite 2** — 5256 (5260 NAT)
- **Satellite 3/SoftPanel** — 5257 (5261 NAT)

Tip: Refer to [MultiPanel](#) on page 131 for information on setting up a MultiPanel system.

6. Click **Finish**.
The switcher appears in the **Tree View**.

DashBoard Proxy Server Minimum Requirements

The switcher passes a lot of messages to and from the DashBoard client. Additional features like the RAVE audio mixer can increase this messaging significantly. If the machine being used for the Proxy Server does not have enough resources to handle the messaging, the DashBoard connection to the switcher can become unstable.



Important: If you are using Caprica to control your switcher, additional DashBoard connections can cause performance issues. It is highly recommended to use a DashBoard Proxy Server to reduce the load on the switcher.

To properly support multiple connections to the switcher, the Proxy Server should have the following resources:

- **Cores** — 8
- **RAM** — 8GB

Note: Other software applications, such as TeamViewer, or services running on the server can lower performance.

FTP/SFTP Connection

You can create a File Transfer Protocol (FTP) connection from a computer to your switcher.

You can use the FTP connection to copy still images and animations to and from your switcher as well as copy Edit Decision List (EDL) files from your switcher.

The procedure for creating an FTP/SFTP connection from a computer varies between operating systems and client software. Consult with the documentation that came with your computer for assistance with creating an FTP/SFTP connection.

Note: The FTP connection to the frame can be disabled. Refer to [System Access](#) on page 90 for more information.

Tip: The FTP connection can be used to copy media items onto the USB that is installed in the switcher.

To Create an FTP/SFTP Connection

This procedure applies to Microsoft® Windows® 7 and above.

Note: FTP must be **Enabled** (Click **Navigation Menu** > **Configuration** > **System** > **Access**) to connect to the frame over FTP. If FTP is disabled SFTP will be used. Refer to [System Access](#) on page 90 for more information.

1. On your computer launch Windows Explorer.
2. In the address bar, type the following depending on the type of connection you are using.
 - FTP — `sftp://IP Address of your switcher:21`
 - SFTP — `ftp://IP Address of your switcher:2222`

You are prompted for a username and password.

3. Type the user name for the application your are creating an FTP/SFTP connection for. Each application has specific requirements. The switcher will set these requirements automatically based on the username.
 - `xpression` – used when creating a connection from a Ross® XPression Motion Graphics System directly to the Media-Store channels on the switcher, as well as any USB drive installed in the switcher.
4. Enter the password `password`

System Access

Enable or disable system access and control methods such as FTP.

To Enable/Disable a System Access Method

1. Click **Navigation Menu > Configuration > System > Access**.



2. Configure the access method as required.

Method	Description
Web MediaManager	The legacy web version of MediaManager can still be accessed by using a Google Chrome™ web browser to navigate to the IP address of the frame. Click Disable to prevent access to the web MediaManager.
FTP	Disable FTP connections to the frame (SFTP Only). This prevents all FTP connections. If FTP is disabled SFTP is used. Refer to FTP/SFTP Connection on page 88 for information on used FTP to connect to the frame.
Role Based Access Control	Ross Platform Manager allows for user authentication and role based access through DashBoard. Refer to To Turn on Role Based Access Control for Ross Platform Manager on page 21 for more information.
RossTalk	Disable RossTalk connections to the switcher. The switcher refuses connections on port 7788.

3. The switcher must be re-started for the change to be applied.

Video Reference

The flexible reference system in the switcher allows you to use an Interlaced video format as the reference to operate the switcher in a video format of the same frequency. Choosing a progressive video format as a reference limits you to operating the switcher only in that same video format and frequency. For example, if you have a 1080i 59.94Hz input reference you can operate the switcher in 720p 59.94Hz, but not 1080i 50Hz. However, if you have a 720p 59.94Hz input reference, you can only operate the switcher in 720p 59.94Hz.

Supported Reference Formats

The switcher supports a number of reference modes for both internal and external reference signals. References to 1080p 59.94Hz (A) and 1080p 50Hz (A) refer to 1080p Level A only.

Switcher Format	Required Reference
SD Formats	
480i/480i 16:9	480i
	1080i 59.94Hz
576i/576i 16:9	576i
	1080i 50Hz
HD Formats	
720p 50Hz	576i
	720p 50Hz
	1080i 50Hz
720p 59.94Hz	480i
	720p 59.94Hz
	1080i 59.94Hz
1080i 50Hz	576i
	1080i 50Hz
1080i 59.94Hz	480i
	1080i 59.94Hz
1080pSF 23.98Hz	1080pSF 23.98Hz
1080pSF 25Hz	576i
	1080pSF 25Hz
1080pSF 29.97Hz	480i
	1080pSF 29.97Hz
1080p 25Hz	576i
	1080i 50Hz

Switcher Format	Required Reference
1080p 29.97Hz	480i
	1080i 59.94Hz
1080p 50Hz (A)	576i
	720p 50Hz
	1080i 50Hz
1080p 59.94Hz (A)	480i
	720p 59.94Hz
	1080i 59.94Hz

The switcher allows you to use any interlaced video format to operate the switcher in any format of the same frequency; however, the use of 480i or 576i (Composite Sync) reference signals for High Definition (720p, 1080i, or 1080p) video modes is not recommended.

The use of composite sync reference formats is recommended for Standard Definition video modes only, and provides stable outputs with jitter performance in compliance with SMPTE-259M specifications.

Reference and Video Mode Setup

The switcher supports both internal and external references. An external reference is provided by an external device to the switcher through the **REF IN** BNC on the frame.

The switcher automatically detects the reference signal and only shows the video modes that you can operate the switcher in that are supported for that reference format.

Note: When you set the switcher to a specific video format, XPression is also set to that format.

To Set a Video Mode

The Vid Mode is the video format that the switcher is operating in.

If you are using an external reference, ensure that a proper reference is connected to the **REF IN** input BNC on the frame.

Note: You must use an interlaced reference source to have the switcher operate in an interlaced reference format if you are using an external reference.

1. Click **Navigation Menu > Configuration > Reference**.



2. Click the **Video Mode** button and select the video format you want to use.

The available video modes depends on the reference format coming into the switcher.

3. Click the **Reference Source** button and select an **Internal** or **External** reference source.

Switching Field

The switching field is the field in an interlaced video format that the switcher uses to transition from one video source to another. An interlaced video format is made up of two fields, field 1 (odd lines) and field 2 (even lines).

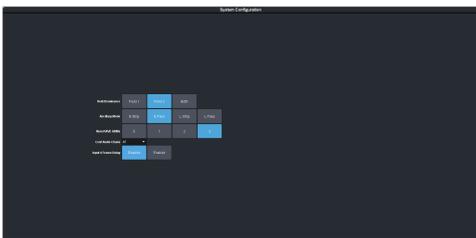
Note: If you are running in a progressive video format, selecting an even or odd fields will cause the switcher to only allow transitions on every second frame.

To Set the Switching Field

Set the field that transitions are performed on.

Note: If you are using a Frame Sync or Format Conversion (FSFC), transitions are locked to Field 1.

1. Click **Navigation Menu > Configuration > System > Global**.



2. Click a **Field Dominance** button to select which field video transitions occur on.
 - **Field 1** — transitions occur on the odd field
 - **Field 2** — transitions occur on the even field
 - **Both** — transitions occur on the current field, either even or odd

Video Inputs

External video sources come into the switcher through the input HD-BNC and HDMI™ ports, and internal sources are generated internally from the switcher or XPression.

Depending on how you want to use these video sources, or where they come from, you may want the switcher to pair them together, or associate an external device with them. Pairing two video sources together is usually used for an auto select key where an external device, such as a character generator, outputs both a key video and key alpha. Associating a video source with an external device allows special control over that device to become active when you select the source on a bus.

HDMI™ Inputs

The HDMI™ input and outputs allow you to input a video source from a computer or DVD player and output them directly to a plasma or projector. The switcher does not support HDCP-encrypted content over HDMI.

Supported HDMI Formats

The switcher supports a number of HDMI video formats.

- VGA — 640×480 (4:3)
- SVGA — 800×600 (4:3)
- XGA — 1024×768 (4:3)
- SXGA — 1280×1024 (5:4)
- 720p — 1280×720 (16:9)
- 1080i — 1920×1080 (16:9)
- 1080p — 1920×1080 (16:9)

Video Input Setup

Video inputs are separated into external sources and internal sources. The external sources are the video inputs coming in on the HD-BNC and the internal sources are generated internally from re-entries or follows, from media generators, or from XPression.

To Set up an External Video Input

External sources come into the switcher from other devices, such as cameras, video servers, or character generators.

Click **Navigation Menu > Configuration > Inputs > External**



The inputs are listed along the side and the various settings are listed across the top. Click the setting button for the source you want to set up to view the available settings.

Setting	Description
Label	Apply a custom name to the source. Enter a new name for each input you want to identify differently. The name is used to identify the input on the panel mnemonics as well as on menus. If TSL id is associated with the input, the switcher will use the router mnemonic name over the internal one. <i>Tip: A line break can be added to the name by entering a vertical bar, or pipe, symbol () where you want the break. For example, entering CAM 1 would be CAM and then 1 on a separate line. Note that the symbol does take up a character slot in the name.</i>
Carbonite	Set up the mnemonic appearance of the source for the control panel you are using. Refer to your control panel documentation for more information on setting up mnemonics.
TouchDrive	
Icon	
Alpha	Link an alpha video feed to the video. If the input is the video or fill for an auto key, click the Alpha button and select the video source you want to use as the alpha. Refer to To Set Up an Auto Key Association on page 96 for information on setting up an auto key.
Device	Link an external device to a video input to allow remote control for that device.
GPO	Assign a GPI output to a video input. The GPI output is triggered with or before the source is taken on-air, depending on the Predelay setting. The GPI output can be used to trigger a video server to play before taking the server on-air. Refer to GPI Device Control on page 96 for information on assigning a GPI output to a video source.
Configure	Assign an FSFC or Delay to the input. Refer to Frame Sync and Format Conversion on page 111 for information on FSFC setup.
TSL (3.1/5)	Assign a TSL id to the input and set the tally state. Refer to To Assign a TSL ID to a Video Input on page 94 for information on assigning a TSL id to an input.

Setting	Description
Panel Follow	Select one of the custom panels to be shown on Live Assist when the source is selected. This can be used to have the DashBoard page for a camera control unit displayed when the camera source is selected. Refer to Custom Page Auto Follow on page 97 for information on setting up custom panels.

Setting	Description
Panel Follow	Select one of the custom panels to be shown on Live Assist when the source is selected. The pages for MediaManager are assigned to the Media-Store sources. Refer to Custom Page Auto Follow on page 97 for information on setting up custom panels.

To Set up an Internal Video Input

Internal sources are generated inside the switcher, such as matte backgrounds, Media-Store channels, and ME re-entries.

Click **Navigation Menu > Configuration > Inputs > Internal**



The internal sources are listed along the side and the various settings are listed across the top. Click the setting button for the source you want to set up to view the available settings.

Setting	Description
Label	Apply a custom name to the source. Enter a new name for each input you want to identify differently. The name is used to identify the input on the panel mnemonics and well as on menus.
Carbonite	Set up the mnemonic appearance of the source for the control panel you are using. Refer to your control panel documentation for more information on setting up mnemonics.
TouchDrive	
Icon	
Alpha	Link an alpha video signal to the video. The Media-Store channels have dedicated alpha channels that cannot be changed. Refer to To Set Up an Auto Key Association on page 96 for information on setting up an auto key.
Device	Link an external device to a video input to allow remote control for that device.
GPO	Assign a GPI output to a video input. The GPI output is triggered with or before the source is taken on-air, depending on the Predelay setting. The GPI output can be used to trigger a video server to play before taking the server on-air. Refer to GPI Device Control on page 96 for information on assigning a GPI output to a video source.

Source Names

Each video source in the switcher can be given a unique name. These names can be customized for how they appear on the mnemonics by adjusting the size or the font and the background color.

Note: If a TSL ID is assigned to a source, the switcher overwrites the source name on the MultiViewer and mnemonics with the TSL name. In DashBoard, the physical input is also shown below the TSL name. If there is no TSL name, or it has not been received yet, the source name is blank. For the labels on the MultiViewer, a combination of the TSL name and switcher source name can be used. The new TSL name is passed from the switcher to any downstream TSL devices.

To Set Up a Source Name

Source names appear on mnemonics, menus, and on the MultiViewer.

Note: Source names are restricted to eight characters in length.

1. Click **Navigation Menu > Configuration > Inputs > External** if you are setting up a physical input, or **Internal** if you are setting up an internal input.
2. Enter a new name in the **Label** field for the video input that you want to name.

Tip: A line break can be added to the name by entering a vertical bar, or pipe, symbol (|) where you want the break. For example, entering `CAM | 1` would be `CAM` and then `1` on a separate line. Note that the | symbol does take up a character slot in the name.

To Assign a TSL ID to a Video Input

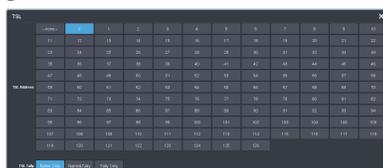
Pass router mnemonic names to the switcher with TSL ID data.

The switcher accepts incoming TSL data on TCP port 5727.

1. Click **Navigation Menu > Configuration > Inputs > External**



2. Click the **TSL** button for the input you want to assign a TSL ID to.



3. Select the **TSL Address** button for the TSL ID that applies to the selected input.
4. Click the **TSL Tally** button and select how the sources are tallied and which mnemonic name is use.
 - **Name Only** — TSL tally information for the selected ID is ignored. TSL mnemonic source names are used.
 - **Name&Tally** — source tallied on the MultiViewer based on the TSL input. TSL mnemonic source names are used.
 - **Tally Only** — source tallied on the MultiViewer based on the TSL input. TSL mnemonic source names are not used.

Note: If a TSL ID is assigned to a source, the switcher overwrites the source name on the MultiViewer and mnemonics with the TSL name. In DashBoard, the physical input is also shown below the TSL name. If there is no TSL name, or it has not been received yet, the source name is blank. For the labels on the MultiViewer, a combination of the TSL name and switcher source name can be used. The new TSL name is passed from the switcher to any downstream TSL devices.

Mnemonics

The mnemonic displays on the control panel show the name of the video source and can be customized for font size, color, and in some cases icons can be added. The customization that is available depends on the control panel you are using.

Note: The SoftPanel uses the Carbonite settings.

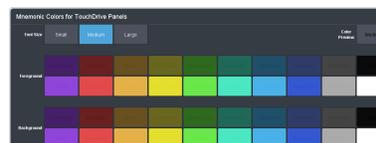
To Customize Mnemonics for TouchDrive

The TouchDrive control panels support RGB color mnemonics and icons.

1. Click **Navigation Menu > Configuration > Inputs > External** if you are setting up a

physical input, or **Internal** if you are setting up an internal input.

2. Click the **TouchDrive** button for the source you want to customize the mnemonics for.



Setting	Description
Font Size	Click Small , Medium , or Large to select the size of the font used on the mnemonic display. The larger the font, the fewer characters that are visible on the mnemonic.
Foreground	Click a Foreground button to select the color you want to apply to the text and icon on the mnemonic.
Background	Click a Background button to select the color you want to apply to the background on the mnemonic.

3. Click the **Icon** button for the source you want to customize the mnemonics for and click the icon you want to use.



To Customize Mnemonics for Carbonite Black

The Carbonite control panels support three-color mnemonics without icons.

1. Click **Navigation Menu > Configuration > Inputs > External** if you are setting up a physical input, or **Internal** if you are setting up an internal input.
2. Click the **Carbonite** button for the source you want to customize the mnemonics for.



Setting	Description
Font Size	Click Small , Medium , or Large to select the size of the font used on the mnemonic display. The larger the font, the fewer characters that are visible on the mnemonic.
Color	Click a Color button to select the color you want to apply to the mnemonic. The color is applied either to the background or the font, depending on the Inverse setting.
Inverse	Click an Inverse button to have the color applied to the background (No) or the text (Yes).

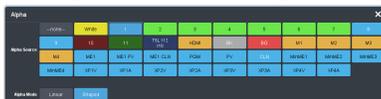
Auto Key Setup

An auto key allows you to associate a key alpha with a key video source in the switcher. When the video source is selected as a keyer, the key alpha is automatically used.

To Set Up an Auto Key Association

As well as input sources, internally generated sources, such as media-stores and color backgrounds, can be set up as an auto key.

1. Click **Navigation Menu > Configuration > Inputs > External** if you are setting up a physical input, or **Internal** if you are setting up an internal input.
2. Click the **Alpha** button for the key video source that you want to assign an alpha to.



3. Click the **Alpha Source** button for the source that you want to assign to the key video.
 - **--none--** — no alpha
 - **White** — uses internally generated white for the alpha
 - **XX** — assign the source on the selected input as a key alpha
 - **HDMI** — assign the HDMI™ input as a key alpha
 - **BK** — assign internal black as a key alpha
 - **BG** — assign the matte generator as a key alpha
 - **MX** — assign the video on Media-Store X as a key alpha
 - **MXA** — assign the alpha source on Media-Store X as a key alpha

- **PGM** — assign the main program output as the key alpha
- **PRV** — assign the main preview output as the key alpha
- **CLN** — assign the main clean feed output as the key alpha
- **MEX** — assign the program output of ME X as the key alpha
- **MEXPV** — assign the preview output of ME X as the key alpha
- **MEXCL** — assign the clean feed output of ME X as the key alpha
- **MiniMEX** — assign the output of MiniME™ X as the key alpha
- **XPXV** — assign the video on XPression channel X as the alpha
- **XPXA** — assign the alpha on XPression channel X as the alpha

4. Click an **Alpha Mode** button to select the alpha mode for the key alpha.
 - **Linear** — switcher performs a multiplicative key. The key alpha cuts a hole based on the gradient values of the alpha. Shades of gray are translated into transparency levels, giving the key a soft edge. Unshaped key alphas can also be considered true linear alphas.
 - **Shaped** — switcher perform an additive key. With shaped keys, the key alpha cuts a hole based on the monochrome value of the alpha. Shades of gray are translated into either white or black, giving the key a hard edge. Shaped Key alphas are sometimes used with Character Generators to cut very precise holes for the fill.

GPI Device Control

You can assign a GPI output to a video source for basic external device control. When a video source is taken on-air, the switcher can be set to trigger a GPI output, with a pre-delay. The external device can be set up to cue a clip, or load a page when it receives the GPI input trigger.

To Assign a GPI to a Video Source

Assign a GPI to a video source to trigger events on external devices.

1. Click **Navigation Menu > Configuration > Inputs > External** if you are setting up a

physical input, or **Internal** if you are setting up an internal input.

2. Click the **GPO** button for the video source that you want to assign a GPI output to.
If you are using the GPI to control the device, the video source should be the video output coming from the device.
3. Click the GPI output that you want to assign to the video source.



Note: You must have GPIs set as outputs to be able to assign them to the video source.

4. In the **Pre-delay** field, enter the pre-delay time, in frames, you want to use with the GPI output.

When you transition a video source with a GPI assigned to it, and the Roll Clip feature is active, the switcher triggers the GPI output, and then waits the pre-delay time before performing the transition. The length of the pre-delay is usually the length of time your video server requires to start playing a clip or your character generator requires to load a page.

Tallies Setup

Tallies are simple contact closure relays that the switcher uses to signal other devices, and users, that a particular video or audio source is on-air. Typically, tallies are used to light a red light on a camera to show people that they are on-air and what camera they should be looking at.

Note: Tallies are tied to the On-Air setting for the bus the source is selected on. If the bus is not set to be tallied as on-air, the tallies for the sources selected on that bus do not trigger. Refer to [On-Air Setting](#) on page 104 for information on setting the on-air status.

To Assign a Tally to an Input

Tallies are assigned to inputs and are triggered when that input is selected on a bus that is on-air or is going on-air, or when selected on a specific bus or mix.

1. Click **Navigation Menu > Configuration > GPIO / Tally > Tally**



2. Click **Add Tally** to add a new tally.

Tip: If you are editing a tally, skip to the next step and click the buttons on the table directly.



3. Click the **Tally** button and select the tally you want to assign an input and output to.



Tip: Select **--none--** to remove an entry from the table.

4. Click the **Input** button and select the input you want to assign to the tally.



- **Video** — select a video source that you want to tally.
- **Audio** — select an audio source that you want to tally. Audio source must be contributing to the mix (above -128db) and not be muted.

5. Click the **Output** button and select the output you want to assign to the tally. This is the bus or mix that the input is selected on that will trigger the tally.

Note: Depending on the type of input you selected (audio or video), the output will show the video output buses or audio mixes.



6. Click **Save**.

Custom Page Auto Follow

DashBoard pages can be assigned to custom page buttons in Live Assist.

These custom pages can then be assigned to video inputs allowing Live Assist to auto follow

to these pages when that video input is selected. For example, you can assign a custom page to the DashBoard page that controls a robotic camera. You can then set that custom page to follow the input from that camera. Whenever you select that camera as a source, Live Assist will jump to the custom page for that camera.

Note: *PaneLink must be active in Live Assist for auto follow to function.*

To Assign a Page to a Custom Page Button

The custom page buttons on the Live Assist page can be assigned any custom page or node in DashBoard. This allows you to quickly access controls from another device on DashBoard from Live Assist on your current device.

1. Click **Navigation Menu > Configuration > System > Live Assist.**



2. Click on the **Address** drop-down list for the custom page button you want to assign to a page.
3. Select the connection or custom panel that you want to assign to the custom page button.
 - **All Connections** — expand the list and select the device and node that you want to assign to the custom page button. Some older DashBoard nodes from plug-ins may not display properly on the Live Assist buttons.

Note: *Do not assign the Live Assist page to a custom page on the same machine.*

- **Open Panels** — expand the list and select the open custom panel you want to assign to the list. You must have the custom panel running on DashBoard for it to appear in the list.

Tip: *Click **Clear** to remove the custom page and name assigned to that button.*

4. Click on the name field for the custom page button you are assigning a page to and enter a descriptive name for the custom page. The name appears on the button in Live Assist.

To Assign a Custom Page to Follow an Input

Assign a Live Assist custom page to follow a physical or internal video source.

1. Click **Navigation Menu > Configuration > Inputs > External** if you are setting up a physical input, or **Internal** if you are setting up an internal input.
2. Click the **Panel Follow** button for the input you want to assign a custom page to.



3. Click the custom page you want to assign to the input or click **none**.

Substitution Table

A substitution table allows you to specify a different source that will be taken on a bus when a specific source is selected on that bus. The substitution table requires either a MultiScreen or ME follow to be set up between the buses to trigger the substitution.

The substitution table can be used with the ME follows feature to create multilingual production feeds. For example, you can have ME 2 follow ME 1 to simultaneously produce multiple feeds. When a source is selected on ME 1, the same source is selected on ME 2. With the substitution table you can have it that when camera 1 is selected on ME 1 the follow will select camera 1 on ME 2 but the substitution table substitutes camera 4 for camera 1 on ME 2. Refer to [ME Follows](#) on page 104 for information on setting up ME follows.

When working with a MultiScreen setup, the substitution tables allow you to take pre-tiled sources from a CG or video server and have the switcher treat them as a single source across multiple areas or buses. When the first tile is selected on MiniME™ 1, the substitution table also selects the second tile on MiniME™ 2.

Keep the following in mind:

Keep the following in mind when working with substitution tables:

- When working with a MultiScreen, the bezel compensation and data doubling setting should be set up on the source generator.

- If you want to create a substitution for an auto-select key, you must set up a substitution for both the fill and the alpha.
- Selecting a crosspoint directly on a bus that has a substitution set up for it overrides the substitution. The substitution continues when a new source is selected on the leading bus.

To Set Up a Pre-Tiled Source

The substitution table is a single table that allows you to specify a different source that should be taken when a specific source is selected on a bus. The substitution table requires either a MultiScreen or ME follow to be set up between the buses to trigger the substitution.

Tip: When you select the Source on the ME/Bus, the Substitution source is taken instead.

1. Click **Navigation Menu > Configuration > Inputs > Substitutional**.



2. Click **New ME Sub** or **New Bus Sub** to select the type of substitution table you want to set up.
 - **New ME Sub** — create a substitution on a MiniME™.
 - **New Bus Sub** — create a substitution on a key bus of an ME or MiniME™, or an aux bus.
3. Click the **Source** button and select the source that you want to substitute with another source.
4. Click the **ME** or **Bus** button and select the area that you want the substitution to occur on.
5. Click the **Substitution** button and select source you want to substitute for the selected one. Repeat for any addition substitutions you want to create.
6. Click **Save**.

Video Outputs

The HD-BNC and HDMI™ outputs can have any video source in the switcher, including Media-Store channels, aux bus, and clean feed assigned to them.

Video Output Setup

You can assign a video source or bus to an output BNC or the HDMI outputs. Some outputs can only be used for certain features. The MultiViewer outputs are only available on output BNCs 5 and 6 and the HDMI™ outputs.

In addition to the external inputs on the BNCs and HDMI™ ports, there are also internal input from XPression subsystem.

Depending on the model of system you have, you may be restricted on what sources can be assigned to each output.

Output BNC	GRAPHITE -4RU -1ME-5IN	GRAPHITE -4RU -1ME-9IN	GRAPHITE -4RU -2ME-9IN	GRAPHITE -4RU -2ME-13IN
Output 1	any source (no MV)			
Output 2	any source (no MV)			
Output 3	only duplicate of Output 1 or Output 2	any source (no MV)		
Output 4	only duplicate of Output 1 or Output 2	any source (no MV)		
Output 5	only duplicate of Output 1 or Output 2, or MV1	any source (MV1 only)		
Output 6	only duplicate of Output 1 or Output 2, or MV2	any source (MV2 only)		
HDMI1	only duplicate of Output 1 or Output 2, or MV1		any source (MV1 only)	
HDMI2	only duplicate of Output 1 or Output 2, or MV2		any source (MV2 only)	

To Set up an External Video Output

Assign video sources or buses to the output HD-BNC or HDMI™ ports. Some outputs are fixed to a specific video signal.

1. Click **Navigation Menu > Configuration > Outputs > External**.



- **Output X** — video output BNCs 1-6.
- **HDMI X** — HDMI™ output 1-2.

2. Click on the **Source** button for the output that you want to assign a source to.

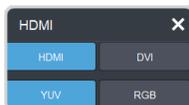


3. Click the video source that you want to assign to the output.
 - **Physical** — the physical inputs to the switcher on the input BNCs.
 - **XX** — output XX
 - **Internal** — the internally generated sources of the switcher (ME, MiniME™, chroma key outputs, etc.).
 - **BK** — black
 - **BG** — matte generator
 - **MX** — Media-Store video channel X
 - **MXA** — Media-Store alpha channel X
 - **MEXMW** — Media-Store video channel used for MediaWipe effects on ME X (if installed)
 - **MEXMA** — Media-Store alpha channel used for MediaWipe effects on ME X (if installed)
 - **MinMEX** — main program output of MiniME™ X
 - **PGM** — main program output of the switcher
 - **PRV** — main preview output of the switcher
 - **CLN** — clean feed for main program of switcher
 - **MEX** — main program output of ME X (if installed)
 - **MEX PV** — main preview output of ME X (if installed)

- **MEXCLN** — clean feed output of ME X (if installed)
- **Aux Follows** — the aux buses.
 - **AUXXX** — output of aux bus XX
- **ME Follows** — the background, preset, and key buses of each ME.
 - **MEXBg** — source on background of ME X (if installed)
 - **MEXPst** — source on preset output of ME X (if installed)
 - **MEXKYV** — key Y video of ME X (if installed)
 - **MEXKYA** — key Y alpha of ME X (if installed)
- **MiniME Follows** — the background, preset, and key buses of each MiniME™.
 - **MMXBg** — source on background of MiniME™ X
 - **MMXPst** — source on preset output of MiniME™ X
 - **MMXKYV** — key Y video of MiniME™ X
 - **MMXKYA** — key Y alpha of MiniME™ X
- **MultiScreen Follows** — the background, preset, and key buses of each MultiScreen.
 - **MSXBg** — source on background of MultiScreen X
 - **MSXPst** — source on preset output of MultiScreen X
 - **MSXKYV** — key Y video of MultiScreen X
 - **MSXKYA** — key Y alpha of MultiScreen X

Note: The MiniME™ preset only shows the source that is selected on the preset bus for the MiniME™. This does not include keys or any video manipulation that is done if the MiniME™ is used as part of a MultiScreen.

4. Click the **HDMI** button for the HDMI™ output you want to set up and select the format/color-space for the video output signal.



- **DVI** — DVI video transmission format.

- **HDMI** — HDMI™ video transmission format.
- **RGB** — HDMI™ signal in RGB color-space
- **YUV** — HDMI™ signal in YCrCb color-space

5. In the **Label** column, enter a new name for each output you want to identify differently. The name is used to identify the output on the panel mnemonics as well as on menus.

To Set up an Internal Video Output

Assign video sources or buses to the internal outputs to XPression.

1. Click **Navigation Menu > Configuration > Outputs > Internal**.



Note: The **toXPxV** and **toXPxA** outputs are the keyed outputs that go to the input channels of XPression. The V is the video channel and A is the alpha channel.

- **toXPxV** — internal video link from the video output of the switcher subsystem to the video input of channel x in the XPression subsystem.
- **toXPxA** — internal video link from the alpha output of the switcher subsystem to the alpha input of channel x in the XPression subsystem.

2. Click on the **Source** button for the output that you want to assign a source to.



3. Click the video source that you want to assign to the output.
 - **Physical** — the physical inputs to the switcher on the input BNCs.
 - **XX** — output XX
 - **Internal** — the internally generated sources of the switcher (ME, MiniME™, chroma key outputs, etc.).
 - **BK** — black
 - **BG** — matte generator
 - **MX** — Media-Store video channel X

- **MXA** — Media-Store alpha channel *X*
- **MEXMW** — Media-Store video channel used for MediaWipe effects on ME *X* (if installed)
- **MEXMA** — Media-Store alpha channel used for MediaWipe effects on ME *X* (if installed)
- **MinMEX** — main program output of MiniME™ *X*
- **MMX PV** — main preview output of MiniME™ *X*
- **MMXCmb** — combined alpha of MiniME™ *X*
- **PGM** — main program output of the switcher
- **PRV** — main preview output of the switcher
- **CLN** — clean feed for main program of switcher
- **MEX** — main program output of ME *X* (if installed)
- **MEX PV** — main preview output of ME *X* (if installed)
- **MEX CLN** — clean feed output of ME *X* (if installed)
- **Aux Follows** — the aux buses.
 - **AUXXX** — output of aux bus *XX*
- **ME Follows** — the background, preset, and key buses of each ME.
 - **MEXBg** — source on background of ME *X* (if installed)
 - **MEXPst** — source on preset output of ME *X* (if installed)
 - **MEXKYV** — key *Y* video of ME *X* (if installed)
 - **MEXKYA** — key *Y* alpha of ME *X* (if installed)
- **MiniME Follows** — the background, preset, and key buses of each MiniME™.
 - **MMXBg** — source on background of MiniME™ *X*
 - **MMXPst** — source on preset output of MiniME™ *X*
 - **MMXKYV** — key *Y* video of MiniME™ *X*
 - **MMXKYA** — key *Y* alpha of MiniME™ *X*
- **MultiScreen Follows** — the background, preset, and key buses of each MultiScreen.

- **MSXBg** — source on background of MultiScreen *X*
- **MSXPst** — source on preset output of MultiScreen *X*
- **MSXKYV** — key *Y* video of MultiScreen *X*
- **MSXKYA** — key *Y* alpha of MultiScreen *X*

Note: The MiniME™ preset only shows the source that is selected on the preset bus for the MiniME™. This does not include keys or any video manipulation that is done if the MiniME™ is used as part of a MultiScreen.

4. In the **Label** column, enter a new name for each output you want to identify differently. The name is used to identify the output on the panel mnemonics as well as on menus.

Ancillary Data

Ancillary data is information such as closed captioning or embedded audio that is included in the non-active video portions of the video signal. These portions include the Horizontal Ancillary Data Space (HANC) and Vertical Ancillary Data Space (VANC).

The switcher can be configured to strip or pass this data from the video output. The amount of data, and how it is stripped, depends on the video format of the video signal.

Note: FSFCs strip embedded audio data from the video signal.

The following restrictions apply to ancillary data being included in the output:

- All ME program buses pass ancillary data.
- MultiViewer outputs do not include any ancillary data.
- MiniME™ and MultiScreen outputs do not include any ancillary data unless an ME with ancillary data is re-entered onto the background bus.
- ME Preview does not include ancillary data unless the background is not selected as part of the next transition.
- A MiniME™ or MultiScreen can include ancillary data if an ME is re-entered onto the background.
- Any format conversion on the input video signal.
- Setting ancillary data to be stripped.

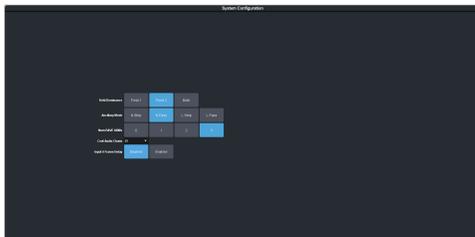
Table 1: Last Line of Vertical Ancillary Data

Video Format	Normal Strip/Pass	Long Strip/Pass
480i	19	21
576i	22	24
720p	25	25
1080i	20	20
1080p	41	41

To Strip or Pass Ancillary Data

Strip or pass ancillary data on video outputs. Video manipulation such as FSFC conversion automatically strips ancillary data from the video signal.

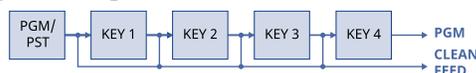
1. Click **Navigation Menu > Configuration > System > Global**.



2. Click an **Ancillary Mode** button to select whether ancillary data is stripped or passed.
 - **N Strip** — ancillary data is stripped
 - **N Pass** — ancillary data is passed unmodified
 - **L Strip** — ancillary data and some lines of active video are replaced with black
 - **L Pass** — ancillary data and some lines of active video are passed unmodified

FlexiClean Clean Feed

FlexiClean clean feed provides a second program output per ME that is derived from a different point in the video layering than the standard program output. The clean feed can be set to come before any key in the video layering for an ME. This allows you to remove particular keys without affecting the primary program output.



Keep the following in mind:

Keep the following in mind when working with clean feeds:

- Recalling a memory register using MemoryAI may cause the clean feed output to look different than expected. MemoryAI allows key elements to be recalled to other keys than originally resulting in different key layering.

To Set Up Clean Feed

Clean Feed can be taken before any or all of the keyers on an ME. This allows you to have a secondary output of an ME without any branding for re-broadcast or archival.

1. Click **Navigation Menu > Configuration > System > ME**.



2. Click an **ME X Clean Feed** button to select which key the clean feed for that ME is taken before.

The selected key, and all keys after it, are not included in the clean feed output.

External Layer Mode

The clean feed for an ME is used to create a composite alpha from the keyers on that ME that is then available as a single alpha source. This allows you to output both the video and alpha from an ME to an external switcher. The key video comes from the output of the ME and the key alpha comes from the clean feed of the ME.

The alphas that are included in the layer mode output are set with the keyer buttons in the next transition area. Toggle a keyer button on to include the alpha from that keyer in the layer mode output.

When layer mode is turned on for an ME, you are restricted to cut, dissolve, and wipe transitions. MediaWipe and DVE transitions are not available.

Tip: To use layer mode internally, select the clean feed for the ME that is set to layer mode as the alpha for an auto key on another ME or a MiniME™.

To Set Up Layer Mode

Use the clean feed to output a composite alpha of the keys on that bus.

1. Click **Navigation Menu > Configuration > System > ME**.



2. Click an **ME X Layer Mode** button to turn layer mode on (**On**), or (**Off**) for that ME.

ME Follows

An ME or MiniME™ can be linked to another ME or MiniME™ so that actions performed on the first are duplicated on the following. Linking can only be set between areas of the same type. You cannot have a MiniME™ follow an ME.

Tip: The ME follows can also be used with the substitution table feature to create multilingual production feeds. For example, you can have ME 2 follow ME 1 to simultaneous produce multiple feeds. When a source is selected on ME 1, the same source is selected on ME 2. With the substitution table you can have it that when camera 1 is selected on ME 1 the follow will select camera 1 on ME 2 but the substitution table substitutes camera 4 for camera 1 on ME 2.

Keep the following in mind:

Keep the following in mind when working with ME Follows:

- You cannot have a MiniME™ follow an ME.
- There must be available resources for the following ME or MiniME™.
- Memories and resets are also performed on the following ME or MiniME™.
- Chroma Key initialization is only performed on the leading ME or MiniME™. The following ME or MiniME™ get the same chroma key parameters as the leading ME or MiniME™. If you are substituting the source on the following ME or MiniME™ the chroma key will not be initialized properly for that source.
- You must turn the MultiScreen off to be able to set the follows for the MiniME™.
- You cannot cascade/re-enter follows. For example, if MiniME™ 1 is following MiniME™ 2, MiniME™ 2 cannot be set to following anything and no other MiniME™ can follow MiniME™ 1.

To Set Up an ME Follow

Set an ME or MiniME™ to follow another ME or MiniME™. Actions on the first ME or MiniME™ are duplicated on the following ME or MiniME™.

1. Click **Navigation Menu > Configuration > System > ME**.



2. Click the **ME XFollow** or **MiniME XFollow** button for the ME that you want ME or MiniME™ X to follow.

For example, click **ME 2** in the **ME 1 Follow** row to have actions performed on ME 2 duplicated on ME 1.

Note: The MiniME™ follows are only available if the MiniME™ is not being used for a MultiScreen. You must turn the MultiScreen off to be able to set the follows for the MiniME™.

Tip: Select **Off** to have the ME or MiniME™ not follow anything.

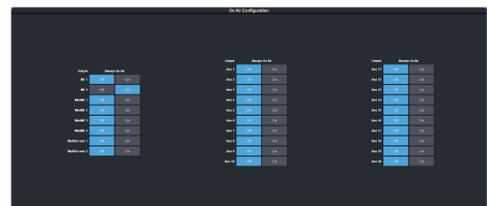
On-Air Setting

Some switcher outputs can be set to be considered on-air or not. This allows you to set which outputs are tallied, how resource allocation is divided, and how the Roll Clip feature works.

To Set the On-Air Status for an Output

Set an output to be on-air to tally sources that are selected on that bus.

1. Click **Navigation Menu > Configuration > On Air**.



2. Click an **Always OnAir** button for an output to select whether the output is considered on-air (**On**) or not (**Off**).

Tip: Setting an output to be always on-air tallies sources that are selected on that bus, or are going to be taken on-air with the next transition.

MultiViewer

The MultiViewer allows you to view multiple video sources from a single output. Video inputs or outputs on the switcher, including Program, Preview, and Media-Store channels, can be assigned to any box on the MultiViewer.

A time-clock can be added as an overlay to the MultiViewer showing either system time or time code.

Keep the following in mind:

Keep the following in mind when working with a MultiViewer:

- The MultiViewer outputs can only be assigned to output BNCs 5 and 6 or the HDMI outputs.
- Inputs are displayed with a red border when they are on-air. A green border is displayed when the input is selected on the Preset bus.

MultiViewer Output Formats

Depending on the format the switcher is operating in, the MultiViewer may output a different video format than the switcher is operating in.

Switcher Video Format	MultiViewer Format
480i	1080i 59.94Hz
576i	1080i 50Hz
720p 50Hz	720p 50Hz
720p 59.94Hz	720p 59.94Hz
1080i 50Hz	1080i 50Hz
1080i 59.94Hz	1080i 59.94Hz
1080pSF 23.98Hz	1080pSF 23.98Hz*
1080pSF 25Hz	1080i 50Hz
1080pSF 29.97Hz	1080i 59.94Hz
1080p 25Hz	1080p 25Hz
1080p 29.97Hz	1080p 29.97Hz
1080p 50Hz	1080i 50Hz
1080p 59.94Hz	1080i 59.94Hz

Note: * For the HDMI™ output the MultiViewer output is set to 1080p 23.98Hz

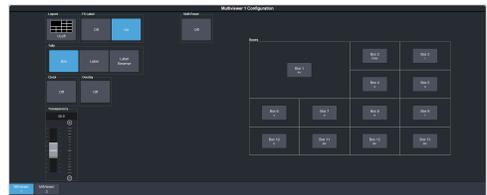
To Set Up a MultiViewer

Note: A MultiViewer must be assigned to a video output to be usable.

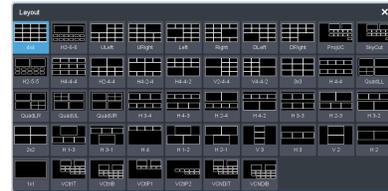
Note: The available layouts and feature depend on the video format the switcher is operating in, the MultiViewer output, and the number of boxes in the layout being used.

1. Click **Navigation Menu > Configuration > MultiViewers** and click the **MultiViewerX** button for the MultiViewer you want to set up.

Tip: The number of MultiViewers that are available depends on the model of switcher you have.



2. Click the **Layout** button and select the arrangement of the boxes that you want to use for the selected MultiViewer.



3. Use the **Transparency** slider to adjust the transparency of the background behind the source label for the selected MultiViewer.
4. Apply an overlay to the MultiViewer as follows:

Note: The overlay feature is only available on MultiViewer outputs 1 and 2 when a layout of less than 16 boxes is used and the switcher is not operating in a 3G video format.

- a) Click the **Overlay** button and click **On** to turn the overlay on, or **Off** to turn it off.

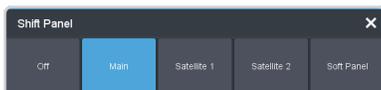
Tip: The overlay can be used to overlay a camera shot of a shot-clock over the MultiViewer output.

- b) Click the **Source** button for the video source that you want to overlay over the MultiViewer output.
- c) Use the **Clip** slider to adjust the clipping of the overlay source.

At **0%** the overlay source is completely opaque, and at **100%** it is completely transparent.

- Click a **Tally** button to select how boxes on the MultiViewer are tallied.
 - Box** — red or green border is shown around the outside of the MultiViewer box
 - Label** — red or green boxes are shown inside the label area of the MultiViewer box
 - Label Reverse** — the same as Label, but the placement of the tally boxes is swapped
- Click an **FS Label** button to select whether FSFC is shown on the source labels (**On**) or not (**Off**) when a FSFC is applied to the source.
- Click **Shift Panel** and select the panel that you want the MultiViewer shift to be active on. When the **Shift** button is pressed on the assigned control panel the MultiViewer shows the shifted sources.

Note: The shift function can only be assigned to a single panel at a time.



Tip: When the MultiViewer Shift is active, the box buttons on the layout show the shifted source in brackets.

- Click on one of the **Boxes** buttons and set up how that box appears on the MultiViewer in the standard and shifted configuration.



- Physical** — the physical inputs to the switcher on the input BNCs.
- Internal** — the internally generated sources of the switcher (ME, MiniME™, chroma key outputs, etc.).
- Aux Follows** — the aux buses.
- ME Follows** — the background, preset, and key buses of each ME.
- MiniME Follows** — the background, preset, and key buses of each MiniME™.
- MultiScreen Follows** — the background, preset, and key buses of each MultiScreen.

- Select how you want that box to appear on the MultiViewer.

Tip: Click **Apply to All** to have the settings for the current box applied to all boxes in MultiViewer. This does not include what video source is assigned to the box.

Option	Description
Green Tally	Turn the preview (green) tally for the box on or off.
Red Tally	Turn the program (red) tally for the box on or off.
Border	Turn the border around the box off (Off), white (White), or black (Black). When the border is turned off, some distortion may be visible around the edges of the box. Border is not available for ViewControl layouts.
Aspect	Turn aspect ratio markers for the box on (Aspect) or off (Off).
Shift Source	Turn the shifted source on (On) or off (Off) for the selected box. When the MultiViewer is shifted, the source in this box will not change.
Label	Turn source labels for the box off, or on in a selected position.
Display	Select what name is shows on the label. <ul style="list-style-type: none"> Fixed — show only the text entered in the Fixed Label field as the name. Switcher — show only the internal mnemonic name. Router — show only the TSL UMD name. Switcher and Router — show both the internal and TSL UMD name <p>Tip: If you select a source on an aux bus that does not have a TSL UMD name, the mnemonic name is used instead on the MultiViewer.</p>
Label Pos	Select a position for the source label for the box (Bottom or Top).
MultiSc X	Turn the MultiScreen overlay Off or On . The overlay shows what portions of the image are cropped to fit into the output of the MultiScreen.

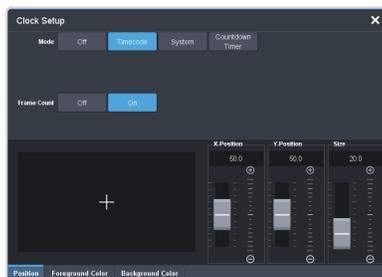
MultiViewer Clock

The clock can show the current system time, LTC data being sent to the switcher, or a countdown timer. The clock can only operate in a single mode at one time.

To Set Up a MultiViewer Timecode Clock

The timecode clock uses LTC data being sent to the switcher and displays it as (hh:mm:ss:ff).

1. Click **Navigation Menu > Configuration > MultiViewers** and select the MultiViewer that you want to apply the clock overlay to.
2. Click **Clock > Timecode**.



3. Click a **Frame Count** button to select whether the number of frames for a timecode is displayed (**On**) or not (**Off**).
4. Click the **Position** tab.
5. Use the **X Position**, **Y Position**, and **Size** sliders to position the clock and change the size.
6. Click the **Foreground Color** tab and select the color and transparency you want to use for the text of the clock.

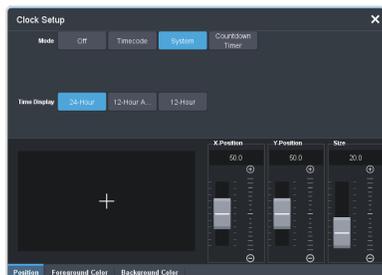


7. Click the **Background Color** tab and select the color and transparency you want to use for the background of the clock.

To Set Up a MultiViewer System Clock

The clock can show the current system time in 12-hour or 24-hour format (hh:mm:ss).

1. Click **Navigation Menu > Configuration > MultiViewers** and select the MultiViewer that you want to apply the clock overlay to.
2. Click **Clock > System**.



3. Click a **Time Display** button to set how the time is displayed.
 - **24 hr** — time is displayed in 24-hour format.
 - **12 hr** — time is displayed in 12-hour format without am/pm.
 - **12 hr AM/PM** — time is displayed in 12-hour format with am/pm.
4. Click the **Position** tab.
5. Use the **X Position**, **Y Position**, and **Size** sliders to position the clock and change the size.
6. Click the **Foreground Color** tab and select the color and transparency you want to use for the text of the clock.

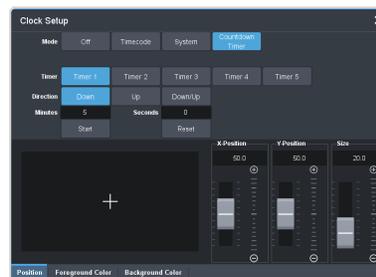


7. Click the **Background Color** tab and select the color and transparency you want to use for the background of the clock.

To Set Up a MultiViewer Countdown Timer

The clock can show a countdown timer that will count down from a set time to 0, up from 0, or down from a set time to 0 and then up.

1. Click **Navigation Menu > Configuration > MultiViewers** and select the MultiViewer that you want to apply the clock overlay to.
2. Click **Clock > Countdown Timer**.



3. Click a **Timer** button to select which countdown timer you want to use. Each timer can be set up differently.

Note: *Timer are shared across all MultiViewers.*

4. Click a **Direction** button to select the direction that the times counts in.
 - **Down** — enter a time in the **Minutes** and **Seconds** field that the timer will start

counting down from. The timer stops when it reaches 0.

- **Up** — the timer counts up from 0 until stopped.
- **Down/Up** — enter a time in the **Minutes** and **Seconds** field that the timer will start counting down from. The timer counts down to 0 and then starts counting up until stopped.

*Tip: You can manually control the countdown timer using the **Start** and **Reset** buttons, or assign these commands to custom controls.*

5. Click the **Position** tab.
6. Use the **X Position**, **Y Position**, and **Size** sliders to position the clock and change the size.
7. Click the **Foreground Color** tab and select the color and transparency you want to use for the text of the clock.



8. Click the **Background Color** tab and select the color and transparency you want to use for the background of the clock.

MultiScreen / MiniME™

The MultiScreen allows you to output multiple video signals that can be combined into a single scene. The switcher treats the multiple outputs as a single background and translates the keys across the multiple backgrounds.

Tip: For information on pre-tiled sources, refer to [Substitution Table](#) on page 98.

Keep the following in mind:

Keep the following in mind when setting up a MultiScreen environment.

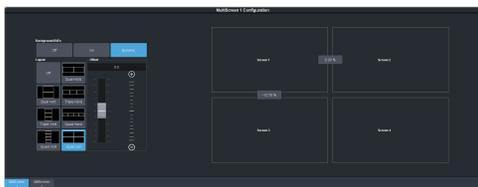
- The MultiScreen uses MiniME™ resources to provide the outputs. This allows you to have up to two DVE keys per screen of the MultiScreen. As a key crosses from one screen to the next, a key from either of the MiniME™ outputs is being used to provide the two halves of the key.
- MultiScreen does not support chroma keys.
- The MultiScreen can either take separate parts of a pre-tiled source, or scale a single source to the size of the MultiScreen output. When you use a pre-tiled source, you must assign sources to each MiniME™ that is used in the MultiScreen. This substitution table allows you to select a single source on the MultiScreen program bus and the switcher automatically assigns the required source to each MiniME™.

MiniME™ Assignment

Each MiniME™ output is pre-assigned to a screen on the MultiScreen layout. MiniME™ 1 and 2 are assigned to MultiScreen 1 and MiniME™ 3 and 4 are assigned to MultiScreen 2. If you select a layout that uses more than two screens, the MiniME™ resources that were assigned to MultiScreen 2 are assigned to MultiScreen 1.

To Set Up a MultiScreen

1. Click **Navigation Menu > Configuration > Canvases**.



2. Click **MultiScreen X** to select the MultiScreen you want to set up.
3. Click a **Layout** button to select the layout you want to use.

Note: The available layouts depend on the number of screens being used by the other MultiScreen.

4. Click **Yes** to confirm.
5. Click a **Background DVEs** button to select how DVE resources are used to scale sources for the MultiScreen screens.
 - **Off** — DVE resources are not allocated to the MultiScreen for scaling of background sources.
 - **On** — DVE resources are always allocated to the MultiScreen for scaling of background sources. This reduces the number of available DVE resources to the switcher when a MultiScreen is turned on.
 - **Dynamic** — DVE resources are dynamically allocated to the MultiScreen for scaling of background sources if there is no substitution table.

Note: If there are no DVE resources to scale the background source across the entire MultiScreen, the switcher needs a substitution table to map separate inputs to the MultiScreen screens or the selected source is repeated in each screen of the MultiScreen.

6. Click **OK**.
7. Use the **Offset** slider to adjust the placement of the background scaling in the MultiScreen output.

This can be used to adjust for the aspect ratio difference between the input video and the MultiScreen output.

8. Click on the button between the two boxes to adjust the size of the edge between those two screens.



9. Use the **Edge Distance** slider to adjust the size of the gap between the MultiScreen screens.

- If you are using monitors for your MultiScreen display, you can use a positive value to compensate for the bezel on the outside of a display.
- If you are using projectors for your MultiScreen display, you can use the negative value to compensate for the amount of overlap of the projected images.

10. If you selected a negative distance, click an **Edge Blending** button to turn edge blending on (**On**) or off (**Off**).



11. If the edge blending is on, use the **Smoothness** and **Gamma Correction** sliders to correct for the overlap in projected images.
 - **Smoothness** — adjust the appearance of the transition area between the overlapping images.
 - **Gamma Correction** — adjust the gamma correction applied to the overlapping images to match the output of your projectors.
12. Repeat the edge adjustment for all other edges in your layout.

Frame Sync and Format Conversion

The switcher has multiple input frame synchronizer / format converter (FSFC) and input de-interlacers that can be used to convert video input signals to the format that the switcher is operating in, as well as correct mistimed, or drifting, video input signal. The frame synchronizers cannot completely correct badly formatted video, mistimed switches, signal drops, or similar issues.

Each FSFC channel maintains a separate setting for different video formats. This lets you change between video formats without losing FSFC channel configurations.

Keep the following in mind:

Keep the following in mind when working with Frame Synchronizers and Format Converters:

- If a video format not compatible with the currently defined conversion is used, the video image is frozen with the last successfully processed image frame.
- FSFCs create a one-frame delay in the video output of the switcher for the video signal being converted.
- FSFCs strip embedded audio data from the video signal. Ensure that no FSFC channels are assigned to any input or bus you are using with external audio mode.
- FSFCs are fixed to the first 6 input BNCs
- The FSFCs used in the switcher conform to the SMPTE ST 125:2013 standard. Some older equipment may not fully conform to the current standards and can send out-of-spec video to the switcher which can have unexpected results. Ensure that video coming into the switcher conforms to current standards, especially with regard to 480i video signals with variable blanking sizes.

Supported FSFC Video Formats

FSFCs can only convert between specific video formats at a given frequency. The available conversions also depends on the switcher mode you are in.

- The switcher supports synchronized and unsynchronized 1080p and 1080i inputs. The 1080i inputs are converted using a 4-line

interpolator and may result in lower quality video.

Table 2: Supported FSFC Input and Output Formats

Input	Switcher	Output
1080p 59.94Hz	1080p 59.94Hz	1080p 59.94Hz
1080i 59.94Hz		
720p 59.94Hz		
1080p 50Hz	1080p 50Hz	1080p 50Hz
1080i 50Hz*		
720p 59.94Hz		
1080p 29.97Hz	1080p 29.97Hz	1080p 29.97Hz
1080p 59.94Hz**		
1080p 25Hz	1080p 25Hz	1080p 25Hz
1080p 50Hz**		
1080i 59.94Hz	1080i 59.94Hz	1080i 59.94Hz
1080p 59.94Hz		
720p 59.94Hz		
480i		
1080i 50Hz	1080i 50Hz	1080i 50Hz
1080p 50Hz		
720p 50Hz		
576i 50Hz		
720p 59.94Hz	720p 59.94Hz	720p 59.94Hz
1080p 59.94Hz		
720p 50Hz	720p 50Hz	720p 50Hz
1080p 50Hz		
576i	576i 50Hz	576i
1080p 50Hz		
1080i 50Hz		
720p 50Hz		
480i	480i 59.94Hz	480i
1080p 59.94Hz		
1080i 59.94Hz		
720p 59.94Hz		

Notes

- * Converted using either a simple line-doubler or 4-line interpolater and may result in lower quality video.

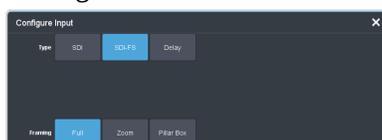
- ** Converted by dropping frames and may result in lower quality video.

To Set Up an Input FSFC

The conversion that is available depends on the format the switcher is operating in and the input that is being converted.

Note: FSFCs are fixed to the first 6 input BNCs

1. Click **Navigation Menu > Configuration > Inputs > External**.
2. Click the **Configure** button for the input you want to assign an FSFC to.



3. Click a **Type** button to turn on the FSFC.
 - **SDI** — no FSFC is applied to the input.
 - **SDI-FS** — an FSFC is applied to the input.

4. If required, select the aspect ratio conversion mode you want to use.

The options that are available depend on the video format that the switcher is converting from and to.

- **Full** — The video signal is scaled disproportionately to fill the display of the new aspect ratio. Aspect distortion occurs as the image is stretched/compressed to fit in the new aspect ratio.
- **Zoom** — The central portion of the video signal is zoomed to fill the display of the new video format. No aspect distortion is introduced but the edges of the video signal may be cropped.
- **Letter Box** — Black bars are added to the top and bottom of a 16:9 image to display correctly in a 4:3 video format.
- **Pillar Box** — Black bars are added to the right and left of a 4:3 image to display correctly in a 16:9 video format.

Aspect Ratio Conversion

Converting between standard-definition and high-definition video formats often requires converting between 4:3 and 16:9 aspect ratios. The switcher support Full, Zoom, Letterbox, and Pillarbox conversions.

In 480i and 576i video formats you can use either a 4:3 or 16:9 aspect ratio.

Full

The video signal is scaled disproportionately to fill the display of the new aspect ratio. Aspect distortion occurs as the image is stretched/compressed to fit in the new aspect ratio.

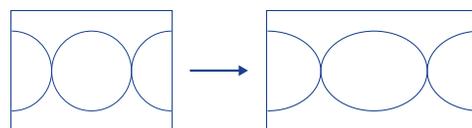


Figure 10: 4:3 to 16:9 Full Aspect Ratio Conversion

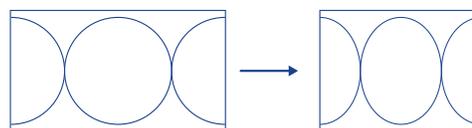


Figure 11: 16:9 to 4:3 Full Aspect Ratio Conversion

Zoom

The central portion of the video signal is zoomed to fill the display of the new video format. No aspect distortion is introduced but the edges of the video signal may be cropped.

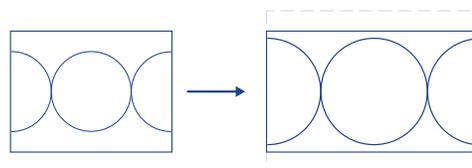


Figure 12: 4:3 to 16:9 Zoom Aspect Ratio Conversion

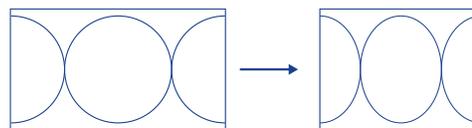


Figure 13: 16:9 to 4:3 Full Aspect Ratio Conversion

Letterbox

Black bars are added to the top and bottom of a 16:9 image to display correctly in a 4:3 video format.

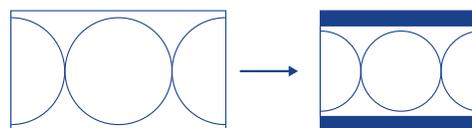


Figure 14: 16:9 to 4:3 Letterbox Aspect Ratio Conversion

Pillarbox

Black bars are added to the right and left of a 4:3 image to display correctly in a 16:9 video format.

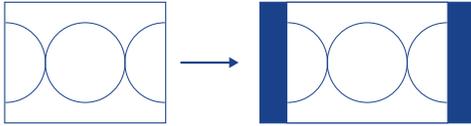


Figure 15: 4:3 to 16:9 Pillarbox Aspect Ratio Conversion

Frame Delays

A delay of up to 16 frames can be added to inputs 1-6. This allows you to delay the timing of an input to compensate for the delay in another source. For example, in a virtual set environment it may take a few frames for the system to track the position of the camera and render the background. In this case you want to delay the foreground cameras to compensate for this delay.

Keep the following in mind:

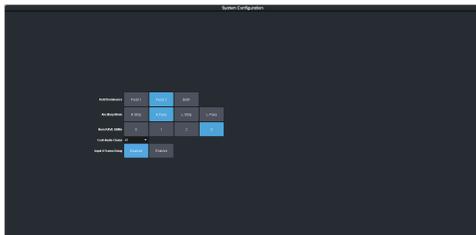
Keep the following in mind when working with frame delays:

- The frame sync functionality is disabled when a frame delay is applied to an input.
- Input 6 Frame Delay shares cache resources with Media-Store channels 2 and 4. If you enable the Frame Delay for input 6 the amount of cache available for Media-Store channels 2 and 4 is reduced.

To Enable Input 6 Frame Delay

The frame delay for input 6 consumes some of the cache used for Media-Store channels 2 and 4. You can disable the frame delay to increase the cache for the Media-Store channels.

1. Click **Navigation Menu > Configuration > System > Global.**



2. Click the **Input 6 Frame Delay** button to enable or disable the frame delay for input 6.
 - **Disabled** — frame delay for input 6 is not available and available cache for Media-Store channels 2 and 4 increases.
 - **Enabled** — frame delay for input 6 is available and available cache for Media-Store channels 2 and 4 decreases.

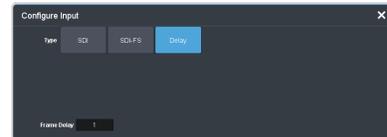
To Apply a Frame Delay to an Input

Delay a video signal coming into the switcher.

Note: A delay can only be applied to the first 6 input BNC.

Note: The **Input 6 Frame Delay** must be **Enabled** before you can apply a frame delay to input 6.

1. Click **Navigation Menu > Configuration > Inputs > External.**
2. Click the **Configure** button for the video input (1-6) you want to apply a delay to.
3. Click **Delay.**



4. In the **Frame Delay** field enter the amount of delay to apply to the input.

Audio Breakout Module Setup

The 1RU Audio Breakout Unit (ABU) provides the audio inputs and outputs for the switcher. A video loop between the switcher and the 1RU Audio Breakout Unit passes all audio signals.



Important: Ensure that Phantom Power is turned off for the Analog Input unless you are connecting a microphone that requires phantom power. Connecting the line out from an audio device to the analog input with phantom power on could damage the audio device and/or the 1RU Audio Breakout Unit. For added safety, a TRS phone connector should be used for line in audio sources.

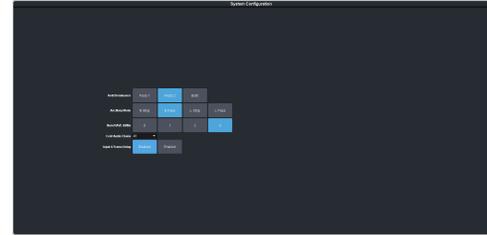
Note: Some TRS jack plug adapters may introduce bleed between the left and right channels.

The system must be set up for the number of 1RU Audio Breakout Units you want to connect (up to three). Each ABU connects to different IN and OUT BNCs on the 4RU Integrated Production System.

Table 3: ABU Cable Connections

	FRAME IN	FRAME OUT
ABU 1*	OUT 4	IN 12
ABU 2	OUT 3	IN 11
ABU 3	OUT 2	IN 10

Note: * Only the Tally and GPI ports on the first 1RU Audio Breakout Unit (ABU 1) are available. The Tally and GPI ports on the remaining 1RU Audio Breakout Units are not available for use.



2. Click a **Num RAVE ABMs** button to select the number of 1RU Audio Breakout Units connected to the system.

To Set Up Multiple 1RU Audio Breakout Units

The system can support up to 3 1RU Audio Breakout Units.

1. Click **Navigation Menu > Configuration > System > Global**.

Personality

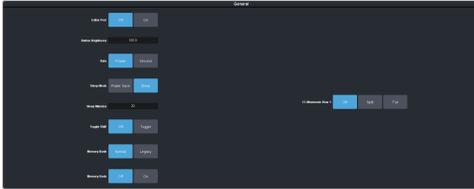
Personality settings allow you to configure how you interact with the control panel and switcher, as well as how the buttons on the control panel appear. All of these settings are stored in the Personality register.

Personality Settings

There are a number of settings for how the switcher will react to different situations, or how switcher elements appear to the operator. All these settings are grouped together into the Switcher Personality. These settings include double-press rates and sleep time, among others.

General Settings

- Click **Navigation Menu > Personality > General**, or **Transition** for the transition settings.



Personality	Description
Editor Port	Allow the switcher to be controlled by an external editor. The external editor can control the switcher to perform transitions, or recall memories, among the supported commands. This setting is for the frame. <ul style="list-style-type: none"> On — allow the switcher to be controlled by an external editor. Off — switcher ignores editor commands.
Button Brightness	Set the overall brightness (0-100%) of all the buttons on any physical control panel connected to the switcher. This setting is unique to the control panel.
Flex Button Brightness	Set the overall brightness (0-100%) of all the buttons on the Flex Control modules of the TD control panels. This setting is unique to the control panel.
Rate	Have the switcher use frames or seconds for transition rates. Rates are entered and displayed in the select selected values. This setting is unique to the control panel. <ul style="list-style-type: none"> Frames — transition rates are in frames. Seconds — transition rates are in seconds.

Personality	Description
Sleep Mode	have the switcher go into a sleep mode after a user-defined amount of time (Sleep Minutes) without user interaction. Touching any button, knob, or fader will wake the switcher. The switcher does not act on the button, knob, or fader control that wakes it from sleep mode. During sleep mode, video related hardware is not affected and video signals still pass through the switcher. This setting is unique to the control panel. <ul style="list-style-type: none"> Power Save — all buttons and displays are turned off and as much power is conserved as possible. Sleep — displays are turned off and buttons light in raindrop pattern.
Sleep Minutes	The amount of time that the switcher waits without user input before going into sleep mode. Setting the value to 0 (Off) prevents the switcher from entering sleep mode. This setting is unique to the control panel.
Toggle Shift	Have the Shift button either be latching (toggle) or momentary (off). When in toggle mode, you can press the shift button and then select a source on the shifted bus without having to hold down the shift button. This only affects the bus the shift button is on. This setting is unique to the control panel. <ul style="list-style-type: none"> Off — the Shift button only stays on as long as you are holding it down. Toggle — when you press the Shift button it stays on until you press a source button on that bus.
Memory Bank	Allows you to set how the BANK button behaves when pressed and released. This setting is unique to the control panel. <ul style="list-style-type: none"> Normal — the keypad is used to enter the bank number directly, followed by the memory (For example, to access memory 3 on bank 2, press BANK > 2 > 3.) Legacy — the next bank is selected every time the button is pressed, cycling through all banks (For example, to access bank 5, press BANK repeatedly until bank 5 is selected.)
Memory Undo	A memory recall can be reversed by pressing the memory number a second time after a memory is recalled. This is the same as pressing the UNDO button, if present on your control panel. This setting is unique to the control panel. <ul style="list-style-type: none"> Off — pressing the memory number again does not undo the recall. On — pressing the memory number again undoes the last memory recall.

Personality	Description
CC Mnemonic Row	<p>How you want the mnemonics on each panel row to display the mnemonics for custom controls.</p> <ul style="list-style-type: none"> • Off — the mnemonics don't change when the row is assigned to a custom control bank. • Split — the mnemonics are split (top to cc name and bottom to bus sources) when the row is assigned to a custom control bank. • Full — the mnemonics are show only the names of the custom controls when the row is assigned to a custom control bank.

Transition Settings

- Click **Navigation Menu > Personality > Transition**.



Personality	Description
Transition	<p>Have the next transition reset to a default background dissolve after each transition. This allows you to prevent the selections from the last transition from being accidentally included with the next transition. This setting is for the frame.</p> <ul style="list-style-type: none"> • No Reset — the next transition settings are not changed after a transition. • Reset — the next transition is reset to a background only transition after a transtion.
Next Transition	<p>Have the next transition buttons on the control panel latch when pressed (toggle). This setting is unique to the control panel.</p> <ul style="list-style-type: none"> • Off — press and hold all the buttons you want included in the next transition. All buttons must be pressed at the same time. • Toggle — press a button to toggle it on or off as being included in the next transition.

Personality	Description
Remove Keys	<p>Have a key removed from the next transition after it has been transitioned off-air using key Cut or Trans buttons. This allows you to transition a key off-air in an emergency and not have it accidentally transitioned back on-air with the next transition. This setting is for the frame.</p> <ul style="list-style-type: none"> • Off — key can remain part of the next transition when it is independently transitioned off-air. • On — key is removed as part of the next transition when it is independently transitioned off-air.
Background Double Press	<p>Have a double-press of the next transition background button select the background and all on-air keys as part of the next transition. This setting is unique to the control panel.</p> <ul style="list-style-type: none"> • Ignore — ignore the double-press of the next transition background button. • Transition Clear — set the next transition to include the background and only the on-air keys. If an off-key is selected as part of the next transition it is deselected.
ME Auto Trans Double Press	<p>Set what action is performed when the auto transition button is pressed again during a transition. This setting is for the frame.</p> <ul style="list-style-type: none"> • Halt Forward — the transition is halted and then continues in the same direction when the transition button is pressed again. • Reverse — the transition immediately reverses directions when the transition button is pressed. • Halt Reverse — the transition is halted and then reverses directions when the transition button is pressed again. • Cut — the transition immediately cuts back to the initial state when the transition button is pressed. • Ignore — the button press is ignored and the transition continues.

Personality	Description
Key Auto Trans Double Press	<p>Set what action is performed when the independent key auto transition button is pressed again during a transition. This setting is for the frame.</p> <ul style="list-style-type: none"> • Halt Forward — the transition is halted and then continues in the same direction when the transition button is pressed again. • Reverse — the transition immediately reverses directions when the transition button is pressed. • Halt Reverse — the transition is halted and then reverses directions when the transition button is pressed again. • Cut — the transition immediately cuts back to the initial state when the transition button is pressed. • Ignore — the button press is ignored and the transition continues.
Roll Clip	<p>Set whether the roll clip feature is always on, or must be turned on manually. This setting is for the frame.</p> <ul style="list-style-type: none"> • User — the roll clip feature must be turned on manually. • Force — the roll clip feature is always on.

Tip: You can load a pre-loaded color scheme and then modify the colors and save it as a custom color scheme. You cannot save your modifications back to the pre-loaded color scheme.

To Create a Custom Color Scheme

A custom color scheme can be created and used instead of one of the pre-loaded color schemes. This setting is unique to the control panel.

1. Click **Navigation Menu > Personality > Color Scheme**.



2. In the **Modify Scheme** area, click the ME, MiniME™, MultiScreen, or aux that you want to change the color for.

*Tip: Click **Change All** to change the color of all the areas at once. They will all use the selected color.*

3. Use the color picker to select the new color you want to use and click **Ok**.



*Tip: Click **Live** to have the color changes update in real time on the control panel.*

4. In the **Unique Key Color** area select how you want the keyer buttons on the control panel to be colored.
 - **Off** — the keyer buttons use the same color as their ME, MiniME™, or MultiScreen.
 - **On** — the keyer buttons use the unique colors assigned to each key. Click the key that you want to change the color for and use the color picker to change the color.
5. Click a **Custom X** button to store your color scheme to that location.
6. Click **Yes**.

Color Schemes

The buttons on the control panel glow with different colors specific to their state, function, and assignment. This color can be selected from a list of pre-set color schemes, or a custom color can be selected. Up to four (4) custom color schemes can be saved on the switcher.

To Select a Color Scheme

ME, MiniME™, MultiScreen, aux buses, and keyers can be set to different colors by loading one of the pre-installed color scheme. This setting is unique to the control panel.

1. Click **Navigation Menu > Personality > Color Scheme**.



2. In the **Load Scheme** area, select the color scheme you want to use on the control panel.

Bus Maps

Any video input can be mapped to any source button on the control panel using a bus map. Each source button can have two inputs

assigned (a standard source and a shifted source).

To Create a Bus Map

The bus map assigns video sources to the buttons on the control panel.

Note: The bus map is unique to the control panel (Main, Sat 1, Sat 2, or Sat 3) and can only be set for that control panel.

1. Click **Navigation Menu > Personality > Bus Map**.



2. Click the source button that you want to assign a source to and select the source you want to assign to that button.

Tip: You must assign a button to the Shift function to be able to access those source buttons on the control panel.



Note: The sources that are available on your switcher may differ depending on the options you have installed and how your switcher is configured.

User Buttons

These buttons can be assigned to a number of functions, including ME and key selections, custom control, and memories. The number and position of the buttons on the control panel depend on the model of your control panel.

If a button is assigned to an ME, aux bus, MiniME™, MultiScreen, or chroma key, you can press and hold the button to be able to select a different ME, aux bus, MiniME™, MultiScreen, or chroma key from the key bus. If the user button is assigned to an Aux, it will allow you to select a different Aux.

To Set A User Button

1. Click **Navigation Menu > Personality > User Select**.

Note: The menu only shows the user buttons that are available on your control panel.



2. Click the user button that you want to assign a function to and select the function you want to assign to that button.

Tip: Each row on your control panel can have a separate set of user button assignment. These settings are tied to the row, and not the ME that is assigned to that row.



Note: The functions that are available on your switcher may differ depending on the options you have installed and how your switcher is configured.

GPI Control

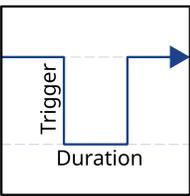
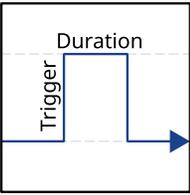
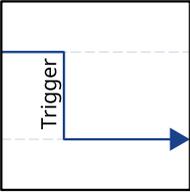
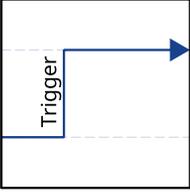
General Purpose Interface (GPI) is a high/low voltage signalling protocol that allows the switcher to send simple commands to an external device, or receive commands from a device. Each pin on the GPI is set as either high (+5 Volts), or low (0 Volts), and it is the switching between high and low that sends commands to the external device, or to the switcher.

Note: The Tally and GPI ports are located on the first 1RU Audio Breakout Unit (ABM 1). The Tally and GPI ports on the remaining 1RU Audio Breakout Units are not available for use.

GPI Trigger Types

There are four trigger types supported by the switcher. These can be either output triggers, or input triggers.

Table 4: Trigger Types

Trigger	Description	
Low Edge	The output level is set high, and momentarily goes low for the trigger.	
High Edge	The output level is set low, and momentarily goes high for the trigger.	
Low Level	The output level toggles from the base high level to the low level. The output signal remains at this level until reset.	
High Level	The output toggles from the base low level to the high level. The output signal remains at this level until reset.	

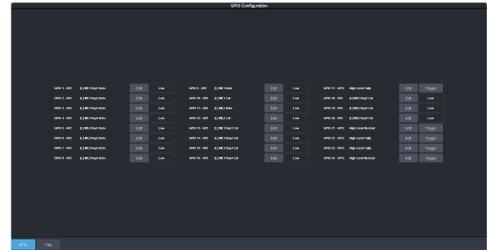
GPI Setup

Each GPI pin on the switcher can be configured as either an input, or an output. By default, all GPIs are set as inputs.

To Set Up a GPI Input

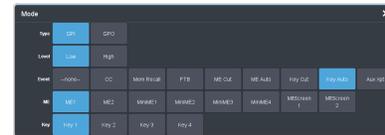
The switcher requires a Low Edge GPI input trigger.

1. Click **Navigation Menu > Configuration > GPIO / Tally > GPIO**.



Tip: The field next to the **Edit** button shows the current state of the GPI input (**High/Low**). High is the resting state. The GPI input must be taken low to trigger.

2. Click **Edit** for the GPI that you want to configure as an input.
3. Click **GPI**.



4. Click a **Level** button to select that state the GPI should be in to trigger an event. You can have events trigger on both **High** and **Low**.
 - **Low** — the event is triggered when the GPI goes low.
 - **High** — the event is triggered when the GPI goes high.
5. Click the **Event** button for the action you want to assign to the selected GPI when it is at the selected level state.

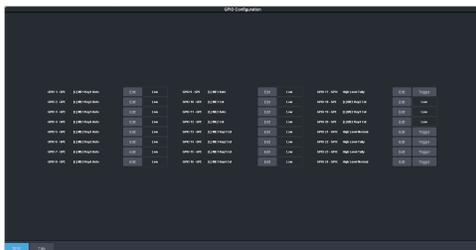
Setting	Description
--none--	No action is taken. Select this option if you do not want the GPI to trigger an event when it is at the selected level state.
CC	Run a specific custom control: <ol style="list-style-type: none"> Enter the custom control bank in the Bank field. Enter the custom control in the CC field.

Setting	Description
Mem Recall	Recall a memory on all MEs: <ul style="list-style-type: none"> Enter the memory to recall in the Mem field.
FTB	Perform a transition to black on the program ME that also takes all keys off-air. The source originally selected on program is selected on preset
ME Cut	Perform a background cut on the selected ME: <ul style="list-style-type: none"> Click an ME button to select the ME, MiniME™, or MultiScreen.
ME Auto	Perform a background auto transition on the selected ME: <ul style="list-style-type: none"> Click an ME button to select the ME, MiniME™, or MultiScreen.
Key Cut	Perform a key cut on the selected ME and key: <ol style="list-style-type: none"> Click an ME button to select the ME, MiniME™, or MultiScreen. Click a Key button to select the keyer.
Key Auto	Perform a key auto transition on the selected ME, MiniME™, or MultiScreen and key: <ol style="list-style-type: none"> Click an ME button to select the ME, MiniME™, or MultiScreen. Click a Key to select the keyer number.
Aux Xpt	Select a video source on an aux bus: <ol style="list-style-type: none"> Click the Aux button and select the aux bus. Click the Source button and select the video source.

To Set Up a GPI Output

A GPI output can be set as a Normal GPI output, or as a Tally output. As a tally output, the GPI output must be assigned to a video source. A GPI output in tally mode can still be used as a normal GPI output.

1. Click **Navigation Menu > Configuration > GPIO / Tally > GPIO**.



Tip: The **Trigger** button next to the **Edit** button allows you to manually trigger a GPI output.

2. Click **Edit** for the GPI that you want to configure as an output.
3. Click **GPO**.



4. Click a **Level** button to select whether you want the GPI to trigger low (**Low**), or high (**High**).
5. Click a **Trigger** button to select whether you want to use an edge trigger (**Edge**), or a level trigger (**Level**).
6. For edge triggers, use the **Duration (fr)** slider to set the length of time (in frames) that the GPI edge output remains triggered.
7. For level triggers, click a **Mode** button to select how you want to GPI output to act.
 - **Normal** — when assigned to a video source and RollClip is active, will trigger with the source going on-air, and back with the source going off-air (pre-delay values are only used when the source is going on-air)
 - **Tally** — when assigned to a video source, will trigger with the source going on-air, and back with the source going off-air (RollClip and pre-delay values are ignored)

GPI Output Triggers

Each video source can have a GPI output assigned to it. This GPI can be used to trigger an external device, such as a video server, to play the cued clip when the video sources from the video server are taken on-air.

A GPI trigger can be set up to occur automatically any time the video source is transitioned on-air, or it can be triggered manually.

Note: The **Next Button Secondary Function** must be set to **GPO** to be able to trigger a GPI output manually using the **NEXT** button on the control panel.

Keep the following in mind:

Keep the following in mind when working with GPI output triggers:

- The **Roll Clip** must be set to **On** to trigger a GPI output with a transition.
- Edge triggered GPI outputs remain triggered for the configured duration.
- Level triggered GPI outputs toggle between high and low each time they are triggered.

To Assign a GPI Output to a Video Source

You can set a pre-delay, or pre-roll, that will specify when the GPI is triggered in relation to taking the video source on-air. This is useful for VTR pre-roll delay and other situations where an input source is not immediately ready to be taken to air.

Note: The roll clip function must be set to on to trigger the GPI output with a transition.

1. Click **Navigation Menu > Configuration > Inputs > External** if you are setting up a physical input, or **Internal** if you are setting up an internal input.
2. Click the **GPO** button for the video source that you want to assign a GPI output to.



When you select this source on a bus, the GPI output will trigger automatically.

Note: Not all sources can have a GPI assigned to them.

3. Click the **GPO** button for GPI output that you want to assign to the selected video source. A GPI must be configured as an output to appear on the list.
4. In the **Predelay** field, enter the pre-delay interval (in frames) that the switcher waits after the GPI output is triggered before taking the source on-air.

Live Edit Decision Lists (LiveEDL)

Edit Decision Lists are files used by non-linear editing (NLE) suites to aid in post-production. Your switcher can capture EDL data in a file that you load into your NLE suite.

LiveEDL Setup

You can configure your switcher to trigger multiple GPI outputs at the start, end, or both, of an EDL data capture to trigger video servers that are recording the feeds coming into the switcher. The EDL data from the switcher can then be paired with the feeds from the video servers, using the timecode data, in the NLE suite to edit or re-cut the show.



Important: A control panel is required to configure this feature. If you do not have access to a physical control panel, the SoftPanel can be used.

You can also set a pre-delay for each GPI output. EDL data capture does not begin until the highest pre-delay has passed. This is useful when the switcher needs to wait for external equipment to become ready. The example below shows the effects of various triggering and pre-delay settings.

To Set the LiveEDL Behavior



Important: A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used. The position of items on the menus on the SoftPanel may not match those of a physical panel.

1. Press **MENU > System > NEXT > NEXT > NEXT > LiveEDL Config**.
2. Use the **GPO** knob to select the GPI output that is connected to your video server. The GPI must be configured as a GPI output before it can be selected.
3. Use the **Triggr** knob to select when the GPI output is triggered.
 - **Off** — GPI is not triggered
 - **Start** — GPI output is triggered at the beginning of the EDL capture
 - **Stop** — GPI output is triggered at the end of the EDL capture

- **Both** — GPI output is triggered at the beginning and end of the EDL capture

If Start or Both is selected, you must set the pre-delay for the GPI.

4. Use the **PreDly** knob to select the pre-delay interval (in frames) that the switcher waits after the GPI output is triggered before starting to capture EDL data.

Timecode Setup

The switcher uses timecode data to mark the EDL file so that it can be used in the non-linear editing suite along with the feeds from the video servers. The timecode data can be either from an external timecode generator, or internally generated. An offset can be applied to both timecode sources.

For an external timecode, an LTC generator must be connected to the LTC port on the back of the frame.

To Confirm External LTC Signal

If you have an external linear timecode generator connected to the switcher, you can confirm that the switcher is receiving timecode data.



Important: A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used. The position of items on the menus on the SoftPanel may not match those of a physical panel.

1. Click **Navigation Menu > Status / Power**
2. Confirm that the information shown in the **Timecode** field matches the timecode from the timecode generator.

If required, an offset can be applied to the incoming timecode data.

To Set Up Communications with a TSC-9902



Important: A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used. The position of items on the menus on the SoftPanel may not match those of a physical panel.

1. Press **MENU > System > NEXT > NEXT > Device Configure**.
2. Press the **Add** knob.
3. Use the **Slot** knob to select **SP** (serial port).
4. Use the **Type** knob to select **LTC**.

5. Press **NEXT**.
6. Use the **SubType** knob to select **LTC_#.#**.
7. Press the **SubType** knob.
8. Press the **Confirm** knob to save your settings.

To Set the LTC Timecode Source

If you are using an external timecode generator, an offset, or delay, is applied to the incoming timecode signal before it is stored in the LiveEDL data file. If you are using an internal timecode, the offset is the starting time that the switcher uses for the timecode that is stored in the LiveEDL file.



Important: A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used. The position of items on the menus on the SoftPanel may not match those of a physical panel.

Note: If a valid timecode signal is detected on the LTC port on the frame, the external timecode will be used even if an internal timecode is set.

1. Press **MENU > System > NEXT > NEXT > NEXT > LiveEDL Config > NEXT**.
2. Use the **Offset** knob to select the source of the timecode data you want to use.
 - **Ext.** — the timecode data received on the LTC port is used
 - **Int.** — an internal timecode is generated
3. Set the timecode offset for an External timecode as follows:
 - a) Use the **LTCOff** knob to select the offset, in frames, that you want to delay the incoming timecode signal by.
4. Set the starting time for an Internal timecode as follows:
 - a) Use the **Field** knob to select the hours, minutes, or seconds that you want to adjust.
The timecode is shown in the [HH:MM:SS] format.
 - b) Use the **Value** knob to set the starting time in the selected field.

LiveEDL Data Capture

Capturing EDL data is manually started and stopped from the switcher. When you select to start capturing EDL data, and GPI outputs set to trigger on start are triggered. If a pre-delay has been set for the GPIs, the switcher does not start

capturing EDL data until the pre-delay time has finished.

When you stop capturing EDL data, you have the option to delete the data, or save it to a USB drive. You can also connect to the switcher via FTP and download the files directly to your editing suite. Use the username `liveedl` and password `password` to create the FTP connection to the switcher.

Keep the following in mind:

Keep the following in mind when reviewing the EDL data from the switcher:

- When a MediaWipe is selected as the transition type, the switcher records the transition duration as the cut point frame multiplied by two (2). This is to ensure that the cut point is recorded accurately.
- If you used more than one ME, or Aux bus, in your shot, a separate EDL file is saved for each ME and Aux bus. The ME re-entry is shown as being selected on the first ME, and the source selections on the second ME are saved to the separate LiveEDL file. Aux bus information is only stored to a LiveEDL file when the Aux bus is not in fixed mode.

To Start Capturing EDL Data

The EDL data can be stored to one of 1000 LiveEDL files stored on the switcher. A separate file is created for each ME when the additional MEs are used.



Important: A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used. The position of items on the menus on the SoftPanel may not match those of a physical panel.

1. Press **MENU > User > LiveEDL**.
2. Use the **Start** knob to select the LiveEDL file on the switcher that you want to store the EDL data to.
If the LiveEDL file already contains data, you are given the option to delete the data, or save it to a USB.
3. Press the **Start** knob to start recording.

To Stop Capturing and Save EDL Data



Important: A control panel is required to perform this procedure. If you do not have access to a physical control panel, the SoftPanel can be used.

The position of items on the menus on the SoftPanel may not match those of a physical panel.

1. Press **MENU** > **User** > **LiveEDL**.
2. Press the **Stop** knob to stop recording.
3. Save the EDL data to a USB as follows:
 - a) Insert your USB drive into the USB Port on the switcher. You must wait 5 seconds for the switcher to recognise the USB drive.
 - b) Press the **Save** knob.
 - c) Press the **Confirm** knob to store the LiveEDL file to the USB drive.

ViewControl (HD Only)

The ViewControl interface through DashBoard allows you to coordinate the control over the Carbonite switcher and other devices through custom controls and transitions.

Keep the following in mind:

Keep the following in mind when working with ViewControl:

- ViewControl requires DashBoard 5.1, or later.
- Using webcam sources in ViewControl requires DashBoard 9.16, or later.
- Only the sources assigned to the MultiViewer boxes are available for direct selection. Custom controls can be used to select other sources.
- The MultiViewer Shift must be set to the main or satellite panel that the DashBoard you are using for ViewControl is assigned to.

ViewControl Overview

The ViewControl interface provides quick access to a number of custom control buttons as well as the transition functionality of the switcher.

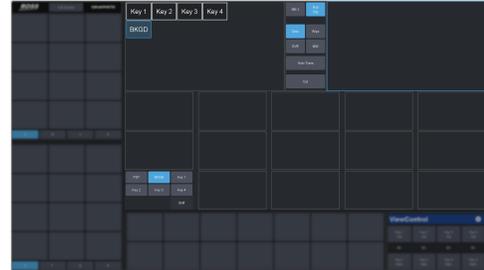
Custom Control Buttons

The custom control buttons can be assigned to any custom control on the switcher and given unique names and icons. The button groups on the left (shown below) are organized into groups, or tabs. The buttons along the bottom are constant across all tabs.



Bus Selection Buttons

The bus selection buttons allow you to select the different buses on different ME and MiniME™ outputs of the switcher.



To Select a Source on a Bus

1. Click **ME 2** at the top and click the ME or MiniME™ that you want to select a bus on.

Tip: If the Shift feature is active the Program and Preview boxes will switch to the selected ME or MiniME™.

2. Click the bus you want to select a source on at the lower left.
3. Click on the source (MultiViewer box) that you want to assign to the selected bus.

*Tip: Click **Shift** to access the sources on the shifted MultiViewer boxes.*

Keyer Transition Buttons

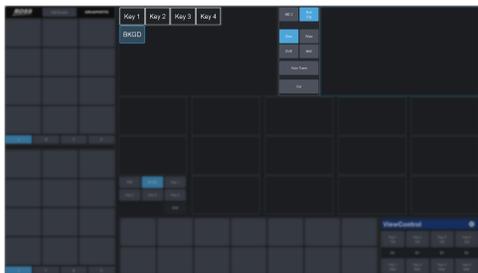
The Keyer Transition buttons allow you to perform a cut or dissolve of the keys on the selected ME or MiniME™. These buttons act the same as the Keyer Transition Buttons on the control panel.

Tip: The Cut buttons tallies when a key is on. Red when the key is on-air or blue when it is on for an ME or MiniME™ that isn't on-air.



Transition Buttons

The transition buttons allow you to select what is included in the next transition, what type of transition is to be performed, and perform the transition. These buttons function similarly to the buttons in the Transition Area on the control panel.



To Perform a Transition

1. Click the **ME 2** button and select the ME or MiniME™ that you want to perform the transition on.
2. Click the **BKGD** and **Key** button over the Preview box to select what to include in the next transition.
3. Click **Diss**, **Wipe**, **DVE**, or **MW** to select the type of transition to perform.

Tip: Live Assist will follow the selection to allow you to set the transition parameters.

4. Click **Auto** to perform the transition, or **Cut** to perform a cut transition.

Custom Control Button Setup

When you assign a custom control to a button, you can give that button a unique name and assign an icon to it. The images for the icons must be on a USB drive in the frame when you assign them. Once assigned the icons are stored in the frame and the USB can be removed. Each of the tabs can be named.

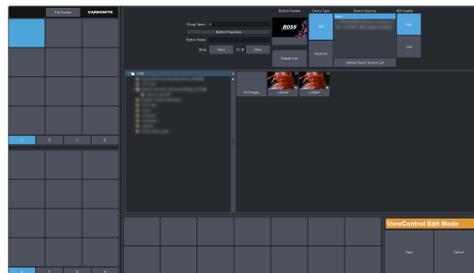
The configuration of the tabs and custom control assignment to buttons are stored with the switcher personality settings.

To Set up the Custom Control Buttons

You must assign custom controls from the switcher to the buttons on ViewControl.

If you want to assign icons to the custom control buttons, you must have the images you want to use for the icons stored on a USB drive installed in the frame. After the images have been assigned you can remove the USB drive.

1. Click the  button.



2. Press the custom control button that you want to set up.
3. Enter a name for the button in the **Button Name** field.

*Tip: You can change the name of a tab by selecting a button on the tab and then entering a new name in the **Group Name** field.*

4. Click the **Bank** button and select the number of the bank you want to select a custom control from.
5. Click the **CC X** button and select the number of the custom control you want to assign to the button.
6. Navigate the files on the USB drive and click the image you want to assign as the icon for the button.

*Tip: Press **Default Icon** to switch back to the default icon.*

7. Set up additional custom control buttons as required.
8. Press **Save** when you are done setting up custom control buttons.

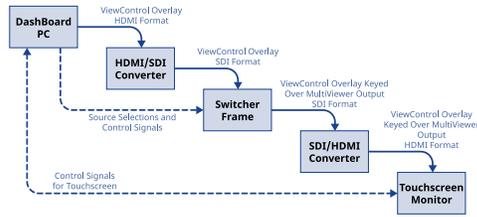
ViewControl Setup

ViewControl can be set up to use either and external HDMI™ converter or a direct NDI® stream. The NDI® stream is only supported on specific MultiViewer layouts.

Connecting ViewControl over HDMI™

ViewControl combines an overlay image from DashBoard with a custom MultiViewer output from the switcher to generate the interface. This requires some external SDI/HDMI video conversion equipment, as well as a touchscreen display.

Note: An input FSFC should be applied to the input you are using for ViewControl.



The following connections are required for ViewControl:

- ViewControl is only supported in 1080i or 720p. The switcher must be operating in one of these formats for ViewControl to operate.
- Set the output resolution of the Dashboard computer to either 1920×1080 or 1280×720.
- Use an HDMI to SDI converter to take the output of the Dashboard computer and put it into a resolution that the switcher can use. Ensure that the resolution is not changed.
- Apply a FSFC to the input that is coming from the Dashboard computer.
- Set up a MultiViewer to use a ViewControl layout.
- Use an SDI to HDMI converter to take the output of the switcher and put it into a resolution that the touchscreen monitor can use. Ensure that the resolution is not changed.
- Connect the USB cable for the touchscreen to the Dashboard computer.

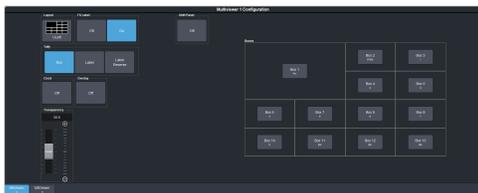
To Set Up the MultiViewer for ViewControl over HDMI™

ViewControl integrates the MultiViewer output of the switcher with a graphical overlay from DashBoard to provide live video in the ViewControl windows. The MultiViewer must be configured to properly align the video for the buttons on ViewControl.

Note: The switcher must be operating in a 1080i or 720p video format for ViewControl to operate.

Note: Only the Video Processor MultiViewer can be used for ViewControl.

1. Click **Navigation Menu > Configuration > MultiViewers** and click **MV VP 1**.



2. Click the **Layout** button and select a ViewControl layout.
 - **VCtrlT** — (**ViewControl Top**) places the boxes at the top of the screen.
 - **VCtrlB** — (**ViewControl Bottom**) places the boxes at the bottom of the screen.

Tip: If you want to create a custom ViewControl layout, you can use one of the other MultiViewer layouts to create the look you want, and use PanelBuilder in DashBoard to assign functionality to the layout. Sources can be hidden from a layout by assigning black to the box. For more information on PanelBuilder, refer to the DashBoard documentation.

3. Click the **Overlay** button and click **On** to turn the overlay on.
4. Click the **Source** button for the overlay input from DashBoard. This is keyed over the MultiViewer layout.
5. Use the **Clip** slider to adjust the clipping of the overlay source.

At **0%** the overlay source is completely opaque, and at **100%** it is completely transparent.
6. Click on one of the **Boxes** buttons and set up how that box appears on the MultiViewer.
7. Click on the source you want to select for the box.

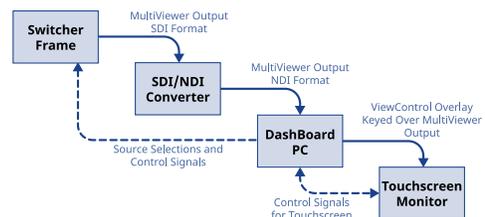
Note: The large box on the left should always be assigned to **PV** and the large box on the right assigned to **PGM**.

Connecting ViewControl over NDI®/Webcam

ViewControl combines an overlay image from DashBoard with a custom MultiViewer output from the switcher to generate the interface. This requires a single SDI to NDI® converter, as well as a touchscreen display.



Important: ViewControl over NDI® is not supported on computers running the macOS® operating system at this time.



The following connections are required for ViewControl:

- ViewControl is only supported in 1080i or 720p. The switcher must be operating in one of these formats for ViewControl to operate.
- Set the output resolution of the DashBoard computer to either 1920×1080 or 1280×720.
- Use an SDI to NDI® converter to take the output of the switcher and make it available to DashBoard.
- Set up a MultiViewer to use one of the ViewControl layouts that support NDI®.
- Connect the USB cable for the touchscreen to the DashBoard computer.

Keep the following in mind:

Keep the following in mind when working with NDI®/Webcam:

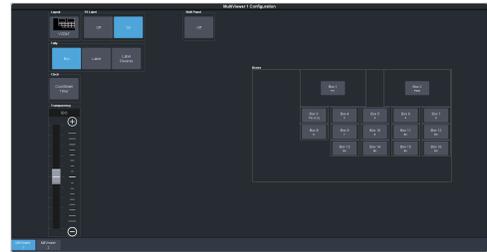
- The MultiViewer must be set to **VCDbT** or **VCDbB** for the NDI® or webcam settings to be available in ViewControl.
- The NDI® converter and DashBoard computer running ViewControl should be on the same subnet.
- The NDI® Access Manager from the NDI® Tools ([ndi.video](#)) may be required for the NDI® stream to appear in ViewControl.
- If required, the NDI® Access Manager must be installed on the DashBoard computer running ViewControl.
- When using the NDI® Access Manager you will need to add the IP address of the NDI® converter to the **Remote Sources** tab.
- You may have to restart the DashBoard computer running the NDI® Access Manager before the NDI® stream becomes visible to ViewControl.
- You must set the NDI® connection in ViewControl every time DashBoard is launched.

To Set Up the MultiViewer for ViewControl over NDI®

ViewControl integrates the MultiViewer output of the switcher with a graphical overlay from DashBoard to provide live video in the ViewControl windows. The MultiViewer must be configured to properly align the video for the buttons on ViewControl.

Note: The switcher must be operating in a 1080i or 720p video format for ViewControl to operate.

1. Click **Navigation Menu > Configuration > MultiViewers** and click **MltViewer 1**.

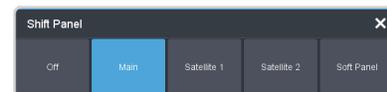


2. Click the **Layout** button and select a ViewControl layout for NDI®.
 - **VCDbT** — (**ViewControl Top**) places the boxes at the top of the screen.
 - **VCDbB** — (**ViewControl Bottom**) places the boxes at the bottom of the screen.

Tip: You must select one of the NDI® layouts to be able to select the NDI® input stream.

3. Click **Shift Panel** and select the panel that you will be operating ViewControl from. When the **Shift** button is pressed on the assigned control panel the MultiViewer shows the shifted sources.

Note: The shift function must be active for the PRV and PGM boxes on the MultiViewer to switch to the active ME.



Tip: When the MultiViewer Shift is active, the box buttons on the layout show the shifted source in brackets.

4. Click on one of the **Boxes** buttons and set up how that box appears on the MultiViewer.
5. Click on the source you want to select for the box.

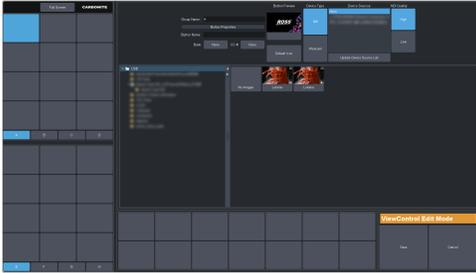
Note: The large box on the left should always be assigned to **PV** and the large box on the right assigned to **PGM**.

To Set Up ViewControl for NDI®/Webcam

Select the NDI® stream that is coming from the switcher that has the MultiViewer video stream.

Note: Refer to the documentation that came with your SDI to NDI® Converter for information on setting it up.

1. Click the  button.



2. Click a **Device Type** button to select the type of input you want to use.
 - **NDI** — select an NDI® source.
 - **Webcam** — select a webcam source.
3. Click **Update Device Source List** and click the NDI® or webcam source that has the MultiViewer output from the switcher.

Note: *The MultiViewer must be set to one of the NDI® layouts for the NDI®/webcam source selection to be available.*

4. Click an **NDI Quality** button to select if you want to use the normal (**High**) or low bandwidth (**Low**) stream.
5. Click **Save**.

MultiPanel

Each frame supports up to 3 independent control connections (Main, Satellite 1, Satellite 2). Each connection can be from a control panel, DashBoard, or a combination of the two. Add devices on the same control connection mirror each other.

The independent control connections are selected by the port you connect to on the frame. Multiple panels and DashBoard connections can connect on the same port, but they will all share the same permissions and mirror each other for control.

- **Main Panel** — 5253 (5258 NAT)
- **Satellite 1** — 5255 (5259 NAT)
- **Satellite 2** — 5256 (5260 NAT)
- **SoftPanel** — 5257 (5261 NAT)

Keep the following in mind:

Keep the following in mind when working with MultiPanel:

- SoftPanel shares the permissions of the Main Panel.
- The assignment of the panel ID is done from the control panel.
- Control panel specific personality settings are stored on the frame for the panel ID and are not tied to the control panel.
- DashBoard automatically follows the main panel but will ignore permissions set for the main panel.
- If you change switcher modes, the MultiPanel permissions may have to be set again.
- An undo of a memory recall ignores panel permissions and will undo the last memory recalled from any panel.
- Bus maps are specific to each control panel. Creating or updating a bus map for one control panel does not change the bus map on another control panel.
- Custom controls ignore control panel permissions and will run events on an ME, MiniME™, or MultiScreen that the control panel does not have permission for.

To Set Up MultiPanel Permissions

1. Click **Navigation Menu > Configuration > System > MultiPanel**.



2. Click a **Main**, **Sat 1**, or **Sat 2** button to select whether that control connection has access to that resource.

Note: *SoftPanel and Main share the same permissions.*

Note: *A control panel must have permission to at least one ME, MiniME™, or MultiScreen.*

MIDI Controller

The MIDI controller is used to control the RAVE audio mixer. The controller connects to RAVE through DashBoard.

For these procedures you will need the following files. They are available with these instructions in your download or on your product resources USB.

- **Common:**
 - Mapping Wizard.grid
- **Generic:**
 - Settings-MIDI_####_generic.controller
- **X-TOUCH:**
 - X-TOUCH-map###.controller
 - X-TOUCH-LayerA###.bin
 - X-TOUCH-LayerB###.bin
- **X-TOUCH MINI:**
 - X-TOUCH-map###.controller
 - X-TOUCH-MINI-LayerA-MonitorFader###.bin
 - X-TOUCH-MINI-LayerB-MonitorFader###.bin



Important: The revision numbers (####) of the .controller and .bin files must match.

MIDI and MMA are trademarks of the MIDI Manufacturers Association.

Compatibility

The MIDI controller and bin files are only compatible with specific versions of switcher software.

X-TOUCH Files	Switcher Software
Version 1: <ul style="list-style-type: none"> • X-TOUCH-map001.controller • X-TOUCH-LayerA001.bin • X-TOUCH-LayerB001.bin 	Graphite 1.2
Version 2: <ul style="list-style-type: none"> • X-TOUCH-map002.controller • X-TOUCH-LayerA002.bin • X-TOUCH-LayerB002.bin 	Graphite 2.0
Version 3: <ul style="list-style-type: none"> • X-TOUCH-map003.controller • X-TOUCH-LayerA003.bin • X-TOUCH-LayerB003.bin 	Graphite 2.2
Version 4: <ul style="list-style-type: none"> • X-TOUCH-map004.controller • X-TOUCH-LayerA004.bin • X-TOUCH-LayerB004.bin 	Graphite 2.3

X-TOUCH Files	Switcher Software
Version 5: <ul style="list-style-type: none"> • X-TOUCH-map005.controller • X-TOUCH-LayerA005.bin • X-TOUCH-LayerB005.bin • X-TOUCH-MINI-LayerA-MonitorFader-005.bin • X-TOUCH-MINI-LayerB-MonitorFader-005.bin 	Graphite 2.4 or higher
	Ultra 4.0 or higher
	Graphite CPC 1.0 or higher

To Connect a MIDI Controller to DashBoard

DashBoard allows you to configure the MIDI controller connected to RAVE audio mixer.



Important: Refer to the documentation that came with your MIDI controller for proper handling and setup instructions.

1. Plug the MIDI controller into one of the USB ports on your DashBoard computer. DashBoard must also be connected to the switcher.
2. Launch DashBoard.
3. Click **File > New > Other**.
4. Click **Input Devices > New MIDI Controller**.
5. Click **Next**
6. Enter the settings for the MIDI Controller:
 - **Display Name** — enter a name for the controller
 - **Slot** — select **1**
 - **Controller** — select your MIDI controller from the list.
7. Click **Finish**.
The MIDI controller appears in the **Tree View**.

To Configure the MIDI Controller Interface

A custom DashBoard panel is used to automatically do all the mapping for the MIDI controller.

You will need the Mapping Wizard.grid file that came with your software.

1. Launch DashBoard.
2. Click **File > Open File**, navigate to the Mapping Wizard.grid file and click **Open**.
3. In the **MIDI** field, select your MIDI controller.
4. In the **Graphite** field, select **Audio Mixer**.

- Click **DO EVERYTHING FOR ME**.

To Map MIDI Controller Buttons to Functions

The map file associates RAVE audio mixer functions to buttons on the MIDI controller.

A generic map file is provided on the product resources disk, or you can customize your own. Refer to [MIDI Device OID List](#) on page 208 for a list of commands.

- Double-click the **MIDI Controller** node in the DashBoard Tree View.
- In the **Device Classes** list, select **audiomixer**.

*Tip: If **audiomixer** is not in the list, click **Add** and name the new device **audiomixer**.*

- Click **Load > Browse** and select the Settings-MIDI_v###_Generic.controller file.
- Click **Open > Restore**.

X-TOUCH Configuration

Configure the X-TOUCH COMPACT and X-TOUCH MINI to control the audio mixer through DashBoard.

To Configure the Button Layers on the X-TOUCH

The Layer A and Layer B files assign the controls on the X-TOUCH to MIDI Commands

Default layer files are provided on the product resources disk, or you can customize your own.

Note: The layer files must match the map file that you load in DashBoard.

- Connect the X-TOUCH to the server.
- Launch the **X-TOUCH Editor** application that came with your controller.
- Click the **GLOBAL** tab.
- Click **LOAD** in the **PRESETS ON COMPUTER** area and click **Yes**.
- Select the file for your controller and click **Open**.
 - X-TOUCH COMPACT — X-TOUCH-LayerA-###.bin
 - X-TOUCH MINI — X-TOUCH-MINI-LayerA-MonitorFader-###.bin
- Wait for the file to be loaded and click **Close** on the success dialog box.

- Click **Dump A** in the **TO HARDWARE** area.
- Click **Yes** to start the upload and **Close** on the success dialog box.
- Repeat these steps to load the corresponding Layer B file for your controller and click **Dump B**.

To Map Buttons to Functions

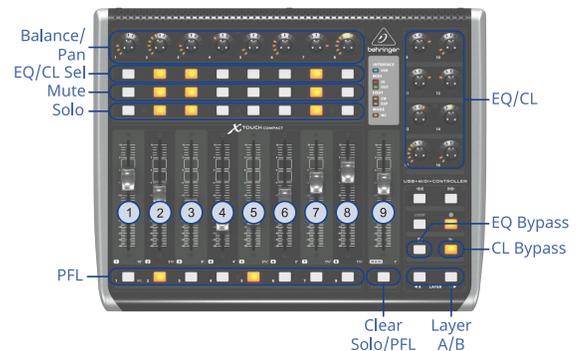
The map file associates RAVE audio mixer functions to buttons on the X-TOUCH COMPACT and X-TOUCH MINI.

A default map file is provided on the product resources disk, or you can customize your own.

- Double-click the **MIDI Controller** node in the DashBoard Tree View.
- Click **Load > Browse** and select the X-TOUCH-map####.controller file.
- Click **Open > Restore**.

Default X-TOUCH COMPACT Mapping

The default mapping comes from the map and layer files that are included on the Product Resources disk.



*Note: The **Clear** button clears the Solo selections on Layer A and the PFL selections on Layer B.*

Fader Mapping

The faders are mapped differently on the A and B layer.

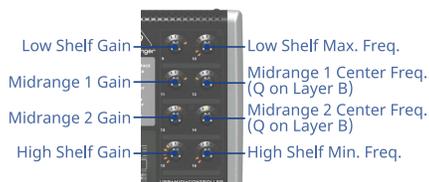
Fader	Layer A	Layer B
1	Audio 1	Audio 9
2	Audio 2	Audio 10
3	Audio 3	Audio 11
4	Audio 4	Audio 12
5	Audio 5	Audio 13
6	Audio 6	Audio 14

Fader	Layer A	Layer B
7	Audio 7	Audio 15
8	Audio 8	Audio 16
9	MAIN	MONITOR

Note: The default assignment is based on the default fader configuration. If you change what is assigned to any of the assignable faders (Audio X) used on the default map, the audio sources those faders control also changes. For example, if you assign **Audio 5** to SDI 5, the stripe on the midi panel will control SDI 5 audio.

Equalizer Control

The **EQ/CL Sel** buttons are used to select which source the EQ is being adjusted for, and the **Layer A/B** buttons are used select what range is assigned to the knobs. The knobs are then used to adjust the EQ values.



Compressor / Limiter Control

The **EQ/CL Sel** buttons are used to select which source the Compressor is being adjusted for, and the **Layer B** knobs are used to adjust the compressor values.



Default X-TOUCH MINI Mapping

The default mapping comes from the map and layer files that are included on the Product Resources disk.



- The encoder knobs turn to control the volume, or audio level, and are pushed to mute that channel.
- The fader controls the level of the Monitor output.

Encoder Knob Mapping

The encoders are mapped differently on the A and B layer.

Fader	Layer A	Layer B
1	Audio 1	Audio 9
2	Audio 2	Audio 10
3	Audio 3	Audio 11
4	Audio 4	Audio 12
5	Audio 5	Audio 13
6	Audio 6	Audio 14
7	Audio 7	Audio 15
8	Audio 8	Audio 16

Note: The default assignment is based on the default fader configuration. If you change what is assigned to any of the assignable encoders (Audio X) used on the default map, the audio sources those encoders control also changes. For example, if you assign **Audio 5** to SDI 5, the stripe on the midi panel will control SDI 5 audio.

Custom Mapping

You can change the current mapping of functions to the buttons, knobs, and sliders on the X-TOUCH COMPACT. The Dashboard controller lists all the inputs on the MIDI controller and allows you to assign a Dashboard OID to them.

Refer to [MIDI Device OID List](#) on page 208 for a list of available OIDs.



Important: Although you can assign different functions to the knobs, sliders, and buttons on the panel, some functions may require changes to the layers in the **X-TOUCH Editor** application. Refer to the documentation that came with your X-TOUCH COMPACT for more information.

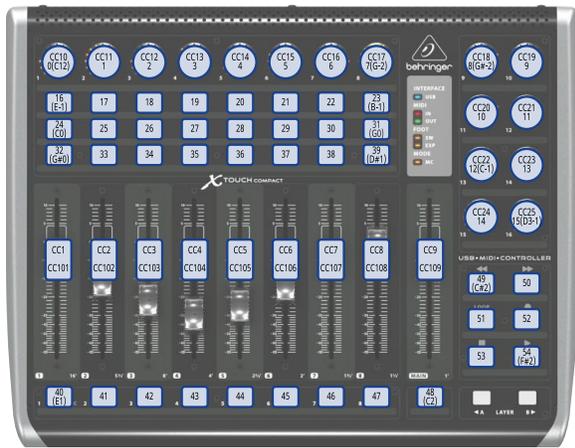


Figure 16: Layer A Button IDs

Note: Buttons CC27 and CC26 on Layer A are the Foot Switch and Expression Pedal connections on the back of the panel.

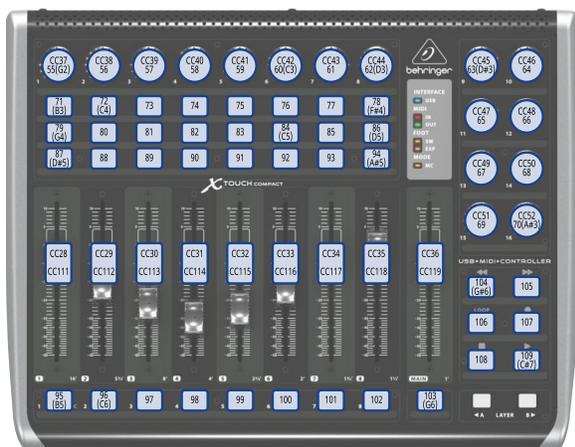


Figure 17: Layer B Button IDs

Note: Buttons CC64 and CC63 on Layer B are the Foot Switch and Expression Pedal connections on the back of the panel.

For the CC knobs and sliders, the top number is the action when the knob or slider is turned or moved, and the second is when it is pushed or touched.

Refer to the documentation that came with your Behringer X-TOUCH COMPACT for more information on how MIDI IDs are assigned to buttons.

To Create a Custom Button Mapping

You can assign any audio mixer function to a button, slider, or knob on the X-TOUCH COMPACT

Tip: Use the same procedure to create a custom button mapping for the X-TOUCH MINI.

1. Double-click the **MIDI Controller** node in the DashBoard Tree View.

Tip: If you want to start with a blank list, click **Load > Factory Default**.

Note: The **Value** column shows the current data coming from the connected MIDI controller.

2. In the **Continuous Controllers** table, set up the knobs and sliders you want to use on the panel. The numbers for these has the **CC** prefix.
 - a) Locate the **ID** for the knob or slider you want to assign a function to. Refer to [Custom Mapping](#) on page 134 for a diagram to locate the knob or slider.
 - b) In the **Mapped OID** field, enter the OID for the function you want to assign to the knob or slider. Refer to [MIDI Device OID List](#) on page 208 for a list of OIDs.
 - c) Click the **Transformation** list and select the type of action for the knob or slider. Sliders should be set to **Volume dB** and knobs to **Middle Point**.
 - **Disabled** — the knob or slider is disabled.
 - **Volume dB** — the slider is configured for volume control.
 - **Middle Point** — the knob is configured for a 200 point range value (-100 to 100).
 - d) Change the default parameters for your knob or slider as required.
 - **Name** — enter a new custom name for the control.
 - **Min** — the minimum value for the selected function. This is the value returned when the knob is at the counter-clockwise stop, or the slider it at the bottom stop.
 - **Max** — the maximum value for the selected function. This is the value returned when the knob is at the clockwise stop, or the slider it at the top stop.
 - **Sensitivity** — the number of points between the minimum value and the maximum value.
 - **Speed %** — 100% (other values not supported at this time)
 - **Invert** — invert the min and max stops of the knob or slider.

3. In the **Buttons** table, set up the buttons you want to use on the panel.

-
- a) Locate the **ID** for the button you want to assign a function to. Refer to *Custom Mapping* on page 134 for a diagram to locate the buttons.
 - b) In the **Mapped OID** field, enter the OID for the function you want to assign to the button. Refer to *MIDI Device OID List* on page 208 for a list of OIDs.
 - c) Click the **Action** list and select the type of action for the button.
 - **OFF** — (not supported at this time)
 - **Stateless** — basic button functionality with no special state.
 - **GPI** — (not supported at this time)
 - **Set Value** — (not supported at this time)
 - **Toggle** — (not supported at this time)
 - **Increment** — (not supported at this time)
 - d) Change the default parameters for your button as required.
 - **Name** — enter a new custom name for the control.
 - **Value (Off)** — 0 (other values not supported at this time)
 - **Value (On)** — 1 (other values not supported at this time)
 - **Min** — 0 (other values not supported at this time)
 - **Max** — 1 (other values not supported at this time)
 - **Hold** — (not supported at this time)
4. Click the **Force Panel Refresh** list and select the how often DashBoard syncs with the panel.
 5. Click **Save**.
 6. Click **Save** again and select a file name and location for your custom controller file.
 7. Click **Save**.
 8. Click **Done**.

Frame Simulator

The frame simulator uses a VM VirtualBox Virtual Machine to run the Graphite software application. The simulator cannot pass video, but can be used to create offline switcher sets, prepare for upcoming shows, or training.

The simulator must be used along with DashBoard, similar to a physical frame. The simulator provides the frame software and DashBoard the menu interface.

Keep the following in mind:

Keep the following in mind when working with the frame simulator:

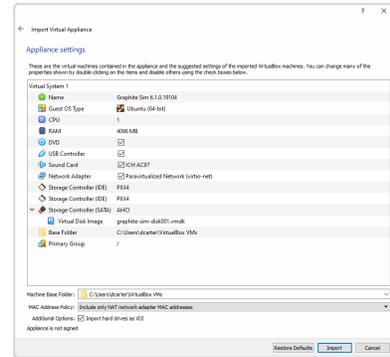
- The simulator uses DHCP to obtain an IP address. If a DHCP server is not available you will not be able to connect to the simulator from DashBoard.
- The IP address assigned to the simulator is shown at the top of the simulator window and is the IP address that you will use to connect to from DashBoard.
- The simulator and DashBoard must be on the same subnet.

To Install the Frame Simulator

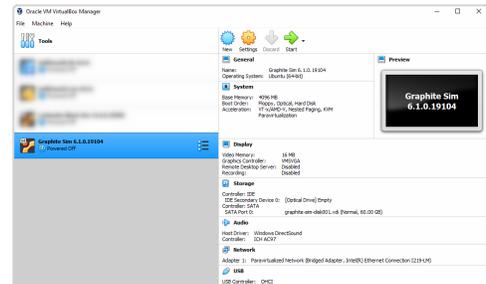
The frame simulator is imported as an appliance into VM VirtualBox.

To install the frame simulator on your computer you need the following:

- Oracle® VM VirtualBox 6.1 or higher.
 - The Ross graphite-sim-##.#.#.#####.ova
1. If you have not already done so, download and install the Oracle® VM VirtualBox on your computer.
 2. Launch VM VirtualBox.
 3. On the Oracle® VM VirtualBox Manager, click **File > Import Appliance**.
 4. Navigate to the Graphite Sim OVA file and click **Open**.
 5. Click **Next**.

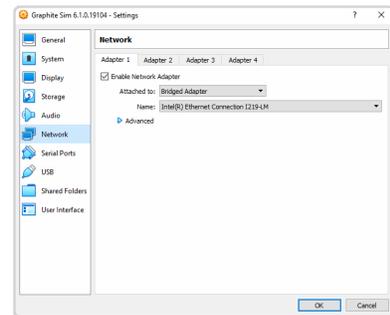


6. In the **MAC Address Policy** list, select **Generate new MAC addresses for all network adapters**.
7. Click **Import** and wait for the appliance to be imported.
8. Click on the **Graphite Sim** in the **Oracle VM VirtualBox Manager**.



9. Click **Settings**, on the right, and then click **Network** on the **Settings** dialog.

Note: You may see an Invalid settings detected for at the bottom of the dialog. Follow the directions to resolve and conflict between the VM VirtualBox and your hardware.



10. Click **Adapter 1** and on the **Attached to** list select **Bridged Adapter**. You can leave the **Name** setting as shown.
11. Click **OK**.

Diagnostics

Switcher status menus and error conditions, installed options, calibration, diagnostics, and logs.

Switcher Status

The status menu shows information for various components of the frame.



- **Software Version** — the current version of the software running on the switcher.
- **Video Processor Serial Number** — the serial number of the video processor card.

Note: If you are asked for the Serial Number of your system, it can be found on a label affixed to the chassis. The Video Processor Serial Number is used to identify the video processor card that is installed in the server.

- **Engine Type** — the model of frame.
- **Video Mode** — the video format that the switcher is operating in.
- **Video Reference Source** — the source of video reference to the switcher (internal/external).
- **External Reference** — the video format of the external reference, if connected.
- **Reference** — status of whether the switcher has locked to the reference format.
- **RAVE ABM 1 Status** — status of whether ABU 1 is connected.
- **RAVE ABM 2 Status** — status of whether ABU 2 is connected.
- **RAVE ABM 3 Status** — status of whether ABU 3 is connected.
- **Field Dominance** — the switching field.
- **Ancillary Mode** — how ancillary data is handled (strip or pass).
- **Temperature** — status of the ambient temperature in the frame.
- **CPU Temperature (C)** — the temperature of the frame CPU in degrees Celsius.
- **FPGA Temperature (C)** — the temperature of the frame video processor FPGA in degrees Celsius.
- **Timecode** — the current timecode being received by the switcher.

- **Main Panel DashBoard Port** — the local and NAT network port that the switcher is listening on for the main panel.
- **Satellite 1 DashBoard Port** — the local and NAT network port that the switcher is listening on for the satellite 1 panel.
- **Satellite 2 DashBoard Port** — the local and NAT network port that the switcher is listening on for the satellite 2 panel.
- **SoftPanel DashBoard Port** — the local and NAT network port that the switcher is listening on for the SoftPanel.
- **RossTalk Server Port** — the network port that the switcher is listening on for RossTalk commands.

Note: You can disable RossTalk control from the **Global** page (Click **Navigation Menu > Configuration > System > Global**). Click **Disable for RossTalk**.

- **Allocated DVEs** — where DVE channels are allocated in the switcher.
- **This DashBoard Connection** — the IP address of the DashBoard system you are currently using to connect to the switcher. The text after the IP address indicates whether the connection is as Main, Satellite, or SoftPanel and the port being used.
- **DashBoard Connections** — the IP addresses of all the DashBoard connections to the switcher, including panels. The text after the IP address indicates whether the connection is as Main, Satellite, or SoftPanel and the port being used. Refer to [MultiPanel](#) on page 131 for more information.

Note: The switcher supports a maximum of 20 DashBoard connections at any one time. If there are already the maximum number of connections to a switcher you will not be able to connect to it.

- **Panel Connections** — The role, IP address, and model of all the physical panels connected to the switcher.

Switcher Logs

Switcher logs can be used to identify and diagnose problems with the switcher. Use this information when contacting Ross Video Technical Support.

A copy of the working set from the switcher is also included with the logs to assist in diagnosing problems.

To Copy Logs To a USB

Switcher logs can be stored onto a USB to be sent to technical support to diagnose problems with your switcher.

Tip: Log can also be exported to your DashBoard computer instead of saving them to the USB. Click **Export As...** in the **Export Logs From Frame** area and select the location on your computer to save the logs file.

Note: Logs must be copied before a reboot or power-cycle of the switcher, or the information in them will be lost.

1. Insert USB drive into the USB port on the frame. Wait 5 seconds after inserting the USB drive before using it.
2. Click **Navigation Menu > Configuration > Diagnostics**.



3. Click the **Copy Logs To USB** button to copy the switcher logs to the USB drive.

Tip: You can have logs stored directly to the USB drive. Click a **Logs Direct to USB** button to select **Yes**.

The logs have been copied into the \switcher directory on the USB drive.

Diagnostic Tests

Diagnostics consist of a number of tests that are used to confirm the functionality of your equipment.

Switcher Restart

Restart the switcher from DashBoard.

Tip: This allows you to restart just the switcher without affect the operation of the server or XPression.

1. Click **Navigation Menu > Configuration > Diagnostics**.



2. Click **Restart** to restart the switcher.

To Run the Control Panel Test

Test the functionality of any of the buttons, knobs or fader and positioner on the control panel.



Important: This test disrupts the functionality of the control panel. If you are running this test from a remote computer, ensure that the control panel is available before performing the test.

1. Click **Navigation Menu > Configuration > Diagnostics**.



2. Click **Start Control Test**. The button remains lit as long as the test is running. The 3-knob menu of the control panel shows the current button, knob, positioner, or fader being used.
3. Test the button, knob, positioner, and fader you want to check.

Note: On the TouchDrive control panel the displays show a touch pattern. Tap on the happy face to test the touch sensitivity and calibration. If the tap registers on the happy face, the happy face disappears. If the tap does not register on the happy face, a green X is shown where the tap was registered.



4. Click **Stop** or press **MENU** and **NEXT** on the control panel to end the test.

To Run the LED Test

Test the color range of all the LEDs on the control panel.



Important: This test disrupts the functionality of the control panel. If you are running this test from a remote computer, ensure that the control panel is available before performing the test.

1. Click **Navigation Menu > Configuration > Diagnostics**.



2. Click **Start P-LEDs Test**. The button remains lit as long as the test is running.
All the buttons and indicators on the control panel cycle through different colors.
3. Click **Stop** or press **MENU** on the control panel to end the test.

To Run the Display Test

Test the displays on the control panel.



Important: This test disrupts the functionality of the control panel. If you are running this test from a remote computer, ensure that the control panel is available before performing the test.

1. Click **Navigation Menu > Configuration > Diagnostics**.



2. Click **Start Display Test**. The button remains lit as long as the test is running.
On the TouchDrive the displays and the mnemonics cycle colors.
On the Carbonite Black a series of letters, numbers, and symbols scroll across the displays and the mnemonics cycle colors.
3. Click **Stop** or press **MENU** on the control panel to end the test.

Error Messages

The switcher will show an error message on the control panel display when a problem is detected.

The following error messages may appear on the control panel display when starting your switcher.

Table 5: Switcher Error Messages

Error	Description	Solution
DDR 0 Not Found; DDR 1 Not Found; or DDR 0 & 1 Not Found	There is a problem with the switcher DDR memory. The switcher may be used but many features will be limited or disabled.	Re-start your switcher. If the problem persists, contact Ross Video Technical Support for assistance.
Panel/frame Mismatch	Your switcher control panel is connected to the wrong frame type.	Connect your switcher control panel to the proper frame and re-start the switcher.
Upgrade PMC?	Your switcher requires a Panel Module Controller (PMC) upgrade as part of a software upgrade. The switcher may be used without the PMC upgrade but may respond in an unpredictable manner.	Allow the PMC upgrade to proceed. Contact Ross Video Technical Support for assistance if you are unsure about upgrading your switcher.
Unknown panel type Please upgrade	The frame does not recognise the control panel. This could be caused by an unsupported panel being connected to the frame, or a problem with the panel module controlled or the configuration files.	Ensure that you have the correct control panel connected to the frame. If the problem persists, download the latest upgrade file from and force an upgrade of the switcher. Contact Ross Video Technical Support for assistance if you are unsure about upgrading your switcher.

Switcher Reset

If required, the switcher can be reset to return it to a user-defined default setting (RState), or the factory default state. A reset can be performed for the entire switcher, or individual components, such as keys.

Custom Reset Settings (RState)

You can customize many of the default switcher parameters and save them as a user-defined reset settings. These custom reset settings can then be recalled when you want to return the switcher to a previous state.

To Save a Custom Reset Setting

The Custom Reset Setting, or RState, saves how you want the switcher to be configured when it

powers up, or when you recall the RState manually.

1. Click **Navigation Menu > Live Assist > Memory > RState.**



2. Click **AuxX, MediaX, MiniMEX, MultiScreenX**, and audio layers to select the buses, channels, or audio outputs that are reset with a switcher reset.

Note: If **Disable Audio Memories** is set to **On** (Click **Navigation Menu > Configuration > System > Global**) the audio memory attributes are disabled.

Tip: Click the **All** button to select or de-select all the items in that category.

3. Click **Save RState** and **Yes.**

To Load a Custom Reset Setting (RState)

The Custom Reset Setting, or RState, is recalled every time the switcher is powered on, or it can be recalled manually.

1. Click **Navigation Menu > Live Assist > Memory > RState.**
2. Click **Load RState** and **Yes.**

Tip: Click **Default RState** to load the default RState settings.

Factory Default Settings

You can restore all or part of the switcher to the factory default state. A factory default returns all installation and personality settings are reset.

To Factory Reset the Switcher

Return the switcher to the factory default settings.

1. Click **Navigation Menu > Configuration > System > Reset.**



2. Click a reset or clear button to return that feature to the factory default state.

- **Clear Memories** — clear all memory registers on the switcher.
- **Clear CCs** — clear all custom controls on the switcher.
- **Default Bus Map** — return the bus map to the default mapping.
- **Factory Reset** — return the installation and personality registers to the default settings.

Specifications

Switcher resources, video specifications, power rating, and port pinouts.

Specifications

The information in this section is subject to change without notice.

Switcher Resources

The number of resources specific to your switcher depends on the options installed.

Resource	Graphite
Audio	
Audio Mixer Faders	48
Mix Layers	13
Max 1RU Audio Breakout Unit	3
ABU Input Audio Delay (Max Frames)	14
Video	
2D DVE Channels	4
Chroma Keys per ME	2 (floating)
Custom Controls	256 (8 Banks × 32 CCs)
Keyers per ME	4
Matte Generators per ME	2
Media-Store CACHE	2 GB
Media-Store Channels (Max)	4
Memories per ME	100
MEs (Max)	2
MiniME™ Engines	4
MultiScreen Generators	2 ¹
MultiViewer Boxes	16 (32 with Shift)
MultiViewer Layouts	47
MultiViewer Outputs	2
Pattern Generators per ME	2
Input FSFCs	6 (inputs 1-6 only)
Frame Delay (Max Frames)	16 (inputs 1-6 only)
Output Format Converters	0
GPI I/Os ²	24
Tallies ²	16
Aux Buses	20

Resource	Graphite
SDI Inputs (HD-BNC)	12
Video Inputs (HDMI)	1
SDI Outputs (HD-BNC)	6
Video Outputs (HDMI)	2
LTC Input (HD-BNC)	1
Reference Input (HD-BNC)	1
Carbonite IP	192.168.0.123
XPression IP	192.168.0.113
Panel/CarboNET IP	192.168.0.129

Notes

¹ Each MultiScreen consumes MiniME™ engines to generate the output. The number of MultiScreen outputs that are available depends on the number of MiniME™ engines that are available.

² The Tally and GPI connectors are only present on the optional 1RU Audio Breakout Unit.

Table 6: Audio Mixer Available Audio Channels

	0 ABU	1 ABU	2 ABU	3 ABU
Analog	0	4 stereo pairs	8 stereo pairs	12 stereo pairs
AES	0	1 stereo pair	2 stereo pairs	3 stereo pairs
SDI (1-12) ³	96 stereo pairs	88 stereo pairs	80 stereo pairs	72 stereo pairs
Media-Store (1-2)	2 stereo pairs	2 stereo pairs	2 stereo pairs	2 stereo pairs
PC Audio	8 stereo pairs	8 stereo pairs	8 stereo pairs	8 stereo pairs
XPression (1-4)	32 stereo pairs	32 stereo pairs	32 stereo pairs	32 stereo pairs
Total Channels	138 stereo pairs	135 stereo pairs	132 stereo pairs	129 stereo pairs

Notes

³ When the 1RU Audio Breakout Unit is connected to the switcher, the HD-BNCs used

for the SDI-Audio Loop are not available for embedded audio. This uses one SDI input and one SDI output.

Hardware Weights

Hardware	Weight
Graphite 4RU	62 lbs (28.1 kg)
Graphite PPC	42 lbs (19.05 kg)

Video Input Specifications

Input Specification	Value
Equalization (using Belden 1694 cable)	>50m @ 3Gb/s
	>100m @ 1.5 Gb/s
	>300m @ 270 Mb/s (5°-40°C)
Impedance	75 ohm, terminating
Video Inputs, SDI	SMPTE 259M/292M/424M (non-looping)
Video Inputs, HDMI	HDMI 1.4
	High Speed HDMI Cable (Max 10m)
Reference Inputs (75 ohm, terminated)	Standard Definition — analog black
	High Definition — tri-level sync

Video Output Specifications

Output Specification	Value
Return Loss (w/o bypass)	>15dB 5Mb/s to 1.5Gb/s
	>10dB 1.5Gb/s to 3Gb/s
Return Loss (w/ bypass)	>13dB 5Mb/s to 1.5Gb/s
	>10dB 1.5Gb/s to 3Gb/s
Rise and Fall Time	800ps ±10% (SD)
	240ps ±10% (HD)
Signal Level	800mV ±10%
DC Offset	0 Volts
Overshoot	<10%
Video Outputs, SDI HD Mode	10-bit SMPTE-292M/424M serial digital
Video Outputs, HDMI	HDMI 1.4
	High Speed HDMI Cable (Max 10m)

Bypass Relay Loop

If the switcher subsystem is not running there is a pair of loop-through bypass replays.

- IN1 — OUT1
- IN3 — OUT3

Note: The cable length for the loop-through depends on the equipment you are using.

ABU Analog Audio Input Specifications

Analog audio inputs on the 1RU Audio Breakout Unit.

Specification	Value	
Input Impedance	XLR: 2K ohm	
	¼" Jack: 10K ohm	
Maximum Level	+24dBu	
Frequency Response	±0.3dBu (22Hz to 20kHz @ Fs = 48kHz)	
Signal to Noise Ratio	-95dB	
	• "A" Weighting	-98dB
	• CCITT Weighting	-107dB
THD	>93dB or <0.002%	
Amplitude Linearity	<0.8dB @ -100dBFS	
Crosstalk	-94dB	

ABU Analog Audio Output Specifications

Analog audio outputs on the 1RU Audio Breakout Unit.

Specification	Value
Maximum Level	+24dBu
Frequency Response	±0.4dB (22Hz to 20kHz @ Fs = 48kHz)
Signal to Noise Ratio	-103dB
THD	>93dB
Amplitude Linearity	<0.3dB @ -100dBFS
Crosstalk	-106dB (20Hz to 20kHz)

Jitter

Specification	Value
HD - Tri-Level Sync	Alignment (> 100kHz) < 0.2UI
	Timing (<10Hz) < 1.0UI
HD - Composite Reference	Performance not guaranteed with composite reference

Specification	Value
SD - Tri-Level Sync	Alignment (> 1KHz) < 0.2UI
	Timing (<10Hz) < 0.2UI
SD - Composite Reference	Alignment (> 1KHz) < 0.2UI
	Timing (<10Hz) < 0.5UI

System Timing

- All video inputs zero time relative to reference input, auto timing will correct for inputs out of time by up to +/- 0.25 line.
- System delay is less than 1 line.

Network Ports

The following network ports are used:

- Dashboard Main — 5253 (5258 NAT)
- Dashboard Sat 1 — 5255 (5259 NAT)
- Dashboard Sat 2 — 5256 (5260 NAT)
- Dashboard SoftPanel — 5257 (5261 NAT)
- FTP — 21
- SFTP — 2222
- GVG LUA — 2100
- RossTalk — 7788
- SLP — 427
- SSH — 22
- TFTP — 69
- TSL 3.1 (TCP, Carbonite) — 5727
- TSL 3.1 (TCP, Ultrix™) — 5727
- TSL 3.1 (UDP, Ultrix™) — 4490
- TSL 5.0 (TCP, Carbonite) — 5728
- TSL 5.0 (TCP, Ultrix™) — 5729
- TSL 5.0 (UDP, Ultrix™) — 4492
- Web Server 1 — 80
- SideShot-NG — 5255

Power Consumption — Frame

	Graphite 4RU	Graphite PPC	1RU Audio Breakout Unit
Power	520W 4.7A 120V	185W 1.5A 120V	45W 3.8A 12V
Input Voltage	100-240VAC, 50-60Hz, 14-7A		

Embedded Audio Assignment

The audio signals are passed back and forth between the 1RU Audio Breakout Unit and 4RU Integrated Production System as embedded audio signals in the SDI loop between the components.

Table 7: Embedded Audio Signals in SDI Stream From 1RU Audio Breakout Unit

Group	Channel	Input Signal to Mixer
1	1	Group 1 is passed through from SDI 1 IN unchanged.
	2	
	3	
	4	
2	1	Analog Input 1
	2	Analog Input 2
	3	Analog Input 3
	4	Analog Input 4
3	1	Analog Input 5
	2	Analog Input 6
	3	Analog Input 7
	4	Analog Input 8
4	1	AES Input — Left Channel
	2	AES Input — Right Channel
	3	unused
	4	unused

Note: All embedded audio streams going to the 1RU Audio Breakout Unit pass through the hardware and are available on the SDI1 OUT.

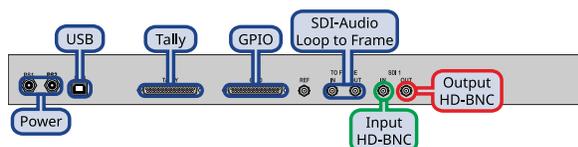
Table 8: Embedded Audio Signals in SDI Stream To 1RU Audio Breakout Unit

Group	Channel	Output Signal from Mixer
1	1	Main — Left Channel
	2	Main — Right Channel
	3	Aux 1 — Left Channel
	4	Aux 1 — Right Channel
2	1	Aux 2 — Left Channel
	2	Aux 2 — Right Channel
	3	Aux 3 — Left Channel
	4	Aux 3 — Right Channel

Group	Channel	Output Signal from Mixer
3	1	Aux 4 — Left Channel
	2	Aux 4 — Right Channel
	3	Aux 5 — Left Channel
	4	Aux 5 — Right Channel
4	1	Aux 6 — Left Channel
	2	Aux 6 — Right Channel
	3	Monitor — Left Channel
	4	Monitor — Right Channel

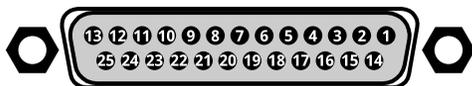
Ports

The GPI and tally ports are located on the 1RU Audio Breakout Unit.



GPI Port

The switcher supports 24 GPI I/Os on a female DB25 port.



Note: The GPI port are located on the first 1RU Audio Breakout Unit (ABM 1). The GPI ports on the remaining 1RU Audio Breakout Units are not available for use.

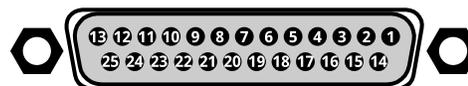
Table 9: GPI I/O Pinouts

Pin	Signal
1	GPI I/O 1
2	GPI I/O 2
3	GPI I/O 3
4	GPI I/O 4
5	GPI I/O 5
6	GPI I/O 6
7	GPI I/O 7
8	GPI I/O 8
9	GPI I/O 9
10	GPI I/O 10
11	GPI I/O 11
12	GPI I/O 12
13	GPI I/O 13

Pin	Signal
14	GPI I/O 14
15	GPI I/O 15
16	GPI I/O 16
17	GPI I/O 17
18	GPI I/O 18
19	GPI I/O 19
20	GPI I/O 20
21	GPI I/O 21
22	GPI I/O 22
23	GPI I/O 23
24	GPI I/O 24
25	Ground

Tally Port

The switcher supports 16 fixed tallies on a female DB25 port.



Note: The Tally port is located on the first 1RU Audio Breakout Unit (ABM 1). The Tally ports on the remaining 1RU Audio Breakout Units are not available for use.

Table 10: Tally Rating

Specification	Value
Input Voltage	24VAC(rms)/40VDC
Maximum Current	120mA
Impedance	<15 ohm

Table 11: Tally Pinouts

Pin	Tally #
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

Pin	Tally #
11	11
12	12
13	13
14	14
15	15
16	16
17	Common
18	Common
19	Common
20	Common
21	Common
22	Common
23	Common
24	Common
25	Common

Custom Control Events

The Custom Control editor in DashBoard allows you to add or edit events in custom controls.

Operations Custom Controls

MultiScreen (BKGD DVE)

Event	Location	Description
BKGD DVE Size	Switcher > Bkgd DVE > Bkgd DVE Crop Param	<p>Set the size of the background DVE for the selected MultiScreen.</p> <ol style="list-style-type: none"> 1. Click the ME button for the Canvas that you want to perform the event on. 2. Click the Parameter button and select Size 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value (%) field, enter the size you want to apply to the Background DVE.
BKGD DVE X-Position	Switcher > Bkgd DVE > Bkgd DVE Crop Param	<p>Set the X-Position of the background DVE for the selected MultiScreen.</p> <ol style="list-style-type: none"> 1. Click the ME button for the Canvas that you want to perform the event on. 2. Click the Parameter button and select X-Position 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value (%) field, enter the position on the X-axis you want to apply to the Background DVE.
BKGD DVE Y-Position	Switcher > Bkgd DVE > Bkgd DVE Crop Param	<p>Set the Y-Position of the background DVE for the selected MultiScreen.</p> <ol style="list-style-type: none"> 1. Click the ME button for the Canvas that you want to perform the event on. 2. Click the Parameter button and select Y-Position 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value (%) field, enter the position on the Y-axis you want to apply to the Background DVE.
BKGD DVE Aspect	Switcher > Bkgd DVE > Bkgd DVE Crop Param	<p>Set the aspect ratio of the background DVE for the selected MultiScreen.</p> <ol style="list-style-type: none"> 1. Click the ME button for the Canvas that you want to perform the event on. 2. Click the Parameter button and select Aspect 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value (%) field, enter the aspect ratio you want to apply to the Background DVE.
BKGD DVE Border Size	Switcher > Bkgd DVE > Bkgd DVE Crop Param	<p>Set the size of the border of the background DVE for the selected MultiScreen.</p> <ol style="list-style-type: none"> 1. Click the ME button for the Canvas that you want to perform the event on. 2. Click the Parameter button and select Edge Size 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value (%) field, enter the size of the border you want to apply to the Background DVE. When a border is set to 0 the border is not visible.

Event	Location	Description
BKGD DVE Edge Softness	Switcher > Bkgd DVE > Bkgd DVE Crop Param	<p>Set the softness of the edge of the background DVE for the selected MultiScreen.</p> <ol style="list-style-type: none"> 1. Click the ME button for the Canvas that you want to perform the event on. 2. Click the Parameter button and select Edge Softness 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value (%) field, enter the amount of softness to apply to the edge of the Background DVE.
BKGD DVE Crop	Switcher > Bkgd DVE > Bkgd DVE Crop Param	<p>Set the amount of cropping you want to apply to each edge of the background DVE for the selected MultiScreen.</p> <ol style="list-style-type: none"> 1. Click the ME button for the Canvas that you want to perform the event on. 2. Click the Parameter button and select the edge you want to crop. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value (%) field, enter the amount of cropping you want to apply to the selected edge of the Background DVE.

Custom Control Events

Event	Location	Description
Cancel All CC	Custom Control > Cancel All	Stop all running custom controls.
Cancel CC	Custom Control > Cancel CC	<p>Stop a particular custom control. The specific custom control is set when the cancel is inserted.</p> <ol style="list-style-type: none"> 1. Click the Bank button and select the custom control bank you want to cancel a custom control on. 2. Click the CC button and select the custom control you want to cancel.
Hold CC	Custom Control > Hold	Insert a command in a custom control that will stop the custom control at the hold event. You must press the custom control button again, or use a GPI trigger, to continue the custom control.
Loop CC	Custom Control > Loop	Have a custom control run continuously until stopped, or a Cancel/Cancel All custom control command is executed from another custom control.
Pause CC	Custom Control > Hold	<p>Insert a command in a custom control that will stop a custom control at the pause event. The length of the pause is set when the pause is inserted.</p> <ol style="list-style-type: none"> 1. Enter the length of the pause in the Pause (fr) field.
Play CC	Custom Control > Play CC	<p>Play a custom control. Note: The Play CC command applies to a target custom control button only. If you move the contents of the custom control from the button selected in the Play CC to another button, the Play CC command will not follow and will continue to play the custom control assigned to the original button.</p> <ol style="list-style-type: none"> 1. Click the Bank button and select the custom control bank you want to play a custom control on. 2. Click the CC button and select the custom control you want to play.
Resume CC	Custom Control > Resume CC	<p>Resume a particular custom control that is at a hold. The specific custom control is set when the resume is inserted. If the target custom control is not at a hold event, the resume command will not start the target custom control.</p> <ol style="list-style-type: none"> 1. Click the Bank button and select the custom control bank you want to resume a custom control on. 2. Click the CC button and select the custom control you want to resume.

Event	Location	Description
Resume All CCs	Custom Control > Resume All	Resume all custom control that are at hold. The specific custom control is set when the resume is inserted. If a custom control is not at a hold event, the resume command will not start the a custom control.
State, Insert	Custom Control > State	Embed the state of the switcher into a custom control. A state in a custom control behaves just like a memory. <ol style="list-style-type: none"> Click State Attributes and select the inclusions and attributes that you want to include in the state of the switcher when it is stored to the custom control. If Disable Audio Memories is set to On (Click Navigation Menu > Configuration > System > Global) the audio attributes are disabled.

Keyer

Event	Location	Description
Key Only Transition	Switcher > Keyer > Keyer Trans	Perform a key only transition for the selected area. <ol style="list-style-type: none"> Click the ME button and select the area that you want to perform the event on. Click the Keyer button for the key you want to perform the event on. Click the Action button and select the type of transition to perform. <ul style="list-style-type: none"> Cut — cut transition Auto — auto transition Reset Rate — reset the transition rate to default Cut On — cut the key on-air Cut Off — cut the key off-air Auto Trans On — auto transition the key on-air Auto Trans Off — auto transition the key off-air
Key Trans Rate	Switcher > Keyer > Keyer Trans Rate	Set or reset the keyer transition rate of the selected area. <ol style="list-style-type: none"> Click the ME button and select the area that you want to perform the event on. Click the Keyer button for the key you want to perform the event on. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Enter a new transition rate, in frames, for the key in the Value (fr) field.
Chroma Key, Initialize	Switcher > Keyer > Chroma Key Init	Initialize a chroma key for the selected key for the selected area. <ol style="list-style-type: none"> Click the ME button and select the area that you want to perform the event on.
Chroma Key Auto Adjust	Switcher > Keyer > CK Auto Adjust	Select the chroma key auto adjustments that you want to turn on. <ol style="list-style-type: none"> Click the ME button and select the area that you want to perform the event on. Click a Parameter button to select whether to toggle Auto Re-Spill Color or Auto Edge Luma. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Click the Value button and select whether to turn the parameter On or Off.
Chroma Key Color	Switcher > Keyer > Chroma Key Color	Select the color you want to key out for the selected key for the selected area. <ol style="list-style-type: none"> Click the ME button and select the area that you want to perform the event on. Click Color and select the color you want to key out.

Event	Location	Description
Chroma Key Measurement Source	Switcher > Keyer > CK Measurement Source	Select the video source that you want to use for the automatic adjustment of the chroma key. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Value button and select video source you want to use.
Chroma Key Re-spill Color	Switcher > Keyer > CK Color (Preset Color)	Select the re-spill color for the chroma key. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Color button and select the re-spill color.
Chroma Key Re-spill Saturation	Switcher > Keyer > CK Color (HSL Color)	Select the re-spill saturation for the chroma key. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Component button and select Sat. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button and select the new value you want to enter for the selected component.
Chroma Key Setup	Switcher > Keyer > UCHR Param	Select the various advanced chroma key settings for the selected key for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the UCHR Controls button and select the parameter you want to adjust. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button and select the new value you want to enter for the selected parameter.
DVE Freeze	Switcher > Keyer > DVE Freeze	Turn the DVE freeze feature on or off for the selected key for the selected ME, MiniME™, or MultiScreen. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button and select whether to freeze the video and appearance of a key (On) or not (Off). When a key is frozen, the DVE attribute are disabled and you can not move the key.
DVE Key Aspect	Switcher > Keyer > DVE Param	Select the aspect ratio for the DVE key on the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Aspect. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter an aspect ratio in the Value (%) field.

Event	Location	Description
DVE Key Border Color (HSL)	Switcher > Keyer > DVE Border Color (HSL)	<p>Select the custom color you want to apply to the border of the DVE key of the selected area. Each component of the HSL color must be inserted individually.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Component button and select the HSL component you want to assign a value to. A value should be applied to all three components. 5. Enter a value for the selected component in the Value (%) field.
DVE Key Border Color (Preset)	Switcher > Keyer > DVE Border Color (Preset)	<p>Select the preset color you want to apply to the border of the DVE key of the selected key for the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Color button and select the preset color you want to apply to the border.
DVE Key Border	Switcher > Keyer > DVE Param	<p>Select the size of border for the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Edge Size. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a size for the border in the Value (%) field.
DVE Key Crop (Bottom Edge)	Switcher > Keyer > DVE Param	<p>Select the amount of cropping on the bottom edge of the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Bottom Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the amount of cropping in the Value (%) field.
DVE Key Crop (Dual Edge)	Switcher > Keyer > DVE Crop Param	<p>Select the amount of cropping on both horizontal or vertical edges of the DVE key of the selected key for the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Parameter button and select the edges you want to crop. 5. Enter the amount of Left or Top cropping you want to apply in the Value % field. 6. Enter the amount of Right or Bottom cropping you want to apply in the Other Value % field.

Event	Location	Description
DVE Key Crop (Left Edge)	Switcher > Keyer > DVE Param	<p>Select the amount of cropping on the left edge of the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Left Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the amount of cropping in the Value (%) field.
DVE Key Crop (Right Edge)	Switcher > Keyer > DVE Param	<p>Select the amount of cropping on the right edge of the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Right Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the amount of cropping in the Value (%) field.
DVE Key Crop (Top Edge)	Switcher > Keyer > DVE Param	<p>Select the amount of cropping on the top edge of the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Top Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the amount of cropping in the Value (%) field.
DVE Key Edge Softness	Switcher > Keyer > DVE Param	<p>Select the amount of softness to apply to the edge of the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Edge Softness. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter an amount of softness for the DVE key or border in the Value (%) field.
DVE Key Size	Switcher > Keyer > DVE Param	<p>Select the size of the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Size. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new size in the Value (%) field.

Event	Location	Description
DVE Key X-Position	Switcher > Keyer > DVE Param	<p>Select the x-axis position of the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select X-Pos. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
DVE Key Y-Position	Switcher > Keyer > DVE Param	<p>Select the y-axis position for the DVE key on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Y-Pos. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
Fly Key (DVE)	Switcher > Keyer > Keyer Fly	<p>Assign DVE resources (Fly) to the selected key for the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button and select whether DVE resources are assigned to the key (On) or not (Off).
Key, Make Linear	Switcher > Keyer > Keyer Make Linear	<p>Make the selected key linear on the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to make linear.
Key Active	Switcher > Keyer > Keyer Active	<p>Transition a key (or include it in the next transition) on or off-air for the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Parameter button and select a cut (Cut Key) or auto transition (Trans Key) for the key, or have to key included in the next transition (Include Key). 5. Click the Value button to select whether the key is transitioned on-air / included in the next transition to go on-air (On) or off-air / included in the next transition to go off-air (Off).
Key Copy	Switcher > Keyer > Keyer Copy	<p>Copy the contents of one key to another key the same or a different area.</p> <ol style="list-style-type: none"> 1. Click the Target ME button and select where you want to copy the key to. 2. Click the Target Keyer button for the key you want to copy to. 3. Click the Source ME button and select where you want to copy the key from. 4. Click the Source Keyer button for the key you want to copy from.

Event	Location	Description
Key Invert	Switcher > Keyer > Keyer Invert	Turn the key invert feature on or off for the selected key for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to reverse the polarity of the key alpha so that the holes in the background are cut by dark areas of the key alpha instead of bright areas. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button to turn key invert on (On) or off (Off).
Key Mode	Switcher > Keyer > Keyer Mode	Select the mode for the selected key for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click a Mode button to have the key set as shaped/unshaped from the key (Normal), as additive for a shaped source (Additive), or alpha to fully opaque/white (Full).
Key Reset	Switcher > Keyer > Keyer Reset Params	Reset the parameters for the selected key for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to reset the clip, gain, transparency, invert, and mask for.
Key Settings (Clip, Gain, Transparency)	Switcher > Keyer > Keyer Settings	Select clip, gain, and transparency settings for the selected key for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a value for the clip, gain, or transparency for the key in the Value field.
Key Swap	Switcher > Keyer > Keyer Swap	Swap the contents of one key with another key the same or a different area. <ol style="list-style-type: none"> 1. Click the 1st ME button and select where the first key you want to swap is. 2. Click the 1st Keyer button for the first key you want to swap. 3. Click the 2nd ME button and select where the second key you want to swap is. 4. Click the 2nd Keyer button for the second key you want to swap.
Key Type	Switcher > Keyer > Keyer Type	Assign a key type for a key for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click a Type button to assign the key type to the selected key.
Mask, Force	Switcher > Keyer > Mask Force	Apply a mask to the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button and select whether to force the area inside the mask region to the foreground (On) or not (Off).

Event	Location	Description
Mask, Invert	Switcher > Keyer > Mask Invert	Invert the mask of the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button and select whether to invert the masked area with the unmasked area (On) or not (Off).
Mask (Box) — Bottom Edge Position	Switcher > Keyer > Box Mask Param	Select the position for the bottom edge of the box mask on the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Bottom Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
Mask (Box) — Edge Softness	Switcher > Keyer > Box Mask Param	Select the amount of softness to apply to the edges of the box mask on the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Edge Softness. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new softness amount in the Value (%) field.
Mask (Box) — Left Edge Position	Switcher > Keyer > Box Mask Param	Select the position for the left edge of the box mask on the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Left Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
Mask (Box) — Right Edge Position	Switcher > Keyer > Box Mask Param	Select the position for the right edge of the box mask on the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Right Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
Mask (Box) — Size	Switcher > Keyer > Box Mask Param	Select the size of the box mask on the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Size. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new size in the Value (%) field.

Event	Location	Description
Mask (Box) — Top Edge Position	Switcher > Keyer > Box Mask Param	<p>Select the position for the top edge of the box mask on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Top Edge. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
Mask (Box) — X-Position	Switcher > Keyer > Box Mask Param	<p>Select the x-axis position of the box mask on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select X-Pos. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
Mask (Box) — Y-Position	Switcher > Keyer > Box Mask Param	<p>Select the y-axis position for the box mask on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click the Parameter button and select Y-Pos. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter a new position in the Value (%) field.
Mask (Pattern) — Aspect Ratio	Switcher > Keyer > Pattern Mask Param	<p>Select the aspect ratio for the pattern mask for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Aspect. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter an aspect ratio in the Value (%) field.
Mask (Pattern) — Border Size	Switcher > Keyer > Pattern Mask Param	<p>Select the size of border for the pattern mask on the selected key for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Border Size. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a size for the border in the Value (%) field.
Mask (Pattern) — Edge Softness	Switcher > Keyer > Pattern Mask Param	<p>Select the amount of softness to apply to the edge of the mask for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Softness. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter an amount of softness for the pattern or border in the Value (%) field.

Event	Location	Description
Mask (Pattern) — Horizontal Multiplication	Switcher > Keyer > Pattern Mask Param	<p>Select the number of times you want to multiply the pattern mask horizontally for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Horizontal Mult. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the number of times the pattern is multiplied in the Value field.
Mask (Pattern) — Reset	Switcher > Keyer > Pattern Mask Reset	<p>Reset the mask for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click Reset Params.
Mask (Pattern) — Rotation	Switcher > Keyer > Pattern Mask Param	<p>Select the rotation for the pattern mask for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Rotation. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a rotation in the Value (%) field.
Mask (Pattern) — Size	Switcher > Keyer > Pattern Mask Param	<p>Select the size of the pattern mask for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Size. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new size in the Value (%) field.
Mask (Pattern) — Vertical Multiplication	Switcher > Keyer > Pattern Mask Param	<p>Select the number of times you want to multiply the pattern mask vertically for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Vertical Mult. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the number of times the pattern is multiplied in the Value field.
Mask (Pattern) — X-Position	Switcher > Keyer > Pattern Mask Param	<p>Select the x-axis position of the pattern mask for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select X-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new position in the Value (%) field.
Mask (Pattern) — Y-Position	Switcher > Keyer > Pattern Mask Param	<p>Select the y-axis position for the pattern mask for the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Y-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new position in the Value (%) field.

Event	Location	Description
Mask	Switcher > Keyer > Mask Type	Apply a mask to the selected key for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Keyer button for the key you want to perform the event on. 3. Click a Mask Type button to apply a pattern mask (Pattern), box mask (Box, or turn the mask off (Off).

Media-Store

Event	Location	Description
Auto Play	Switcher > Media-Store > Attributes	Select whether an animation plays automatically when taken on-air for the selected Media-Store channel. <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Auto Play. 4. Click the Value button and select whether the animation plays automatically (On) or not (Off).
Capture Alpha	Switcher > Media-Store > Capture Alpha	Select whether to include the alpha with a capture on the selected Media-Store channel. <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Capture Alpha button and select whether the alpha is captured with the source (Yes) or not (No).
Capture Alpha Source	Switcher > Media-Store > Capture Alpha Source	Select the alpha source you want to capture for the selected Media-Store channel. <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click Source and select the alpha source that you want to capture.
Capture	Switcher > Media-Store > Capture	Capture a still to the selected Media-Store channel. <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click a Capture Type button to select whether the Media-Store captures the media to a file name (Capture) or the next available capture number (Capture+). 3. If you selected Capture, enter the name you want use for the capture file in the Capture File Name field. If a file with the same name exists it will be overwritten.
Capture Mode	Switcher > Media-Store > Capture Display	Select the capture mode for the selected Media-Store channel. <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click a Capture Display button to select whether the capture is in electronic-to-electronic "E/E" (End to End) or playback "P/B" (Playback) mode.
Capture Source	Switcher > Media-Store > Capture Source	Select the video source you want to capture for the selected Media-Store channel. <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click Source and select the video source that you want to capture.

Event	Location	Description
Clear Channel	Switcher > Media-Store > Channel Action	<p>Clear the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click Clear Channel.
Cut Frame	Switcher > Media-Store > Attributes	<p>Select the point, in frames, from the start of the media item that the MediaWipe background cut occurs for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Cut Frame. 4. Enter the frame in the media item that you want to cut to occur for the MediaWipe in the Value field.
Delete Capture	Switcher > Media-Store > Delete Media Capture	<p>Delete a captured still.</p> <ol style="list-style-type: none"> 1. Enter the number of the capture file you want to delete in the Capture File field.
Media-Store Load	Switcher > Media-Store > Load	<p>Load a media item into the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Location button to select whether the media item you want to load is located on the internal storage (Internal) or on the USB (USB). 3. Enter the number of the media item you want to load in the Media Number field.
Looping	Switcher > Media-Store > Attributes	<p>Select whether an animation will loop at the end for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Looping. 4. Click the Value button and select whether the animation loops at the end (On) or not (Off).
Move To Frame	Switcher > Media-Store > Attributes	<p>Move to a specific frame in the media item for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Move To Frame. 4. Enter the frame that you want to jump to in the media item in the Value field.

Event	Location	Description
Mute	Switcher > Media-Store > Attributes	<p>Select whether the associated audio is turned on or off during playback for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Mute. 4. Click the Value button and select whether the audio plays (On) or not (Off).
Play	Switcher > Media-Store > Channel Action	<p>Start an animation playing for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click Toggle Play.
Play Speed	Switcher > Media-Store > Playback Speed	<p>Select the speed for an animation to play at on the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Playback Speed. 4. Enter the speed, faster or slower than 100%, that you want the animation to play at in the Value (%) field.
Reset Media	Switcher > Media-Store > Channel Action	<p>Reset the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click Reset Media.
Reverse	Switcher > Media-Store > Attributes	<p>Select whether an animation plays in reverse for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Reverse. 4. Click the Value button and select whether the animation plays in reverse (On) or not (Off).
Rewind	Switcher > Media-Store > Channel Action	<p>Rewind an animation to the first frame for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click Move to Frame 1.
Shaped	Switcher > Media-Store > Attributes	<p>Select whether the alpha of the media item should be shaped or unshaped for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Shaped. 4. Click the Value button and select whether the alpha of the media item is shaped (On) or not (Off).

Event	Location	Description
Thumb Frame	Switcher > Media-Store > Attributes	<p>Select the point, in frames, from the start of the animation that is used as the thumbnail for the media item.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Thumb Frame. 4. Enter the frame in the media item that you want to use as the thumbnail.
X-Position	Switcher > Media-Store > Attributes	<p>Select the x-axis position for the media item for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select X-Pos. 4. Enter a new position in the Value field.
Y-Position	Switcher > Media-Store > Attributes	<p>Select the y-axis position for the media item for the selected Media-Store channel.</p> <ol style="list-style-type: none"> 1. Click the MediaStore Channel button for the Media-Store channel you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Parameter button and select Y-Pos. 4. Enter a new position in the Value field.

Matte

Event	Location	Description
Matte Color, Reset	Switcher > Matte > Matte Color Reset	<p>Reset the matte color for the selected ME or aux.</p> <ol style="list-style-type: none"> 1. Click the ME/Matte button for the ME or aux that you want to perform the event on. 2. For an ME, click the Matte button and select Matte.
Matte Color (HSL)	>Switcher > Matte > Matte Color (HSL)	<p>Select the custom matte color for the selected ME or aux. Each component of the HSL color must be inserted individually.</p> <ol style="list-style-type: none"> 1. Click the ME/Matte button for the ME or aux that you want to perform the event on. 2. Click the Matte button and select Matte. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Component button and select the HSL component you want to assign a value to. A value should be applied to all three components. 5. Enter a value for the selected component in the Value (%) field.
Matte Color (Preset)	>Switcher > Matte > Matte Color (Preset)	<p>Select a preset matte color for the selected ME or aux.</p> <ol style="list-style-type: none"> 1. Click the Matte button and select Matte. 2. Click the Color button and select the color you want to use.

Event	Location	Description
Wash Color (HSL)	>Switcher > Matte > Wash Color (HSL)	Select the custom matte color for the selected ME or aux. Each component of the HSL color must be inserted individually. This is the second color of the wash, the first color is set from the matte color. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Matte button and select Wash. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Component button and select the HSL component you want to assign a value to. A value should be applied to all three components. 5. Enter a value for the selected component in the Value (%) field.
Wash Color (Preset)	>Switcher > Matte > Wash Color (Preset)	Select a preset wash color for the selected ME. This is the second color of the wash, the first color is set from the matte color. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Matte button and select Wash. 3. Click the Color button and select the color you want to use.
Wash Color Reset	>Switcher > Matte > Wash Color Reset	Reset the matte color for the selected ME. This is the second color of the wash, the first color is set from the matte color. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Matte button and select Wash.
Wash Generator — Disable	>Switcher > Matte > Wash Enabled Reset	Disable the wash generator for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on.
Wash Generator — Enable	>Switcher > Matte > Wash Enabled	Enable the wash generator for the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Wash button and select whether the wash generator is enabled (On) or not (Off).

Sequencer

Event	Location	Description
Load	Sequencer > Load	Load a sequence into the selected Sequencer. <ol style="list-style-type: none"> 1. Click the Sequencer button and select the Sequencer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Value field, enter the sequence number for the sequence you want to load in the selected Sequencer.
Reload	Sequencer > Reload	Reload the sequence currently loaded into the selected Sequencer. <ol style="list-style-type: none"> 1. Click the Sequencer button and select the Sequencer you want to perform the event on.
Clear	Sequencer > Clear	Unload the sequence currently loaded into the selected Sequencer. <ol style="list-style-type: none"> 1. Click the Sequencer button and select the Sequencer you want to perform the event on.
Next	Sequencer > Next	Run the next event in the selected Sequencer. <ol style="list-style-type: none"> 1. Click the Sequencer button and select the Sequencer you want to perform the event on.

Event	Location	Description
Up	Sequencer > Up	Move the next event highlight (green) up one event in the sequence loaded into the selected Sequencer. <ol style="list-style-type: none"> 1. Click the Sequencer button and select the Sequencer you want to perform the event on.
Down	Sequencer > Down	Move the next event highlight (green) down one event in the sequence loaded into the selected Sequencer. <ol style="list-style-type: none"> 1. Click the Sequencer button and select the Sequencer you want to perform the event on.
Link	Sequencer > Link	Turn Link on or off for the selected Sequencer. <ol style="list-style-type: none"> 1. Click the Sequencer button and select the Sequencer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to turn link On or Off.

Special

Event	Location	Description
Row ME Assignment	Special > Row ME Assignment	Assign a control panel row to an ME, MiniME™, or MultiScreen on a particular panel. <ol style="list-style-type: none"> 1. Click the Panel button for the control panel that you want to assign a row from. 2. Click the Row button for the row on the control panel that you want to assign to an ME. 3. Click the ME button as select the area that you want to assign the control panel row to.

Switcher Operation

Event	Location	Description
Bus Source Copy	Switcher > Bus Source Copy	Copy the contents of one bus to another. <ol style="list-style-type: none"> 1. Click the Source ME button and select the location containing the bus you want to copy from. 2. Click the Source Bus/Keyer button and select the bus that you want to copy. 3. Click the Destination ME button and select the location containing the bus you want to copy to. 4. Click the Dest. Bus/Keyer button and select the bus that you want to copy to.
Bus Source Select	Switcher > Bus Source	Select a source on the selected bus for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to select a bus on. 2. Click the Bus/Keyer button and select the bus that you want to select a source on. 3. If you selected a key bus, click a Bus button to select whether you are selecting a source for the fill (Video) or the alpha (Alpha) of the key. 4. Click the Source button and select the source that you want on the selected bus.

Event	Location	Description
ME Copy	Switcher > ME Copy	Copy the contents of one area to another. <ol style="list-style-type: none"> 1. Click the Target ME button and select the location that you want to copy to. 2. Click the Source ME button and select the location that you want to copy from.
Memory Recall	Switcher > Memory Recall	Recall a memory for the selected area. <ol style="list-style-type: none"> 1. Click the Include button and select all the locations that you want to perform the memory recall on. 2. Click the Bank button and select the bank that you want to recall the memory on. 3. Click the Memory button and select the memory that you want to recall.
RState, Load	Switcher > Load RState	Load the custom reset settings for the selected area. <ol style="list-style-type: none"> 1. Click the Include button and select all the locations that you want to recall the custom reset settings on.
Memory Recall	Switcher > Memory Recall	Recall a memory for the selected area. <ol style="list-style-type: none"> 1. Click the Include button and select all the locations that you want to perform the memory recall on. 2. Click the Bank button and select the bank that you want to recall the memory on. 3. Click the Memory button and select the memory that you want to recall.

Transitions

Event	Location	Description
Combined Transition Event		
Transition Action - Dissolve	Switcher > Transition > Transition Action	Set up a dissolve transition with a single custom control event. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click Dissolve. 3. Click the Toggle, Include On, and Include Off buttons to set up what is included with the next transition. Something must always be selected for the toggle inclusion. Key toggle and on/off inclusions are mutually exclusive. <ul style="list-style-type: none"> • Toggle — select the background and any keys that you want included with the transition. This is the same as using the next trans buttons on the Transition area of a control panel. • Include On — select that keys that you want to transition on-air with the next transition. If a key is already on-air it is ignored. • Include Off — select that keys that you want to transition off-air with the next transition. If a key is already off-air it is ignored. 4. Click an Auto Trans button to select whether the transition is performed with the custom control (On) or if the custom control only sets up the next transition but does not perform it (Off). 5. Enter a rate for transition in the Trans Rate (fr) field. A rate of 0 is performed as a cut. 6. Click a Diss/Flash button to select whether the transition is performed as a dissolve (Dissolve) or a WhiteFlash (Flash). The existing onset, offset, and color values for the ME are used for the WhiteFlash.

Event	Location	Description
Transition Action - Wipe	Switcher > Transition > Transition Action	<p>Set up a wipe transition with a single custom control event.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click Wipe. 3. Click the Toggle, Include On, and Include Off buttons to set up what is included with the next transition. Something must always be selected for the toggle inclusion. Key toggle and on/off inclusions are mutually exclusive. <ul style="list-style-type: none"> • Toggle — select the background and any keys that you want included with the transition. This is the same as using the next trans buttons on the Transition area of a control panel. • Include On — select that keys that you want to transition on-air with the next transition. If a key is already on-air it is ignored. • Include Off — select that keys that you want to transition off-air with the next transition. If a key is already off-air it is ignored. 4. Click an Auto Trans button to select whether the transition is performed with the custom control (On) or if the custom control only sets up the next transition but does not perform it (Off). 5. Enter a rate for transition in the Trans Rate (fr) field. A rate of 0 is performed as a cut. 6. Click the Pattern button and select the wipe pattern you want to use for the transition.
Transition Action - DVE	Switcher > Transition > Transition Action	<p>Set up a DVE wipe transition with a single custom control event.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click DVE. 3. Click the Toggle, Include On, and Include Off buttons to set up what is included with the next transition. Something must always be selected for the toggle inclusion. Key toggle and on/off inclusions are mutually exclusive. <ul style="list-style-type: none"> • Toggle — select the background and any keys that you want included with the transition. This is the same as using the next trans buttons on the Transition area of a control panel. • Include On — select that keys that you want to transition on-air with the next transition. If a key is already on-air it is ignored. • Include Off — select that keys that you want to transition off-air with the next transition. If a key is already off-air it is ignored. 4. Click an Auto Trans button to select whether the transition is performed with the custom control (On) or if the custom control only sets up the next transition but does not perform it (Off). 5. Enter a rate for transition in the Trans Rate (fr) field. A rate of 0 is performed as a cut. 6. Click the DVE Effect button and select the DVE wipe pattern you want to use for the transition.

Event	Location	Description
Transition Action - MediaWipe	Switcher > Transition > Transition Action	<p>Set up a MediaWipe transition with a single custom control event.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click MediaWipe. 3. Click the Toggle, Include On, and Include Off buttons to set up what is included with the next transition. Something must always be selected for the toggle inclusion. Key toggle and on/off inclusions are mutually exclusive. <ul style="list-style-type: none"> • Toggle — select the background and any keys that you want included with the transition. This is the same as using the next trans buttons on the Transition area of a control panel. • Include On — select that keys that you want to transition on-air with the next transition. If a key is already on-air it is ignored. • Include Off — select that keys that you want to transition off-air with the next transition. If a key is already off-air it is ignored. 4. Click an Auto Trans button to select whether the transition is performed with the custom control (On) or if the custom control only sets up the next transition but does not perform it (Off). 5. Click the Layer button to select what the MediaWipe animation covers. 6. Click a Location button for the drive that the animation to use for the MediaWipe is stored on. 7. Enter the media number for the animation you want use for the MediaWipe in the Media Number field. 8. Click a Channel number to select the Media-Store channel you want to use for the MediaWipe.
Individual Transition Events		
Auto Trans	Switcher > Transition > ME Trans Action	<p>Performs an auto transition on the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Auto Trans.
Cut	Switcher > Transition > ME Trans Action	<p>Performs a cut on the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Cut.
DVE Wipe, Reset	Switcher > Transition > DVE Wipe Reset	<p>Reset the parameters or direction and flip-flop for the DVE wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click Reset to reset the DVE wipe parameters.
DVE Wipe Direction (Flip-Flop)	Switcher > Transition > DVE Wipe Direction	<p>Select whether the DVE wipe reverses direction for every second transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click Flip-Flop. 4. Click On or Off to select whether Flip-Flop is on (On) or not (Off).

Event	Location	Description
DVE Wipe Direction	Switcher > Transition > DVE Wipe Direction	Select the direction for the DVE wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click Direction. 4. Click Forward or Reverse to select whether the DVE wipe moves in a forward (Forward) or reverse (Reverse) direction.
DVE Wipe Pattern	Switcher > Transition > DVE Wipe Effect	Select the pattern you want to use for a DVE wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Effect button and select the pattern you want to use for the DVE wipe.
MediaWipe — Channel	Switcher > Transition > Media Wipe Channel	Select which Media-Store channel will be used for the MediaWipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click M1 or M2 to assign that Media-Store channel to the MediaWipe.
MediaWipe Cut Point, Set	Switcher > Transition > ME Trans Action	Sets the cut point for a MediaWipe transition for the selected area. You must select the point in the transition that you want to place the cut before running this event. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Set Media Cut.
MediaWipe — Direction, Flip-Flop	Switcher > Transition > DVE Wipe Direction	Select whether the MediaWipe reverses direction for every second transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click Flip-Flip. 4. Click the Value button and select whether Flip-Flop is on (On) or not (Off).
MediaWipe — Direction	Switcher > Transition > DVE Wipe Direction	Select the direction for the MediaWipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click Direction. 4. Click the Value button and select whether the MediaWipe moves in a forward (Forward) or reverse (Reverse) direction.
MediaWipe — Layer	Switcher > Transition > ME Media Trans Layer	Select which Media-Store channel will be used for the MediaWipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Layer button to select what the MediaWipe animation covers.
MediaWipe Trans End Point, Set	Switcher > Transition > ME Trans Action	Sets the ending point for a MediaWipe transition for the selected area. Use the fader to move through the animation to the point you want to end the transition and run this CC to save that point. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Set Media Trans End.

Event	Location	Description
MediaWipe Trans Start Point, Set	Switcher > Transition > ME Trans Action	<p>Sets the starting point for a MediaWipe transition for the selected area. Use the fader to move through the animation to the point you want to start the transition and run this CC to save that point.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Set Media Trans Start.
MediaWipe Trans Thumbnail	Switcher > Transition > ME Trans Action	<p>Sets the starting point for a MediaWipe transition for the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Set Media Thumb.
ME Dissolve Type	Switcher > Transition > ME Dissolve Type	<p>Select the type of dissolve transition (WhiteFlash or Dissolve) you want to use.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click a Type button to select a Dissolve (Dissolve) or WhiteFlash (Flash) transition.
ME Trans Rate	Switcher > Transition > ME Trans Parameter	<p>Set or reset the background transition rate of the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Parameter button and select ME Trans Rate. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new transition rate, in frames, in the Value (fr) field.
ME Trans Type	Switcher > Transition > ME Trans Type	<p>Select the transition type for a background transition of the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Type button for the type of transition you want to use.
ME WhiteFlash Color	Switcher > Transition > ME Flash Dissolve Color (Preset)	<p>Select color for the WhiteFlash transition.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Color button and select the preset color you want to use.
ME WhiteFlash Offset	Switcher > Transition > ME Trans Value	<p>Select time for the offset of the WhiteFlash transition.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click Flash Offset. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new offset position in the Value (%) field.
ME WhiteFlash Onset	Switcher > Transition > ME Trans Value	<p>Select time for the onset of the WhiteFlash transition.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click Flash Onset. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new onset position in the Value (%) field.
Reset	Switcher > Transition > ME Trans Action	<p>Resets the transition area of the selected area.</p> <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Reset.

Event	Location	Description
Roll Clip	Switcher > Transition > Roll Clip	Turn the Roll Clip feature on or off for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Value button and select whether roll clip is on (On) or not (Off).
Trans Clear	Switcher > Transition > ME Trans Action	Configures the next transition area of the selected area to take all keys off-air with the next transition. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Trans Clear.
Trans Delay	Switcher > Transition > ME Trans Action	Applies the pre-delay to the transition. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Delayed Auto Trans.
Trans Elements	Switcher > Transition > ME Trans Element	Select the elements to be included in the next transition of the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Elements button and select background and/or the keys that you want to include in the next transition.
Trans Limit — On/Off	Switcher > Transition > ME Trans Limit	Turn the transition limit feature on or off for the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Value button and select whether trans limit is on (On) or not (Off).
Trans Limit — Reset	Switcher > Transition > ME Trans Action	Resets the transition limit point of the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Reset Limit.
Trans Limit — Set	Switcher > Transition > ME Trans Action	Sets the transition limit point of the selected area. You must select the point in the transition that you want to place the limit before running this event. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click the Action button and select Set Limit.
Trans Limit — Value	Switcher > Transition > ME Trans Value	Select the limit point for the trans limit of the selected area. <ol style="list-style-type: none"> 1. Click the ME button and select the area that you want to perform the event on. 2. Click Trans Limit. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the point in the transition that you want to place the trans limit in the Value (%) field.

Event	Location	Description
Wipe Direction (Flip-Flop)	Switcher > Transition > Wipe Direction	<p>Select whether the wipe reverses direction for every second transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Pattern button and select Wipe. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Parameter button and select Flip-Flip. 5. Click the Value button and select whether Flip-Flop is on (On) or off (Off).
Wipe Direction	Switcher > Transition > Wipe Direction	<p>Select the direction for the wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Pattern button and select Wipe. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Parameter button and select Direction. 5. Click the Value button and select whether the wipe moves in a forward (Forward) or reverse (Reverse) direction.
Wipe Pattern — Aspect Ratio	Switcher > Transition > Wipe Param	<p>Select the aspect ratio for the wipe pattern you want to use for a wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Aspect. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter an aspect ratio in the Value (%) field.
Wipe Pattern — Border Color (HSL)	Switcher > Transition > Wipe Border Color (HSL)	<p>Select the custom color you want to apply to the border of the pattern for the wipe transition of the selected ME. Each component of the HSL color must be inserted individually.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Matte button and select Wipe Border. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Component button and select the HSL component you want to assign a value to. A value should be applied to all three components. 5. Enter a value for the selected component in the Value (%) field.
Wipe Pattern — Border Color (Preset)	Switcher > Transition > Wipe Border Color (Preset)	<p>Select the preset color you want to apply to the border of the pattern for the wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Matte button and select Wipe Border. 3. Click the Color button and select the preset color you want to apply to the border.
Wipe Pattern — Border Size	Switcher > Transition > Wipe Param	<p>Select the size of border for the wipe pattern you want to use for a wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Border Size. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a size for the border in the Value (%) field.

Event	Location	Description
Wipe Pattern — Edge Softness	Switcher > Transition > Wipe Param	Select the amount of softness to apply to the edge of the pattern or border for the wipe pattern you want to use for a wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Softness. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter an amount of softness for the pattern or border in the Value (%) field.
Wipe Pattern — Horizontal Multiplication	Switcher > Transition > Wipe Param	Select the number of times you want to multiply the wipe pattern horizontally for the wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Horizontal Mult. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the number of times the pattern is multiplied in the Value field.
Wipe Pattern — Pattern	Switcher > Transition > Wipe Effect	Select the pattern you want to use for a wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Pattern button and select the pattern you want to use for the wipe.
Wipe Pattern — Rotation	Switcher > Transition > Wipe Param	Select the rotation for the wipe pattern you want to use for a wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Rotation. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a rotation in the Value (%) field.
Wipe Pattern — Size	Switcher > Transition > Wipe Param	Select the size for the wipe pattern you want to use for a wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Size. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new size in the Value (%) field.
Wipe Pattern — Vertical Multiplication	Switcher > Transition > Wipe Param	Select the number of times you want to multiply the wipe pattern vertically for the wipe transition of the selected ME. <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Vertical Mult. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the number of times the pattern is multiplied in the Value field.

Event	Location	Description
Wipe Pattern — X-Position	Switcher > Transition > Wipe Param	<p>Select the x-axis position for the wipe pattern you want to use for a wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select X-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new position in the Value (%) field.
Wipe Pattern — Y-Position	Switcher > Transition > Wipe Param	<p>Select the y-axis position for the wipe pattern you want to use for a wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click the Parameter button and select Y-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter a new position in the Value (%) field.
Wipe Reset	Switcher > Transition > Wipe Reset	<p>Reset the parameters or direction and flip-flop for the wipe transition of the selected ME.</p> <ol style="list-style-type: none"> 1. Click the ME button for the ME that you want to perform the event on. 2. Click Reset Params to reset the wipe parameters or Reset Direction to reset the wipe direction and flip-flop.

Personality Custom Controls

Personality

Event	Location	Description
Personality — Auto Remove Key	Switcher Personality > Auto Remove Key	<p>Have a key removed from the Next Transition area, so that it is not included in the next transition, after it has been transitioned off-air using the KEY X CUT or KEY X AUTO buttons.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Click the Value button and select whether the personality option is on (On) or not (Off).
Personality — Auto Trans Second Press (Key)	Switcher Personality > Key Auto Trans 2nd Press	<p>Select how the switcher reacts when the KEY AUTO button is pressed during a transition.</p> <ol style="list-style-type: none"> 1. Click the Second Auto button and select how the switcher reacts to pressing the button during a transition. <ul style="list-style-type: none"> • Ignore — the buttons are ignored during the transition • Halt Forward — halt the transition and move forward through the transition when pressed again • Halt Reverse — halt the transition and move backwards through the transition when pressed again • Reverse — reverse the transition immediately • Cut — cut the transition to the end

Event	Location	Description
Personality — Auto Trans Second Press (ME)	Switcher Personality > ME Auto Trans 2nd Press	Select how the switcher reacts when the AUTO TRANS button is pressed during a transition. <ol style="list-style-type: none"> Click the Second Auto button and select how the switcher reacts to pressing the button during a transition. <ul style="list-style-type: none"> Ignore — the buttons are ignored during the transition Halt Forward — halt the transition and move forward through the transition when pressed again Halt Reverse — halt the transition and move backwards through the transition when pressed again Reverse — reverse the transition immediately Cut — cut the transition to the end
Personality — Next Trans Reset	Switcher Personality > Auto Reset Trans	Have the transition area reset to a default background dissolve after each transition. <ol style="list-style-type: none"> Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Click the Value button and select whether the personality option is on (On) or not (Off).
Personality — Roll Clip	Switcher Personality > Roll Clip Force	Select whether the Roll Clip functionality is always on. <ol style="list-style-type: none"> Click the ME button and select the area that you want to adjust the roll clip for. Click a Roll Clip button to select whether Roll Clip is always on (Force) or must be turned on manually (User).

Installation Custom Controls

Switcher Installation

Event	Location	Description
AES Output	Switcher Installation > Output > AES	Assign an audio stream to an AES output. <ol style="list-style-type: none"> Click the AES button for the AES output you want to assign an audio stream to. Click the Value button and select the audio stream you want to assign to the AES output.
Ancillary Data Mode	Switcher Installation > Ancillary Mode	Select how the switcher will strip or pass ancillary data. <ol style="list-style-type: none"> Click a Value button to select whether ancillary data is stripped (Strip), or passed (Pass).
Clean Feed	Switcher Installation > ME > ME Clean Feed	Select the clean feed location for the selected ME. <ol style="list-style-type: none"> Click the ME button for the ME that you want to perform the event on. Click the Before Keyer button and select the key you want the clean feed output to be taken before.
Color Corrector Color Reset	Switcher Installation > Proc Amp/Color Corrector > Color Corrector R/G/B Reset	Reset the values for the selected color corrector color channel(s). <ol style="list-style-type: none"> Click the Input/Output button and select the input or output BNC that has the color corrector assigned to it that you want to reset. Click the Color button and select the individual color component (Red, Green, Blue) you want to adjust, or RGB for all of them.

Event	Location	Description
Color Corrector Enable	Switcher Installation > Proc Amp/Color Corrector > Color Corrector Enable	<p>Enable a Color Corrector for a video input or output.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that you want assign a Color Corrector to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to select whether to enable the color corrector (On) or disable the color corrector (Off).
Color Corrector Gain	Switcher Installation > Proc Amp/Color Corrector > Color Corrector Param	<p>Adjust the Gain for the selected color corrector.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the color corrector assigned to it that you want to adjust the parameter for. 2. Click the Color button and select the individual color component (Red, Green, Blue) you want to adjust, or RGB for all of them. 3. Click the Parameter button and select Gain. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new gain value in the Value field.
Color Corrector Gamma	Switcher Installation > Proc Amp/Color Corrector > Color Corrector Param	<p>Adjust the Offset for the selected color corrector.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the color corrector assigned to it that you want to adjust the parameter for. 2. Click the Color button and select the individual color component (Red, Green, Blue) you want to adjust, or RGB for all of them. 3. Click the Parameter button and select Gamma Value. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new gamma value in the Value field.
Color Corrector Gamma Offset	Switcher Installation > Proc Amp/Color Corrector > Color Corrector Param	<p>Adjust the Gamma Offset for the selected color corrector.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the color corrector assigned to it that you want to adjust the parameter for. 2. Click the Color button and select the individual color component (Red, Green, Blue) you want to adjust, or RGB for all of them. 3. Click the Parameter button and select Gamma Offset. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new gamma offset value in the Value field.
Color Corrector Lower Offset	Switcher Installation > Proc Amp/Color Corrector > Color Corrector Param	<p>Adjust the Lower Offset for the selected color corrector.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the color corrector assigned to it that you want to adjust the parameter for. 2. Click the Color button and select the individual color component (Red, Green, Blue) you want to adjust, or RGB for all of them. 3. Click the Parameter button and select Lower Offset. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new lower offset value in the Value field.

Event	Location	Description
Color Corrector Offset	Switcher Installation > Proc Amp/Color Corrector > Color Corrector Param	Adjust the Offset for the selected color corrector. <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the color corrector assigned to it that you want to adjust the parameter for. 2. Click the Color button and select the individual color component (Red, Green, Blue) you want to adjust, or RGB for all of them. 3. Click the Parameter button and select Offset. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new offset value in the Value field.
Color Corrector Reset	Switcher Installation > Proc Amp/Color Corrector > Color Corrector Reset	Reset the values for the selected color corrector. <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the color corrector assigned to it that you want to reset.
Color Gamut, Input	Switcher Installation > Input > Input Color Gamut	Select the color gamut that video input is in. <ol style="list-style-type: none"> 1. Click the Input button and select the input BNC that you want to set the color gamut for. 2. Click a Value button to select the whether the input is in BT.709 (709) or BT.2020 (2020).
Color Gamut, Output	Switcher Installation > Output > Output Color Gamut	Select the color gamut that video output is in. <ol style="list-style-type: none"> 1. Click the Output button and select the output BNC that you want to set the color gamut for. 2. Click a Value button to select the whether the output is in BT.709 (709) or BT.2020 (2020).
Color Gamut, Switcher	Switcher Installation > Reference > Switcher Color Gamut	Select the color gamut that the switcher will operate in. <ol style="list-style-type: none"> 1. Click a Gamut button to select the whether the switcher operates in BT.709 (709) or BT.2020 (2020).
Disable Audio Memories	Switcher Installation > Disable Audio Memories	Disable the inclusion of audio attributes in memories. <ol style="list-style-type: none"> 1. Click a Value button to select whether audio is included with memory recalls (On), or not (Off).
Dynamic Range, Input	Switcher Installation > Input > Input Dynamic Range	Select the dynamic range that a video input is in. <ol style="list-style-type: none"> 1. Click the Input button and select the input BNC that you want to set the dynamic range for. 2. Click a Value button to select the dynamic range that the input is in.
Dynamic Range, Output	Switcher Installation > Output > Output Dynamic Range	Select the dynamic range that a video output is in. <ol style="list-style-type: none"> 1. Click the Output button and select the output BNC that you want to set the dynamic range for. 2. Click a Value button to select the dynamic range that the output is in.
Dynamic Range, Switcher	Switcher Installation > Reference > Switcher Dynamic Range	Select the dynamic range that the switcher will operate in. <ol style="list-style-type: none"> 1. Click a Dynamic Range button to select the dynamic range that the switcher operates in.
Frame Delay	Switcher Installation > Input > Frame Delay	Assign a Frame Delay to an input. <ol style="list-style-type: none"> 1. Click the Input button and select the input BNC that you want to assign an frame delay to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Value field, enter the value of the frame delay you want to apply.

Event	Location	Description
FSFC Assignment	Switcher Installation > Input FSFC Assign	Assign an FSFC to an input BNC. This event is only available if you have fewer FSFCs than inputs. <ol style="list-style-type: none"> Click the FSFC button and select the FSFC resource that you want to assign to an input. Click the Assignment button and select the input that you want to assign the selected FSFC to.
Input FSFC Assignment	Switcher Installation > Input > Input Type	Assign an FSFC to an input. <ol style="list-style-type: none"> Click the Input button and select the input BNC that you want to assign an FSFC to. Click a ValueType button to assign an FSFC to the input or select (SDI Off) to turn the FSFC off.
Input FSFC Framing	Switcher Installation > Input > Input Framing	Select the video framing that is applied to the converted video input. <ol style="list-style-type: none"> Click the Input button and select the input BNC that you want to assign the framing to. Click a Type button for the input FSFC that is being used. Click a Value button to assign a type of framing to the input.
Input Scaler Mode (UHDTV1 Only)	Switcher Installation > Input > Input Scaler Mode	Select the format of the video input to be converted. <ol style="list-style-type: none"> Click the Input button and select the input BNC that you want to assign the scaler to. Click the Value button and select the format of the video input.
Layer Mode	Switcher Installation > ME > ME Layer Mode	Select whether external layer mode is active for the selected ME. <ol style="list-style-type: none"> Click the ME button for the ME that you want to perform the event on. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Click a Value button to select whether external layer mode is on (On) or not (Off).
ME Follow	Switcher Installation > ME > ME Follow	Select whether an ME or MiniME™ follows another ME or MiniME™. <ol style="list-style-type: none"> Click the ME button and select the area you want to have follow another area. Click a Follow button to select the ME or MiniME™ that you want to follow the selected area.
Output Assignment	Switcher Installation > Output > Output Assignment	Assign a source to the selected output BNC. <ol style="list-style-type: none"> Click the Output button and select the output BNC that you want to assign a source to. Click the Source button and select the source that you want to assign to the selected output BNC.
Output FSFC Video Format	Switcher Installation > Output > Output UHD Mode	Select a video format for the output FSFC conversion. <ol style="list-style-type: none"> Click the Output button and select the output BNC that you want to select a different video format for. Click the Value button and select the format you want the output video signal converted to.
Proc Amp/Color Corrector Reset	Switcher Installation > Proc Amp/Color Corrector > Proc Amp / Color Corrector Reset	Reset the values for the selected proc amp or color corrector. <ol style="list-style-type: none"> Click the Input/Output button and select the input or output BNC that has the proc amp or color corrector assigned to it that you want to reset.

Event	Location	Description
Proc Amp Enable	Switcher Installation > Proc Amp/Color Corrector > Proc Amp Enable	<p>Enable a Proc Amp for a video input or output.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that you want assign a Proc Amp to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to select whether to enable the proc amp (On) or disable the proc amp (Off).
Proc Amp Gain	Switcher Installation > Proc Amp/Color Corrector > Proc Amp Param	<p>Adjust the gain of a color component for the selected proc amp.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the proc amp assigned to it that you want to adjust the parameter for. 2. Click the Component button and select the color component you want to adjust the gain for. 3. Click the Parameter button and select Gain. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new gain value in the Value field.
Proc Amp Gamma	Switcher Installation > Proc Amp/Color Corrector > Proc Amp Param	<p>Adjust the Gamma for the selected proc amp.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the proc amp assigned to it that you want to adjust the parameter for. 2. Click the Component button and select YCrCb. 3. Click the Parameter button and select Gamma. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new gamma value in the Value field.
Proc Amp Gamma Offset	Switcher Installation > Proc Amp/Color Corrector > Proc Amp Param	<p>Adjust the Gamma for the selected proc amp.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the proc amp assigned to it that you want to adjust the parameter for. 2. Click the Component button and select YCrCb. 3. Click the Parameter button and select Gamma Offset. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new gamma offset value in the Value field.
Proc Amp Hue Rotation	Switcher Installation > Proc Amp/Color Corrector > Proc Amp Hue Rot	<p>Adjust the Hue for the selected proc amp.</p> <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the proc amp assigned to it that you want to adjust the parameter for. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Enter a new hue rotation value in the Value field.

Event	Location	Description
Proc Amp Offset	Switcher Installation > Proc Amp/Color Corrector > Proc Amp Param	Adjust the offset of a color component for the selected proc amp. <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the proc amp assigned to it that you want to adjust the parameter for. 2. Click the Component button and select the color component you want to adjust the offset for. 3. Click the Parameter button and select Offset. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the new offset value in the Value field.
Proc Amp Reset	Switcher Installation > Proc Amp/Color Corrector > Proc Amp Reset	Reset the values for the selected proc amp. <ol style="list-style-type: none"> 1. Click the Input/Output button and select the input or output BNC that has the proc amp assigned to it that you want to reset.
Reference Source	Switcher Installation > Reference > Video Reference	Select the reference source for the switcher. <ol style="list-style-type: none"> 1. Click a Reference Source button to select whether to use an internal (Internal) or external (External) reference source.
Rotation Mode, Output	Switcher Installation > Output > Output Rotation Mode	Enable video rotation on a selected output. <ol style="list-style-type: none"> 1. Click the Output button and select the output BNC that you want to apply rotation to. 2. Click a Value button to select the amount of rotation to apply to the output.
Rotation Zoom, Output	Switcher Installation > Output > Output Rotation	Adjust the size of the rotated output image. <ol style="list-style-type: none"> 1. Click the Output button and select the output BNC that you want to adjust the rotation for. 2. Click Zoom. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter new size in the Value field.
Rotation X-Position, Output	Switcher Installation > Output > Output Rotation	Adjust the rotated image along the x-axis. <ol style="list-style-type: none"> 1. Click the Output button and select the output BNC that you want to adjust the rotation for. 2. Click X-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter new x-axis offset in the Value field.
Rotation Y-Position, Output	Switcher Installation > Output > Output Rotation	Adjust the rotated image along the y-axis. <ol style="list-style-type: none"> 1. Click the Output button and select the output BNC that you want to adjust the rotation for. 2. Click Y-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter new y-axis offset in the Value field.

Event	Location	Description
Source Substitution, Bus	Switcher Installation > Source Substitution > Source Bus Subst	Set a bus source substitution for the substitution table. <ol style="list-style-type: none"> 1. Click the Source button and select the source that you want to set a substitution for. 2. Click the ME button and select the area that the bus you want to set up the substitution for is on. 3. Click the Bus/Keyer button and select the bus (Background or Preset) or keyer for the substitution. 4. If you selected Keyer, click the Bus button and select the video (Video) or alpha (Alpha) bus that you want to substitute for 5. Click the Subst button and select the source you want to substitute for the selected source.
Source Substitution, Delete	Switcher Installation > Source Substitution > Delete Subst Table	Delete the entire substitution table.
Source Substitution, ME	Switcher Installation > Source Substitution > Source ME Subst	Set an ME source substitution for the substitution table. <ol style="list-style-type: none"> 1. Click the Source button and select the source that you want to set a substitution for. 2. Click the ME button and select the MiniME™ that you want to assign a substitution source to. 3. Click the Subst button and select the source you want to substitute for the selected source.
Switching Field	Switcher Installation > Field Dominance	Select the field that a video transition will be performed on. <ol style="list-style-type: none"> 1. Click a Switch Field button to select whether video transitions are performed on field 1 only (Field 1), field 2 only(Field 2), or the current field (Both).
TSL Address	Switcher Installation > Input > TSL Address	Assign a TSL id to an input. <ol style="list-style-type: none"> 1. Click the Input button and select the input BNC that you want to set the TSL id for. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Enter the TSL id in the Value field.
TSL Tally MultiViewer Display Mode (Name)	Switcher Installation > Input > TSL Tally Mode	Assign a TSL id to an input. <ol style="list-style-type: none"> 1. Click the Input button and select the input BNC that you want to set the TSL mode for. 2. Click a TSL Tally button to select whether the MultiViewer shows the Mnemonic name (Name Only), TSL name (Tally Only), or both (Both).
Video Mode	Switcher Installation > Reference > Video Format	Select the video format that the switcher will operate in. <ol style="list-style-type: none"> 1. Click the Video Mode button and select the video format for the switcher.

MultiViewer

Event	Location	Description
MultiViewer Box — Apply to All	MultiViewer > Box > MV Box Apply To All	Apply the configurations for the selected box to all boxed on the selected MultiViewer. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click Apply to All.

Event	Location	Description
MultiViewer Box — Aspect Ratio Markers	MultiViewer > Box > MV Box Aspect Ratio	<p>Select whether aspect ratio markers are shown for the selected box on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button and select whether aspect ratio markers are shown (On) or not (Off).
MultiViewer Box — Border	MultiViewer > Box > MV Box Border Mode	<p>Select the type of border you want to apply to the selected box on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click a Border Mode button and select whether the border around the selected box is white (White), black (Black), or if there is no border (Off).
MultiViewer Box — Green Tally (Preview)	MultiViewer > Box > MV Box Preview Tally	<p>Select whether a green (preview) tally is shown for the selected box on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button and select whether a green tally is shown on the selected box (On) or not (Off).
MultiViewer Box — Label	MultiViewer > Box > MV Box Label	<p>Select whether the source label is on or off for the selected box on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button and select whether the label on the selected box is on (On) or not (Off).
MultiViewer Box — Label Mode	MultiViewer > Box > MV Box Label Mode	<p>Select what source name is shown on the label for the selected box on the selected MultiViewer. This event only applies to the Carbonite eXtreme.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Label Mode button and select whether the name comes from the switcher (Switcher), the router (Router), or both are shown (Both).

Event	Location	Description
MultiViewer Box — Label Position	MultiViewer > Box > MV Box Label Position	<p>Select the position of the source label for the selected box on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button and select whether the label on the selected box is at the top (Top) or bottom (Bottom).
MultiViewer Box — Label Transparency	MultiViewer > MV Label Transp	<p>Select transparency for the background behind the source labels on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Enter the amount of transparency in the Value (%) field.
MultiViewer Box — Red Tally (On-Air)	MultiViewer > Box > MV Box On-Air Tally	<p>Select whether a red (on-air) tally is shown for the selected box on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button and select whether a red tally is shown on the selected box (On) or not (Off).
MultiViewer Box — Video Source	MultiViewer > Box > MV Box Source	<p>Assign a source to one of the boxes on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Box button and select the box that you want perform the event on. 3. Click the Value button and select the source that you want to assign to the box.
MultiViewer — Clip	MultiViewer > MV Keyer Clip	<p>Select the amount of clipping to be applied to the overlay source on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Enter the amount of clipping to be applied in the Value field.

Event	Location	Description
MultiViewer Clock — Background Color (HSL)	MultiViewer > Clock > MV Clock (HSL Color)	<p>Select the custom color for the background of the clock on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Clock Area button and select Background. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Component button and select the HSL component you want to assign a value to. A value should be applied to all three components. 5. Enter a value for the selected component in the Value (%) field.
MultiViewer Clock — Background Color (Preset)	MultiViewer > Clock > MV Clock (Preset Color)	<p>Select a preset color for the background of the clock on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click Background. 3. Click the Color button and select the color you want to use.
MultiViewer Clock — Countdown Timer Direction	MultiViewer > Clock > Countdown Timer Direction	<p>Select the direction you want to countdown timer to count in.</p> <ol style="list-style-type: none"> 1. Click the Timer button and select the timer you want to configure. 2. Click a Timer Direction button to select whether the timer counts down from a preset value (Down), up from zero (Up), or down from a preset value and then up from zero (Down > Up).
MultiViewer Clock — Countdown Timer Reset	MultiViewer > Clock > Countdown Timer Reset	<p>Reset the selected timer.</p> <ol style="list-style-type: none"> 1. Click the Timer Reset button and select the timer you want to reset.
MultiViewer Clock — Countdown Timer State	MultiViewer > Clock > Countdown Timer State	<p>Select the direction you want to countdown timer to count in.</p> <ol style="list-style-type: none"> 1. Click the Timer button and select the timer you want to configure. 2. Click a Timer State button to select whether to send the pause (Pause), or start (Run) command to the timer.
MultiViewer Clock — Foreground Color (HSL)	MultiViewer > Clock > MV Clock (HSL Color)	<p>Select the custom color for the lettering of the clock on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Clock Area button and select Foreground. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Component button and select the HSL component you want to assign a value to. A value should be applied to all three components. 5. Enter a value for the selected component in the Value (%) field.
MultiViewer Clock — Foreground Color (Preset)	MultiViewer > Clock > MV Clock (Preset Color)	<p>Select a preset color for the lettering of the clock on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click Foreground. 3. Click the Color button and select the color you want to use.
MultiViewer Clock — Format	MultiViewer > Clock > MV Clock Format	<p>Select the hour format for the clock on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click a Value button and select whether the clock shows 24-hour (24-Hours), 12-hour with am/pm (12-Hour AM/PM), or simple 12-hour (12-Hour) clock.

Event	Location	Description
MultiViewer Clock — Mode	MultiViewer > Clock > MV Clock Mode	Select whether the clock shows timecode or system time on the selected MultiViewer. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click a Clock Mode button and select whether the clock shows timecode (Timecode), system time (System), a countdown timer (CountDown), or is off (Off).
MultiViewer Clock — MV Timer	MultiViewer > Clock > MV Timer	Select which countdown timer you want a MultiViewer to use. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Timer button and select the timer (1-5) that you want to assign to the selected MultiViewer.
MultiViewer Clock — Size	MultiViewer > Clock > MV Clock Param	Select the size of the clock on the selected MultiViewer. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click Clock Size. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the size of the clock in the Value (%) field.
MultiViewer Clock — Timecode Frame Count	MultiViewer > Clock > MV Clock Frame Count	Select whether number of frames for a timecode are shown on the selected MultiViewer. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button and select whether the frame count is shown (On) or not (Off).
MultiViewer Clock — Timer Set Time (Minutes)	MultiViewer > Clock > Timer Set Times	Set the starting time in minutes for the timer. <ol style="list-style-type: none"> 1. Click the Timer button and select the timer you want to configure. 2. Click Set Time (Minutes). 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value field, enter the number of minutes that you want to start the timer at.
MultiViewer Clock — Timer Set Time (Seconds)	MultiViewer > Clock > Timer Set Times	Set the starting time in seconds for the timer. <ol style="list-style-type: none"> 1. Click the Timer button and select the timer you want to configure. 2. Click Set Time (Seconds). 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Value field, enter the number of seconds (0-59) that you want to start the timer at. If you want a value that is larger than 59 seconds you must insert a command for minutes and then a command for seconds.

Event	Location	Description
MultiViewer Clock — X-Position	MultiViewer > Clock > MV Clock Param	<p>Select the horizontal position of the clock on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click Clock X-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the horizontal position of the clock in the Value (%) field.
MultiViewer Clock — Y-Position	MultiViewer > Clock > MV Clock Param	<p>Select the vertical position of the clock on the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click Clock Y-Pos. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the vertical position of the clock in the Value (%) field.
MultiViewer — Follow	MultiViewer > MV Follow	<p>Select whether a MultiViewer follows the layout of a MultiScreen.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click a Follow button to select which MultiScreen the MultiViewer will follow or select Off to have the MultiViewer operate normally.
MultiViewer — FSFC Label	MultiViewer > MV FSFC Label	<p>Select whether FSFC is shown on the label on the selected MultiViewer when a source has an FSFC applies to it.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to select whether FSFC is shown on the label (On) or not (Off).
MultiViewer — Layout	MultiViewer > MV Layout	<p>Select a layout for the selected MultiViewer.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Layout button and select the layout you want to use.
MultiViewer — Overlay	MultiViewer > MV Overlay	<p>Select whether the MultiViewer overlay is turned on or not.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to select whether the overlay is turned on (On) or not (Off).
MultiViewer — Shift	MultiViewer > MV Shift	<p>Select whether the sources on the selected MultiViewer are shifted, or not.</p> <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to select whether the MultiViewer shows the shifted sources (On) or not (Off).

Event	Location	Description
MultiViewer — Shift Panel	MultiViewer > MV Shift Panel	Select which control panel the MultiViewer shift is following. When Shift is press on the selected panel, the selected MultiViewer shifts. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click Panel and click the control panel you want to shift to follow or click Off to have shift not follow any panel.
MultiViewer — Tally Display	MultiViewer > MV Tally Display	Select how the tallies are shown on the selected MultiViewer. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click a Tally Display button to select whether tallies are shown as a border around the box (Box), as boxes on either side of the label (Label), or as boxes on either side of the label but swapped (Label Reverse).
MultiViewer — ViewControl Shift	MultiViewer > View Control Shift	Select whether the ViewControl sources are shifted, or not. <ol style="list-style-type: none"> 1. Click a MultiViewer button to select which MultiViewer you want to perform the event on. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to select whether ViewControl shows the shifted sources (On) or not (Off).

RAVE Audio Mixer Custom Controls

Audio Mixer (RAVE)

Channel Events

Event	Location	Description
AFV	Audio Mixer > Channel > AFV Enable	Turn on Audio Follow Video (AFV) for a channel. <ol style="list-style-type: none"> 1. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Value button to turn on AFV for the selected channel (On), or turn it off (Off).
AFV Volume	Audio Mixer > Channel > AFV Volume	Set the level for AFV for a channel. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. In the AFV Volume (dB) field, enter the level for the selected channel. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Aux Pre/Post	Audio Mixer > Channel > Aux Pre/Post	Set whether the source on an aux is take before or after the fader. <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Value button to set the aux source to post-fader (Post), or pre-fader (Pre). 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Event	Location	Description
Balance/Pan	Audio Mixer > Channel > Balance/Pan	<p>Set the balance or pan for the selected channel.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Value (%) field, enter the balance or pan you want to apply. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Input Volume	Audio Mixer > Channel > Volume	<p>Set the level for the selected channel.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. In the Volume (dB) field, enter the level you want to set. 3. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Mute	Audio Mixer > Channel > Mute	<p>Mute the selected channel.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Value button to mute the selected channel (On), or un-mute it (Off). 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
PFL	Audio Mixer > Channel > PFL	<p>Set Pre Fader Listen (PFL) for a channel.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Value button to turn on PFL for the selected channel (On), or turn it off (Off).
Solo	Audio Mixer > Channel > Solo	<p>Set the selected channel to solo.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click the Value button to solo the selected channel (On), or un-solo it (Off). 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Noise Gate Events

Event	Location	Description
Attack	Audio Mixer > Noise Gate > Attack	Select the amount of time (ms) you want to pass between when the noise gate is triggered to open (pass the threshold) and the attenuation being fully released. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the time for the event in the Transition Time (ms) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Bypass	Audio Mixer > Noise Gate > Bypass	Bypass the noise gate. <ol style="list-style-type: none"> 1. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to turn bypass on (On) or off (Off).
Default All NG	Audio Mixer > Noise Gate > Default All NG	Default the NG for all audio channels.
Default NG Channel	Audio Mixer > Noise Gate > Default NG Selection	Default the NG for a selected audio channel. <ol style="list-style-type: none"> 1. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Depth	Audio Mixer > Noise Gate > Attack	Select the level that the audio signal must go below the threshold before the noise gate is triggered to close. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Hold	Audio Mixer > Noise Gate > Hold	Select the amount of time (s) between when the noise gate is triggered to close (level is below the Depth) and the Release is applied. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the time for the event in the Transition Time (ms) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Release	Audio Mixer > Noise Gate > Release	Select the amount of time (ms) you want to pass after the Hold is applied and the gate is fully closed (full Reduction is applied). <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the time for the event in the Transition Time (ms) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Threshold	Audio Mixer > Noise Gate > Threshold	Select the level (-dB) at which the noise gate opens. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Ducking Events

Event	Location	Description
Attack	Audio Mixer > Mixer Ducking > Ducking Mode	Select the amount of time (ms) you want to pass between when ducking is triggered to apply (pass the threshold) and the attenuation being fully applied to the mix. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Default All Ducking	Audio Mixer > Mixer Ducking > Ducking Mode	Default the ducking for all audio channels. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Default Ducking Channel	Audio Mixer > Mixer Ducking > Ducking Mode	Default the ducking for a selected audio channel. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Depth	Audio Mixer > Mixer Ducking > Ducking Mode	Select the level that the audio signal must go below the threshold before the ducking is removed. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Ducking Mode	Audio Mixer > Mixer Ducking > Ducking Mode	Turn on Ducking for the selected channel. <ol style="list-style-type: none"> 1. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 2. Click Ducking Mode.
Hold	Audio Mixer > Mixer Ducking > Ducking Mode	Select the amount of time (s) between when ducking is triggered to release (level is below the Depth) and the Release is applied. <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Mix Reduction	Audio Mixer > Mixer Ducking > Ducking Mode	Select the amount of attenuation/gain (dB) that you want to reduce the mix by when the ducking is applied (above threshold). <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Event	Location	Description
Release	Audio Mixer > Mixer Ducking > Ducking Mode	<p>Select the amount of time (ms) you want to pass after the Hold is applied and the ducking is fully released (mix back to normal levels).</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Threshold	Audio Mixer > Mixer Ducking > Ducking Mode	<p>Select the level (-dB) at which the ducking is applied to the mix.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Talkback Events

Event	Location	Description
Attack	Audio Mixer > Mixer Ducking > Ducking Mode	<p>Select the amount of time (ms) you want to pass between when talkback is triggered to apply and the attenuation being fully applied to the mix.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Default All Talkback	Audio Mixer > Mixer Ducking > Ducking Mode	<p>Default the talkback for all audio channels.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Default Talkback Channel	Audio Mixer > Mixer Ducking > Ducking Mode	<p>Default the talkback for a selected audio channel.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Hold	Audio Mixer > Mixer Ducking > Ducking Mode	<p>Select the amount of time (s) between when talkback is released (Talkback button is released) and the Release is applied.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Event	Location	Description
Mix Reduction	Audio Mixer > Mixer Ducking > Ducking Mode	Select the amount of attenuation/gain (dB) that you want to reduce the mix by when the talkback is applied (Talkback button held). <ol style="list-style-type: none"> Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Enter the new gain value in n the Gain (dB) field. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Release	Audio Mixer > Mixer Ducking > Ducking Mode	Select the amount of time (ms) you want to pass after the Hold is applied and the talkback is fully released (mix back to normal levels). <ol style="list-style-type: none"> Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Enter the new gain value in n the Gain (dB) field. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Talkback Mode	Audio Mixer > Mixer Ducking > Ducking Mode	Turn on Talkback for the selected channel. <ol style="list-style-type: none"> Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click Talkback Mode.

Equalizer Events

Event	Location	Description
Default All EQ	Audio Mixer > Equalizer	Default the equalizer for all audio channels. <ol style="list-style-type: none"> Click Default All EQ.
Default Selected EQ	Audio Mixer > Equalizer	Default the equalizer for a selected audio channel. <ol style="list-style-type: none"> Click Default EQ Selection. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
EQ Bypass	Audio Mixer > Equalizer	Bypass equalizer. <ol style="list-style-type: none"> Click Bypass. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Click the Value button to turn bypass on (On), or off (Off).
High Shelf Gain	Audio Mixer > Equalizer	Adjust the gain of the high frequency band. <ol style="list-style-type: none"> Click High Shelf 1 Gain. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Enter the new gain value in n the Gain (dB) field. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Event	Location	Description
High Shelf Min Freq	Audio Mixer > Equalizer	<p>Set the high shelf minimum frequency.</p> <ol style="list-style-type: none"> 1. Click High Shelf Min Freq. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Frequency (Hz) field, enter the new frequency setting. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Low Shelf Gain	Audio Mixer > Equalizer > Low Shelf Gain	<p>Adjust the gain of the low frequency band.</p> <ol style="list-style-type: none"> 1. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 2. Enter the new gain value in n the Gain (dB) field. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Midrange 1 Center Freq	Audio Mixer > Equalizer	<p>Set the midrange 1 center frequency.</p> <ol style="list-style-type: none"> 1. Click Midrange 1 Center Freq. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Frequency (Hz) field, enter the new frequency setting. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Midrange 1 Gain	Audio Mixer > Equalizer	<p>Adjust the gain of a midrange frequency band.</p> <ol style="list-style-type: none"> 1. Click Midrange 1 Gain. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Enter the new gain value in n the Gain (dB) field. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Midrange 1 Q	Audio Mixer > Equalizer	<p>Set the midrange 1 Q.</p> <ol style="list-style-type: none"> 1. Click Midrange 1 Q. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Value (%) field, enter the new Q setting. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Midrange 2 Center Freq	Audio Mixer > Equalizer	<p>Set the midrange 2 center frequency.</p> <ol style="list-style-type: none"> 1. Click Midrange 2 Center Freq. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Frequency (Hz) field, enter the new frequency setting. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Event	Location	Description
Midrange 2 Gain	Audio Mixer > Equalizer	Adjust the gain of a midrange frequency band. <ol style="list-style-type: none"> Click Midrange 2 Gain. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Enter the new gain value in n the Gain (dB) field. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Midrange 2 Q	Audio Mixer > Equalizer	Set the midrange 2 Q. <ol style="list-style-type: none"> Click Midrange 2 Q. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. In the Value (%) field, enter the new Q setting. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Compressor Limiter Events

Event	Location	Description
Attack	Audio Mixer > Compressor Limiter	Set the attack for CL. <ol style="list-style-type: none"> Click Attack. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. In the Transition Time (ms) field, enter the new attack time setting. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Channel AFV Fade	Audio Mixer > Config	Select whether AFV transitions use a fade or a cut. <ol style="list-style-type: none"> Click Channel AFV Fade. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Click a Value button to select whether AFV transition use a fade (On) or a cut (Off).
Channel Position	Audio Mixer > Config	Move a fader stripe left or right on the mix layer in the RAVE audio mixer. <ol style="list-style-type: none"> Click Channel Position. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click an Action button to move the stripe to the left of the layer (Up) or to the right (Down).

Event	Location	Description
Channel Processing Order (EQ/CL)	Audio Mixer > Config	Select the EQ and CL processing order for specific fader. <ol style="list-style-type: none"> 1. Click Channel Processing Order. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click a Component button to select whether you are assigning the order for the EQ (EQ) or CL (CL). 4. Click a Position button to select whether the EQ or CL processing is applied first (1) or last (2).
Channel Visible	Audio Mixer > Config	Select whether AFV transitions use a fade or a cut. <ol style="list-style-type: none"> 1. Click Channel Visible. 2. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 3. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Click a Value button to select whether the selected fader is visible on the mixer (On) or a not (Off).
CL Bypass	Audio Mixer > Compressor Limiter	Bypass CL. <ol style="list-style-type: none"> 1. Click Bypass. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button to turn bypass on (On), or off (Off).
Clear PFL	Audio Mixer > Output	Clear Pre Fader Listen (PFL). <ol style="list-style-type: none"> 1. Click Clear PFL.
Clear Solo	Audio Mixer > Output	Clear solo for an output. <ol style="list-style-type: none"> 1. Click Clear Solo. 2. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to.
Compression	Audio Mixer > Compressor Limiter	Set the compression ratio for CL. <ol style="list-style-type: none"> 1. Click Compression. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Ratio (:1) field, enter the new ratio for the compression setting. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Default All CL	Audio Mixer > Compressor Limiter	Default All CL setting. <ol style="list-style-type: none"> 1. Click Default All CL.
Default Selected CL	Audio Mixer > Compressor Limiter	Default CL settings. <ol style="list-style-type: none"> 1. Click Default CL Selection. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.

Event	Location	Description
Makeup	Audio Mixer > Compressor Limiter	<p>Set the makeup level for CL.</p> <ol style="list-style-type: none"> 1. Click Makeup. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Enter the new gain value in n the Gain (dB) field. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Output Volume	Audio Mixer > Output	<p>Set the output volume.</p> <ol style="list-style-type: none"> 1. Click Volume. 2. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. In the Volume (dB) field, enter the level you want to set.
Pad	Audio Mixer > PreAmp	<p>Turn pad power on or off on a ABU.</p> <ol style="list-style-type: none"> 1. Click Pad. 2. Click the InnerAudioMixerAnalogInput button and select the analog input you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button to turn pad on (On), or off (Off).
Phantom Power	Audio Mixer > PreAmp	<p>Turn phantom power on or off on a ABU.</p> <ol style="list-style-type: none"> 1. Click Phantom Power. 2. Click the InnerAudioMixerAnalogInput button and select the analog input you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button to turn phantom power on (On), or off (Off).
Pre-Amp Gain	Audio Mixer > PreAmp	<p>Set the pre-amp gain on a ABU analog input.</p> <ol style="list-style-type: none"> 1. Click Gain. 2. Click the InnerAudioMixerAnalogInput button and select the analog input you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the new gain value in n the Gain (dB) field.
Processing Order (EQ/CL)	Audio Mixer > Config	<p>Select the EQ and CL processing order for all faders.</p> <ol style="list-style-type: none"> 1. Click Processing Order. 2. Click a Component button to select whether you are assigning the order for the EQ (EQ) or CL (CL). 3. Click a Position button to select whether the EQ or CL processing is applied first (1) or last (2).

Event	Location	Description
Release	Audio Mixer > Compressor Limiter	Set the release for CL. <ol style="list-style-type: none"> 1. Click Release. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Transition Time (ms) field, enter the new release time setting. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Source AFV Input	Audio Mixer > Config	Select the video source that you want a fader to follow. <ol style="list-style-type: none"> 1. Click Source AFV Input. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click the Value button and select the video source that you want the audio fader to follow.
Source Audio Channel	Audio Mixer > Config	Select the audio channels to be assigned to a fader. <ol style="list-style-type: none"> 1. Click Source Audio Channel. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click the Value button and select the channels you want to assign to the fader.
Source Audio Input	Audio Mixer > Config	Select the audio source to be assigned to a fader. <ol style="list-style-type: none"> 1. Click Source Audio Input. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click the Value button and select the audio source you want assigned to the fader.
Threshold Control	Audio Mixer > Compressor Limiter	Set the threshold control for CL. <ol style="list-style-type: none"> 1. Click Threshold Control. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Enter the new gain value in n the Gain (dB) field. 4. Click the InnerAudioMixerChannel button and select the channel you want to send the command to.
Video Out Audio Mix	Audio Mixer > Output	Set what audio is embedded in an video output. <ol style="list-style-type: none"> 1. Click Video Out Audio Mix. 2. Click the Output button and select video output that you want to set up. 3. Click a Value button to select which audio is embedded in the selected output video stream.
Video Out Custom Audio Mix	Audio Mixer > Output	Set what audio is embedded in an video output. <ol style="list-style-type: none"> 1. Click Video Out Custom Audio Mix. 2. Click the Output button and select video output that you want to set up. 3. Click the Channel button and select the stereo pair that you want to embed audio on. 4. Click the Audio Mix button and select the mix that you want to embed on the selected channels.

Output Audio Events

Event	Location	Description
ABM Input Delay	Audio Mixer > ABM Input > Delay	Add a delay to the audio inputs on the ABU. <ol style="list-style-type: none"> 1. Click Pad. 2. Click the InnerAudioMixerAnalogInput button and select the analog input you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the amount of delay (0-16) in the Value field.
Clear PFL	Audio Mixer > Output > Clear PFL	Clear Pre Fader Listen (PFL).
Clear Solo	Audio Mixer > Output > Clear Solo	Clear solo for an output. <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to.
Output Volume	Audio Mixer > Output > Volume	Set the output volume. <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. In the Volume (dB) field, enter the level you want to set.
Pad	Audio Mixer > PreAmp	Turn pad power on or off on a ABU. <ol style="list-style-type: none"> 1. Click Pad. 2. Click the InnerAudioMixerAnalogInput button and select the analog input you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button to turn pad on (On), or off (Off).
Phantom Power	Audio Mixer > PreAmp	Turn phantom power on or off on a ABU. <ol style="list-style-type: none"> 1. Click Phantom Power. 2. Click the InnerAudioMixerAnalogInput button and select the analog input you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click the Value button to turn phantom power on (On), or off (Off).
Pre-Amp Gain	Audio Mixer > PreAmp	Set the pre-amp gain on a ABU analog input. <ol style="list-style-type: none"> 1. Click Gain. 2. Click the InnerAudioMixerAnalogInput button and select the analog input you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the new gain value in n the Gain (dB) field.
Video Out Audio Mix	Audio Mixer > Output > Video Out Audio Mix	Set what audio is embedded in an video output. <ol style="list-style-type: none"> 1. Click the Output button and select video output that you want to set up. 2. Click a Value button to select which audio is embedded in the selected output video stream.

Event	Location	Description
Video Out Custom Audio Mix	Audio Mixer > Output > Video Out Custom Audio Mix	<p>Set what audio is embedded in an video output.</p> <ol style="list-style-type: none"> 1. Click the Output button and select video output that you want to set up. 2. Click the Channel button and select the stereo pair that you want to embed audio on. 3. Click the Audio Mix button and select the mix that you want to embed on the selected channels.

Configuration Audio Events

Event	Location	Description
Channel AFV Fade	Audio Mixer > Config > Channel AFV Fade	<p>Select whether AFV transitions use a fade or a cut.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 2. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 3. Click a Value button to select whether AFV transition use a fade (On) or a cut (Off).
Channel Position	Audio Mixer > Config > Channel Position	<p>Move a fader stripe left or right on the mix layer in the RAVE audio mixer.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click an Action button to move the stripe to the left of the layer (Up) or to the right (Down).
Channel Processing Order (EQ/CL)	Audio Mixer > Config > Processing Order	<p>Select the EQ and CL processing order for specific fader.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 2. Click a Component button to select whether you are assigning the order for the EQ (EQ) or CL (CL). 3. Click a Position button to select whether the EQ or CL processing is applied first (1) or last (2).
Channel Visible	Audio Mixer > Config > Channel Visible	<p>Select whether a channel is available on the selected layer.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button to select whether the selected fader is visible on the mixer layer (On) or a not (Off).
Channel Disable	Audio Mixer > Config > Channel Visible	<p>Select whether a channel is disabled on the selected layer.</p> <ol style="list-style-type: none"> 1. Click the InnerAudioMixerOutput button and select the mixer output that you want to send the command to. 2. Click the InnerAudioMixerChannel button and select the channel you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Click a Value button to select whether the selected fader is disabled on the mixer layer (On) or a not (Off).

Event	Location	Description
Processing Order (EQ/CL)	Audio Mixer > Config > Channel Processing Order	Select the EQ and CL processing order for all faders. <ol style="list-style-type: none"> Click a Component button to select whether you are assigning the order for the EQ (EQ) or CL (CL). Click a Position button to select whether the EQ or CL processing is applied first (1) or last (2).
Source AFV Input	Audio Mixer > Config > Source AVF Input	Select the video source that you want a fader to follow. <ol style="list-style-type: none"> Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click the Value button and select the video source that you want the audio fader to follow.
Source Audio Channel	Audio Mixer > Config > Source Audio Channel	Select the audio channels to be assigned to a fader. <ol style="list-style-type: none"> Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click the Value button and select the channels you want to assign to the fader.
Source Audio Input	Audio Mixer > Config > Source Audio Input	Select the audio source to be assigned to a fader. <ol style="list-style-type: none"> Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click the Value button and select the audio source you want assigned to the fader.
Test Tone Frequency	Audio Mixer > Config > Test Tone Frequency	Select the test tone frequency for the selected audio channel. <ol style="list-style-type: none"> Click the InnerAudioMixerChannel button and select the channel you want to send the command to. Click the Frequency (Hz) button and select the audio frequency you want to use for the test tone.

Device Custom Controls

Audio Mixer (Device)

Event	Location	Description
Audio Mixer Pan	Devices > Audio Mixer	Set the pan level for the selected channel on the selected device. <ol style="list-style-type: none"> Click Audio Pan. Click the Audio Mixer button and select the device you want to send the command to. Click the Channel button and select the channel you want to send the command to. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Enter the new pan level in the Pan Left/Right (%) field.
Audio Mixer Volume	Devices > Audio Mixer	Set the level for the selected channel on the selected device. <ol style="list-style-type: none"> Click Audio Volume. Click the Audio Mixer button and select the device you want to send the command to. Click the Channel button and select the channel you want to send the command to. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. Enter the new audio level in the Volume (%) field.

Camera

Event	Location	Description
Robotic Camera — Halt All	Devices > Camera	Send the halt command to the selected camera. <ol style="list-style-type: none"> 1. Click Camera Halt All. 2. Click the Camera button and select the device you want to send the command to.
Robotic Camera — Recall Shot	Devices > Camera	Recall a shot on the selected camera at the rate/speed set in the shot. <ol style="list-style-type: none"> 1. Click Recall Shot. 2. Click the Camera button and select the device you want to send the command to. 3. Click the Channel button and select the channel you want to send the command to. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the shot number you want to recall from in the Shot field.
Robotic Camera — Recall Shot Fast	Devices > Camera	Recall a shot on the selected camera as quickly as possible. <ol style="list-style-type: none"> 1. Click Recall Shot (Fast). 2. Click the Camera button and select the device you want to send the command to. 3. Click the Channel button and select the channel you want to send the command to. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the shot number you want to recall from in the Shot field.
Robotic Camera — Store Shot	Devices > Camera	Store a shot on the selected camera. <ol style="list-style-type: none"> 1. Click Store Shot. 2. Click the Camera button and select the device you want to send the command to. 3. Click the Channel button and select the channel you want to send the command to. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the shot number you want to store to in the Shot field.

GPI

Event	Location	Description
GPI Output — Edge Trigger Setup	Devices > GPO	Set up the type of edge trigger for the GPI output. <ol style="list-style-type: none"> 1. Click GPO Edge Duration 2. Click the GPO button and select the GPI output that you want to configure. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the duration of the edge trigger in the Duration (fr) field.

Event	Location	Description
GPI Output — Level Trigger Setup	Devices > GPO	<p>Set up the type of level trigger for the GPI output.</p> <ol style="list-style-type: none"> 1. Click GPO Level Config 2. Click the GPO button and select the GPI output that you want to configure. 3. Click a Level to select whether the level trigger uses a high (High) or low (Low) level trigger.
GPI Output — Mode	Devices > GPO	<p>Select whether the level trigger GPI output act as a tally.</p> <ol style="list-style-type: none"> 1. Click GPO Mode 2. Click the GPO button and select the GPI output that you want to configure. 3. Click a Mode button to select whether the level trigger GPI output, when assigned to video source, acts as a roll clip (Normal) or as a tally (Tally) for the selected source.
GPI Output — Trigger	Devices > GPO	<p>Trigger a GPI output.</p> <ol style="list-style-type: none"> 1. Click GPO Trigger 2. Click the GPO button and select the GPI output that you want to trigger.
GPI Output — Trigger Type	Devices > GPO	<p>Select the type of trigger for the GPI output.</p> <ol style="list-style-type: none"> 1. Click GPO Trigger Configuration 2. Click the GPO button and select the GPI output that you want to configure. 3. Click a Trigger to select whether the GPI output uses a level (Level) or edge (Edge) trigger.

PBus II

Event	Location	Description
PBus — Recall	Devices > PBus	<p>Recall a register on the selected PBus device.</p> <ol style="list-style-type: none"> 1. Click PBus Recall Register. 2. Click the PBus button and select the device you want to send the command to. 3. Click the Device button and select the channel you want to send the command to. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter number of the register you want to recall in the Register field.
PBus — Trigger	Devices > PBus	<p>Trigger a function on the selected PBus device.</p> <ol style="list-style-type: none"> 1. Click PBus Trigger Function. 2. Click the PBus button and select the device you want to send the command to. 3. Click the Device button and select the channel you want to send the command to. 4. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 5. Enter the number of the function you want to trigger in the Function field.

RossTalk

Table 12: RossTalk (XPression)

Event	Location	Description
RossTalk CC	Devices > RossTalk (XPression) > CC	Send the simulated custom control to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the bank of the custom control in the Bank field. Enter the number of the custom control in the Custom field.
RossTalk Clear All	Devices > RossTalk (XPression) > Clear All	Send the Clear All command to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to.
RossTalk Clear Channel	Devices > RossTalk (XPression) > Clear Channel	Send the Clear Framebuffer command to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the framebuffer that you want to perform the action on in the Channel field.
RossTalk Clear Layer	Devices > RossTalk (XPression) > Clear Layer	Send the Clear Framebuffer command for a framebuffer and layer to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the framebuffer that you want to perform the action on in the Channel field. Enter the layer that you want to perform the action on in the Layer field.
RossTalk — Cue Channel	Devices > RossTalk (XPression) > Cue (2)	Send the Cue command for a specific item and framebuffer to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the take item id of the item you want to perform the action on in the Take ID field. Enter the framebuffer that you want to perform the action on in the Channel field.
RossTalk — Cue Current	Devices > RossTalk (XPression) > Cue	Send the Cue command to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to.
RossTalk — Cue Item	Devices > RossTalk (XPression) > Cue (1)	Send the Cue command for a specific item to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the take item id of the item you want to perform the action on in the Take ID field.
RossTalk — Cue Layer	Devices > RossTalk (XPression) > Cue (3)	Send the Cue command for a specific item and location to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the take item id of the item you want to perform the action on in the Take ID field. Enter the framebuffer that you want to perform the action on in the Channel field. Enter the layer that you want to perform the action on in the Layer field.
RossTalk Custom Command	Devices > RossTalk (XPression) > RossTalk Custom Cmd(CRLF)	Send a manual RossTalk string to XPression. Each string has CRLF (carriage return line feed) appended to the end. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the RossTalk string in the Custom Cmd field.

Event	Location	Description
RossTalk — Focus	Devices > RossTalk (XPression) > Focus	Send the Focus command for a specific item to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the take item id of the item you want to perform the action on in the Take ID field.
RossTalk — GPI	Devices > RossTalk (XPression) > GPI	Send the simulated GPI input to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the GPI you want to simulate triggering in the GPI field.
RossTalk — Layer Off	Devices > RossTalk (XPression) > layer Off	Send the Layer Off command for a specific framebuffer and layer to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the framebuffer that you want to perform the action on in the Channel field. Enter the layer that you want to perform the action on in the Layer field.
RossTalk — Next	Devices > RossTalk (XPression) > Next	Send the Next command to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to.
RossTalk — Read Current	Devices > RossTalk (XPression) > Read	Send the Read command to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to.
RossTalk — Read Item	Devices > RossTalk (XPression) > Read (1)	Send the Read command for a specific item to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the take item id of the item you want to perform the action on in the Take ID field.
RossTalk — Read Layer	Devices > RossTalk (XPression) > Read (2)	Send the Read command for a specific item and layer to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the take item id of the item you want to perform the action on in the Take ID field. Enter the layer that you want to perform the action on in the Layer field.
RossTalk — Resume Channel	Devices > RossTalk (XPression) > Resume Channel	Send the Resume command for a framebuffer to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the framebuffer that you want to perform the action on in the Channel field.
RossTalk — Resume Layer	Devices > RossTalk (XPression) > Resume Layer	Send the Resume command for a framebuffer and layer to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to. Enter the framebuffer that you want to perform the action on in the Channel field. Enter the layer that you want to perform the action on in the Layer field.
RossTalk — Sequencer Down	Devices > RossTalk (XPression) > Sequencer Down	Send the Sequencer Down command to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to.
RossTalk — Sequencer Up	Devices > RossTalk (XPression) > Sequencer Up	Send the Sequencer Up command to the selected device. <ol style="list-style-type: none"> Click the RossTalk Device button and select the device you want to send the RossTalk command to.

Event	Location	Description
RossTalk — Swap Channel	Devices > RossTalk (XPression) > Swap (1)	Send the Swap command for a specific framebuffer to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the framebuffer that you want to perform the action on in the Channel field.
RossTalk — Swap Current	Devices > RossTalk (XPression) > Swap	Send the Swap command to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to.
RossTalk — Swap Layer	Devices > RossTalk (XPression) > Swap (2)	Send the Swap command for a specific framebuffer and layer to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the framebuffer that you want to perform the action on in the Channel field. 3. Enter the layer that you want to perform the action on in the Layer field.
RossTalk — Take Channel	Devices > RossTalk (XPression) > Take (2)	Send the Take command for a specific item and framebuffer to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the take item id of the item you want to perform the action on in the Take ID field. 3. Enter the framebuffer that you want to perform the action on in the Channel field.
RossTalk — Take Item	Devices > RossTalk (XPression) > Take (1)	Send the Take command for a specific item to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the take item id of the item you want to perform the action on in the Take ID field.
RossTalk — Take Layer	Devices > RossTalk (XPression) > Take (3)	Send the Take command for a specific item and location to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the take item id of the item you want to perform the action on in the Take ID field. 3. Enter the framebuffer that you want to perform the action on in the Channel field. 4. Enter the layer that you want to perform the action on in the Layer field.
RossTalk — Take Offline	Devices > RossTalk (XPression) > Take Offline	Send the Take Offline command for a specific item to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the take item id of the item you want to perform the action on in the Take ID field.
RossTalk — Up Next	Devices > RossTalk (XPression) > Up Next	Send the Next command for a specific item to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the take item id of the item you want to perform the action on in the Take ID field.

Table 13: RossTalk (Generic)

Event	Location	Description
RossTalk CC	Devices > RossTalk (Generic) > CC	Send the simulated custom control to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the bank of the custom control in the Bank field. 3. Enter the number of the custom control in the Custom field.
RossTalk Custom Command (CRLF)	Devices > RossTalk (Generic) > RossTalk Custom Cmd(CRLF)	Send a manual RossTalk string to the selected device. Each string has CRLF (carriage return line feed) appended to the end. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the RossTalk string in the Custom Cmd field.
RossTalk Custom Command (LF)	Devices > RossTalk (Generic) > RossTalk Custom Cmd(LF)	Send a manual RossTalk string to the selected device. Each string has LF (line feed) appended to the end. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the RossTalk string in the Custom Cmd field.
RossTalk Custom Command (CR)	Devices > RossTalk (Generic) > RossTalk Custom Cmd(CR)	Send a manual RossTalk string to the selected device. Each string has CR (carriage return) appended to the end. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the RossTalk string in the Custom Cmd field.
RossTalk Custom Command (no CRLF)	Devices > RossTalk (Generic) > RossTalk Custom Cmd(No CRLF)	Send a manual RossTalk string to the selected device. CRLF (carriage return line feed) is not appended to the end of the string. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the RossTalk string in the Custom Cmd field.
RossTalk — GPI	Devices > RossTalk (Generic) > GPI	Send the simulated GPI input to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the GPI you want to simulate triggering in the GPI field.

Table 14: RossTalk (Ultrix™)

Event	Location	Description
RossTalk Custom Command	Devices > RossTalk (Ultrix) > RossTalk Custom Cmd	Send a manual RossTalk string to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the RossTalk string in the Custom Cmd field.
RossTalk — MV Clock End	Devices > RossTalk (Ultrix) > MV Clock End	Send the end selected clock command to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the number of the clock you want to perform the action on in the MV Clock field.
RossTalk — MV Clock Pause	Devices > RossTalk (Ultrix) > MV Clock Pause	Send the pause selected clock command to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the number of the clock you want to perform the action on in the MV Clock field.

Event	Location	Description
RossTalk — MV Clock Run	Devices > RossTalk (Ultrix) > MV Clock Run	Send the run selected clock command to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the number of the clock you want to perform the action on in the MV Clock field.
RossTalk — MV Clock Stop	Devices > RossTalk (Ultrix) > MV Clock Stop	Send the stop selected clock command to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the number of the clock you want to perform the action on in the MV Clock field.
RossTalk — Salvo	Devices > RossTalk (Ultrix) > Salvo	Send the fire salvo command to the selected device. <ol style="list-style-type: none"> 1. Click the RossTalk Device button and select the device you want to send the RossTalk command to. 2. Enter the salvo you want to fire in the SALVO field.

Video Server

Event	Location	Description
Video Server — Cue	Video Server > Cue	Send the Cue command and name of clip to cue to the selected device. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to. 3. Enter the identifier of the clip in the Cue field.
Video Server — Get Clips	Video Server > Get Clips	Query the selected device for a list of clips. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to.
Video Server — Jog	Video Server > Jog	Send the jog command to the selected device. The Jog command is not supported by the internal Clip Player at this time. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the amount you want to jog in the Jog field.
Video Server — Loop Off	Video Server > Loop Off	Send the Loop Off command to the selected device. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to.
Video Server — Loop On	Video Server > Loop On	Send the Loop On command to the selected device. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to.

Event	Location	Description
Video Server — Play	Video Server > Play	Send the Play command to the selected device. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to.
Video Server — Record	Video Server > Record	Send the eject command to the device, followed by the record command. The clip is given the name <code>recording_DATE_TIME</code> . <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to. 3. Enter a name for the clip in the Record field.
Video Server — Shuttle	Video Server > Shuttle	Send the shuttle command to the selected device. The Shuttle command is not supported by the internal Clip Player at this time. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to. 3. Click the Change Type button and select whether you want to set (Absolute) or reset (Reset) the parameter. Some selections will not be available when you reset the parameter. 4. Enter the speed you want to shuttle in the Shuttle field.
Video Server — Stop	Video Server > Stop	Send the Stop command to the selected device. <ol style="list-style-type: none"> 1. Click the Video Server button and select the device you want to send the command to. 2. Click a Channel button to select the channel you want to send the command to.

MIDI Device OID List

The OID for the MIDI device is made of a number of parts separated by a period. These parts identify things like the device class (`audiomixer`), audio source, audio destination, and control function.

For example, the OID `audiomixer.aux.2.sdi2.volume` translates to device class (`audiomixer`), audio destination (`aux.2`), audio source (`sdi2`), and control function (`volume`). This is a continuous input that allows you to control the volume of SDI 2 on the Aux 2 out.

Note: As this interface has not been tested with many MIDI controllers, unpredictability can arise. In some cases it may help to restart the switcher or reset the OIDs by altering the OID, press **Enter**, and then set the OID back.

Table 15: Audio Mixer OIDs

Target	Syntax	Description
Volume		
Assignable Audio Channels	<code>audiomixer.main.audio1.volume</code>	Volume for assignable audio channel 1 input on the Main layer. Replace <code>audio1</code> with the assignable audio channel you want to set the volume for. Replace <code>main</code> with the Aux layer you want set the volume for (<code>aux.1-aux.12</code>).
Output Mix	<code>audiomixer.output.main.volume</code>	Primary volume for the Main layer. Replace <code>main</code> with the Aux layer you want set the volume for (<code>aux.1-aux.12</code>) or the Monitor output (<code>monitor</code>).
Balance/Pan		
Assignable Audio Channel	<code>audiomixer.main.audio1.pan</code>	Balance for assignable audio channel 1 input on the Main layer. Replace <code>audio1</code> with the assignable audio channel you want to set the balance for. Replace <code>main</code> with the Aux layer you want set the balance for (<code>aux.1-aux.12</code>).
Equalization (EQ)		
EQ Channel Select	<code>audiomixer.eqchannelselect</code>	Select the audio channel that you want to set the EQ for. This oid is assigned to a button on the same strip as that audio channel you want to EQ. This tells the mixer that the EQ values are to be applied to the selected audio channel.
EQ Bypass	<code>audiomixer.eqbypasscommon</code>	Bypass the equalization for the selected audio channel.
Low Shelf Gain	<code>audiomixer.lowshelfgaincommon</code>	Gain setting for the Low Shelf EQ of the selected audio channel.
Midrange 1 Gain	<code>audiomixer.midrange1gaincommon</code>	Gain setting for the Midrange 1 EQ of the selected audio channel.
Midrange 2 Gain	<code>audiomixer.midrange2gaincommon</code>	Gain setting for the Midrange 2 EQ of the selected audio channel.
High Shelf Gain	<code>audiomixer.highshelfgaincommon</code>	Gain setting for the High Shelf EQ of the selected audio channel.
Low Shelf Max Frequency (linear)	<code>audiomixer.lowshelfmaxfreqcommon</code>	Maximum Frequency setting for the Low Shelf EQ of the selected audio channel. Frequency selection is performed on a linear scale.
Midrange 1 Center Frequency (linear)	<code>audiomixer.midrange1centerfreqcommon</code>	Center Frequency setting for the Midrange 1 EQ of the selected audio channel. Frequency selection is performed on a linear scale.

Target	Syntax	Description
Midrange 2 Center Frequency (linear)	<code>audiomixer .midrange2centerfreqcommon</code>	Center Frequency setting for the Midrange 2 EQ of the selected audio channel. Frequency selection is performed on a linear scale.
Midrange 1 Q (linear)	<code>audiomixer .midrange1qcommon</code>	Q Ratio setting for the Midrange 1 EQ of the selected audio channel. Ratio selection is performed on a linear scale.
Midrange 2 Q (linear)	<code>audiomixer .midrange2qcommon</code>	Q Ratio setting for the Midrange 2 EQ of the selected audio channel. Ratio selection is performed on a linear scale.
High Shelf Minimum Frequency (linear)	<code>audiomixer .highshelfminfreqcommon</code>	Minimum Frequency setting for the High Shelf EQ of the selected audio channel. Frequency selection is performed on a linear scale.
Low Shelf Max Frequency (scaled)	<code>audiomixer .lowshelfmaxfreqscaledcommon</code>	Maximum Frequency setting for the Low Shelf EQ of the selected audio channel. Frequency selection is performed on a non-linear scale.
Midrange 1 Center Frequency (scaled)	<code>audiomixer .midrange1centerfreqscaledcommon</code>	Center Frequency setting for the Midrange 1 EQ of the selected audio channel. Frequency selection is performed on a non-linear scale.
Midrange 2 Center Frequency (scaled)	<code>audiomixer .midrange2centerfreqscaledcommon</code>	Center Frequency setting for the Midrange 2 EQ of the selected audio channel. Frequency selection is performed on a non-linear scale.
Midrange 1 Q (scaled)	<code>audiomixer .midrange1qscaledcommon</code>	Q Ratio setting for the Midrange 1 EQ of the selected audio channel. Ratio selection is performed on a non-linear scale.
Midrange 2 Q (scaled)	<code>audiomixer .midrange2qscaledcommon</code>	Q Ratio setting for the Midrange 2 EQ of the selected audio channel. Ratio selection is performed on a non-linear scale.
High Shelf Minimum Frequency (scaled)	<code>audiomixer .highshelfminfreqscaledcommon</code>	Minimum Frequency setting for the High Shelf EQ of the selected audio channel. Frequency selection is performed on a non-linear scale.
Compressor / Limiter (C/L)		
C/L Channel Select	<code>audiomixer .clchannelselect</code>	Select the audio channel that you want to set the C/L for. This oid is assigned to a button on the same strip as that audio channel you want to C/L. This tells the mixer that the C/L values are to be applied to the selected audio channel.
C/L Threshold	<code>audiomixer .thresholdscaledcommon</code>	The level at which the compressor starts to be applied.
C/L Attack	<code>audiomixer .attackcontrolscaledcommon</code>	The amount of time you want to pass between the level surpassing the threshold and the full compression ratio being applied
C/L Compression	<code>audiomixer .compressionscaledcommon</code>	The ratio for the amount of compression you want to apply.
C/L Release	<code>audiomixer .releasecontrolscaledcommon</code>	The amount of time you want to pass between the level falling below the threshold and the compression ratio returning to 1:1 (no compression applied).
C/L Makeup	<code>audiomixer .makeupgainscaledcommon</code>	Increase the gain of the audio after compression.
C/L Bypass	<code>audiomixer .clbypasscommon</code>	Bypass the equalization for the selected audio channel.

Target	Syntax	Description
Gain		
Analog	<code>audiomixer.abm1.1.gain</code>	Gain for the Analog 1 input. Replace <code>abm1.1</code> with the analog port on the ABU you want to set the gain for (<code>abm1.1-abm3.8</code>). For example, <code>abm2.5</code> is the Analog 5 input port on ABU 2.
Pad		
Analog	<code>audiomixer.abm1.1.pad</code>	Toggle pad for analog 1 input on ABU 1. Replace <code>abm1.1</code> with the analog port on the ABU you want to set pad for (<code>abm1.1-abm3.8</code>). For example, <code>abm2.5</code> is the Analog 5 input port on ABU 2.
Phantom Power		
Analog	<code>audiomixer.abm1.1.phantompower</code>	Toggle phantom power for the analog 1 input port on ABU a. Replace <code>abm1.1</code> with the analog port on the ABU you want to set phantom power for (<code>abm1.1-abm3.8</code>). For example, <code>abm2.5</code> is the Analog 5 input port on ABU 2.
Mute		
Assignable Audio Channel	<code>audiomixer.main.audio1.mute</code>	Toggle mute for assignable audio channel 1 input on the Main layer. Replace <code>audio1</code> with the assignable audio channel want to set mute for. Replace <code>main</code> with the Aux layer you want set mute for (<code>aux.1-aux.12</code>).
Solo		
Assignable Audio Channel	<code>audiomixer.main.audio1.solo</code>	Toggle solo for assignable audio channel 1 input on the Main layer. Replace <code>audio1</code> with the assignable audio channel input you want to set solo for. Replace <code>main</code> with the Aux layer you want set solo for (<code>aux.1-aux.12</code>).
Clear Solo		
Main	<code>audiomixer.output.main.clearsolo</code>	Clear solo for all sources on Main layer.
Monitor	<code>audiomixer.output.monitor.clearsolo</code>	Clear solo for all sources on Monitor layer.
Aux	<code>audiomixer.output.aux.1.clearsolo</code>	Clear solo for all sources on the Aux layers. Replace <code>Aux.1</code> with the Aux layer you want set solo for (<code>aux.1-aux.12</code>).
Pre/Post		
Assignable Audio Channel	<code>audiomixer.aux.1.audio1.pre</code>	Toggle pre fader for assignable audio channel 1 input on the Aux 1 layer. Replace <code>audio1</code> with the assignable audio channel input you want to set pre for. Replace <code>aux.1</code> with the Aux layer you want set pre for (<code>aux.1-aux.12</code>).
PFL		
Assignable Audio Channel	<code>audiomixer.audio1.pfl</code>	Toggle PFL for assignable audio channel 1. Replace <code>audio1</code> with the assignable audio channel input you want to set solo for (<code>sdi1-sdi12</code>).
Clear PFL		
All	<code>audiomixer.clearpfl</code>	Clear PFL on all sources.

Third-party Licenses

This product may use one or more software components subject to the following licenses:

- This software uses Autoconf v2.65, a tool for generating configure scripts, released under the GNU General Public License.
- This software uses Automake v1.11.1, a tool for a tool for automatically generating Makefile.ini files compliant with the GNU Coding Standards, released under the GNU General Public License.
- This software uses binutils v2.20.1, a collection of binary tools, released under the GNU General Public License.
- This software uses busybox v1.18.4, collection of tools for embedded Linux, released under the GNU General Public License.
- This software uses ccache v3.1.3, a compiler cache, released under the GNU General Public License.
- This software uses dosfstools v3.0.11, a set of tools to check and label file systems of the FAT family, released under the GNU General Public License.
- This software uses e2fsprog v1.41.14, a tool for generating configure scripts, released under the GNU General Public License.
- This software uses eeprog v0.7.6, a program that reads and writes 24Cxx EEPROMs connected to I2C serial bus, released under the GNU General Public License.
- This software uses ethtool v2.6.38, licensed under the Apache License, Version 2.0 (the "License").
- This software uses FakeRoot v1.9.5, a tool to allow processes to run in an environment where they appear to have root privileges, released under the GNU General Public License.
- Portions of this software are copyright © 2013 The FreeType Project (www.freetype.org). All rights reserved.
- This software uses gcc v4.5.1, the gnu C compiler, released under the GNU General Public License.
- This software uses gdb v7.1, the GNU Project debugger, released under the GNU General Public License.
- This software uses gmp v4.2.4, a free library for arbitrary precision arithmetic, released under the GNU General Public License.
- This software includes i2c-tools v3.0.3, which is distributed under the terms of the Lesser General Public License (LGPL) version [version number].
- This software is based in part on the work of the Independent JPEG Group.
- This software includes libelf v0.8.13, which is distributed under the terms of the Lesser General Public License (LGPL) version 2.1.
- This software uses liblockfile v1.08-4.debian, a library that provides functions to lock standard mailboxes, released under the GNU General Public License.
- This software uses lbsndfile v1.0.25, a C library for reading and writing files containing sampled sound, released under the GNU General Public License.
- This software uses libtool v2.2.10, a generic library support script that hides the complexity of using shared libraries behind a consistent, portable interface, released under the GNU General Public License.
- This software includes libusb v1.0.8, which is distributed under the terms of the Lesser General Public License (LGPL) version 2.1+.
- This software includes libusb-compat v0.1.3, which is distributed under the terms of the Lesser General Public License (LGPL) version 2.1+
- This software includes lmsensors v3.2.0, which is distributed under the terms of the Lesser General Public License (LGPL) version 2.1+.
- This software uses lockfile-progs v0.1.15, which provides a method to lock and unlock mailboxes and files safely (via liblockfile), released under the GNU General Public License.
- This software uses logrotate v3.7.9, a utility is designed to simplify the administration of log files, released under the GNU General Public License.
- This software uses ltrace v0.5.3-2.1, a debugging program to track runtime library calls in dynamically linked programs, released under the GNU General Public License.

-
- This software uses lzo v2.03, a utility is designed to simplify the administration of log files, released under the GNU General Public License.
 - This software uses m4 v1.4.15, a portable lossless data compression library, released under the GNU General Public License.
 - This software uses memstat v0.8, copyright © 2014 Kenn Ejima, which is distributed under the MIT License.
 - This software uses memtester v4.2.1, a utility for testing the memory subsystem in a computer to determine if it is faulty, released under the GNU General Public License.
 - This software includes mpc v0.8.2, which is distributed under the terms of the Lesser General Public License (LGPL) version 3.
 - This software includes mpfr v2.4.1, which is distributed under the terms of the Lesser General Public License (LGPL) version 3.
 - This software uses mtd-utils v1.4.4, a tool for building in environment of cygwin, released under the GNU General Public License.
 - This software uses OpenSLP, which uses the Caldera Systems open source license, which is compatible with the BSD open source license.
 - This software uses pciutils v3.1.7, a library for portable access to PCI bus configuration registers, released under the GNU General Public License.
 - This software uses pkg-config v0.25, a library for portable access to PCI bus configuration registers, released under the GNU General Public License.
 - This software uses proftpd v1.3.3b, a GPL-licensed FTP server, released under the GNU General Public License.
 - This software uses readline v6.2, a library which provides a set of functions for use by applications that allow users to edit command lines as they are typed in, released under the GNU General Public License.
 - This software uses rsync v6.2, a utility that provides fast incremental file transfer, released under the GNU General Public License.
 - This software uses setserial v2.17, a basic system utility for displaying or setting serial port information, released under the GNU General Public License Version 2.
 - This software uses sysfsutils v2.1.0, a package that provides a set of utilities for interfacing with sysfs, released under the GNU General Public License.
 - This software includes uclibc v0.9.31, which is distributed under the terms of the Lesser General Public License (LGPL) version 3.
 - This software includes udev v114, which is distributed under the terms of the Lesser General Public License (LGPL) version 2.1+.
 - This software uses usbutils v002, a tool to query what type of USB devices are connected to the system, released under the GNU General Public License.

Note: As required by the GNU General Public License, and the Lesser GNU Public License (LGPL), source code can be obtained from Ross Video for at least 3 years. Contact Ross Video Technical Support for more information.

Apache License

Version 2.0, January 2004

<http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

- a.** You must give any other recipients of the Work or Derivative Works a copy of this License; and
- b.** You must cause any modified files to carry prominent notices stating that You changed the files; and

c. You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

d. If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

ARV-LIBC

The contents of avr-libc are licensed with a Modified BSD License.

All of this is supposed to be Free Software, Open Source, DFSG-free, GPL-compatible, and OK to use in both free and proprietary applications.

See the license information in the individual source files for details.

Additions and corrections to this file are welcome.

Portions of avr-libc are Copyright (c) 1999-2005

- Keith Gudger,
- Bjoern Haase,
- Steinar Haugen,
- Peter Jansen,
- Reinhard Jessich,
- Magnus Johansson,
- Artur Lipowski,
- Marek Michalkiewicz,
- Colin O'Flynn,
- Bob Paddock,
- Reiner Patommel,
- Michael Rickman,
- Theodore A. Roth,
- Juergen Schilling,
- Philip Soeberg,
- Anatoly Sokolov,
- Nils Kristian Strom,
- Michael Stumpf,
- Stefan Swanepoel,
- Eric B. Weddington,
- Joerg Wunsch,
- Dmitry Xmelkov,
- The Regents of the University of California.

All rights reserved.

Portions of avr-libc documentation Copyright (c) 1990, 1991, 1993, 1994 The Regents of the University of California. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of the copyright holders nor the names of contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Boost

Boost Software License - Version 1.0 - August 17th, 2003

Permission is hereby granted, free of charge, to any person or organization obtaining a copy of the software and accompanying documentation covered by this license (the “Software”) to use, reproduce, display, distribute, execute, and transmit the Software, and to prepare derivative works of the Software, and to permit third-parties to whom the Software is furnished to do so, all subject to the following:

The copyright notices in the Software and this entire statement, including the above license grant, this restriction and the following disclaimer, must be included in all copies of the Software, in whole or in part, and all derivative works of the Software, unless such copies or derivative works are solely in the form of machine-executable object code generated by a source language processor.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT. IN NO EVENT SHALL THE COPYRIGHT HOLDERS OR ANYONE DISTRIBUTING THE SOFTWARE BE LIABLE FOR ANY DAMAGES OR OTHER LIABILITY, WHETHER IN CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

BSD License

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR “AS IS” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

BZIP2

bzip2 applet in busybox is based on lightly-modified source of bzip2 version 1.0.4. bzip2 source is distributed under the following conditions (copied verbatim from LICENSE file)

This program, "bzip2", the associated library "libbzip2", and all documentation, are copyright (C) 1996-2006 Julian R Seward. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
3. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.

-
4. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Julian Seward, Cambridge, UK.

jseward@bzip.org

bzip2/libbzip2 version 1.0.4 of 20 December 2006

Dmalloc - Debug Malloc Library

Copyright 1992 to 2020 by Gray Watson.

Permission to use, copy, modify, and/or distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED "AS IS" AND THE AUTHOR DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

Dropbear

The majority of code is written by Matt Johnston, under the license below.

Portions of the client-mode work are (c) 2004 Mihnea Stoenescu, under the same license:

Copyright (c) 2002-2008 Matt Johnston

Portions copyright (c) 2004 Mihnea Stoenescu

All rights reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Import code in `keyimport.c` is modified from PuTTY's `import.c`, licensed as follows:

PuTTY is copyright 1997-2003 Simon Tatham.

Portions copyright Robert de Bath, Joris van Rantwijk, Delian Delchev, Andreas Schultz, Jeroen Massar, Wez Furlong, Nicolas Barry, Justin Bradford, and CORE SDI S.A.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “ Software ”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “ AS IS ” , WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

FreeType font driver for BDF fonts

Francesco Zappa Nardelli

<francesco.zappa.nardelli@ens.fr>

Copyright (C) 2001-2002 by Francesco Zappa Nardelli

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “ AS IS ” , WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

*** Portions of the driver (that is, bdf.c and bdf.h):

Copyright 2000 Computing Research Labs, New Mexico State University

Copyright 2001-2002 Francesco Zappa Nardelli

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “ Software ”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “ AS IS ” , WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE COMPUTING RESEARCH LAB OR NEW MEXICO STATE UNIVERSITY BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

FreeType font driver for PCF fonts

Copyright (C) 2000 by Francesco Zappa Nardelli

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “ Software ”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “ AS IS ” , WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

GNU General Public License Version 2

GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software — to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributes of a free program will individually obtain patent licenses, in effect making the program

proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The “ Program ” , below, refers to any such program or work, and a “ work based on the Program ” means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term “ modification ” .) Each licensee is addressed as “ you ” .

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a. You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b. You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c. If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

a. Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

b. Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c. Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people

have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and “ any later version ”, you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM “ AS IS ” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

GNU General Public License Version 3

Version 3, 29 June 2007

Copyright © 2007 Free Software Foundation, Inc. <<http://fsf.org/>>

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The GNU General Public License is a free, copyleft license for software and other kinds of works. The licenses for most software and other practical works are designed to take away your freedom to share and change the works. By contrast, the GNU General Public License is intended to guarantee your freedom

to share and change all versions of a program — to make sure it remains free software for all its users. We, the Free Software Foundation, use the GNU General Public License for most of our software; it applies also to any other work released this way by its authors. You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs, and that you know you can do these things.

To protect your rights, we need to prevent others from denying you these rights or asking you to surrender the rights. Therefore, you have certain responsibilities if you distribute copies of the software, or if you modify it: responsibilities to respect the freedom of others.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must pass on to the recipients the same freedoms that you received. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

Developers that use the GNU GPL protect your rights with two steps: (1) assert copyright on the software, and (2) offer you this License giving you legal permission to copy, distribute and/or modify it.

For the developers' and authors' protection, the GPL clearly explains that there is no warranty for this free software. For both users' and authors' sake, the GPL requires that modified versions be marked as changed, so that their problems will not be attributed erroneously to authors of previous versions.

Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free. The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS

0. Definitions.

“ This License ” refers to version 3 of the GNU General Public License.

“ Copyright ” also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

“ The Program ” refers to any copyrightable work licensed under this License. Each licensee is addressed as “ you ”. “ Licensees ” and “ recipients ” may be individuals or organizations.

To “ modify ” a work means to copy from or adapt all or part of the work in a fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a “ modified version ” of the earlier work or a work “ based on ” the earlier work.

A “ covered work ” means either the unmodified Program or a work based on the Program.

To “ propagate ” a work means to do anything with it that, without permission, would make you directly or secondarily liable for infringement under applicable copyright law, except executing it on a computer or modifying a private copy. Propagation includes copying, distribution (with or without modification), making available to the public, and in some countries other activities as well.

To “ convey ” a work means any kind of propagation that enables other parties to make or receive copies. Mere interaction with a user through a computer network, with no transfer of a copy, is not conveying.

An interactive user interface displays “ Appropriate Legal Notices ” to the extent that it includes a convenient and prominently visible feature that (1) displays an appropriate copyright notice, and (2) tells the user that there is no warranty for the work (except to the extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.

1. Source Code.

The “ source code ” for a work means the preferred form of the work for making modifications to it. “ Object code ” means any non-source form of a work.

A “ Standard Interface ” means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The “ System Libraries ” of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A “ Major Component ”, in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The “ Corresponding Source ” for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work's System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

The Corresponding Source need not include anything that users can regenerate automatically from other parts of the Corresponding Source.

The Corresponding Source for a work in source code form is that same work.

2. Basic Permissions.

All rights granted under this License are granted for the term of copyright on the Program, and are irrevocable provided the stated conditions are met. This License explicitly affirms your unlimited permission to run the unmodified Program. The output from running a covered work is covered by this License only if the output, given its content, constitutes a covered work. This License acknowledges your rights of fair use or other equivalent, as provided by copyright law.

You may make, run and propagate covered works that you do not convey, without conditions so long as your license otherwise remains in force. You may convey covered works to others for the sole purpose of having them make modifications exclusively for you, or provide you with facilities for running those works, provided that you comply with the terms of this License in conveying all material for which you do not control copyright. Those thus making or running the covered works for you must do so exclusively on your behalf, under your direction and control, on terms that prohibit them from making any copies of your copyrighted material outside their relationship with you.

Conveying under any other circumstances is permitted solely under the conditions stated below. Sublicensing is not allowed; section 10 makes it unnecessary.

3. Protecting Users' Legal Rights From Anti-Circumvention Law.

No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures.

When you convey a covered work, you waive any legal power to forbid circumvention of technological measures to the extent such circumvention is effected by exercising rights under this License with respect to the covered work, and you disclaim any intention to limit operation or modification of the work as a means of enforcing, against the work's users, your or third parties' legal rights to forbid circumvention of technological measures.

4. Conveying Verbatim Copies.

You may convey verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice; keep intact all notices stating that this License and any non-permissive terms added in accord with section 7 apply to the code; keep intact all notices of the absence of any warranty; and give all recipients a copy of this License along with the Program.

You may charge any price or no price for each copy that you convey, and you may offer support or warranty protection for a fee.

5. Conveying Modified Source Versions.

You may convey a work based on the Program, or the modifications to produce it from the Program, in the form of source code under the terms of section 4, provided that you also meet all of these conditions:

- a. The work must carry prominent notices stating that you modified it, and giving a relevant date.
- b. The work must carry prominent notices stating that it is released under this License and any conditions added under section 7. This requirement modifies the requirement in section 4 to “ keep intact all notices ”.
- c. You must license the entire work, as a whole, under this License to anyone who comes into possession of a copy. This License will therefore apply, along with any applicable section 7 additional terms, to the whole of the work, and all its parts, regardless of how they are packaged. This License gives no permission to license the work in any other way, but it does not invalidate such permission if you have separately received it.
- d. If the work has interactive user interfaces, each must display Appropriate Legal Notices; however, if the Program has interactive interfaces that do not display Appropriate Legal Notices, your work need not make them do so.

A compilation of a covered work with other separate and independent works, which are not by their nature extensions of the covered work, and which are not combined with it such as to form a larger program, in or on a volume of a storage or distribution medium, is called an “ aggregate ” if the compilation and its resulting copyright are not used to limit the access or legal rights of the compilation's users beyond what the individual works permit. Inclusion of a covered work in an aggregate does not cause this License to apply to the other parts of the aggregate.

6. Conveying Non-Source Forms.

You may convey a covered work in object code form under the terms of sections 4 and 5, provided that you also convey the machine-readable Corresponding Source under the terms of this License, in one of these ways:

- a. Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by the Corresponding Source fixed on a durable physical medium customarily used for software interchange.
- b. Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.

c. Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.

d. Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

e. Convey the object code using peer-to-peer transmission, provided you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the object code, whose source code is excluded from the Corresponding Source as a System Library, need not be included in conveying the object code work.

A “User Product” is either (1) a “consumer product”, which means any tangible personal property which is normally used for personal, family, or household purposes, or (2) anything designed or sold for incorporation into a dwelling. In determining whether a product is a consumer product, doubtful cases shall be resolved in favor of coverage. For a particular product received by a particular user, “normally used” refers to a typical or common use of that class of product, regardless of the status of the particular user or of the way in which the particular user actually uses, or expects or is expected to use, the product. A product is a consumer product regardless of whether the product has substantial commercial, industrial or non-consumer uses, unless such uses represent the only significant mode of use of the product.

“Installation Information” for a User Product means any methods, procedures, authorization keys, or other information required to install and execute modified versions of a covered work in that User Product from a modified version of its Corresponding Source. The information must suffice to ensure that the continued functioning of the modified object code is in no case prevented or interfered with solely because modification has been made.

If you convey an object code work under this section in, or with, or specifically for use in, a User Product, and the conveying occurs as part of a transaction in which the right of possession and use of the User Product is transferred to the recipient in perpetuity or for a fixed term (regardless of how the transaction is characterized), the Corresponding Source conveyed under this section must be accompanied by the Installation Information. But this requirement does not apply if neither you nor any third party retains the ability to install modified object code on the User Product (for example, the work has been installed in ROM).

The requirement to provide Installation Information does not include a requirement to continue to provide support service, warranty, or updates for a work that has been modified or installed by the recipient, or for the User Product in which it has been modified or installed. Access to a network may be denied when the modification itself materially and adversely affects the operation of the network or violates the rules and protocols for communication across the network.

Corresponding Source conveyed, and Installation Information provided, in accord with this section must be in a format that is publicly documented (and with an implementation available to the public in source code form), and must require no special password or key for unpacking, reading or copying.

7. Additional Terms.

“Additional permissions” are terms that supplement the terms of this License by making exceptions from one or more of its conditions. Additional permissions that are applicable to the entire Program shall be treated as though they were included in this License, to the extent that they are valid under applicable law. If additional permissions apply only to part of the Program, that part may be used

separately under those permissions, but the entire Program remains governed by this License without regard to the additional permissions.

When you convey a copy of a covered work, you may at your option remove any additional permissions from that copy, or from any part of it. (Additional permissions may be written to require their own removal in certain cases when you modify the work.) You may place additional permissions on material, added by you to a covered work, for which you have or can give appropriate copyright permission.

Notwithstanding any other provision of this License, for material you add to a covered work, you may (if authorized by the copyright holders of that material) supplement the terms of this License with terms:

- a.** Disclaiming warranty or limiting liability differently from the terms of sections 15 and 16 of this License; or
- b.** Requiring preservation of specified reasonable legal notices or author attributions in that material or in the Appropriate Legal Notices displayed by works containing it; or
- c.** Prohibiting misrepresentation of the origin of that material, or requiring that modified versions of such material be marked in reasonable ways as different from the original version; or
- d.** Limiting the use for publicity purposes of names of licensors or authors of the material; or
- e.** Declining to grant rights under trademark law for use of some trade names, trademarks, or service marks; or
- f.** Requiring indemnification of licensors and authors of that material by anyone who conveys the material (or modified versions of it) with contractual assumptions of liability to the recipient, for any liability that these contractual assumptions directly impose on those licensors and authors.

All other non-permissive additional terms are considered “ further restrictions ” within the meaning of section 10. If the Program as you received it, or any part of it, contains a notice stating that it is governed by this License along with a term that is a further restriction, you may remove that term. If a license document contains a further restriction but permits relicensing or conveying under this License, you may add to a covered work material governed by the terms of that license document, provided that the further restriction does not survive such relicensing or conveying.

If you add terms to a covered work in accord with this section, you must place, in the relevant source files, a statement of the additional terms that apply to those files, or a notice indicating where to find the applicable terms.

Additional terms, permissive or non-permissive, may be stated in the form of a separately written license, or stated as exceptions; the above requirements apply either way.

8. Termination.

You may not propagate or modify a covered work except as expressly provided under this License. Any attempt otherwise to propagate or modify it is void, and will automatically terminate your rights under this License (including any patent licenses granted under the third paragraph of section 11).

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, you do not qualify to receive new licenses for the same material under section 10.

9. Acceptance Not Required for Having Copies.

You are not required to accept this License in order to receive or run a copy of the Program. Ancillary propagation of a covered work occurring solely as a consequence of using peer-to-peer transmission to

receive a copy likewise does not require acceptance. However, nothing other than this License grants you permission to propagate or modify any covered work. These actions infringe copyright if you do not accept this License. Therefore, by modifying or propagating a covered work, you indicate your acceptance of this License to do so.

10. Automatic Licensing of Downstream Recipients.

Each time you convey a covered work, the recipient automatically receives a license from the original licensors, to run, modify and propagate that work, subject to this License. You are not responsible for enforcing compliance by third parties with this License.

An “entity transaction” is a transaction transferring control of an organization, or substantially all assets of one, or subdividing an organization, or merging organizations. If propagation of a covered work results from an entity transaction, each party to that transaction who receives a copy of the work also receives whatever licenses to the work the party's predecessor in interest had or could give under the previous paragraph, plus a right to possession of the Corresponding Source of the work from the predecessor in interest, if the predecessor has it or can get it with reasonable efforts.

You may not impose any further restrictions on the exercise of the rights granted or affirmed under this License. For example, you may not impose a license fee, royalty, or other charge for exercise of rights granted under this License, and you may not initiate litigation (including a cross-claim or counterclaim in a lawsuit) alleging that any patent claim is infringed by making, using, selling, offering for sale, or importing the Program or any portion of it.

11. Patents.

A “contributor” is a copyright holder who authorizes use under this License of the Program or a work on which the Program is based. The work thus licensed is called the contributor's “contributor version”.

A contributor's “essential patent claims” are all patent claims owned or controlled by the contributor, whether already acquired or hereafter acquired, that would be infringed by some manner, permitted by this License, of making, using, or selling its contributor version, but do not include claims that would be infringed only as a consequence of further modification of the contributor version. For purposes of this definition, “control” includes the right to grant patent sublicenses in a manner consistent with the requirements of this License.

Each contributor grants you a non-exclusive, worldwide, royalty-free patent license under the contributor's essential patent claims, to make, use, sell, offer for sale, import and otherwise run, modify and propagate the contents of its contributor version.

In the following three paragraphs, a “patent license” is any express agreement or commitment, however denominated, not to enforce a patent (such as an express permission to practice a patent or covenant not to sue for patent infringement). To “grant” such a patent license to a party means to make such an agreement or commitment not to enforce a patent against the party.

If you convey a covered work, knowingly relying on a patent license, and the Corresponding Source of the work is not available for anyone to copy, free of charge and under the terms of this License, through a publicly available network server or other readily accessible means, then you must either (1) cause the Corresponding Source to be so available, or (2) arrange to deprive yourself of the benefit of the patent license for this particular work, or (3) arrange, in a manner consistent with the requirements of this License, to extend the patent license to downstream recipients. “Knowingly relying” means you have actual knowledge that, but for the patent license, your conveying the covered work in a country, or your recipient's use of the covered work in a country, would infringe one or more identifiable patents in that country that you have reason to believe are valid.

If, pursuant to or in connection with a single transaction or arrangement, you convey, or propagate by procuring conveyance of, a covered work, and grant a patent license to some of the parties receiving the covered work authorizing them to use, propagate, modify or convey a specific copy of the covered work, then the patent license you grant is automatically extended to all recipients of the covered work and works based on it.

A patent license is “ discriminatory ” if it does not include within the scope of its coverage, prohibits the exercise of, or is conditioned on the non-exercise of one or more of the rights that are specifically granted under this License. You may not convey a covered work if you are a party to an arrangement with a third party that is in the business of distributing software, under which you make payment to the third party based on the extent of your activity of conveying the work, and under which the third party grants, to any of the parties who would receive the covered work from you, a discriminatory patent license (a) in connection with copies of the covered work conveyed by you (or copies made from those copies), or (b) primarily for and in connection with specific products or compilations that contain the covered work, unless you entered into that arrangement, or that patent license was granted, prior to 28 March 2007.

Nothing in this License shall be construed as excluding or limiting any implied license or other defenses to infringement that may otherwise be available to you under applicable patent law.

12. No Surrender of Others' Freedom.

If conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot convey a covered work so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not convey it at all. For example, if you agree to terms that obligate you to collect a royalty for further conveying from those to whom you convey the Program, the only way you could satisfy both those terms and this License would be to refrain entirely from conveying the Program.

13. Use with the GNU Affero General Public License.

Notwithstanding any other provision of this License, you have permission to link or combine any covered work with a work licensed under version 3 of the GNU Affero General Public License into a single combined work, and to convey the resulting work. The terms of this License will continue to apply to the part which is the covered work, but the special requirements of the GNU Affero General Public License, section 13, concerning interaction through a network will apply to the combination as such.

14. Revised Versions of this License.

The Free Software Foundation may publish revised and/or new versions of the GNU General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies that a certain numbered version of the GNU General Public License “ or any later version ” applies to it, you have the option of following the terms and conditions either of that numbered version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of the GNU General Public License, you may choose any version ever published by the Free Software Foundation.

If the Program specifies that a proxy can decide which future versions of the GNU General Public License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Program.

Later license versions may give you additional or different permissions. However, no additional obligations are imposed on any author or copyright holder as a result of your choosing to follow a later version.

15. Disclaimer of Warranty.

THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM “ AS IS ” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. Limitation of Liability.

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MODIFIES AND/OR CONVEYS THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

17. Interpretation of Sections 15 and 16.

If the disclaimer of warranty and limitation of liability provided above cannot be given local legal effect according to their terms, reviewing courts shall apply local law that most closely approximates an absolute waiver of all civil liability in connection with the Program, unless a warranty or assumption of liability accompanies a copy of the Program in return for a fee.

END OF TERMS AND CONDITIONS

GNU Lesser Public License Version 2.1

GNU LESSER GENERAL PUBLIC LICENSE

Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages—typically libraries—of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what

they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the “ Lesser ” General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a “ work based on the library ” and a “ work that uses the library ” . The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

GNU LESSER GENERAL PUBLIC LICENSE

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called “ this License ”). Each licensee is addressed as “ you ” .

A “ library ” means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executable.

The “ Library ” , below, refers to any such software library or work which has been distributed under these terms. A “ work based on the Library ” means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term “ modification ” .)

“ Source code ” for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library. You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a. The modified work must itself be a software library.

b. You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy. This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a “work that uses the Library”. Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a “work that uses the Library” with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a “work that uses the library”. The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a “work that uses the Library” uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a “work that uses the Library” with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a. Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable “work that uses the Library”, as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e. Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the “work that uses the Library” must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b. Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royaltyfree redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances. It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices.

Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he

or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and “ any later version ”, you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY “ AS IS ” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

GNU Lesser General Public License Version 3

Version 3, 29 June 2007

Copyright (c) 2010 by Bruce Korb - all rights reserved

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

This version of the GNU Lesser General Public License incorporates the terms and conditions of version 3 of the GNU General Public License, supplemented by the additional permissions listed below.

0. Additional Definitions.

As used herein, “ this License ” refers to version 3 of the GNU Lesser General Public License, and the “ GNU GPL ” refers to version 3 of the GNU General Public License.

“ The Library ” refers to a covered work governed by this License, other than an Application or a Combined Work as defined below.

An “ Application ” is any work that makes use of an interface provided by the Library, but which is not otherwise based on the Library. Defining a subclass of a class defined by the Library is deemed a mode of using an interface provided by the Library.

A “ Combined Work ” is a work produced by combining or linking an Application with the Library. The particular version of the Library with which the Combined Work was made is also called the “ Linked Version ” .

The “ Minimal Corresponding Source ” for a Combined Work means the Corresponding Source for the Combined Work, excluding any source code for portions of the Combined Work that, considered in isolation, are based on the Application, and not on the Linked Version.

The “ Corresponding Application Code ” for a Combined Work means the object code and/or source code for the Application, including any data and utility programs needed for reproducing the Combined Work from the Application, but excluding the System Libraries of the Combined Work.

1. Exception to Section 3 of the GNU GPL.

You may convey a covered work under sections 3 and 4 of this License without being bound by section 3 of the GNU GPL.

2. Conveying Modified Versions.

If you modify a copy of the Library, and, in your modifications, a facility refers to a function or data to be supplied by an Application that uses the facility (other than as an argument passed when the facility is invoked), then you may convey a copy of the modified version:

a. under this License, provided that you make a good faith effort to ensure that, in the event an Application does not supply the function or data, the facility still operates, and performs whatever part of its purpose remains meaningful, or

b. under the GNU GPL, with none of the additional permissions of this License applicable to that copy.

3. Object Code Incorporating Material from Library Header Files.

The object code form of an Application may incorporate material from a header file that is part of the Library. You may convey such object code under terms of your choice, provided that, if the incorporated material is not limited to numerical parameters, data structure layouts and accessors, or small macros, inline functions and templates (ten or fewer lines in length), you do both of the following:

a. Give prominent notice with each copy of the object code that the Library is used in it and that the Library and its use are covered by this License.

b. Accompany the object code with a copy of the GNU GPL and this license document.

4. Combined Works.

You may convey a Combined Work under terms of your choice that, taken together, effectively do not restrict modification of the portions of the Library contained in the Combined Work and reverse engineering for debugging such modifications, if you also do each of the following:

a. Give prominent notice with each copy of the Combined Work that the Library is used in it and that the Library and its use are covered by this License.

b. Accompany the Combined Work with a copy of the GNU GPL and this license document.

c. For a Combined Work that displays copyright notices during execution, include the copyright notice for the Library among these notices, as well as a reference directing the user to the copies of the GNU GPL and this license document.

d. Do one of the following:

0. Convey the Minimal Corresponding Source under the terms of this License, and the Corresponding Application Code in a form suitable for, and under terms that permit, the user to recombine or relink the Application with a modified version of the Linked Version to produce a modified Combined Work, in the manner specified by section 6 of the GNU GPL for conveying Corresponding Source.

1. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (a) uses at run time a copy of the Library already present on the user's computer system, and (b) will operate properly with a modified version of the Library that is interface-compatible with the Linked Version.

e. Provide Installation Information, but only if you would otherwise be required to provide such information under section 6 of the GNU GPL, and only to the extent that such information is necessary to install and execute a modified version of the Combined Work produced by recombining or relinking the Application with a modified version of the Linked Version. (If you use option 4d0, the Installation Information must accompany the Minimal Corresponding Source and Corresponding Application Code. If you use option 4d1, you must provide the Installation Information in the manner specified by section 6 of the GNU GPL for conveying Corresponding Source.)

5. Combined Libraries.

You may place library facilities that are a work based on the Library side by side in a single library together with other library facilities that are not Applications and are not covered by this License, and convey such a combined library under terms of your choice, if you do both of the following:

a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities, conveyed under the terms of this License.

b. Give prominent notice with the combined library that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

6. Revised Versions of the GNU Lesser General Public License.

The Free Software Foundation may publish revised and/or new versions of the GNU Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. Each version is given a distinguishing version number. If the Library as you received it specifies that a certain numbered version of the GNU Lesser General Public License “or any later version” applies to it, you have the option of following the terms and conditions either of that published version or of any later version published by the Free Software Foundation.

If the Library as you received it does not specify a version number of the GNU Lesser General Public License, you may choose any version of the GNU Lesser General Public License ever published by the Free Software Foundation.

If the Library as you received it specifies that a proxy can decide whether future versions of the GNU Lesser General Public License shall apply, that proxy's public statement of acceptance of any version is permanent authorization for you to choose that version for the Library.

GNU Library General Public License Version 2

Version 2, June 1991

Copyright (C) 1991 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111- 1307 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the library GPL. It is numbered 2 because it goes with version 2 of the ordinary GPL.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users.

This license, the Library General Public License, applies to some specially designated Free Software Foundation software, and to any other libraries whose authors decide to use it. You can use it for your libraries, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library, or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link a program with the library, you must provide complete object files to the recipients so that they can relink them with the library, after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

Our method of protecting your rights has two steps: (1) copyright the library, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the library.

Also, for each distributor's protection, we want to make certain that everyone understands that there is no warranty for this free library. If the library is modified by someone else and passed on, we want its recipients to know that what they have is not the original version, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that companies distributing free software will individually obtain patent licenses, thus in effect transforming the program into proprietary software. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License, which was designed for utility programs. This license, the GNU Library General Public License, applies to certain designated libraries. This license is quite different from the ordinary one; be sure to read it in full, and don't assume that anything in it is the same as in the ordinary license.

The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a “work based on the library” and a “work that uses the library”. The former contains code derived from the library, while the latter only works together with the library. Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

GNU LIBRARY GENERAL PUBLIC LICENSE

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library General

Public License (also called “ this License ”). Each licensee is addressed as “ you ” . A “ library ” means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The “ Library ” , below, refers to any such software library or work which has been distributed under these terms. A “ work based on the Library ” means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term “ modification ” .)

“ Source code ” for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a. The modified work must itself be a software library.

b. You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c. You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d. If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a “work that uses the Library”. Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a “work that uses the Library” with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a “work that uses the library”. The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a “work that uses the Library” uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a “work that uses the Library” with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a. Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable “work that uses the Library”, as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

c. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place. Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the “work that uses the Library” must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a. Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b. Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people

have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Library General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and “ any later version ”, you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY “ AS IS ” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

IJG

The authors make NO WARRANTY or representation, either express or implied, with respect to this software, its quality, accuracy, merchantability, or fitness for a particular purpose. This software is provided “ AS IS ”, and you, its user, assume the entire risk as to its quality and accuracy.

This software is copyright (C) 1991-2010, Thomas G. Lane, Guido Vollbeding.

All Rights Reserved except as specified below.

Permission is hereby granted to use, copy, modify, and distribute this software (or portions thereof) for any purpose, without fee, subject to these conditions:

1. If any part of the source code for this software is distributed, then this README file must be included, with this copyright and no-warranty notice unaltered; and any additions, deletions, or changes to the original files must be clearly indicated in accompanying documentation.

2. If only executable code is distributed, then the accompanying documentation must state that “ this software is based in part on the work of the Independent JPEG Group ” .

3. (3) Permission for use of this software is granted only if the user accepts full responsibility for any undesirable consequences; the authors accept NO LIABILITY for damages of any kind.

These conditions apply to any software derived from or based on the IJG code, not just to the unmodified library. If you use our work, you ought to acknowledge us.

Permission is NOT granted for the use of any IJG author's name or company name in advertising or publicity relating to this software or products derived from it. This software may be referred to only as “ the Independent JPEG Group's software ” .

We specifically permit and encourage the use of this software as the basis of commercial products, provided that all warranty or liability claims are assumed by the product vendor.

ansi2knr.c is included in this distribution by permission of L. Peter Deutsch, sole proprietor of its copyright holder, Aladdin Enterprises of Menlo Park, CA. ansi2knr.c is NOT covered by the above copyright and conditions, but instead by the usual distribution terms of the Free Software Foundation; principally, that you must include source code if you redistribute it. (See the file ansi2knr.c for full details.) However, since ansi2knr.c is not needed as part of any program generated from the IJG code, this does not limit you more than the foregoing paragraphs do.

The Unix configuration script “ configure ” was produced with GNU Autoconf. It is copyright by the Free Software Foundation but is freely distributable. The same holds for its supporting scripts (config.guess, config.sub, ltmain.sh). Another support script, install-sh, is copyright by X Consortium but is also freely distributable.

The IJG distribution formerly included code to read and write GIF files. To avoid entanglement with the Unisys LZW patent, GIF reading support has been removed altogether, and the GIF writer has been simplified to produce “ uncompressed GIFs ” . This technique does not use the LZW algorithm; the resulting GIF files are larger than usual, but are readable by all standard GIF decoders.

We are required to state that “ The Graphics Interchange Format(c) is the Copyright property of CompuServe Incorporated. GIF(sm) is a Service Mark property of CompuServe Incorporated. ”

IMLIB2

Copyright (C) 2000 Carsten Haitzler and various contributors (see AUTHORS)

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “ Software ”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies of the Software and its Copyright notices. In addition publicly documented acknowledgment must be given that this software has been used if no source code of this software is made available publicly. This includes acknowledgments in either Copyright notices, Manuals, Publicity and Marketing documents or any documentation provided with any product containing this software. This License does not apply to any software that links to the libraries provided by this software (statically or dynamically), but only to the software provided.

Please see the COPYING.PLAIN for a plain-english explanation of this notice and it's intent.

THE SOFTWARE IS PROVIDED “ AS IS ” , WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR

OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

LIBPCAP

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The names of the authors may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED “ AS IS ” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

LIBPNG

This code is released under the libpng license.

libpng versions 1.2.6, August 15, 2004, through 1.4.7, April 10, 2011, are Copyright (c) 2004, 2006- 2010 Glenn Randers-Pehrson, and are distributed according to the same disclaimer and license as libpng-1.2.5 with the following individual added to the list of Contributing Authors

- Cosmin Truta

libpng versions 1.0.7, July 1, 2000, through 1.2.5 - October 3, 2002, are Copyright (c) 2000-2002 Glenn Randers-Pehrson, and are distributed according to the same disclaimer and license as libpng- 1.0.6 with the following individuals added to the list of Contributing Authors

- Simon-Pierre Cadieux
- Eric S. Raymond
- Gilles Vollant

and with the following additions to the disclaimer:

There is no warranty against interference with your enjoyment of the library or against infringement. There is no warranty that our efforts or the library will fulfill any of your particular purposes or needs. This library is provided with all faults, and the entire risk of satisfactory quality, performance, accuracy, and effort is with the user.

libpng versions 0.97, January 1998, through 1.0.6, March 20, 2000, are Copyright (c) 1998, 1999 Glenn Randers-Pehrson, and are distributed according to the same disclaimer and license as libpng-0.96, with the following individuals added to the list of Contributing Authors:

- Tom Lane
- Glenn Randers-Pehrson
- Willem van Schaik

libpng versions 0.89, June 1996, through 0.96, May 1997, are Copyright (c) 1996, 1997 Andreas Dilger Distributed according to the same disclaimer and license as libpng-0.88, with the following individuals added to the list of Contributing Authors:

- John Bowler
- Kevin Bracey
- Sam Bushell
- Magnus Holmgren
- Greg Roelofs
- Tom Tanner

libpng versions 0.5, May 1995, through 0.88, January 1996, are Copyright (c) 1995, 1996 Guy Eric Schalnat, Group 42, Inc.

For the purposes of this copyright and license, “Contributing Authors” is defined as the following set of individuals:

- Andreas Dilger
- Dave Martindale
- Guy Eric Schalnat
- Paul Schmidt
- Tim Wegner

The PNG Reference Library is supplied “AS IS”. The Contributing Authors and Group 42, Inc. disclaim all warranties, expressed or implied, including, without limitation, the warranties of merchantability and of fitness for any purpose. The Contributing Authors and Group 42, Inc. assume no liability for direct, indirect, incidental, special, exemplary, or consequential damages, which may result from the use of the PNG Reference Library, even if advised of the possibility of such damage.

Permission is hereby granted to use, copy, modify, and distribute this source code, or portions hereof, for any purpose, without fee, subject to the following restrictions:

1. The origin of this source code must not be misrepresented.
2. Altered versions must be plainly marked as such and must not be misrepresented as being the original source.
3. This Copyright notice may not be removed or altered from any source or altered source distribution.

The Contributing Authors and Group 42, Inc. specifically permit, without fee, and encourage the use of this source code as a component to supporting the PNG file format in commercial products. If you use this source code in a product, acknowledgment is not required but would be appreciated.

A “png_get_copyright” function is available, for convenient use in “about” boxes and the like:

```
printf("%s",png_get_copyright(NULL));
```

Also, the PNG logo (in PNG format, of course) is supplied in the files “pngbar.png” and “pngbar.jpg (88x31)” and “pngnow.png” (98x31).

Libpng is OSI Certified Open Source Software. OSI Certified Open Source is a certification mark of the Open Source Initiative.

Glenn Randers-Pehrson

glennrp at users.sourceforge.net

April 10, 2011

LIBXML2

Except where otherwise noted in the source code (e.g. the files hash.c, list.c and the trio files, which are covered by a similar licence but with different Copyright notices) all the files are:

Copyright (C) 1998-2003 Daniel Veillard. All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE DANIEL VEILLARD BE

LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Daniel Veillard shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from him.

LUA

Copyright © 1994-2008 Lua.org, PUC-Rio.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “ Software ”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “ AS IS ” , WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

MIT

Copyright 2014 Fedora Project Authors

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

NcFTP

The Clarified Artistic License

Preamble

The intent of this document is to state the conditions under which a Package may be copied, such that the Copyright Holder maintains some semblance of artistic control over the development of the package, while giving the users of the package the right to use and distribute the Package in a more-or-less customary fashion, plus the right to make reasonable modifications.

Definitions:

"Package" refers to the collection of files distributed by the Copyright Holder, and derivatives of that collection of files created through textual modification.

"Standard Version" refers to such a Package if it has not been modified, or has been modified in accordance with the wishes of the Copyright Holder as specified below.

"Copyright Holder" is whoever is named in the copyright or copyrights for the package.

"You" is you, if you're thinking about copying or distributing this Package.

"Distribution fee" is a fee you charge for providing a copy of this Package to another party.

"Freely Available" means that no fee is charged for the right to use the item, though there may be fees involved in handling the item. It also means that recipients of the item may redistribute it under the same conditions they received it.

1. You may make and give away verbatim copies of the source form of the Standard Version of this Package without restriction, provided that you duplicate all of the original copyright notices and associated disclaimers.
2. You may apply bug fixes, portability fixes and other modifications derived from the Public Domain, or those made Freely Available, or from the Copyright Holder. A Package modified in such a way shall still be considered the Standard Version.
3. You may otherwise modify your copy of this Package in any way, provided that you insert a prominent notice in each changed file stating how and when you changed that file, and provided that you do at least ONE of the following:
 - a) place your modifications in the Public Domain or otherwise make them Freely Available, such as by posting said modifications to Usenet or an equivalent medium, or placing the modifications on a major network archive site allowing unrestricted access to them, or by allowing the Copyright Holder to include your modifications in the Standard Version of the Package.
 - b) use the modified Package only within your corporation or organization.
 - c) rename any non-standard executables so the names do not conflict with standard executables, which must also be provided, and provide a separate manual page for each non-standard executable that clearly documents how it differs from the Standard Version.
 - d) make other distribution arrangements with the Copyright Holder.
 - e) permit and encourage anyone who receives a copy of the modified Package permission to make your modifications Freely Available in some specific way.
4. You may distribute the programs of this Package in object code or executable form, provided that you do at least ONE of the following:
 - a) distribute a Standard Version of the executables and library files, together with instructions (in the manual page or equivalent) on where to get the Standard Version.
 - b) accompany the distribution with the machine-readable source of the Package with your modifications.
 - c) give non-standard executables non-standard names, and clearly document the differences in manual pages (or equivalent), together with instructions on where to get the Standard Version.
 - d) make other distribution arrangements with the Copyright Holder.
 - e) offer the machine-readable source of the Package, with your modifications, by mail order.
5. You may charge a distribution fee for any distribution of this Package. If you offer support for this Package, you may charge any fee you choose for that support. You may not charge a license fee for the right to use this Package itself. You may distribute this Package in aggregate with other (possibly commercial and possibly nonfree) programs as part of a larger (possibly commercial and possibly nonfree) software distribution, and charge license fees for other parts of that software distribution, provided that you do not advertise this Package as a product of your own. If the Package includes an interpreter, You may embed this Package's interpreter within an executable of yours (by linking); this shall be construed as a mere form of aggregation, provided that the complete Standard Version of the interpreter is so embedded.
6. The scripts and library files supplied as input to or produced as output from the programs of this Package do not automatically fall under the copyright of this Package, but belong to whoever generated them, and may be sold commercially, and may be aggregated with this Package. If such scripts or library files are aggregated with this Package via the so-called "undump" or "unexec" methods of producing a binary executable image, then distribution of such an image shall neither be construed as a distribution

of this Package nor shall it fall under the restrictions of Paragraphs 3 and 4, provided that you do not represent such an executable image as a Standard Version of this Package.

7. C subroutines (or comparably compiled subroutines in other languages) supplied by you and linked into this Package in order to emulate subroutines and variables of the language defined by this Package shall not be considered part of this Package, but are the equivalent of input as in Paragraph 6, provided these subroutines do not change the language in any way that would cause it to fail the regression tests for the language.

8. Aggregation of the Standard Version of the Package with a commercial distribution is always permitted provided that the use of this Package is embedded; that is, when no overt attempt is made to make this Package's interfaces visible to the end user of the commercial distribution. Such use shall not be construed as a distribution of this Package.

9. The name of the Copyright Holder may not be used to endorse or promote products derived from this software without specific prior written permission.

10. THIS PACKAGE IS PROVIDED "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

NCURSES

Copyright (C) 1998-2007, 2008 Free Software Foundation, Inc.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, distribute with modifications, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE ABOVE COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Free Software Foundation, Inc. shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from Free Software Foundation, Inc.

NETPERF

Copyright 2021 Hewlett Packard Enterprise Development LP

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF

CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

NGREP

Copyright (c) 2017 Jordan Ritter. All rights reserved.

Permission is granted to anyone to use this software for any purpose on any computer system, and to alter it and redistribute it, subject to the following restrictions:

1. The origin of this software must not be misrepresented, either by explicit claim or by omission.
2. Altered versions must be plainly marked as such, and must not be misrepresented as being the original software. Any altered version must clearly and properly represent the origin of this software in any accompanying documentation.
3. All advertising materials which relate specifically to derivative works of this software must display the following acknowledgement: This product includes software developed by Jordan Ritter.
4. The name of the Author may not be used to endorse or promote products derived from this software without specific prior written permission.
5. This notice, and any references to this notice, in any original or derived source distribution of or documentation for this software, may not be removed or altered.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Portions were copied from tcpkill (part of dsniiff), which has the following copyright:

Copyright (c) 1999, 2000 Dug Song <dugsong@monkey.org> All rights reserved, all wrongs reversed.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED ``AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NTP (Network Time Protocol Version 4.2.8p2 Distribution)

Copyright (c) University of Delaware 1992-2015

Permission to use, copy, modify, and distribute this software and its documentation for any purpose with or without fee is hereby granted, provided that the above copyright notice appears in all copies and that both the copyright notice and this permission notice appear in supporting documentation, and that the name University of Delaware not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission. The University of Delaware makes no representations about the suitability of this software for any purpose. It is provided "as is" without express or implied warranty.

Content starting in 2011 from Harlan Stenn, Danny Mayer, and Martin Burnicki is:

Copyright (c) Network Time Foundation 2011-2020. All Rights Reserved

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHORS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

PCRE2 LICENCE

PCRE2 is a library of functions to support regular expressions whose syntax and semantics are as close as possible to those of the Perl 5 language.

Releases 10.00 and above of PCRE2 are distributed under the terms of the "BSD" licence, as specified below, with one exemption for certain binary redistributions. The documentation for PCRE2, supplied in the "doc" directory, is distributed under the same terms as the software itself. The data in the testdata directory is not copyrighted and is in the public domain.

The basic library functions are written in C and are freestanding. Also included in the distribution is a just-in-time compiler that can be used to optimize pattern matching. This is an optional feature that can be omitted when the library is built.

THE BASIC LIBRARY FUNCTIONS

- Written by: Philip Hazel
- Email local part: Philip.Hazel
- Email domain: gmail.com

Retired from University of Cambridge Computing Service, Cambridge, England.

Copyright (c) 1997-2021 University of Cambridge All rights reserved.

PCRE2 JUST-IN-TIME COMPILATION SUPPORT

- Written by: Zoltan Herczeg
- Email local part: hzmester
- Email domain: freemail.hu

Copyright(c) 2010-2021 Zoltan Herczeg All rights reserved.

STACK-LESS JUST-IN-TIME COMPILER

- Written by: Zoltan Herczeg
- Email local part: hzmester
- Email domain: freemail.hu

Copyright(c) 2009-2021 Zoltan Herczeg All rights reserved.

THE "BSD" LICENCE

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notices, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notices, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of the University of Cambridge nor the names of any contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

EXEMPTION FOR BINARY LIBRARY-LIKE PACKAGES

The second condition in the BSD licence (covering binary redistributions) does not apply all the way down a chain of software. If binary package A includes PCRE2, it must respect the condition, but if package B is software that includes package A, the condition is not imposed on package B unless it uses PCRE2 independently.

POPT

Copyright (c) 1998 Red Hat Software

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.

IN NO EVENT SHALL THE X CONSORTIUM BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of the X Consortium shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from the X Consortium.

SNTP

Copyright (c) University of Delaware 1992-2011

Permission to use, copy, modify, and distribute this software and its documentation for any purpose with or without fee is hereby granted, provided that the above copyright notice appears in all copies and that both the copyright notice and this permission notice appear in supporting documentation, and that the name University of Delaware not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission. The University of Delaware makes no representations about the suitability this software for any purpose. It is provided “ as is ” without express or implied warranty.

STRACE

Copyright (c) 1991, 1992 Paul Kranenburg <pk@cs.few.eur.nl>

Copyright (c) 1993 Branko Lankester <branko@hacktic.nl>

Copyright (c) 1993 Ulrich Pegelow <pegelow@moorea.uni-muenster.de>

Copyright (c) 1995, 1996 Michael Elizabeth Chastain <mec@duracef.shout.net>

Copyright (c) 1993, 1994, 1995, 1996 Rick Sladkey <jrs@world.std.com>

Copyright (C) 1998-2001 Wichert Akkerman <wakkerma@deephackmode.org>

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR “ AS IS ” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

TCPDUMP

Copyright (c) 1999-2023, The TCPDump Group

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions, and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions, and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. Neither the name of the [copyright holder] nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS “AS IS” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

USBMOUNT

Copyright: 2004-2007, Martin Dickopp <martin@zero-based.org>, 2008-2015, Rogério Theodoro de Brito rbrito@ime.usp.br

License: BSD-2

This package is free software; the copyright holder gives unlimited permission to copy and/or distribute it, with or without modifications, as long as this notice is preserved.

This package is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY, to the extent permitted by law; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

UBI-UTILS

Copyright (c) 2000-2007 by Nicolas Devillard.

MIT License

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the “Software”), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

UUID

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, and the entire permission notice in its entirety, including the disclaimer of warranties.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED “ AS IS ” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF NOT ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Whetstone

Converted Whetstone Double Precision Benchmark

Version 1.2 22 March 1998

(c) Copyright 1998 Painter Engineering, Inc. All Rights Reserved.

Permission is granted to use, duplicate, and publish this text and program as long as it includes this entire comment block and limited rights reference.

Converted by Rich Painter, Painter Engineering, Inc. based on the www.netlib.org/benchmark/whetstone version obtained 16 March 1998.

A novel approach was used here to keep the look and feel of the FORTRAN version. Altering the FORTRAN-based array indices, starting at element 1, to start at element 0 for C, would require numerous changes, including decrementing the variable indices by 1. Instead, the array E1[] was declared 1 element larger in C. This allows the FORTRAN index range to function without any literal or variable indices changes. The array element E1[0] is simply never used and does not alter the benchmark results.

The major FORTRAN comment blocks were retained to minimize differences between versions. Modules N5 and N12, like in the FORTRAN version, have been eliminated here.

An optional command-line argument has been provided [-c] to offer continuous repetition of the entire benchmark. An optional argument for setting an alternate LOOP count is also provided. Define PRINTOUT to cause the POUT() function to print outputs at various stages. Final timing measurements should be made with the PRINTOUT undefined.

Questions and comments may be directed to the author at r.painter@ieee.org

ZLIB DATA COMPRESSION LIBRARY

zlib.h -- interface of the 'zlib' general purpose compression library version 1.3, August 18th, 2022

Copyright (C) 1995-2023 Jean-loup Gailly and Mark Adler

This software is provided 'as-is', without any express or implied warranty. In no event will the authors be held liable for any damages arising from the use of this software.

Permission is granted to anyone to use this software for any purpose, including commercial applications, and to alter it and redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not claim that you wrote the original software. If you use this software in a product, an acknowledgment in the product documentation would be appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not be misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

Jean-loup Gailly — jloup@gzip.org

Mark Adler — madler@alumni.caltech.edu

Glossary

Interlaced

An Interlaced video format starts at the top of the screen and draws all the odd number scan lines and then all the even number scan lines in sequence. This results in half the image being drawn in one pass and the other half of the image being drawn in the second. These two passes are called Fields, where the first pass is called Field 1 and the second pass is called Field 2. When both Field 1 and Field 2 have been drawn, resulting in a complete image, you have a single Frame.

Progressive

A Progressive scan video format draws each scan line in sequence, starting from the top of the screen and working to the bottom. Unlike Interlaced, with Progressive scan the entire image is drawn at one time, in a single pass. This means that there are no fields in a Progressive scan image.

Auto Key

A pairing of two video signals, a key video and a key alpha, to create a key. In the switcher, you associate the fill and alpha so that the switcher knows which alpha to use when the video is selected.

Auto Transition

An automatic transition in which the manual movement of the fader handle is simulated electronically. The transition starts when the **AUTO TRANS** button is pressed and takes place over a pre-selected time period, measured in frames.

Chroma Key

Chroma Key is a key in which the hole is cut based on a color value, or hue, rather than a luminance value or alpha signal. The color is removed and replaced with background video from another source.

Cut

An instantaneous switch from one video signal to another.

Dissolve

A transition from one video signal to another in which one signal is faded down, while the other is simultaneously faded up. The terms mix or cross-fade are often used interchangeably with dissolve.

Field

One half of a complete picture (or frame) interval containing all of the odd, or all of the even, lines in interlaced scanning. One scan of a TV screen is called a field; two fields are required to make a complete picture (which is a frame).

Force, Mask

An effect that forces the masked region to the foreground but is not bound by the key. For example, if you have a key and apply a mask to it. The masked area is bound by the edges of the key. When force is turned on, the masked area is filled with the video from the key (nothing appears masked) but you can move the mask outside of the key and the key video is still filling the masked region.

Frame

One complete picture consisting of two fields of interlaced scanning lines.

File Transfer Protocol

A network protocol that is used to transfer files from one host computer to another over a TCP-based network.

Gain

Gain represents the range of signal values present in a video signal from a lowest to a highest point (from black to white for example). Increasing gain expands this range, while decreasing gain compresses this range. Clipping occurs if applied gain changes cause output signal values to fall outside the allowable range. Generally, increasing the gain for a specific color component causes the video signal colors to become increasingly saturated with that color. Similarly, decreasing the gain for a specific color component progressively removes that color component from the output video signal.

Gamma

Gamma corrections introduce non-linear corrections to a video signal. A gamma

correction can be described as taking a point on the output versus input video signal line and pulling it perpendicularly away from the line. The result is a Bezier curve between the start, the new point, and the end point. Generally, increasing the gamma value adds more of the component to the video signal in the location of the gamma offset point. Decreasing the gamma value reduces the amount of the component in the video signal in the location of the gamma offset point. Moving the gamma offset point allows you to select which part of the input video signal receives the gamma correction. For example, if you increase the red gamma correction to the part of the video signal that has no red component you will add red to those areas while having little effect on areas that already contain a significant amount of red. This allows you to add a red tint to the image while minimizing the amount of red-clipping that occurs.

General Purpose Interface

A simple high/low signal that is used to trigger an action either on an external device or on the switcher. A GPI can be an input or an output to the switcher.

High Definition

A high definition (720p, 1080i, or 1080p/3G) video signal.

Hue

The characteristic of a color signal that determines whether the color is red, yellow, green, blue, purple, etc. (the three characteristics of a TV color signal are chrominance, luminance, and hue). White, black, and gray are not considered hues.

Hue Rotation

Hue rotate affects the color of the entire video signal by rotating the input video hues. This produces an output video signal with colors that are shifted from their original hues. By rotating colors around the wheel, hue values will shift. For example, a clockwise rotation where yellows become orange, reds become magenta, blues become green. The more rotation applied, the further around the wheel colors are shifted.

Key

An effect produced by cutting a hole in the background video, then filling the hole with video or matte from another source. Key source video cuts the hole, key fill video fills the hole. The video signal used for cut and fill can come from the same, or separate, sources.

Key Alpha

The video signal which cuts a hole in the background video to make a key effect possible. Also called Key Video or Source. In practice, this signal controls when a video mixer circuit will switch from background to key fill video.

Key Invert

An effect that reverses the polarity of the key source so that the holes in the background are cut by dark areas of the key source instead of bright areas.

Key Mask

A keying technique in which a shape is combined with the key source to block out unwanted portions of the key source.

Key Video

A video input which is timed to fill the hole provided by the key source video. An example of key video is the video output of a character generator.

Linear Key

Linear keys make it possible to fully specify the transparency of a key from opaque, through transparent, to fully off. The transparency is specified by the key alpha that is associated with the key video. A keyer capable of a linear key converts the key signal voltage directly to the transparency effect on the screen.

Mnemonics

A green, orange, or yellow display used to show the names of a source above or below the source button or used as a custom command or pattern button.

Offsets

Offsets shift the video signal by a set amount. Depending on the offset applied, different parts or all of the video signal may be affected. Clipping occurs if applied offsets cause output signal values to fall outside the allowable range.

Pre-Delay

A pre-delay is a delay that is inserted into a transition between the triggering of a GPI output and performing the transition. The length of the pre-delay is usually the length of time your video server requires to start playing a clip or your character generator required to load a page.

RossTalk

An ethernet based protocol that allows the control over Ross devices using plain english commands.

Standard-Definition

A standard definition (480i or 576i) video signal.

Self Key

A key effect in which the same video signal serves as both the key signal and key fill.

Shaped Key

An additive key where the Key Alpha cuts a hole based on the monochrome value of the alpha. Shades of gray are translated into either white or black, giving the key a hard edge. Shaped Key alphas are sometimes used with Character Generators to cut very precise holes for the fill.

Split Key

A Split key allows you to assign a different alpha source for a key than the fill/alpha associations that are set up during configuration or to use a separate alpha source for a Self key.

Tally

An indicator which illuminates when the associated button, or control, is selected or is on-air.

Unshaped Key

A multiplicative key where the Key Alpha cuts a hole based on the gradient values of the alpha. Shades of gray are translated into transparency levels, giving the key a soft edge. Unshaped Key alphas can also be considered true linear alphas.

Index

A

ABM [115](#)
Access Control [21](#)
AFV [57](#)
AFV Set, Audio [55](#)
Allocated DVEs [139](#)
Ancillary Data [102](#)
Ancillary Mode [139](#)
Animations [73](#)
Aspect Ratio Conversion [112](#)
 Full [112](#)
 Letterbox [112](#)
 Pillarbox [113](#)
 Zoom [112](#)
Audio [61–62, 73](#)
Audio Auxes [58](#)
Audio Breakout Module [115](#)
Audio Delay [59](#)
Audio Fader, Disable [58](#)
Audio Fader, Visible [58](#)
Audio Follow Video [55](#)
Audio Mixer [20, 55](#)
 DashBoard [20](#)
AudioDucking [61](#)
AudioTalkback [62](#)
Auto Follow [97](#)
 Custom Pages [97](#)
Auto Key [96](#)
Auto Select Keys [42](#)
Auto Transition [35–37](#)
Auto, RAVE AutoMix [67](#)
Automixer [66](#)
 Weight [66](#)
Aux Bus [26](#)
 Source Selection [26](#)

B

Balance, Audio [55](#)
BG Source [30](#)
Bus Copying [31](#)
Bus Hold [51](#)
Bus Map, Default [142](#)
Bus Maps [118](#)
Bus Select Buttons, ViewControl [126](#)
Buses [24](#)
 Ultritouch [24](#)
Bypass CL [64](#)
Bypass EQ [63](#)
Bypass Noise Gate [61](#)

C

Cache Manager [74](#)

Canvas [26](#)
 Source Selection [26](#)
Caprica [88](#)
Capture [76](#)
CC, *See* Custom Controls
CC Events, *See*
CC Pause [78](#)
Chroma Key [43, 45](#)
 Advanced Mode [45](#)
 Basic Mode [43](#)
Chroma Key Modes [43](#)
Clean Feed [28, 103](#)
 Layer Mode [103](#)
Clear Custom Controls [142](#)
Clear Memories [142](#)
Clock, MultiViewer [106](#)
Color Background [30](#)
Color Schemes [118](#)
Colors, Memory Recall [52](#)
Compressor [64](#)
 Bypass [64](#)
Copy Buses [31](#)
Copy Keys [31](#)
Copy Logs [140](#)
Copy MEs [31](#)
CPU Temperature [139](#)
Custom Control Buttons, ViewControl [126](#)
Custom Control Event [148, 180](#)
 ABM Input Delay [197](#)
 AES Output [174](#)
 Ancillary Data Mode [174](#)
 Audio Pan [199](#)
 Audio Volume [199](#)
 Auto Trans [167](#)
 BKGD DVE Aspect [148](#)
 BKGD DVE Border Size [148](#)
 BKGD DVE Crop [149](#)
 BKGD DVE Edge Softness [149](#)
 BKGD DVE Size [148](#)
 BKGD DVE X-Position [148](#)
 BKGD DVE Y-Position [148](#)
 Box Mask Edge Position [156](#)
 Box Mask Edge Softness [156](#)
 Bus Copy [164](#)
 Bus Source [164](#)
 Cancel All CC [149](#)
 Cancel CC [149](#)
 Channel AFV Fade [198](#)
 Channel Disable [198](#)
 Channel Position [198](#)
 Channel Processing Order [198](#)
 Channel Visible [198](#)
 Chroma Key Auto Adjust [150](#)
 Chroma Key Color [150](#)
 Chroma Key Initialize [150](#)
 Chroma Key Measurement Source [151](#)
 Chroma Key Parameters [151](#)

Custom Control Event (*continued*)

Chroma Key Re-Spill Color [151](#)
Chroma Key Re-Spill Saturation [151](#)
CL Attack [193](#)
CL Channel AFV Fade [193](#)
CL Channel Position [193](#)
CL Channel Processing Order [194](#)
CL Channel Visible [194](#)
CL CL Bypass [194](#)
CL Clear PFL [194](#)
CL Clear Solo [194](#)
CL Compression [194](#)
CL Default All CL [194](#)
CL Default Selected CL [194](#)
CL Makeup [195](#)
CL Output Volume [195](#)
CL Pad [195](#)
CL Phantom Power [195](#)
CL Pre-Amp Gain [195](#)
CL Processing Order [195](#)
CL Release [196](#)
CL Source AFV Input [196](#)
CL Source Audio Channel [196](#)
CL Source Audio Input [196](#)
CL Threshold Control [196](#)
CL Video Out Audio Mix [196](#)
CL Video Out Custom Audio Mix [196](#)
Clean Feed [174](#)
Clear PFL [197](#)
Clear Solo [197](#)
Color Corrector Color Reset [174](#)
Color Corrector Enable [175](#)
Color Corrector Gain [175](#)
Color Corrector Gamma [175](#)
Color Corrector Gamma Offset [175](#)
Color Corrector Lower Offset [175](#)
Color Corrector Offset [176](#)
Color Corrector Reset [176](#)
Color Gamut [176](#)
Cut Transition [167](#)
Delay Auto Trans [170](#)
Disable Audio Memories [176](#)
Ducking Attack [189](#)
Ducking Default All [189](#)
Ducking Default Channel [189](#)
Ducking Depth [189](#)
Ducking Hold [189](#)
Ducking Mix Reduction [189](#)
Ducking Mode [189](#)
Ducking Release [190](#)
Ducking Threshold [190](#)
DVE Freeze [151](#)
DVE Key Aspect [151](#)
DVE Key Border [152](#)
DVE Key Border Color (HSL) [152](#)
DVE Key Border Color (Preset) [152](#)
DVE Key Crop (Bottom Edge) [152](#)
DVE Key Crop (Dual Edge) [152](#)
DVE Key Crop (Left Edge) [153](#)
DVE Key Crop (Right Edge) [153](#)
DVE Key Crop (Top Edge) [153](#)

Custom Control Event (*continued*)

DVE Key Edge Softness [153](#)
DVE Key Size [153](#)
DVE Key X-Position [154](#)
DVE Key Y-Position [154](#)
DVE Wipe Direction [168](#)
DVE Wipe Direction (Flip-Flop) [167](#)
DVE Wipe Pattern [168](#)
DVE Wipe, Reset [167](#)
Dynamic Range [176](#)
EQ Default All EQ [191](#)
EQ Default Selected EQ [191](#)
EQ EQ Bypass [191](#)
EQ High Shelf Gain [191](#)
EQ High Shelf Min Freq [192](#)
EQ Low Shelf Gain [192](#)
EQ Midrange 1 Center Freq [192](#)
EQ Midrange 1 Gain [192](#)
EQ Midrange 1 Q [192](#)
EQ Midrange 2 Center Freq [192](#)
EQ Midrange 2 Gain [193](#)
EQ Midrange 2 Q [193](#)
Field Dominance [180](#)
See also Switching Field
Fly Key (DVE) [154](#)
FSFC Input Assignment [177](#)
GPI Output — Edge Trigger Setup [200](#)
GPI Output — Level Trigger Setup [201](#)
GPI Output — Mode [201](#)
GPI Output — Trigger [201](#)
GPI Output — Trigger Type [201](#)
Hold CC [149](#)
Input Color Gamut [176](#)
Input Dynamic Range [176](#)
Input Frame Delay [176](#)
Input FSFC Assignment [177](#)
Input FSFC Framing [177](#)
Input Scaler Mode [177](#)
Key Active [154](#)
Key Copy [154](#)
Key Invert [155](#)
Key Mode [155](#)
Key Only Transition [150](#)
Key Settings (Clip, Gain, Transparency) [155](#)
Key Trans Rate [150](#)
Key Type [155](#)
Key, Make Linear [154](#)
Key, Reset [155](#)
Layer Mode [177](#)
Loop CC [149](#)
Mask [159](#)
Mask (Box) — Left Edge Position [156](#)
Mask (Box) — Right Edge Position [156](#)
Mask (Box) — Size [156](#)
Mask (Box) — Top Edge Position [157](#)
Mask (Box) — X-Position [157](#)
Mask (Box) — Y-Position [157](#)
Mask (Pattern) — Aspect Ratio [157](#)
Mask (Pattern) — Border Size [157](#)
Mask (Pattern) — Edge Softness [157](#)
Mask (Pattern) — Horizontal Multiplication [158](#)

Custom Control Event (*continued*)

Mask (Pattern) — Reset [158](#)
Mask (Pattern) — Rotation [158](#)
Mask (Pattern) — Size [158](#)
Mask (Pattern) — Vertical Multiplication [158](#)
Mask (Pattern) — X-Position [158](#)
Mask (Pattern) — Y-Position [158](#)
Mask, Force [155](#)
Mask, Invert [156](#)
Matte Color (HSL) [162](#)
Matte Color (Preset) [162](#)
Matte Color, Reset [162](#)
ME Copy [165](#)
ME Dissolve Type [169](#)
ME Follow [177](#)
ME Trans Rate [169](#)
ME Trans Type [169](#)
ME WhiteFlash Color [169](#)
ME WhiteFlash Offset [169](#)
ME WhiteFlash Onset [169](#)
Media Cut Point, Set [168](#)
Media Trans End Point, Set [168](#)
Media Trans Start Point, Set [169](#)
Media Trans Thumbnail [169](#)
Media-Store — Auto Play [159](#)
Media-Store — Capture [159](#)
Media-Store — Capture Alpha [159](#)
Media-Store — Capture Alpha Source [159](#)
Media-Store — Capture Mode [159](#)
Media-Store — Capture Source [159](#)
Media-Store — Clear Channel [160](#)
Media-Store — Cut Frame [160](#)
Media-Store — Delete Capture [160](#)
Media-Store — Load [160](#)
Media-Store — Looping [160](#)
Media-Store — Move To Frame [160](#)
Media-Store — Mute [161](#)
Media-Store — Play [161](#)
Media-Store — Play Speed [161](#)
Media-Store — Reset Media [161](#)
Media-Store — Reverse [161](#)
Media-Store — Rewind [161](#)
Media-Store — Shaped [161](#)
Media-Store — Thumb Frame [162](#)
Media-Store — X-Position [162](#)
Media-Store — Y-Position [162](#)
MediaWipe — Channel [168](#)
MediaWipe — Direction [168](#)
MediaWipe — Direction, Flip-Flop [168](#)
MediaWipe — Layer [168](#)
Memory Recall [165](#)
MultiViewer — Clip [182](#)
MultiViewer — Follow [185](#)
MultiViewer — FSFC Label [185](#)
MultiViewer — Layout [185](#)
MultiViewer — Overlay [185](#)
MultiViewer — Shift [185](#)
MultiViewer — Shift Panel [186](#)
MultiViewer — Tally Display [186](#)
MultiViewer — ViewControl Shift [186](#)
MultiViewer Box — Apply to All [180](#)

Custom Control Event (*continued*)

MultiViewer Box — Aspect Ratio Markers [181](#)
MultiViewer Box — Border [181](#)
MultiViewer Box — Green Tally (Preview) [181](#)
MultiViewer Box — Label [181](#)
MultiViewer Box — Label Mode [181](#)
MultiViewer Box — Label Position [182](#)
MultiViewer Box — Label Transparency [182](#)
MultiViewer Box — Red Tally (On-Air) [182](#)
MultiViewer Box — Video Source [182](#)
MultiViewer Clock — Background Color (HSL) [183](#)
MultiViewer Clock — Background Color (Preset) [183](#)
MultiViewer Clock — Countdown Timer Direction [183](#)
MultiViewer Clock — Countdown Timer Reset [183](#)
MultiViewer Clock — Countdown Timer State [183](#)
MultiViewer Clock — Foreground Color (HSL) [183](#)
MultiViewer Clock — Foreground Color (Preset) [183](#)
MultiViewer Clock — Format [183](#)
MultiViewer Clock — Mode [184](#)
MultiViewer Clock — MV Timer [184](#)
MultiViewer Clock — Size [184](#)
MultiViewer Clock — Timecode Frame Count [184](#)
MultiViewer Clock — Timer Set Time (Minutes) [184](#)
MultiViewer Clock — Timer Set Time (Seconds) [184](#)
MultiViewer Clock — X-Position [185](#)
MultiViewer Clock — Y-Position [185](#)
NG Attack [188](#)
NG Bypass [188](#)
NG Default All [188](#)
NG Default Channel [188](#)
NG Depth [188](#)
NG Hold [188](#)
NG Release [188](#)
NG Threshold [188](#)
Output BNC Assignment [177](#)
Output Color Gamut [176](#)
Output Dynamic Range [176](#)
Output FSFC Video Format [177](#)
Output Rotation Mode [179](#)
Output Rotation X-Position [179](#)
Output Rotation Y-Position [179](#)
Output Rotation Zoom [179](#)
Output Volume [197](#)
Pad [197](#)
Pause CC [149](#)
PBus — Recall [201](#)
PBus — Trigger [201](#)
Personality — Auto Remove Key [173](#)
Personality — Auto Trans Second Press (Key) [173](#)
Personality — Auto Trans Second Press (ME) [174](#)
Personality — Next Trans Reset [174](#)
Personality — Roll Clip [174](#)
Phantom Power [197](#)
Play CC [149](#)
Pre-Amp Gain [197](#)
Proc Amp Enable [178](#)
Proc Amp Gain [178](#)
Proc Amp Gamma [178](#)
Proc Amp Gamma Offset [178](#)
Proc Amp Hue Rotation [178](#)
Proc Amp Offset [179](#)

Custom Control Event (*continued*)

Proc Amp Reset [179](#)
Proc Amp/Color Corrector Reset [177](#)
Processing Order [199](#)
RAVE AFV [186](#)
RAVE AFV Volume [186](#)
RAVE Aux Pre/Post [186](#)
RAVE Bal/Pan [187](#)
RAVE Input Volume [187](#)
RAVE Mute [187](#)
RAVE PFL [187](#)
RAVE Solo [187](#)
Reference Source [179](#)
Reset [169](#)
Resume All CC [150](#)
Resume CC [149](#)
Robotic Camera — Halt All [200](#)
Robotic Camera — Recall Shot [200](#)
Robotic Camera — Recall Shot Fast [200](#)
Robotic Camera — Store Shot [200](#)
Roll Clip [170](#)
RossTalk — CC [202, 205](#)
RossTalk — Clear All [202](#)
RossTalk — Clear Channel [202](#)
RossTalk — Clear Layer [202](#)
RossTalk — Cue Channel [202](#)
RossTalk — Cue Current [202](#)
RossTalk — Cue Item [202](#)
RossTalk — Cue Layer [202](#)
RossTalk — Focus [203](#)
RossTalk — GPI [203, 205](#)
RossTalk — Layer Off [203](#)
RossTalk — MV Clock End [205](#)
RossTalk — MV Clock Pause [205](#)
RossTalk — MV Clock Run [206](#)
RossTalk — MV Clock Stop [206](#)
RossTalk — Next [203](#)
RossTalk — Read Current [203](#)
RossTalk — Read Item [203](#)
RossTalk — Read Layer [203](#)
RossTalk — Resume Channel [203](#)
RossTalk — Resume Layer [203](#)
RossTalk — Salvo [206](#)
RossTalk — Sequencer Down [203](#)
RossTalk — Sequencer Up [203](#)
RossTalk — Swap Channel [204](#)
RossTalk — Swap Current [204](#)
RossTalk — Swap Layer [204](#)
RossTalk — Take Channel [204](#)
RossTalk — Take Item [204](#)
RossTalk — Take Layer [204](#)
RossTalk — Take Offline [204](#)
RossTalk — Up Next [204](#)
RossTalk Custom Command [202, 205](#)
Row ME Assignment [164](#)
RState, Load [165](#)
Sequencer Clear [163](#)
Sequencer Down [164](#)
Sequencer Link [164](#)
Sequencer Load [163](#)
Sequencer Next [163](#)

Custom Control Event (*continued*)

Sequencer Reload [163](#)
Sequencer Up [164](#)
Source AFV Input [199](#)
Source Audio Channel [199](#)
Source Audio Input [199](#)
Source Bus Substitution [180](#)
Source ME Substitution [180](#)
Source Substitution, Delete [180](#)
State, Insert [150](#)
Talkback Attack [190](#)
Talkback Default All [190](#)
Talkback Default Channel [190](#)
Talkback Hold [190](#)
Talkback Mix Reduction [191](#)
Talkback Mode [191](#)
Talkback Release [191](#)
Test Tone Frequency [199](#)
Trans Clear [170](#)
Trans Elements [170](#)
Trans Limit — On/Off [170](#)
Trans Limit — Reset [170](#)
Trans Limit — Set [170](#)
Trans Limit — Value [170](#)
Transition Action Dissolve [165](#)
Transition Action DVE [166](#)
Transition Action MediaWipe [167](#)
Transition Action Wipe [166](#)
TSL Address [180](#)
TSL Tally MultiViewer Display Mode [180](#)
Video Mode [180](#)
Video Out Audio Mix [197](#)
Video Out Custom Audio Mix [198](#)
Video Server — Cue [206](#)
Video Server — Get Clips [206](#)
Video Server — Jog [206](#)
Video Server — Loop Off [206](#)
Video Server — Loop On [206](#)
Video Server — Play [207](#)
Video Server — Record [207](#)
Video Server — Shuttle [207](#)
Video Server — Stop [207](#)
Wash Color (HSL) [163](#)
Wash Color (Preset) [163](#)
Wash Color Reset [163](#)
Wash Generator — Disable [163](#)
Wash Generator — Enable [163](#)
Wipe Direction [171](#)
Wipe Direction (Flip-Flop) [171](#)
Wipe Pattern — Aspect Ratio [171](#)
Wipe Pattern — Border Color (HSL) [171](#)
Wipe Pattern — Border Color (Preset) [171](#)
Wipe Pattern — Border Size [171](#)
Wipe Pattern — Edge Softness [172](#)
Wipe Pattern — Horizontal Multiplication [172](#)
Wipe Pattern — Pattern [172](#)
Wipe Pattern — Rotation [172](#)
Wipe Pattern — Size [172](#)
Wipe Pattern — Vertical Multiplication [172](#)
Wipe Pattern — X-Position [173](#)
Wipe Pattern — Y-Position [173](#)

Custom Control Event (*continued*)

- Wipe Reset [173](#)
- Custom Controls [19, 24, 78–81, 148–150, 159, 162–165, 173–174, 180, 186, 199–202, 206](#)
 - Audio Events [199](#)
 - BKGD DVE Events [148](#)
 - Camera Events [200](#)
 - CC Events [149](#)
 - CC Pause [78](#)
 - Combined Transition Events [165](#)
 - Copy/Paste [81](#)
 - DashBoard [19](#)
 - Deleting [80](#)
 - Editing [78](#)
 - GPI Events [200](#)
 - Individual Transition Events [165](#)
 - Installation Events [174](#)
 - Keyer Events [150](#)
 - Matte Events [162](#)
 - Media Events [159](#)
 - MultiViewer Events [180](#)
 - Naming [80](#)
 - Pause Mode [79](#)
 - PBus Events [201](#)
 - Personality Events [173](#)
 - Rave Audio Events [186](#)
 - Recording [78](#)
 - RossTalk Events [202](#)
 - Run Event [78](#)
 - Running [79](#)
 - Sequencer [82](#)
 - Sequencer Events [163](#)
 - Special Events [164](#)
 - Switcher Events [164](#)
 - Ultritouch [24](#)
 - Video Server Events [206](#)
- Custom Controls, Default [142](#)
- Custom Pages [19, 97–98](#)
 - Auto Follow [97](#)
- Cut Transition [35–37](#)
- Cut Transitions [38](#)

D

- Dante [65](#)
- DashBoard [18–20, 22, 88](#)
 - Audio Mixer [20](#)
 - Configuration [18](#)
 - Connecting [88](#)
 - Custom Controls [19](#)
 - Devices [18](#)
 - Live Assist [18](#)
 - MediaManager [19](#)
 - Panel [22](#)
 - PaneLINK [19](#)
 - Personality [20](#)
 - Status [18](#)
 - ViewControl [19](#)
- DashBoard Menus [18](#)
- DashBoard Proxy Server [88](#)

- Default [142](#)
 - Factory [142](#)
- Default Bus Map [142](#)
- Delays [114](#)
- Delete Media Item [73](#)
- Delete Memory [54](#)
- Delete Still [75](#)
- Deleting a Still [73](#)
- Device [18](#)
- Device Control [14](#)
- Device Name [18](#)
- Diagnostics [140](#)
 - Copy Logs [140](#)
- Disable FTP [88](#)
- Disable RossTalk [139](#)
- Disable Web Media-Store [73](#)
- Disable, Audio Fader [58](#)
- Dissolve Transitions [38](#)
- Ducking [61–62](#)
- DVE [47–48](#)
 - Key [47–48](#)
 - Cropping [48](#)
- DVE Freeze [48](#)
- DVE Transitions [39](#)

E

- EDL [123](#)
- Eject Media Item [73](#)
- Engine Type [139](#)
- EQ, *See* Equalization
- EQ Bypass [63](#)
- Equalization [63](#)
 - Bypass [63](#)
 - High Shelf [63](#)
 - Low Shelf [63](#)
 - Midrange [63](#)
- Events, Custom Control [148](#)
- Exporting Sets [71](#)
- Exporting Working Set [71](#)
- External Reference [139](#)

F

- Factory Default [142](#)
- Fade to Black [120](#)
- Fader, Audio [55](#)
- Field Dominance [139](#)
- FlexiClean [28, 103](#)
- Fly Key [47](#)
- Follows, ME [104](#)
- Format Conversion [111](#)
- FPGA Temperature [139](#)
- Frame Delay [114](#)
- Frame Synchronizer [111](#)
- Freeze [48](#)
- FSFC [111–112](#)
 - Input [112](#)
 - QuadFS [112](#)
 - SDI-FS [112](#)

FTP 88
FTP Disable 88

G

Gain, Audio 59
Gate 60
Glow 118
GPI 96, 120
 Assign to Source 96
 Setup 120
GPO Tally 121

H

HDMI 93
 Formats 93
Help 20
High Shelf, EQ 63

I

Input FSFC 112

K

Key Preview 42–43, 48
Key RATE 38
Key Swap 32
Keyer Transition Buttons, ViewControl 126
Keying 42–43, 45, 47–50
 Auto Select 42
 Chroma Key 43
 Chroma Key, Advanced 45
 Chroma Key, Basic 43
 Cropping 48
 DVE 47–48
 Key Priority 42
 Mask 49
 Self Key 42
 Split 43
 Split Keys 50
Keys 31
 Copy 31

L

Layer Mode 103
Layers, Audio 55
Limiter 64
Live Assist 18–19, 98
 Custom Pages 19, 98
 PaneLINK 19
LiveEDL 123–124
 Capture 124
 Store 124
Loopback 57
Low Shelf, EQ 63

M

Mask 49
Matte 30
ME 26
 Source Selection 26
ME Copying 31
ME Follows 98, 104
 Substitution Table 98
Media Transitions 40
Media-Manager 75
 Delete Media Item 75
Media-Store 73–74, 76
 Animations 73
 Audio 73
 Cache Manager 74
 Capture 76
 Clear Channel 73
 Delete Database Entry 73
 Disable Web 73
 Eject 73
 File Specifications 74
 Loading 74
MediaManager 19
 DashBoard 19
Memories 51–54
 As Stored Attribute 52
 Attributes 53
 Bus Hold 51
 Delete 54
 No Recall Attribute 52
 Recall Attribute 52
 Recall Colors 52
 Storing 51
Memories, Default 142
Memory Names 54
Midrange, EQ 63
MiniME 16, 26, 33, 109
 Assignment 109
 Source Selection 26
 Transitions 33
MiniME Chroma Key 47
Mixer Layer Names 58
Mnemonic Source Names 94
Mnemonics 54, 95
 Memory 54
MultiPanel 24, 131
 Ultritouch 24
MultiScreen 98–99, 109
 MiniME Assignment 109
 Substitution Table 98–99
MultiViewer 29, 105–106
 Ancillary Source 105
 Clock 106
 Embedded Audio 105
 Formats 105
 Time-Clock 105
Mute, Audio 55
Mute, RAVE AutoMix 67

N

NDI [129](#)
Network Ports [86, 145](#)
Network Setup [86](#)
Next Trans Buttons [35–37](#)
Noise Gate [60–61](#)
 Bypass [61](#)

O

On-Air Setting [104](#)
Outputs [100](#)
 Video [100](#)

P

PAD, Audio [59](#)
Pan, Audio [55](#)
PanelBuilder [128](#)
PaneLINK [19](#)
Pause Mode, Custom Control [79](#)
Performance Meter [19](#)
Personality [20, 116](#)
 DashBoard [20](#)
PFL [55](#)
Phantom Power, Audio [59](#)
Popup keyboard shortcut [18](#)
Ports, Network [145](#)
Pre Fader Listen [55](#)
Pre-Tiled Sources [98](#)
Preamp [59](#)
Preview [29](#)
Preview, Transitions [35–37](#)

Q

QuadFS [112](#)

R

Rate, Transition [33](#)
RAVE AutoMix [67](#)
 Auto [67](#)
 Mute [67](#)
 Weight [67](#)
RBAC [21](#)
Re-Entry [27](#)
Re-Entry Timing [27](#)
Reference [91–92](#)
 External [91](#)
 Internal [91](#)
 Video Switching Field [92](#)
Reference OK [139](#)
Reference Source [139](#)
Remove Media-Store Item [74](#)
Reset [141](#)
 Custom [141](#)
 Saving [141](#)
Restart [140](#)

ROLL CLIP [35–37](#)
RossLinq [88](#)
RossTalk Disable [139](#)
RossTalk Port [139](#)
RState [141](#)
RState, Save [141](#)

S

Save Custom Reset [141](#)
SDI-FS [112](#)
Self Key [42](#)
Sequencer [82–84](#)
 Copy/Paste [84](#)
 Creating [82](#)
 Deleting [84](#)
 Editing [82](#)
 Loading [83](#)
 Naming [83](#)
 Running [83](#)
Serial Number [139](#)
Sets [70](#)
 Exporting [71](#)
 Loading [70](#)
 Storing [70](#)
Setup, XPression [85](#)
Show Alpha [42–45, 48–49](#)
Simple Mixer Layer [58](#)
Simulator, Frame [137](#)
SoftPanel [22–23](#)
 Bus Area [23](#)
 Control Area [22](#)
 Menu Area [22](#)
 User Area [22](#)
Software Version [139](#)
Solo Clear, Audio [55](#)
Solo, Audio [55](#)
Source Names [94](#)
Sources [27](#)
 Layering [27](#)
 Re-Entry [27](#)
Specifications [143, 146](#)
 GPI I/O [146](#)
 Tally [146](#)
Split Key [50](#)
Split Keys [43](#)
State Attributes [150](#)
Status [24, 139](#)
 Ultritouch [24](#)
Storing Memories [51](#)
Substitution Table [99](#)
 MultiScreen [99](#)
Substitution Tables [98](#)
Switcher Status [139](#)
Switching Field [92](#)

T

Talkback [62](#)

Tallies [97](#), [121](#)
 GPO [121](#)
Temperature OK [139](#)
Time-Clock [105](#)
Timecode [123](#), [139](#)
Timing Windows, Re-Entry [27](#)
Trans Preview [35–37](#)
Transition Buttons, ViewControl [126](#)
Transitions [33](#), [35–40](#)
 Auto Transition [35–37](#)
 Cut [35–37](#)
 Cuts [38](#)
 Direction [33](#)
 Dissolves [38](#)
 DVE [39](#)
 Flip Flop [33](#)
 from Panel [35–37](#)
 from Touchscreen Menu [33](#)
 GPO Trigger [121](#)
 Media [40](#)
 MiniME [33](#)
 Pause [33](#)
 Preview [35–37](#)
 Rate [33](#)
 Roll Clip [33](#)
 Trans Preview [33](#)
 Whiteflash [38](#)
 Wipes [39](#)
Transitions Limit [33](#)
Trigger GPO [121](#)
TSL UMD [94](#)
TSL UMD Port [139](#)

U

Ultritouch [24](#)
 Buses [24](#)
 Custom Controls [24](#)
 MultiPanel [24](#)
 Navigation Menu [24](#)
 Status [24](#)
User Buttons [119](#)

V

Video Inputs [93–94](#), [96](#)
 Auto Key [96](#)

Video Inputs (*continued*)
 GPI Device Control [96](#)
 HDMI [93](#)
 Names [94](#)
Video Layering [27](#)
Video Mode [91](#), [139](#)
 Setup [91](#)
Video Output [100](#), [102–103](#), [105](#)
 Ancillary Data [102](#)
 Clean Feed [103](#)
 MultiViewer [105](#)
Video Processing and Flow [25](#)
Video Source [26](#), [118](#)
 Bus Map [118](#)
Video Sources [26](#)
 External [26](#)
 Follows [26](#)
 Internal [26](#)
 Selecting [26](#)
 Selecting on DashBoard [26](#)
ViewControl [19](#), [126–127](#), [129](#)
 Bus Selection Buttons [126](#)
 Button Setup [127](#)
 Custom Control Buttons [126](#)
 Keyer Transition Buttons [126](#)
 NDI [129](#)
 Transition Buttons [126](#)
Virtual Outputs [100](#)
VirtualBox [137](#)
Visible, Audio Fader [58](#)

W

Web Media Manager Disable [73](#)
Weight, Automixer [66](#)
Weight, RAVE AutoMix [67](#)
Whiteflash [38](#)
WhiteFlash [38](#)
Windows Audio [65](#)
Wipe Transitions [39](#)
Working Set [71](#)
 Export [71](#)

X

XPression Setup [85](#)