

# ATEM

# Constellation

# Switchers



ATEM 1 M/E Constellation HD  
ATEM 2 M/E Constellation HD  
ATEM 4 M/E Constellation HD  
ATEM Constellation 8K

ATEM 1 M/E Constellation 4K  
ATEM 2 M/E Constellation 4K  
ATEM 4 M/E Constellation 4K  
ATEM 4 M/E Constellation 4K Plus

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## Welcome

Thank you for purchasing an ATEM switcher for your live production work!

If you're new to live production switchers, then you're about to become involved in the most exciting part of the television industry and that's live production! There is nothing like live production and it's so easy to become addicted to the adrenaline rush of editing in real time while the live event unfolds before your eyes. It's real television the way it should be!

Previously, broadcast quality live production has always been way too high in cost for most people to afford, while affordable switchers lacked broadcast features and quality. The new ATEM switchers change this and you can use them for the most amazing professional live production results. We hope you get years of use from them and have lots of fun with your live production!

This instruction manual should contain all the information you'll need for installing your ATEM Constellation switcher. The ATEM switcher includes a software control panel which you can run on your computer or you can purchase a hardware based broadcast control panel separately. The computer and control panels connect to your ATEM switcher via a network cable and you can directly connect them together without any extra equipment!

Please check the support page on our web site at [www.blackmagicdesign.com](http://www.blackmagicdesign.com) for the latest version of software for your ATEM switcher. Simply connect your computer to the ATEM switcher and the ATEM broadcast control panel via USB to update software so you get all the latest features! When downloading software, please register with your information so we can keep you updated when new software is released. We are constantly working on new features and improvements, so we would love to hear from you!

A stylized, handwritten signature in black ink that reads "Grant Petty". The script is fluid and cursive.

**Grant Petty**

CEO Blackmagic Design

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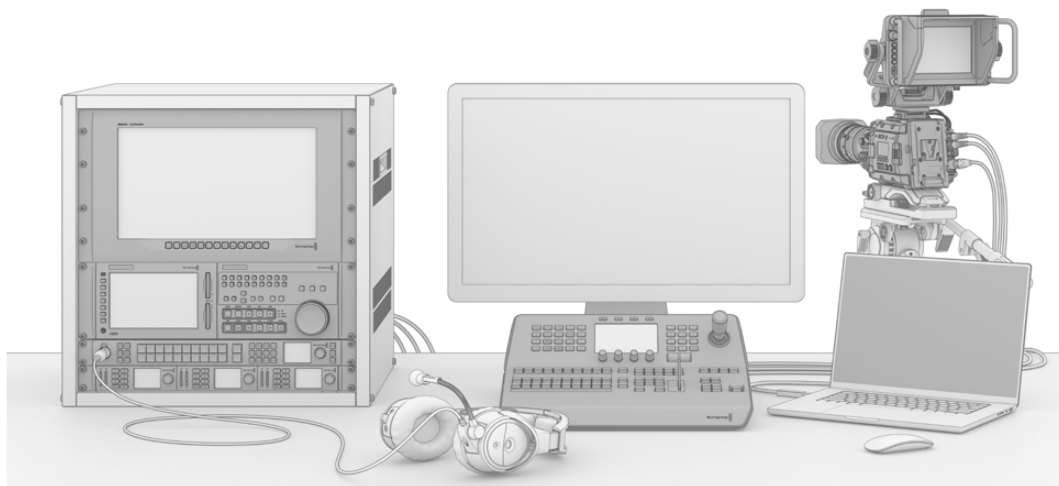
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# Introducing ATEM Constellation

ATEM Constellation switchers are professional broadcast grade digital production switchers capable of switching and processing a variety of video sources in live video production and broadcast environments. The switcher uses the current and familiar M/E (Mix Effects) based design with software and hardware control options that provides an intuitive, fast and easy to use workflow for program/preview switching! If you're used to the older A/B direct switcher style, ATEM switchers also support A/B direct switching which makes it easy to get started!

You only need an ATEM live production switcher and the included software control panel to get started. Then you can optionally add one or more hardware control panels if you need a more advanced solution.

Multiple control panels can be connected to control the same switcher by simple Ethernet connections. The ATEM software control panel can be installed on as many computers as you like at no extra cost.



You can build a custom ATEM live broadcast system to suit your individual requirements

## What is an M/E Switcher?

If you have used low cost switchers before, then these might not have used the mix effects style of operation that's commonly called an M/E style of operation. If you have used an M/E style switcher, then you might want to skip ahead to install and get working with your new ATEM switcher!

When you're starting out with a switcher for the first time, the ATEM can look a little intimidating with all its buttons and knobs, however it's all very logically laid out so it's very simple to use!

ATEM is a true high-end broadcast switcher that operates using the M/E workflow standards used in the broadcast industry. This means once you get familiar with how it works, you will feel instantly at home on virtually any switcher used in broadcast today.

The M/E style of operation has been developed over decades to help eliminate errors when switching live events and is a broadcast standard. It's extremely easy to see what's going on at any time so you don't get confused and make mistakes. The M/E style of operation lets you check the sources you are about to switch on air, as well as try effects before using them on air. You can see buttons for each keyer and transition, so you instantly know what's going on and what's about to happen.

The best way to learn about how your ATEM works is to grab your switcher and play with it while referencing this manual! You might want to jump ahead and install your switcher before reading the rest of this section!

To start, the most visible part of an M/E based control panel is the fader bar and the program and preview rows of source buttons!

The program bus source select buttons are used to hot switch sources to the program output. The source currently on air is indicated by a button that is illuminated red. Be careful when selecting sources on this row, as they will instantly be switched on air!

A safer and more orderly way to do transitions is to select them on the preview row and then use a transition to cut or transition them on air.

The bottom row of buttons is the preview bus source selection. This is where you will spend most of your time selecting sources about to go on air. This selected source is sent to the program output when the next transition occurs. The next transition can be triggered by pushing the cut button, the auto button, or by toggling the fader bar. You can select between a mix, dip, wipe, DVE or other transition depending what you have selected in the transition control section.

This is a very powerful way to use a switcher, because you can select your source on the preview row and see it on the preview video output to confirm that you have the correct source before you select the transition you want. You can see what's happening at all stages so it's hard to make mistakes. Only the M/E style of operation allows you to keep track of what's going on.

You also might notice that once your transition is complete, the sources selected on the preview and program rows swap over. This is because the source you selected on the preview row is now the new on air source, so it becomes selected on the program row once the transition is complete. Remember the program row always shows what's on air.

You will also see both the program and preview buttons illuminate red when doing an auto transition, as for a short time, they are both on air while the transition occurs.

The other concept that is important to know about M/E style switchers, including ATEM, is the video on the program and preview rows is technically called the background video. This is because the upstream (effects) keyers and downstream keyers will overlay on top of this source. So you can load graphics into the keyers and see them with the preview video and when keys are turned on, you will see the overlay on top of the program video. This is very powerful and allows multiple layers to be built up.

Another great advantage of the ATEM M/E style of operation is you can tie keyers to the transition. This means when you do a mix transition, you can also fade on or off keyers at the same time. This allows you to build up a composition and then bring the whole lot on air at the same time. This is what the next transition buttons do and you can select background for normal transitions, or select one or more keyers to transition them on air.

You can even press multiple buttons on the hardware control panel to tie multiple keys and the background at the same time. There are also dedicated downstream key tie buttons to tie downstream keyers to the transition. Downstream keys also have dedicated cut and mix buttons and so are very flexible. Downstream keyers are always layered over the top of everything including the transition, so are a great place to key bugs and logos!

When your live production is finishing, it's nice to have a dedicated fade to black (FTB) control to fade everything to black! You can see the dedicated fade to black control on the right side of the control panel. This lets you fade everything to black and helps make sure you don't miss a layer. Fade to black is at the extreme end of the processing chain so you get a clean fade of all sources.

The last part of an M/E style switcher is the select bus. This is above the program row and simply allows sources to be selected for effects processing and other purposes, and there is a label above this to show what you're switching. The select bus is commonly used to select key inputs, and outputs. It's a clean switch, so when used to select outputs, you get a clean cut.

As you can see by this quick overview, M/E style of operation allows confident live production with good feedback on what's going on and the state of your switcher and programming at any point in your production. Once you learn the M/E style of operation, you can move between models of production switchers with little retraining as they all work the same!

## What is an A/B Direct Switcher?

If you have been using video switchers for a long time, then you might be used to older-style A/B direct switchers and you can easily set your ATEM switcher to A/B direct switching in the ATEM software preferences. See the Transition Control section of this instruction manual for details about where to change this setting.

A/B direct switchers have an A bus and a B bus. One bus is the program bus which shows a red button for the current program output. The other is the preview bus which has a green button for the preview video. As you move the fader bar up and down, the buses switch so that the red program button follows the fader handle. This is where A/B direct switching is really easy to use as the buttons stay lit in the same positions and just switch color between green and red.

A/B direct switching becomes a little more confusing when the fader bar is not used to make the switch. If you use a cut or auto transition button to bring your preview source on air, or if you use more than one control panel connected to your switcher, the fader bar won't have moved on the control panel that you are using. The red program output always follows the fader bar handle and, as you haven't moved it, the red program light has to move to another button on the same row and the green preview light has to move to another button in its row.

This can become quite confusing when sometimes using the fader bar to make switches, and sometimes not, as the rows containing your preview and program buttons will sometimes switch and sometimes stay where they are which has the potential to lead to mistakes.

This is why modern M/E style switching is preferable because you'll always find your green preview button in the row labeled Preview, and the red program button in the row labeled Program. It's always consistent and there are no surprises with M/E style switching.

## Understanding the ATEM Switcher

The ATEM switcher provides all the video processing as well as all video input and output connectors, connection for control panels and power connections. You use the switcher by connecting and using various types of control panels. This allows the switcher to be located remotely, such as in machine rooms where it's closer to the connected video devices, while the control panel can be placed in a location from where it is easier to run production.

ATEM Constellation switchers are SDI based switchers designed to fit into your SDI production workflow. ATEM Constellation switchers support up to 1080p60 via 3G-SDI on HD models, 2160p60 via 12G-SDI on 4K models and 4320p60 on ATEM Constellation 8K switchers. All models feature talkback, tally and camera control, high quality front panel buttons and a built in LCD so you can test your setup and switch sources from the unit itself.

Each switcher features multiple outputs that can have any source routed to them, multiview outputs capable of displaying up to 16 views at one time and a webcam output for streaming.



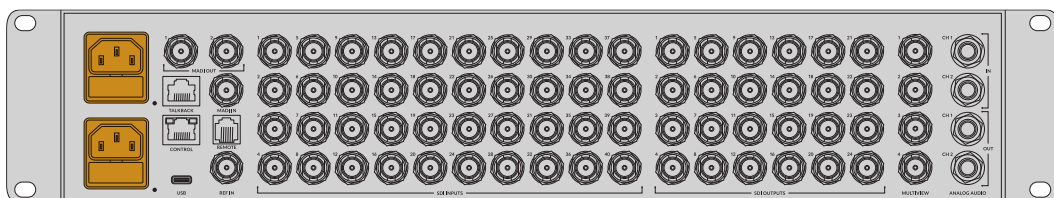
ATEM 4 M/E Constellation 4K Plus, ATEM 4 M/E Constellation, ATEM 2 M/E Constellation and ATEM 1 M/E Constellation

## Getting Started

Getting started with your ATEM Constellation switcher is as simple as connecting power, adding your SDI video sources and using the front panel to check your inputs.

### Plugging in Power

To power your switcher, plug a standard IEC cable to the switcher's power input on the rear panel. Once powered the LCD display will turn on and the button for input one will illuminate.

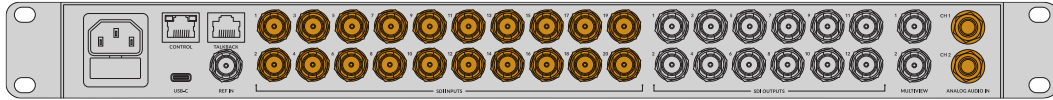


ATEM 4 M/E Constellation model switchers include a second IEC power input for redundancy



## Plugging in Sources

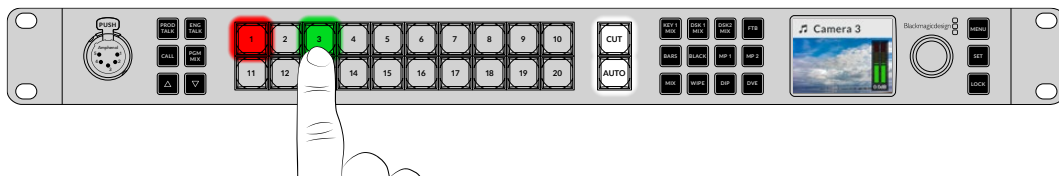
Plug SDI cameras and other sources into the SDI inputs. These SDI connections feature format conversion and frame synchronizers so all sources will conform to the video format set on your switcher.



3G-SDI and 1/4" analog audio inputs on ATEM 2 M/E Constellation HD

Once the video sources are connected, you can check the inputs via the front panel LCD. The numbered buttons on the front panel correspond to the numbered inputs on the rear of the switcher. As you select different sources you will see them appear on the LCD. If a music note appears to the left of the label, it means that the source contains audio and the levels will appear on the audio meters.

Press the 'cut' button to switch the source to program. The LCD label will return to 'master' and the audio meter will reflect the master audio levels. You can see which input is currently on the program and preview outputs because their respective buttons will be illuminated red and green.



When checking your sources, you can also check the levels of the audio via the LCD

## Plugging In Audio

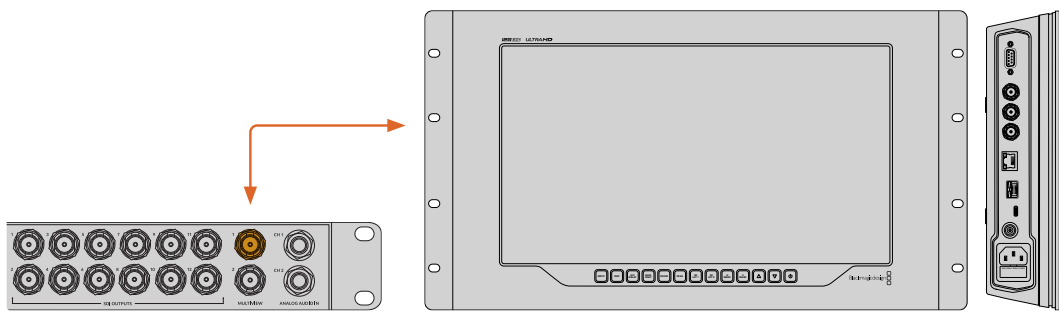
The built in audio mixer allows the use of embedded SDI audio from your cameras as well as external audio from the dedicated 1/4" analog audio inputs or the MADl inputs on ATEM 4 M/E and Constellation 8K switchers. These audio inputs can be used for other audio sources such as camera microphones and prerecorded audio.

Another way to check your inputs is to connect an SDI monitor to the multiview output.

## Connecting the Multiview

Once the multiview output is connected to an SDI monitor, you should see 8 small boxes and 2 larger boxes on the display. Each box is a separate view and as you connect additional sources, they will appear on the multiview. You can customize the look of the multiview to show up to 16 views using ATEM Software Control. For more information, see 'multiview settings' later in this manual.

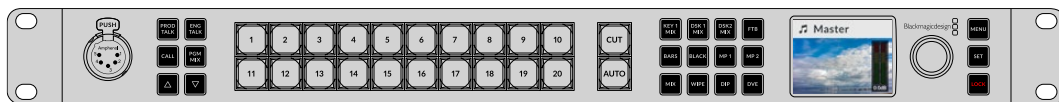
If you can see the multiview, then your ATEM is powered on and running fine and you can start using your switcher.



Connect your ATEM Constellation switcher to an SDI display, eg Blackmagic SmartView 4K G3 to view the multiview output

## Using the Front Panel

ATEM Constellation switchers feature a built in control panel featuring dedicated talkback buttons, a keypad to switch your production and a control knob with menu buttons to access the switcher settings letting you operate the entire switcher! While you can easily use the front panel for live switching, its intended purpose is for initially testing your production setup before going to air. For example, the control panel lets you quickly test keyers, switch sources and generally confirm everything is working fine before settling into the main production. This is why we added a lock button so once you are happy that everything is working fine, you can lock the panel and make sure there are no accidental changes to air.



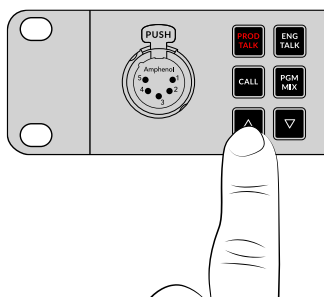
Once your production is setup, lock the panel via the 'lock' button

## Talkback and Call Buttons

Talkback and call buttons on the front panel give you direct access to talkback features without the need for additional hardware.

### Talkback

Push to talk 'prod talk' and 'eng talk' buttons let you converse with production and engineering teams. Press the 'pgm mix' button to listen to the program mix. Plug an intercom headset equipped with microphone into the 5 pin XLR socket on the front panel. If you double press one of the 'prod talk' or 'eng talk' buttons, the mic stays on and the button illuminates red until you double press the button again. When both talkback buttons are selected, the mic will stay on for all talkback channels.



Next, mix the levels in your headphones for production talkback, engineering talkback and program mix using the dedicated buttons. The selected button is lit red, meaning you can adjust its level with the up and down buttons.

The back panel of ATEM Constellation switchers have a 'talkback' connector for routing engineering talkback and production talkback. For information on how to make your own talkback adapter cable, see the 'talkback pin connections' section.

## The Call Button

Holding down the 'call' button will flash the tally light on all connected cameras. This is a helpful way of seeking the camera operators' attention, or to let your operators know you are about to go live.

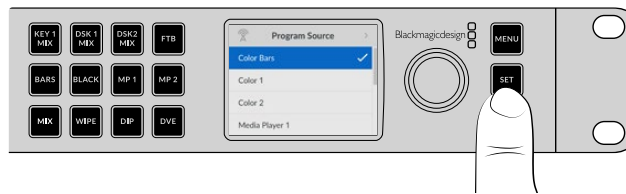
## ATEM Constellation LCD Menu

The LCD menus make almost the entire operation of the switcher available. The following examples show only some of the functions you can perform via the front panel. It's a good idea to explore the menus to see what's available. If you have used the software control panel on an ATEM switcher in the past, then you will see that each menu is like a palette on the software control panel and each palette on the software control panel has a menu page on the LCD. There are a few extra LCD menus for configuring SDI outputs and the audio mixer as well as a settings page where you can set your switcher transition format, talkback channels and IP address.

<b>Program Source</b>	Select your program source.
<b>Preview Source</b>	Select your preview source.
<b>Outputs</b>	Configure your outputs.
<b>Color Generators</b>	Adjust the internal color generators.
<b>Upstream Keys</b>	Configure upstream keyers to use as luma, linear, chroma or pattern keys.
<b>Transitions</b>	Select the active transition type and adjust parameters.
<b>Downstream Keys</b>	Configure the downstream keyers with options to select fill and source.
<b>Fade To Black</b>	Set your fade to black transitions rate and select your AFV audio follow video mixer output.
<b>Media Players</b>	Assign clips or stills to your switchers media players.
<b>Audio Mixer</b>	Adjust the master audio level or each input individually.
<b>Headphones</b>	Use the headphones menu to select the audio levels when using a headset connected on the front panel.
<b>Settings</b>	Set your switchers general settings including switching mode, video format and networking settings. You can also enable or disable talkback and mix minus outputs.

To use the menus:

- 1 Press the 'menu' button to display the menus.
- 2 Scroll with the knob through the menus to the menu you want.
- 3 Press the 'set' button and you will see the menu page will be selected to use.
- 4 Scroll down the list to the specific menu setting you want to change.
- 5 Select it by pressing the 'set' button.
- 6 Scroll through the list of options for this menu item.
- 7 Press 'set' when you want to make the desired setting active.
- 8 Press 'menu' a few times to go back to the main video preview screen.



**TIP** You can also select sources, including internal sources and media players, using the LCD menu.

## Changing to Cut Bus Switching

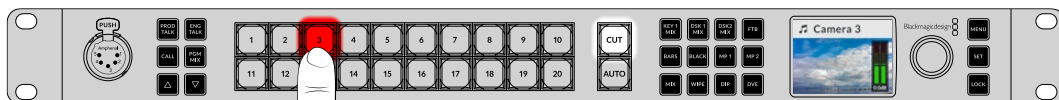
By default, the control panel works in program/preview mode, which is more like a traditional switcher and means changing sources is a two step process where you select the next source on the preview bus and then select cut or auto. However, in many cases you might like to have the switch to the new source happen immediately when you select it. This mode is called cut bus switching and you can change the mode in the LCD menus.

To change to cut bus mode:

- 1 Press the menu button to display the menus.
- 2 Scroll with the knob through the menus to the 'Settings' menu.
- 3 Press the set button and you will see the settings menu page will be selected.
- 4 Scroll down the list to the mode menu and select it by pressing the set button.
- 5 Scroll to the cut bus mode and select it by pressing set.
- 6 Press the menu button to back out of the menus back to the video preview screen.

Now the front panel will have changed how it works and switching is performed the instant you select a source. For example, try selecting a different source using the main input buttons and you can see that it's immediately selected and the button is illuminated red. You will notice that there is no green button highlighted now and that's because there is no preview bus to select the source as the source is simply selected the moment you push the button and it's on air instantly. That's why all buttons are now illuminated red.

However, there is another change to the front panel in cut bus mode and that's the behavior of the cut and auto buttons. Now the inputs are selected the instant you press them, the cut and auto buttons don't trigger the transition anymore. What they are now used for is to select the type of transition you want when you press the input buttons.



In cut bus mode, transitions are performed when you press a source button

For example if you want cuts when you select sources, then select the cut button. It will be illuminated and now when you select sources you will see a cut. If you want to do transitions now, then press the auto button. It will illuminate and now when you select sources, you will see that each transition will use your currently selected transition. Use the same process as shown in the previous examples to select the type of transition you want in the LCD menus.

## In Case of Strange Behavior!

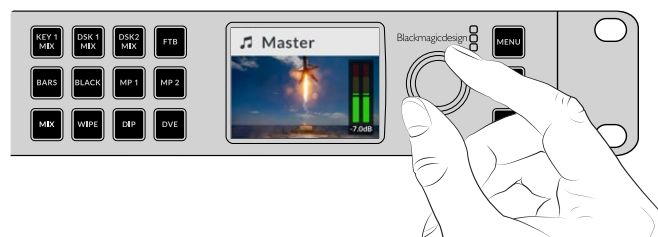
It's important to note that anything you change on the front panel buttons or in the LCD menus here will also be reflected on the software and hardware panel. What this means is if the front panel does not behave in a normal way and seems to be doing strange things that are unexpected, then it could be that another user has selected a mode that you cannot easily see on the front panel. For example, another user could have a keyer selected and no background, so when you press the auto button you are actually selecting a keyer. If you see this happen, it's a good idea to check the LCD menus or use the software control panel to clear these settings back to normal.

This is very important if someone selects a specific switcher feature and then saves the switcher state! It could mean you turn on the switcher and the front panel does not do what you expect!

## Audio Levels

The function of the knob on the front panel is primarily for audio level adjustment, although it is used for menu selection when you are in the LCD menus. Normally it's used for audio level control and you can tell what it's controlling by looking at the LCD. The label on the LCD will tell you what the knob is adjusting.

Normally, the LCD has the label 'master' and this means the knob is adjusting the main audio mixer master output. Adjusting the knob will lower the whole program audio levels and you can see the effect on the main audio meters in the LCD that are superimposed on the video preview.



Use the knob to adjust the master audio level and you can see the effect on the main audio meters in the LCD

If you want to adjust the audio for each of the SDI inputs, you can view and adjust the audio levels individually through the menus on the LCD. This is a useful way to identify when the main audio level is too high because single input is too high level. In this case you don't want to adjust the master audio level because all the other inputs will now become too low. You really want to select the input audio level and adjust just that single audio level.

To adjust an input audio level, for example on input 4:

- 1 Select the input 4 button. This is easier when using program/preview mode as you can just select it on the preview source.
- 2 The label on LCD will change to that input, for example input 4, to show you're adjusting the level for that specific input.
- 3 Adjust the knob and you will see the audio meter on the LCD will reduce in level.

If this input is on air, the master audio output will be reduced because this input is being lowered in level.



To go back to the master audio level:

- 1 Press the set button on the right side of the control panel and it will go back to master immediately. If you don't press 'set', the front panel will automatically switch itself back to master after a few moments.
- 2 Now adjusting the knob will be adjusting the master audio output and the LCD has master displayed.

This is a quick way to test audio channels when you setup your ATEM Constellation switcher. For fine control of individual audio channel parameters during production, we recommend you use ATEM Software Control.

## Switcher Keypad

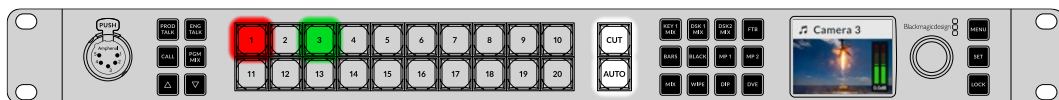
The large keypads on the front of the switcher provide dedicated buttons for all the switcher inputs along with buttons for keyers and media players. ATEM 2 M/E, 4 M/E and 8K models even include dedicated buttons for transitions, however these can also be selected via the front panel menu for all switcher models.

### Performing a Transition

When checking your setup, the first step you may want to try is to perform a transition. The group of large numbered buttons represent the inputs into the switcher. When using ATEM Constellation 8K in 8K mode the first 10 buttons control the 10 quad link 8K inputs. When you first turn on the switcher, you will see input 1 is the button illuminated red. This means that input 1 is on air and if you have a video source connected to input 1 it will appear on the program output.

Unlike a standard program/preview switcher control panel, these buttons on ATEM Constellation switcher models serve as both preview and program source buttons and will illuminate green and red to indicate which source. This section shows how to use the buttons to switch content to the preview and program outputs.

In this example, we have input 1 on air and we want to transition to input 3.



In program/preview mode with input 1 on air and input 3 on preview

To perform a transition:

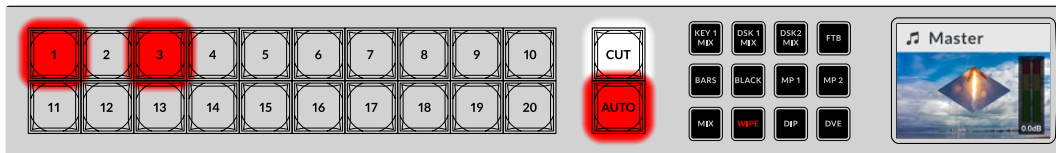
- 1 Select the next source by pressing button 3. The button will now illuminate green to show it is selected on the preview bus and 'camera 3' will appear on the LCD.
- 2 Press the cut or auto buttons.

If you press cut, button 3 will now illuminate red as it's on air. Input 3 will also be switched to the program output. If you select auto, then the currently selected transition will be triggered. While the transition is occurring, you will see both buttons illuminated red because both sources are on air during the transition. That's all there is to it!

If you would like to change the transition type from a cut, then you can do this in the LCD menus or the four dedicated transition selection buttons on the front panel of ATEM 8K, 4 M/E and 2 M/E Constellation switchers. You can choose from Mix, Dip, Wipe and DVE transitions with the touch of a button.

To select the transition type using the dedicated buttons:

- 1 Press the dedicated wipe transition button on ATEM 2 M/E, 4 M/E and Constellation 8K switchers.
- 2 Source 3 will be red and source 1 will be green following the previous transition.
- 3 Press 'auto' to perform a wipe transition from source 3 to source 1. During the transition, both source numbers will illuminate red to indicate they are both on air and the 'wipe' button will illuminate red.



Buttons will illuminate red during transitions

To select the transition using the front panel menu:

- 1 Press the menu button to display the menus.
- 2 Scroll through to the 'transition' menu using the knob and press the 'set' button to select.
- 3 With the transition option highlighted, press 'set', this will display all the available transition types. Turn the knob to highlight the 'mix' transition and press 'set'. Now when you select the auto button, the program source will wipe transition to the preview source.



- 4 Press 'menu' to return to the transition menu and then twice more to exit the menus.

While in the menu, you can press the 'auto' button to try the different types of transitions available to you. Each one of the transition types listed in the LCD menus can also be selected in ATEM Software Control or a hardware control panel.

As well as the group of main input buttons, the front panel has other sources labeled 'mp1' and 'mp2'. These are media player 1 and media player 2. If you have graphics in your switcher, such as a graphic or title slide, then you can select the media players as sources and then cut or transition to them.

## Fading the Downstream Key 1

You can trigger the downstream key 1 from the front panel by using the DSK 1 MIX button. This can be useful when you have a logo or bug and you want to bring it on and off again regularly. For example you could have a 'live' logo that you want to fade on from time to time. You can set up the logo in the downstream key 1 and then use the DSK 1 MIX button to bring it on and off air. The duration of the transition when pressing the button will be set in the downstream key LCD menu, or on a control panel.

You can feed a keyer with an input or a media player. This can be set up in the LCD menus, on a hardware panel or you can use the software control panel to load the media pool with some graphics or logos so you have sources to use.

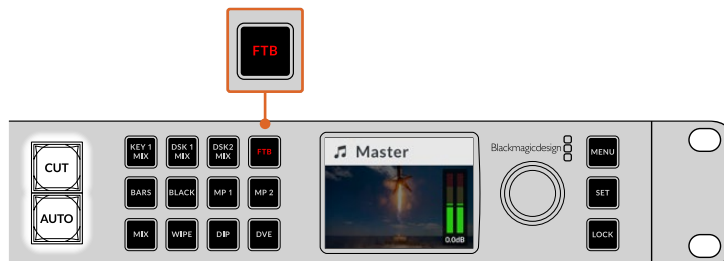


Press the DSK 1 MIX button to fade the downstream key 1 on and off air

## Fade to Black

When you start or finish a program, you want to be able to fade to black without worrying about leaving a logo on the screen by accident. Your ATEM switcher has a lot of powerful features and lots of layers that you can enable for transitions. What this means is you could have a complex setup on the switcher with many layers but you really just want a single button to start your program. This is what the FTB or fade to black button does.

If you press the FTB button, the whole program output of the switcher will fade to black. The button will flash to indicate to you that it's active. You can set the duration for the fade to black transition in the LCD menu or on a software or hardware control panel.



Press the fade to black or FTB button to perform a fade to black on the whole program output, including any graphics or keyers that may be in use

## Using the Lock Button

The lock button prevents accidental switching and changes to settings for transitions and media players. When the front panel is locked, the 'lock' button glows a dim red and if a button is pressed it is ignored and the 'lock' button flashes bright red. The 'lock' button doesn't affect the LCD menus or the comms buttons such as 'prod talk' and 'eng talk'.

To unlock the front panel, press and hold the 'lock' button for one second.

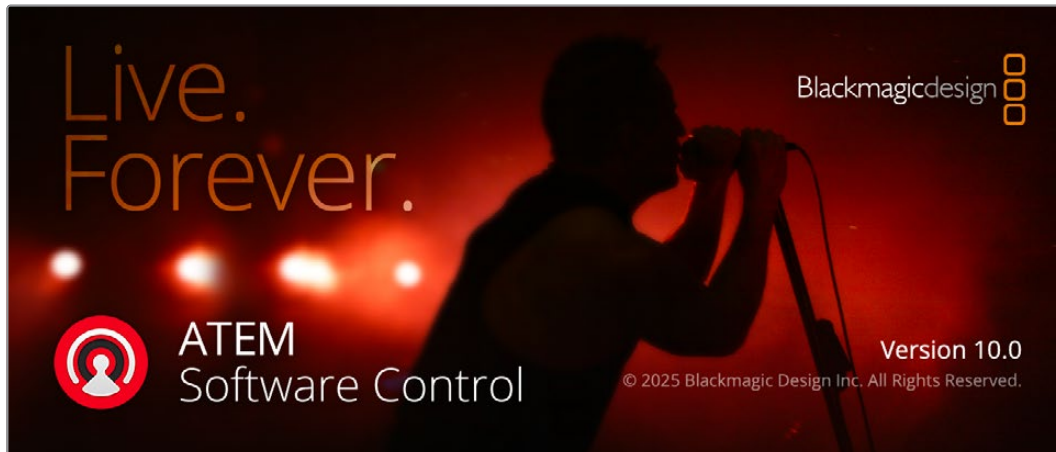
To lock the front panel, press and hold the 'lock' button for two seconds.

**TIP** It's a good practice to lock the front panel while on air to prevent accidental switching

# ATEM Software Control

ATEM Software Control is included with your ATEM switcher and allows you to control your switcher in a similar way to a full hardware control panel. Instead of menu buttons, the software uses a range of palettes on the right side that shows you all processing features of your production switcher. This allows you to control the switcher from another location, for example when the switcher is rack mounted in a different room to the person operating it.

Before you can get started with ATEM Software Control you will need to install the software.



To install ATEM Software Control:

- 1 From a web browser navigate to [www.blackmagicdesign.com/support](http://www.blackmagicdesign.com/support) and download the latest ATEM Constellation drivers.
- 2 When the file has finished downloading, double click 'install ATEM' icon to run the installer. Follow the prompts to the end and press 'install' to install the software.
- 3 Once the software is installed, navigate to 'Blackmagic ATEM Switchers' folder in your applications or programs folder and double click 'ATEM Software Control'.

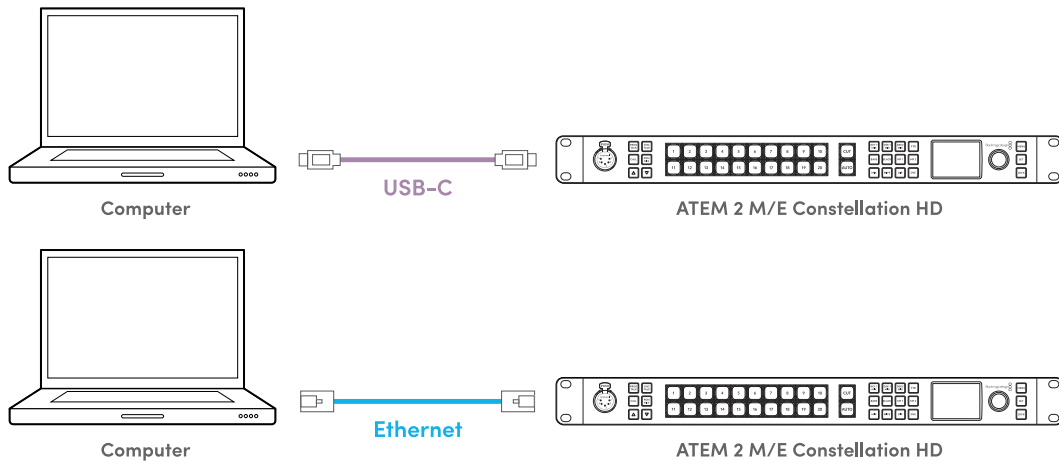
Now the software is installed you will need to connect the switcher to the computer. This can be done by connecting the devices directly via USB or Ethernet, or connecting over a network.

## Connecting to a Network

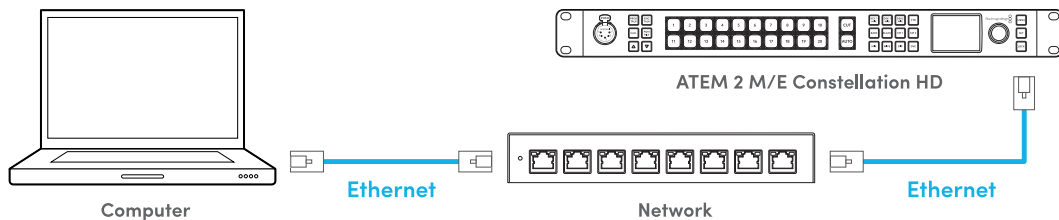
Most people simply plug their computer and control panel direct to the switcher, however in some situations it can be very powerful to connect via your network. If you want to connect your ATEM switcher to a larger Ethernet network, then you will most likely need to change the network settings on your ATEM switcher.

It's worth noting that if you use your ATEM on a network, then you're also increasing the complexity of the connection between your control panel and the switcher, so there is possibly a greater chance of something going wrong. However, ATEM can be used when plugged into a switch, and even via most VPNs and over the internet.

## Connecting Directly



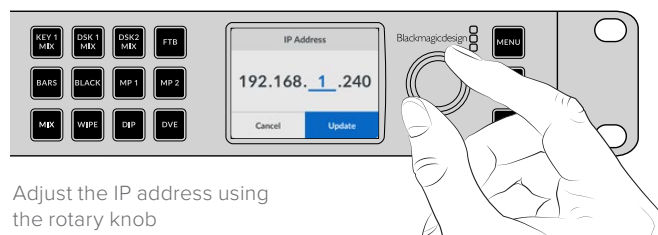
## Connecting via a Network



ATEM Constellation switchers default to DHCP so the switcher can get its network information automatically. However you can set a fixed IP address manually.

To set the IP address via the front panel:

- 1 Press the 'menu' button and using the knob scroll to the 'settings' menu. Press 'set'.
- 2 Turn the knob to scroll to the network section and highlight 'ip address'. Press 'set'.
- 3 Press 'set' to select the underlined values and use the knob to adjust. Press 'set' to confirm before adjusting the next set of values. Highlight the update icon and press 'set' to save.
- 4 Now you can adjust your gateway address and subnet address the same way.



Adjust the IP address using the rotary knob

For some production workflows, you may want to use external hardware panels such as an ATEM Advanced Panel. Your ATEM ships from the factory with settings to allow hardware control panels to simply be connected directly with an Ethernet cable. However if you are connecting the devices via a network, you may need to change the IP addresses of the hardware panels as the IP address for each device will depend on the IP address range of the network you are plugging into.



ATEM Advanced Panels and ATEM Camera Control panels can be set to DHCP or fixed IP addresses. Generally when used on a network you would select DHCP so the device is automatically assigned an IP address when connected to the network. This also ensure a unique IP address is used. When using the switcher with external hardware panels, you will need to enter the switcher IP address. For more information on using an advanced or camera control panel, including assigning IP addresses, see the ATEM Control Panels manual available at [www.blackmagicdesign.com/support](http://www.blackmagicdesign.com/support).

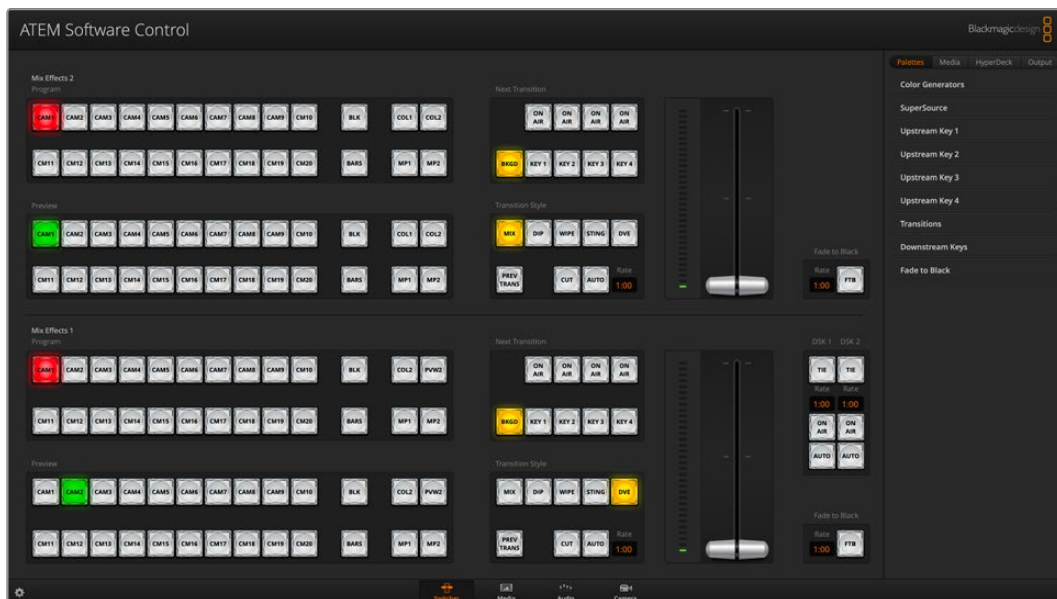
Lastly, you need to ensure your computer is connected and working on your network. Then when you launch the ATEM Software Control application, you will be prompted to select a switcher. If it can be seen on the network, you can select it from the list, or enter an IP address manually. Use the IP address you just entered for the switcher. Then the ATEM Software Control can find the switcher and communicate.

## Switcher Control Panel

The software control panel has four main control windows: Switcher, Media, Audio and Camera. You can open these windows by selecting the buttons at the bottom of the interface or by pressing the Shift and left/right arrow hot keys. A general settings window can be opened by selecting the gear icon at the lower left of the interface. The switcher, media, audio and camera windows all contain unique settings for the switcher, which can only be made from the software control panel.

### Switcher Panel

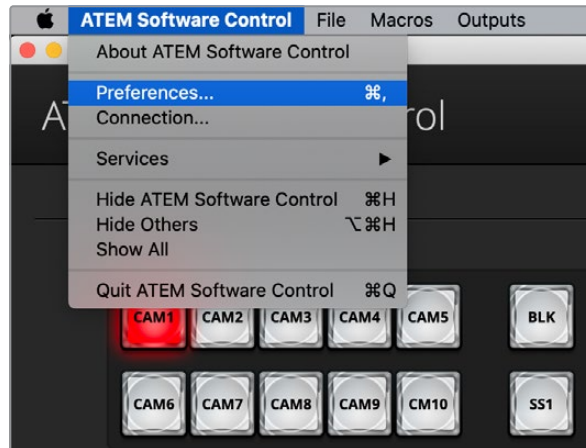
When first launched, the switcher screen is selected, which is the main control interface for the switcher. The software control panel must be connected to a switcher to run.



ATEM Software Control window

## Preferences

The preferences settings are arranged as 'general' preferences and 'mapping' preferences. General preferences contain settings for transition control, language selection and enabling or disabling midi control. Mapping preferences let you assign inputs to specific buttons on the preview and program rows. Go to the menu bar at the top of your screen, select 'ATEM Software Control' and open the 'preferences'.



Open preferences from the ATEM Software Control menu

### General Preferences

When you first receive your ATEM switcher, it will be set to program/preview switching which is the current standard for an M/E switcher. You can change this preference to A/B Direct if you wish to use older style A/B switching.

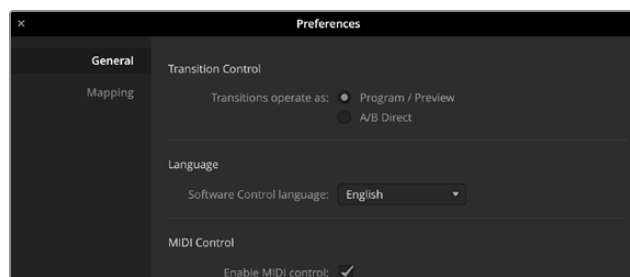
ATEM Software Control can be set to display in English, German, Spanish, French, Italian, Japanese, Korean, Polish, Portuguese, Russian, Turkish, Ukrainian and simplified Chinese languages.

When running ATEM Software Control for the first time after installation, a setup dialog box will prompt you to set the language for the software, but you can change the language of the software at any time.

From the language menu select your preferred language. A warning will appear asking you to confirm the action. Click 'change'.

ATEM Software Control will now close and restart in your selected language.

To operate your ATEM switcher using a MIDI controller, check the box to enable MIDI control.

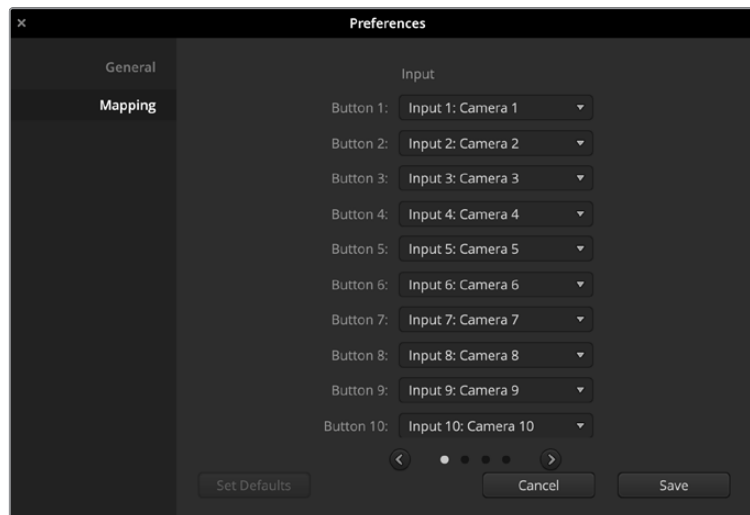


Set your general preferences

## Button Mapping

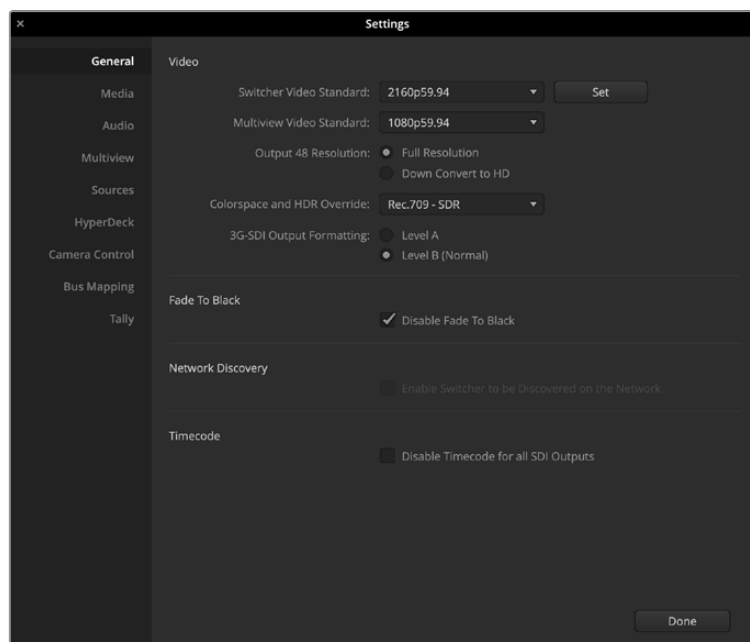
In the mapping preferences, you can assign inputs to specific buttons on the preview and program rows.

ATEM software and hardware control panels support button mapping so you can assign your most important sources, especially cameras, to the most accessible buttons in the program and preview rows. Occasional sources can be assigned to less prominent buttons. Button mapping is set independently for each control panel so button mapping set on a software control panel will not affect the button mapping set on a hardware control panel.



## Changing Switcher Settings

Clicking on the switcher settings 'gear' icon in the bottom left hand corner will open the settings window where you can change general switcher settings, audio, multiview, sources, HyperDeck and camera control settings. These settings are divided into vertical tabs on the left hand side.



ATEM 4 M/E Constellation 4K general settings

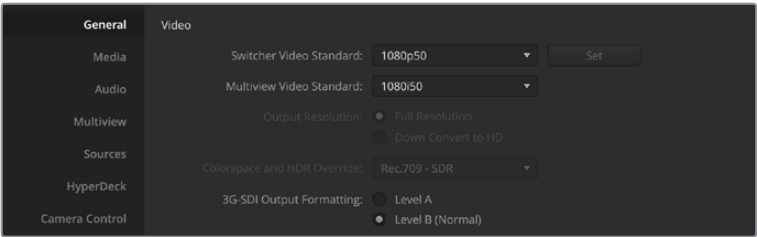
# General Settings

The general tab contains settings for your video standard, media pool settings as well as choosing the camera control monitoring output.

## Video

### Setting the Switcher Video Standard

The video setting is used to select the operating video standard of the ATEM switcher. You can set the video standard to suit the region in which you are broadcasting, such as 1080p59.94 or 2160p59.94 if you are broadcasting in NTSC based countries. If you are broadcasting in PAL based countries, you can set your video standard to formats such as 1080p50 or 2160p50. A good way to work out the video standard you should use is to check cameras and then set the switcher video standard to the same format.



Set your video standard

All ATEM Constellation switchers support the following video standards.

<b>HD Video Standards</b>	720p50, 720p59.94, 720p60
	1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60
	1080i50, 1080i59.94, 1080i60

ATEM Constellation 4K and 8K switchers also support the following Ultra HD video standards.

<b>Ultra HD Standards</b>	2160p23.98, 2160p24, 2160p25, 2160p29.97, 2160p30, 2160p50, 2160p59.94, 2160p60
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ATEM Constellation 8K switchers also support the following 8K video standards.

<b>8K Standards</b>	4320p23.98, 4320p24, 4320p25, 4320p29.97, 4320p30, 4320p50, 4320p59.94, 4320p60
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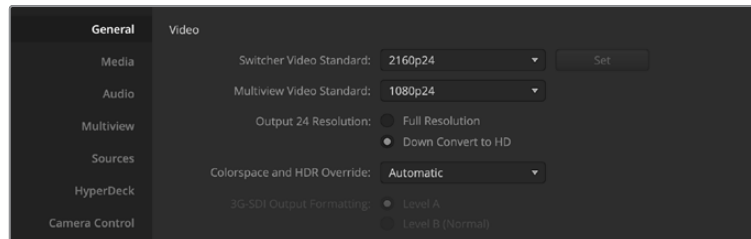
To set the video standard, select the video standard from the menu and then press the 'set' button. Any time the video standard is changed, it will erase any frames you have loaded into the media pool. It's worth noting that ATEM Constellation 8K has 1 M/E when in 8K mode and 4 M/E's in HD and Ultra HD.

### Setting the Multiview Video Standard

If your production video standard is set to 1080p25 or higher, you can adjust the multiview output to a lower frame rate. This way you can set the multiview outputs to be down converted for even greater monitor compatibility. For example, if your video standard is set to 1080p60, you can set the multiview output to 1080i60.

## Setting the Resolution for the Last Output

When working with Ultra HD video using ATEM Constellation 4K switchers, you can down convert the resolution on the last SDI output. This is helpful if you need to connect an HD monitor on an Ultra HD production. For example, on ATEM 4 M/E Constellation 4K, to enable the down conversion on output 24, set the 'output 24 resolution' setting to 'down convert to HD'.



## Setting the Colorspace and HDR Override

If you are connecting sources with HDR metadata to an Ultra HD SDR production then set the color space and HDR override to match your switcher standard. For example, if your production is Ultra HD SDR, select 'Rec.2020 SDR'. If you are connecting HDR PQ or HLG Ultra HD sources and you want to output the same HDR standard, then select 'Rec.2020 - HDR (PQ)' or 'Rec.2020 - HDR (HLG)'.

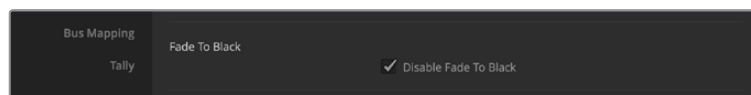
When outputting HDR we recommend that all sources match the same HDR standard. Selecting automatic will set the color space to Rec.709 SDR for HD and Ultra HD sources.

## Set the 3G SDI Output Formatting

If you're outputting 1080p50 or higher HD video to equipment with 3G-SDI inputs, you may need to toggle between level A and B 3G-SDI output standards to maintain compatibility with equipment that can only accept level A or B 3G-SDI video. Level B is the default setting that works with most equipment, but you can switch to Level A by clicking the 'level A' radio button.

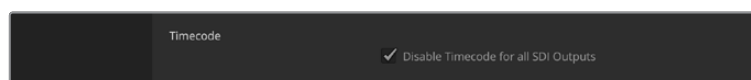
## Fade To Black

To disable the FTB button on the front of the switcher along with ATEM Software Control click the 'disable fade to black' checkbox.



## Timecode

ATEM Constellation switchers automatically run time of day timecode or free run timecode from the moment you turn on the Constellation switcher. To disable the timecode over the SDI outputs click the checkmark.



## Media Settings

### Media Pool

#### Adjusting the Media Pool Clip Length

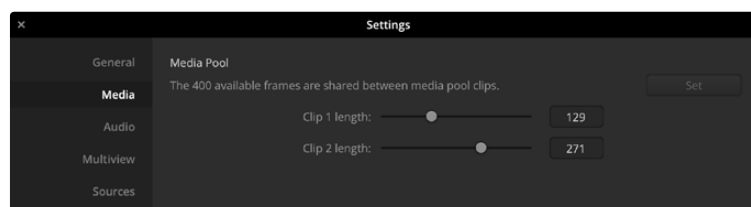
Each ATEM switcher model has memory for graphics that's called the media pool. This memory varies in size between different ATEM Constellation models and holds images with an alpha channel as well as video clips that can be assigned to a media player for use in the production.

ATEM Switcher Model	Still Graphics	Video Clips	Video Format	Clip Length
ATEM Constellation 8K	64	4	720p	3200 frames
			1080pHD	1600 frames
			Ultra HD	400 frames
	24	2	8K	100 frames
ATEM 4 M/E Constellation 4K and ATEM 4 M/E Constellation 4K Plus	64	4	1080p	1600 frames
			Ultra HD	400 frames
ATEM 2 M/E Constellation 4K	40	2	1080p	1600 frames
			Ultra HD	400 frames
ATEM 1 M/E Constellation 4K	20	2	1080p	800 frames
			Ultra HD	200 frames
ATEM 4 M/E Constellation HD	60	4	720p	1200 frames
			1080p	600 frames
ATEM 2 M/E Constellation HD	40	2	720p	800 frames
			1080p	400 frames
ATEM 1 M/E Constellation HD	20	2	720p	400 frames
			1080p	200 frames

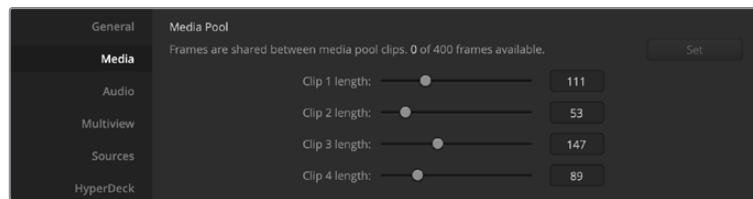
ATEM Constellation media pool capacities

ATEM 1 M/E and 2 M/E Constellation models feature two clips that share the same pool of memory, ATEM 4 M/E Constellation switchers share the memory between four clips and ATEM Constellation 8K shares the memory between 2 clips in 8K and 4 clips in HD and Ultra HD.

By default, each clip receives equal amounts of the available memory which determines the maximum number of frames. If you need a clip to be longer, adjust the balance of frames. It's worth remembering that lengthening one clip will shorten the other.



Media pool sharing on ATEM 2 M/E Constellation HD



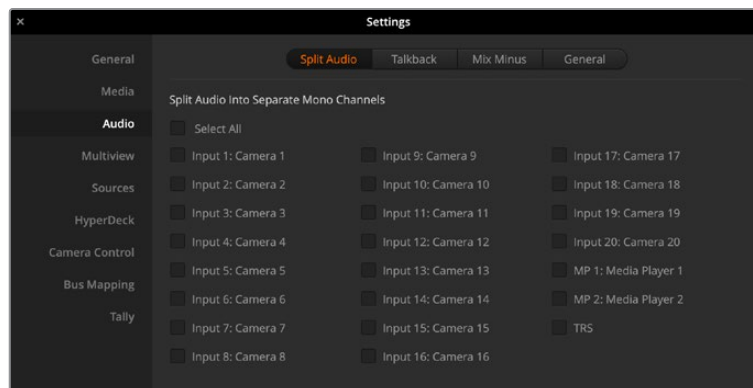
Media pool sharing on ATEM 4 M/E Constellation 4K

## Audio Settings

The audio tab contains all the audio settings separated into four categories, split audio, talkback, mix minus and general.

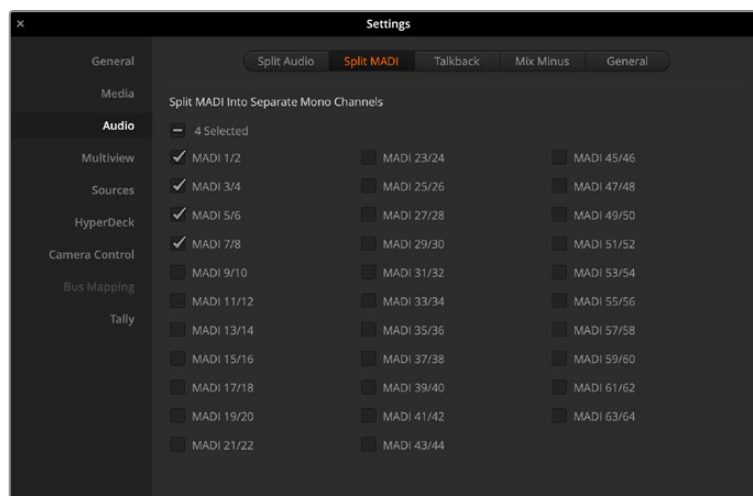
### Split Audio

ATEM Constellation switchers can split a stereo input signal into two separate mono channels. This is helpful for mixing a mono input into both channels on the stereo master output. You can also select between splitting all audio into separate channels, or select each input individually.



Audio settings on ATEM 2 M/E Constellation HD

On ATEM 4 M/E Constellation and ATEM Constellation 8K models you can also split MADI channels in separate mono channels.



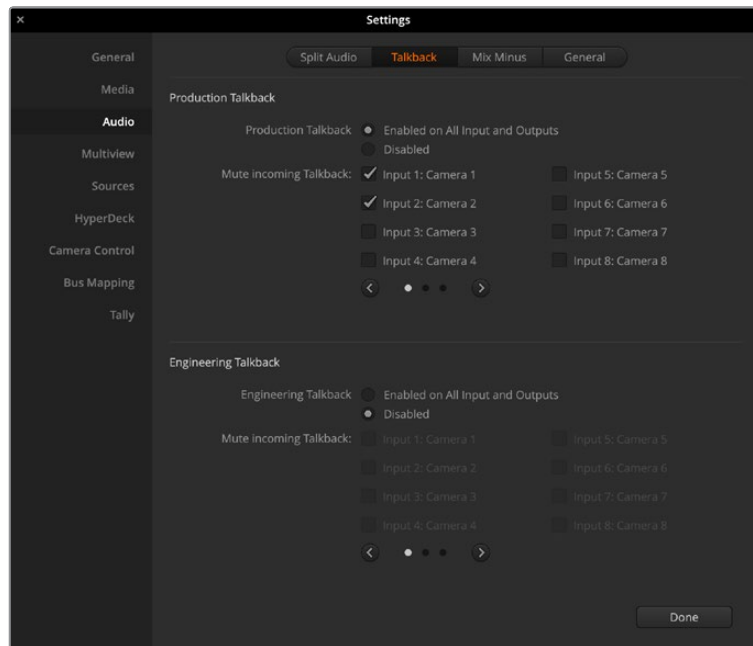
Use the checkboxes to split MADI into separate mono channels on ATEM 4 M/E Constellation switchers



## Talkback

Set your talkback behavior via the talkback tab. Production talkback is embedded into SDI channels 15 and 16 and engineering talkback is embedded into SDI channel 13 and 14. Talkback can be enabled or disabled via the check box.

You may want to loop one of your ATEM's outputs to an input to achieve a desired effect. In some cases this can cause a feedback loop in SDI talkback channels. If this occurs, you can mute SDI channels talkback by clicking the 'mute' checkbox beside each input. If you do want to mute incoming talkback, make sure to check the box for both production and engineering talkback.



Mute incoming production talkback on inputs

## Mix Minus

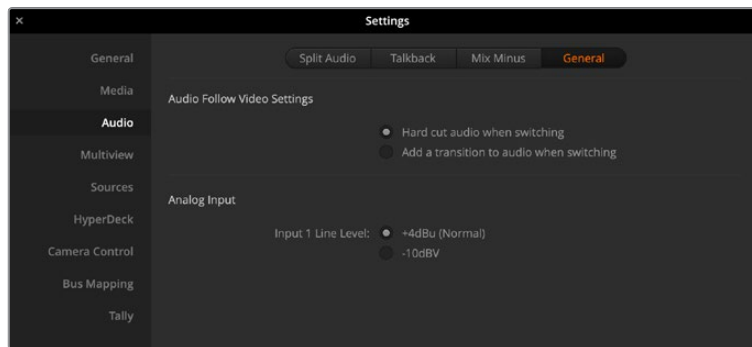
The mix minus settings on SDI outputs let you mute the audio from their return program feed. For example, when doing live crosses there can be a delay in the audio which may be distracting when the presenter can hear his or her own voice delayed on the program return feed. Enabling mix minus for an input will output all program audio in the mix, minus that particular input.

## General

The final audio settings are in the general tab with options for AFV and analog audio input levels.

### Audio Follow Video Settings

When using AFV, you can select the audio behavior during transitions using the radio buttons. To crossfade the audio when inputs change, check the radio button to add a transition. The audio will only be sent to the program output when the input is on air.



Set the audio follows video behavior

## Analog Input

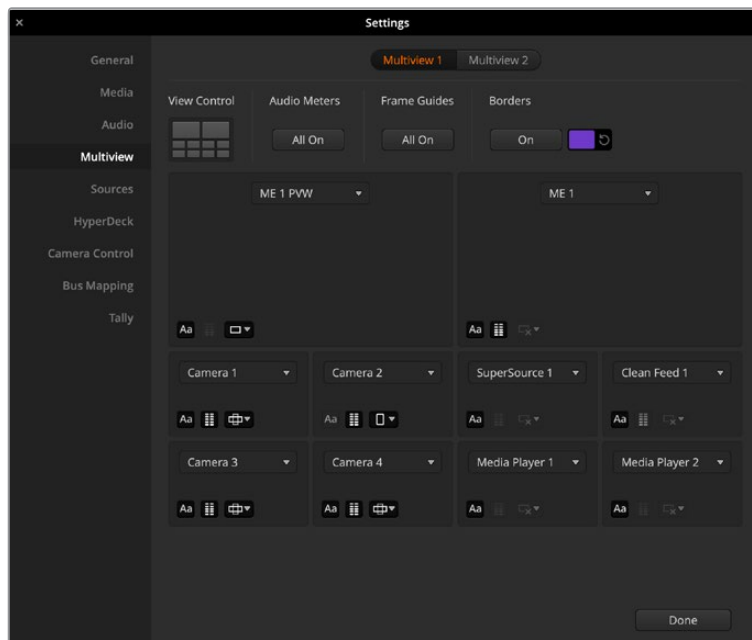
Set your input level when connecting analog audio via the 1/4" audio inputs.

## Multiview Settings

The multiview settings allow you to set the multiview orientation. The default view features two large windows at the top and eight smaller windows beneath, however each quadrant of the multiview can be set to either one large view or four smaller views so you can configure 4, 7, 10, 13 or 16 views. Click on each quadrant in the 'view control' to toggle between 1 and 4 views.

Audio meters can be turned on or off for all the switcher sources and program view by enabling the 'All On' button in the multiview settings, or you can turn them on or off individually by clicking the audio meter icon in each view.

On each source and preview view you can turn on safe area markers to make sure your program will look great on any monitor. Frame guides display as 16:9 for horizontal or 9:16 for vertical workflows. Select 'all' to turn on both frame guides.



Configure the two multiviews on ATEM 2 M/E Constellation HD

The multiview will also display tally, so if any of the sources in the multiview are used in a layer on the program or preview outputs, the border will be highlighted red or green. A red border

indicates the source is used on the program output and a green border indicates a source is selected on the preview output. Using the borders settings you can disable the border or select a color using the color menu. The labels on the multiview will also change to red or green when on the preview or program outputs. Labels can also be disabled on any window by clicking the 'Aa' icon.

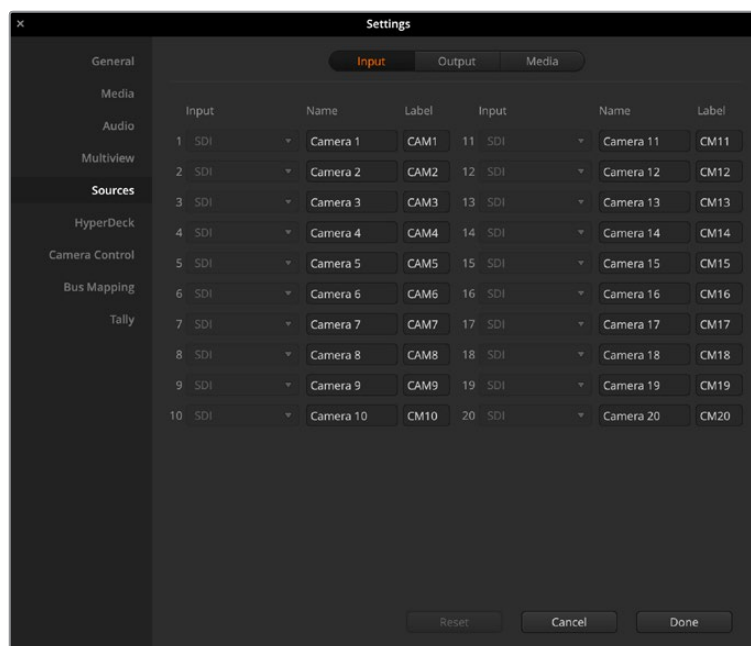
ATEM 1 M/E Constellation switchers include a single multiview, 2 M/E switchers include two multiviews and 4 M/E switchers include four multiviews. ATEM Constellation 8K has four multiview outputs for HD and Ultra HD viewing and one 8K multiview when the switcher is in 8K mode.

## Sources Settings

The sources tab can be used to change labels for the switchers inputs, outputs and media players. Each input and output will have a long name and a short name.

The long name supports up to 20 characters in length and are displayed in various source selection boxes on the software control panel, the multiview windows on screen labels and on the advanced panel. The short 4 character name is used to identify the input buttons on software control panel.

To change an input name, click in the text field, enter the text and select set. The input name will be updated on the multiview, software control panel and advanced panel if one is connected. It's a very good idea to change both the short and long labels at the same time, so they match. For example Camera 1 would be entered in as a long label and CAM1 as the short label.

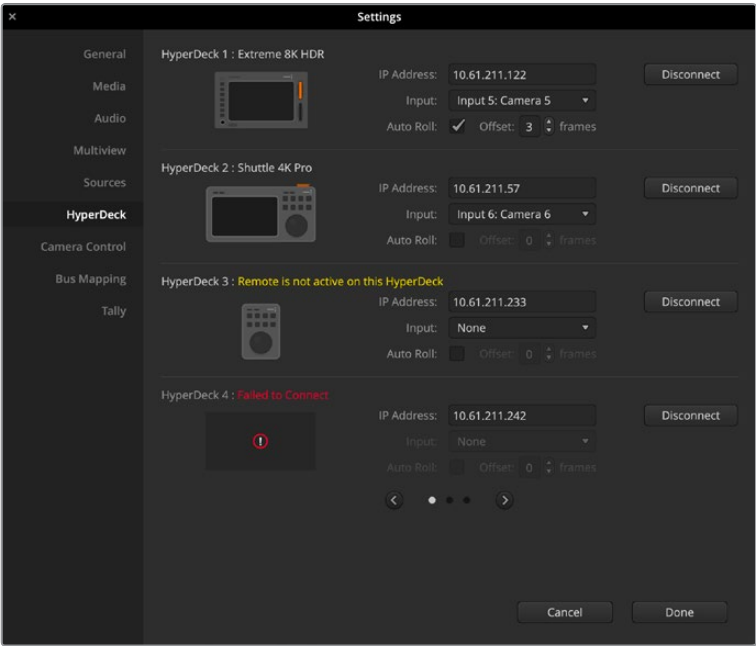


Enter the long and short names for the inputs, outputs and media players.

## HyperDeck Settings

Your ATEM Constellation switcher can be connected to up to 10 HyperDeck disk recorders and control them using ATEM Software Control. When connecting HyperDecks, use these settings to configure the IP Address, select the inputs your HyperDecks are connected to, turn the auto roll feature for each deck on or off and set their frame offset settings so they can switch cleanly.

Status indicators appear above and below each deck so you can see if they are successfully connected and if their remote buttons are active.



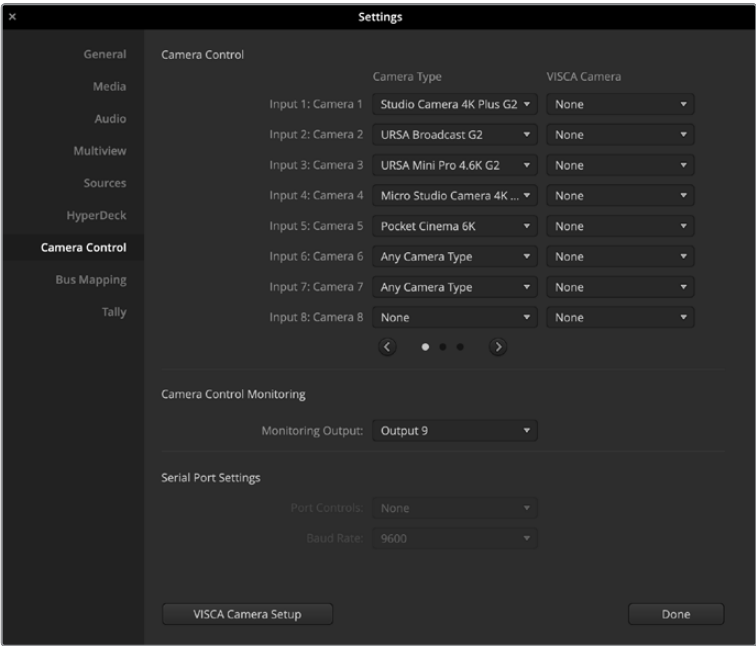
Add up to 10 HyperDecks

Customizing the labels for your HyperDeck inputs can make it easier to pick from the list.

For detailed information on setting up HyperDeck disk recorders with your ATEM switcher and setting the 'HyperDeck' configuration settings, refer to the 'HyperDeck control' section of this manual.

## Camera Control Settings

The camera control tab features settings for assigning cameras to inputs and selecting your monitoring output.

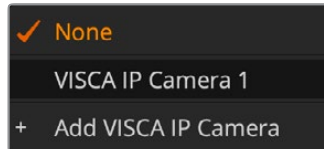


## Camera Control

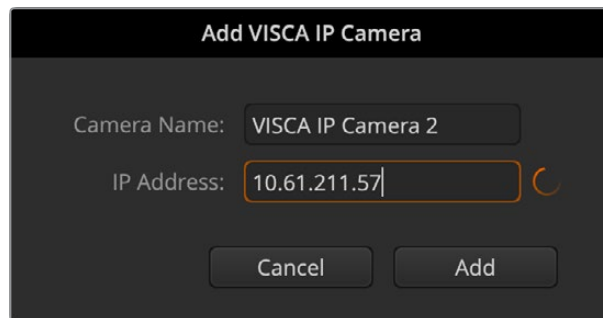
The camera type menu lets you select a Blackmagic camera for each input, or you can select 'any camera type' when adding third party cameras. Selecting the correct camera for the input will ensure that all the parameters for that camera are set correctly.

To add PTZ cameras and PTZ camera heads controlled by VISCA over IP:

- 1 Using the camera type menu select 'any camera type'.
- 2 Click on the corresponding VISCA camera menu. If you've already added a VISCA camera it will appear in the list, or you can click the 'add VISCA IP Camera' option.

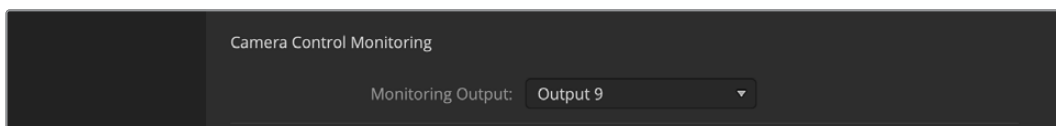


- 3 In the 'add VISCA IP camera' menu enter the IP address for the PTZ camera or camera head. You can also enter a custom camera name. Click 'add'.



## Camera Control Monitoring

You can select any SDI output for camera control monitoring. When controlling your cameras via the camera control panel, you can monitor the adjustments via the monitoring output. Click the menu to choose the output you want to use.

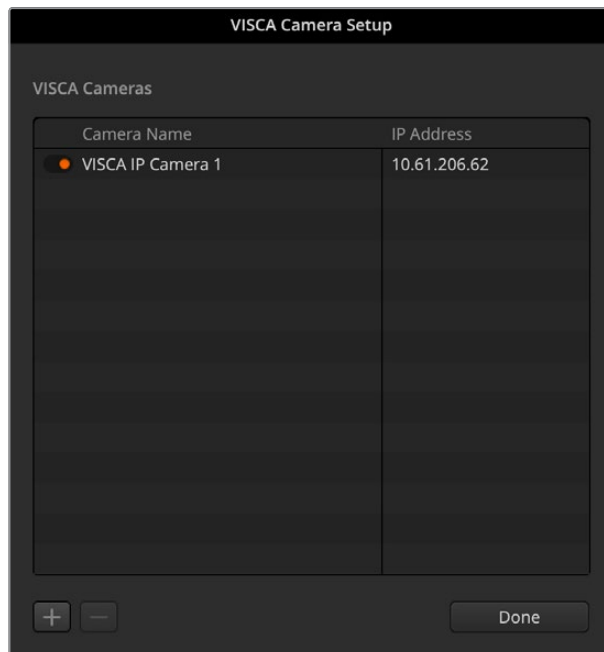


## Serial Port Settings

ATEM 4 M/E and Constellation 8K switcher models feature a RJ12 remote port on the rear for RS-422 control. You can select how it is used with the port controls menu. The options are 'none', VISCA and GVG, where GVG sets it to use GVG100, a common legacy interface for communicating with equipment such as linear editing suites. When VISCA is selected choose between 9600 or 38400 baud rates.

To detect remote VISCA cameras click on the 'VISCA camera setup' button.

A window will appear listing available serial VISCA cameras. You can also add 'VISCA IP cameras' by clicking the plus '+' icon. Once serial VISCA cameras are detected they can be selected via the 'VISCA camera' menu for each input. To remove a VISCA over IP camera press the '-' minus button.



## Bus Mapping

With ATEM Constellation switchers you can link two or more mix effects buses to follow the operation of the primary M/E. This lets you create multiple outputs of the same program, with follower M/Es controlled by the primary's program row.

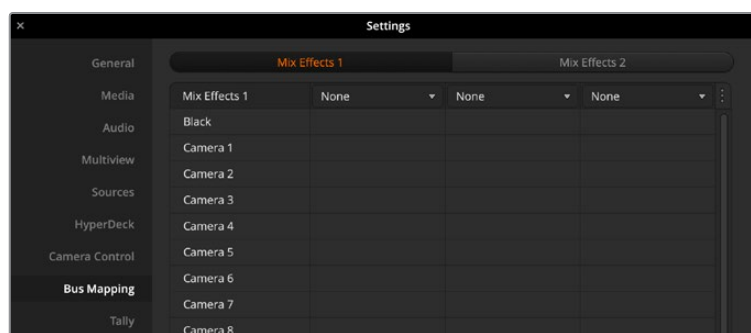
Using the bus mapping tab in settings, you can substitute sources on follower M/Es to override selected inputs. Once set, followers will match the primary for cuts and transitions, but can output different sources when needed. For example, you could localize a program by substituting title graphics on each follower M/E with a different language. The follower will then perform every transition in sync with the primary, while showing the localized graphics you've assigned, resulting in up to 4 distinct program outputs.

Any M/E can be set as a primary and you can even have multiple primary M/Es. For example, M/E 2 could follow M/E 1 while M/E 4 follows M/E 3.

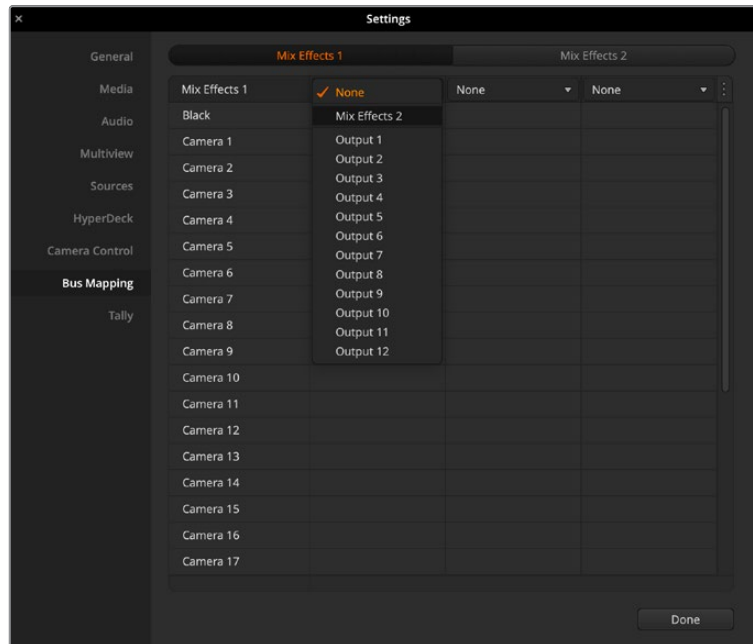
You can also create a reverse follower setup, where two M/Es follow each other. For instance, M/E 1 could follow M/E 2 while M/E 2 follows M/E 1. When set up this way, transitions on both M/Es will remain perfectly synchronized. This can be useful when you have two program outputs, for example, one program going to a live stream and the other to a venue screen. Both need to stay in sync for transitions but can use different sources for certain inputs.

To set up source substitution:

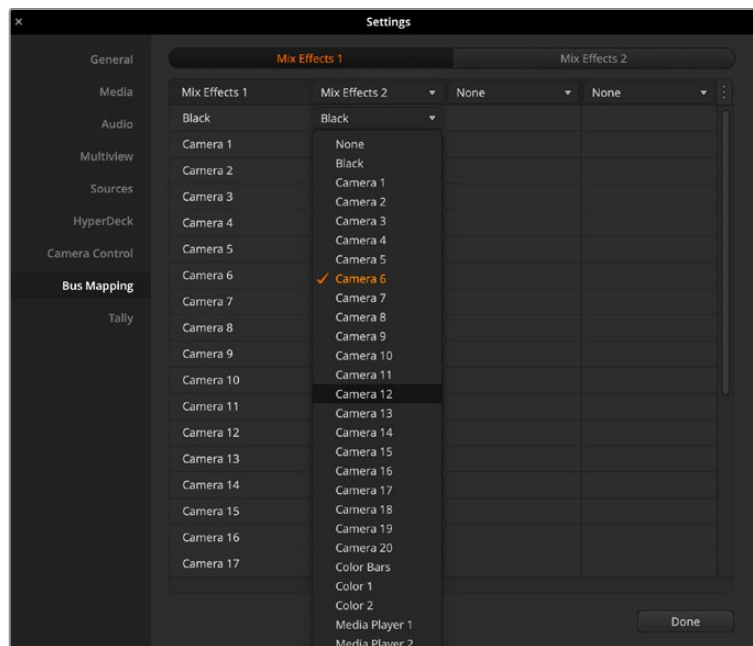
- 1 From the top of the bus mapping tab click on the mix effects to be used as the primary.



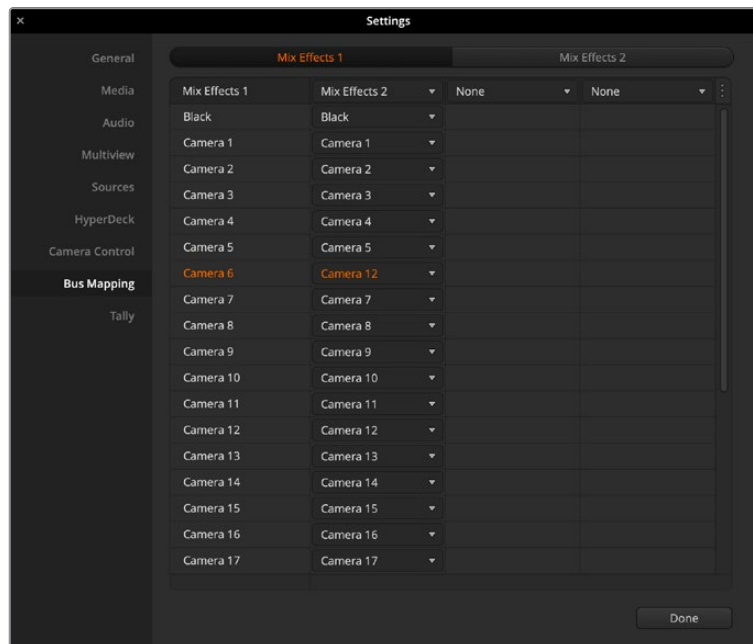
- Using the menu at the top of the second column select the mix effects bus you want to use as a follower.



- In this example camera 6 will be substituted. Navigate to the corresponding source list under mix effects 2 for camera 6 and click on the list menu.



- 4 Select camera 12 from the list. Camera 6 under the primary bus will now highlight orange to indicate a substitution has been made.



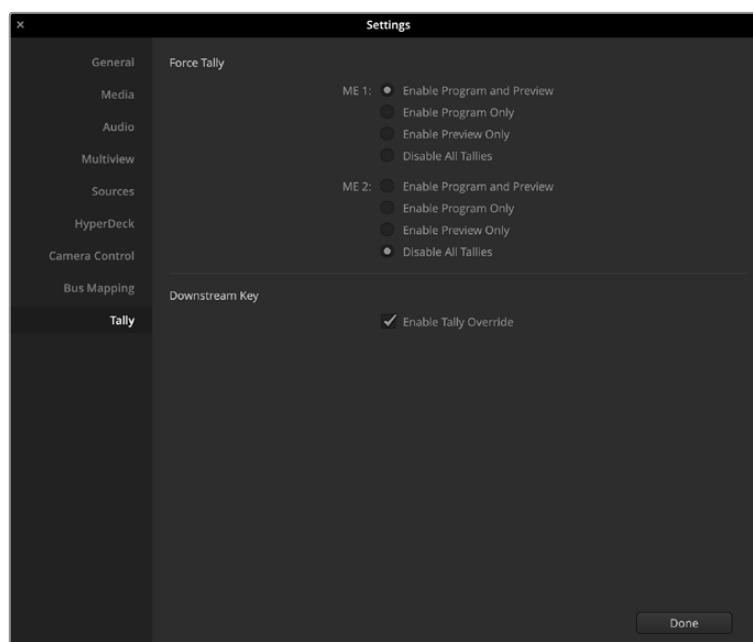
Now when you cut or transition to camera 6 on mix effects program, mix effects two will cut or transition to camera 12. A quick way to see this in action is if you map both ME 1 and ME 2 to your multiview output.

You also have the option of setting an output as a follower. It is worth noting that these are simple cuts only outputs so they won't include any transitions you may use in your program.

## Tally

Enable tally on each M/E using the tally menu. These can be set independently per M/E and one M/E can have a different tally output to another.

To disable tally while a downstream key is on air click the 'enable tally override' checkbox.





## Saving and Restoring Switcher Settings

Now you've setup your ATEM Constellation switcher, you can save your settings using two different options.

### Save Startup State

If your switcher uses the same settings for all your productions you can save the default startup state. Once saved, each time you open ATEM Software Control all your presets and preferences will load. These settings can be cleared using the 'clear startup state'.

### Save Settings as an XML

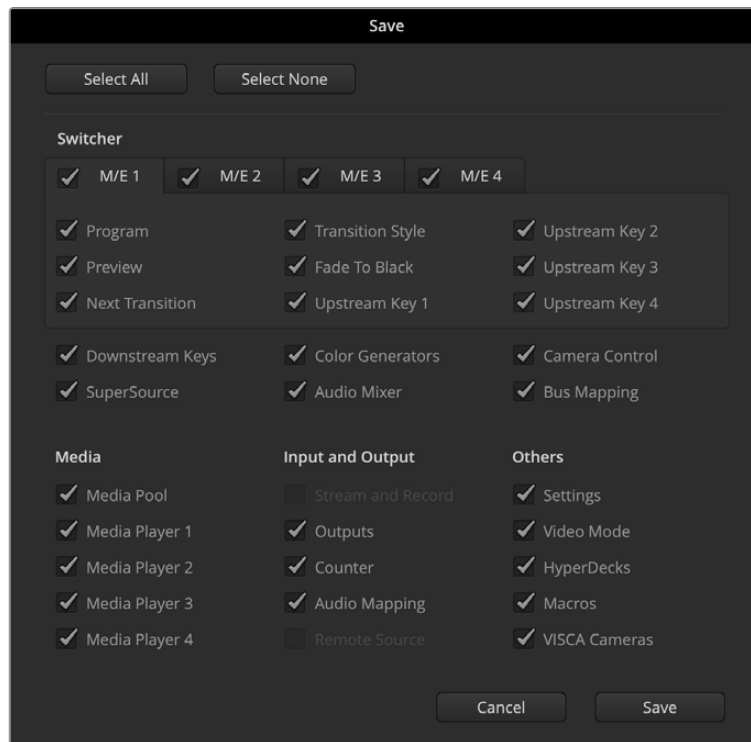
For workflows where you may have multiple productions each with their own setup, you can use the 'save as' feature. This powerful feature is incredibly time saving on live productions where regular settings are used. For example, you can immediately restore saved camera settings, lower third graphics and detailed key setups from a laptop or USB drive.

To save settings:

- 1 Go to the menu bar in ATEM Software Control and select File>Save As.
- 2 A window will open asking for a file name and destination folder. After you have made your selection, click Save.
- 3 The Save Switcher State panel containing checkboxes for all the available settings on each block of your ATEM switcher will open. The Select All checkbox is enabled by default. If you save with Select All enabled, ATEM Software Control saves your entire switcher settings. If you want to choose specific settings to save, you can deselect settings individually, or to remove all settings click Select All once to deselect them. Now you can select specific settings you want to save.
- 4 Click Save. A saving status will appear in the bottom right hand corner of the panel to confirm the save is complete.

ATEM Software Control saves your settings as an XML file together with a folder for ATEM Media Pool contents.

After you have saved your settings you can quick save at any time by selecting File>Save, or by pressing Command S for Mac, or Ctrl S for Windows. Doing so will not overwrite your previous save, but will add a new XML file to your destination folder which is clearly identified with a time and date stamp. This means you can always restore a previous save if necessary.



With ATEM Software Control you can save and restore all your switcher settings for your live production, including key settings, transition styles, media pool contents and more

If your switcher settings are saved on a laptop, it's easy to take all your settings with you on location. Connect your laptop to any ATEM switcher and quickly restore your switcher settings.

Live production can be a busy and exciting time and you're always working in the moment, which means you can easily forget to back up your saved files when the production is over.

If you have settings you want to keep, save them to your computer and an external drive, such as a USB drive. This means you can carry your settings with you and have a back up in case your settings are accidentally deleted on your computer.

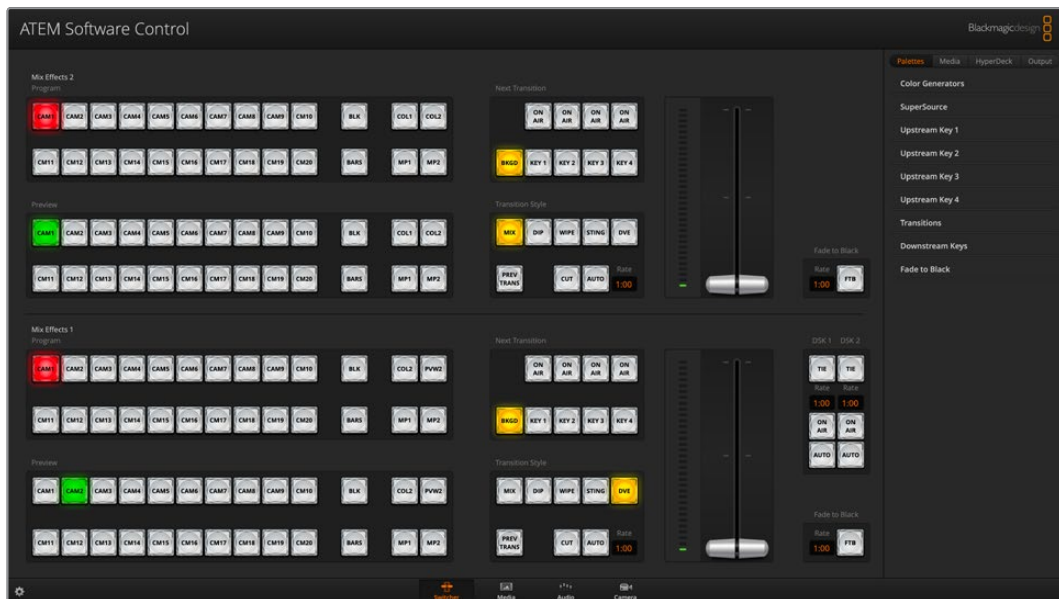
To restore settings:

- 1 Go to the menu bar in ATEM Software Control and select File>Restore.
- 2 A window will ask for the file you want to open. Select your save file and click Open.
- 3 You'll now see a window containing active checkboxes for your saved settings on each block of your ATEM switcher. Leave Select All enabled to restore all your saved settings, or select only the checkboxes for the settings you want to restore.
- 4 Click Restore.

## Switching with ATEM Software Control

The switcher window is the main control interface for the switcher. During live production, the switcher window can be used to select sources and take them to air.

You can select the transition style, manage upstream/downstream keyers and turn on/off the fade to black. The palettes on the right hand side of the interface are where you adjust transition settings including transition rates, adjust color generators, control media players, and adjust the upstream and downstream keyers as well as control fade to black rate.



## Mouse or Trackpad Operation

The virtual buttons, sliders and fader bar on the Software Control Panel are operated using your computer mouse or trackpad if you're using a laptop.

To activate a button, click once with the left mouse button. To activate a slider, click and hold down the left mouse button while dragging. Similarly, to control the fader bar, click and hold down the left mouse button on the fader bar handle and drag up or down.

## Using Keyboard Hot Keys

Hot keys can be used allowing convenient control of some switcher functions using a standard QWERTY keyboard as shown in the following table:

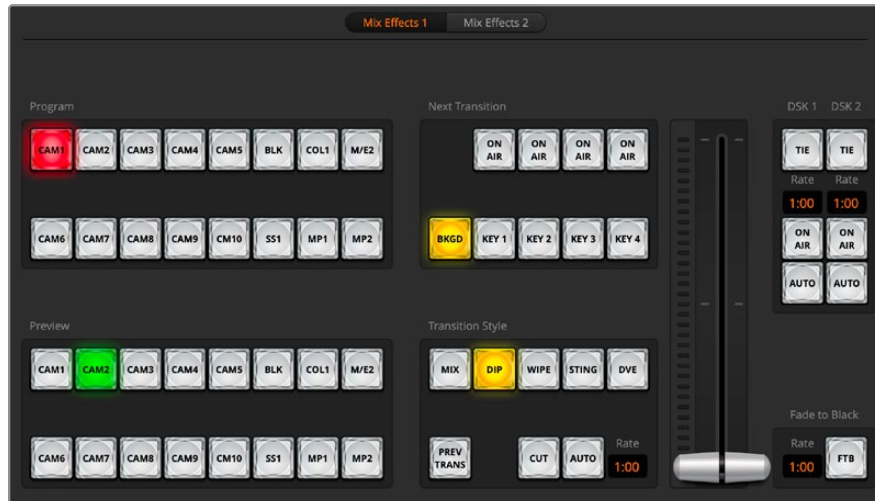
Hot Keys	Function
<1> - <0>	Previews source on switcher Inputs 1 - 10. 0 = input 10.
<Shift> <1> - <0>	Previews source on switcher Inputs 11 - 20. Shift 0 = input 20.
<Control> <1> - <0>	Hot switches source on switcher Inputs 1 - 10 to Program output
Press and release <Control>, then <1> - <0>	Hot switches source on switcher Inputs 1 - 10 to Program output. Hot switching remains on and the CUT button is lit red.
<Control> <Shift> <1> - <0>	Hot switches source on switcher Inputs 11 - 20 to Program output
Press and release <Control>, then <Shift> <1> - <0>	Hot switches source on switcher Inputs 11 - 20 to Program output. Hot switching remains on and the CUT button is lit red.
<Control>	Turns off hot switching if currently on. The CUT button is white.
<Space>	CUT
<Return> or <Enter>	AUTO

More information on how to use the switcher control panel is included in the next sections.

## Mix Effects

The Mix Effects block of the switcher tab contains all the source select buttons for the program and preview buses, allowing external inputs or internal sources to be selected for next transition previewing or switching to air.

If your switcher has 2 or more Mix Effects panels, you can optimize the interface to show two, or select each panel by clicking on the numbered Mix Effects buttons at the top of the interface.



On ATEM 2 M/E, 4 M/E and 8K models, select the mix effects panel using the numbered buttons at the top of the interface

When both panels are visible, the Mix Effects 1 or 2 buttons will move to the processing palettes.

### Program Bus Source Select Buttons

The program bus source select buttons are used to hot switch background sources to the program output. The source currently on air is indicated by a button that is illuminated red.

### Preview Bus Source Select Buttons

The preview bus source select buttons are used to select a background source on the preview output, this source is sent to the program bus when the next transition occurs. The currently selected preview source is indicated by a button that is illuminated green.

The source select buttons for the Program bus match the Preview bus.

<b>INPUTS</b>	Input buttons match the number of external switcher inputs. Tab will bank input buttons up to inputs 40-80 on ATEM 4M/E Constellation 4K Plus.
<b>BLACK</b>	Color black source internally generated by the switcher.
<b>SUPERSOURCE</b>	ATEM 2 M/E, 4 M/E and 8K models feature SuperSource. Shift select for Bars.
<b>BARS</b>	Color bars source internally generated by the switcher. This is a dedicated button when using ATEM 1 M/E Constellation HD
<b>COLOR 1</b>	Color sources internally generated by the switcher. Shift select for Color 2.
<b>MEDIA 1 and 2</b>	Internal media players that display stills or clips stored in the switcher. When using ATEM 2 M/E, 4 M/E or Constellation 8K switchers in HD or Ultra HD mode, hold the shift button down on your keyboard to reveal the additional media player buttons on the preview and program rows.

## M/E2

This button is present on ATEM 2 M/E, 4 M/E and 8K models and allows a Mix Effects 2 setup to be instantly brought to air or previewed. On ATEM 4 M/E and Constellation 8K switchers you can also select M/E 3 and M/E 4. Shift select for the M/E preview output.

## Transition Control and Upstream Keyers

### Cut

The CUT button performs an immediate transition of the program and preview outputs, overriding the selected transition style.



Transition Control

### Auto

The AUTO button will perform the selected transition at the rate specified in the 'rate' display. The transition rate for each transition style is set in the transition palette for that style and is displayed in the 'rate' window of the transition control block when the corresponding transition style button is selected.

The AUTO button illuminates red for the duration of the transition and the 'rate' display updates to indicate the number of frames remaining as the transition progresses. If an ATEM advanced panel is connected, the fader bar indicator on the panel updates to provide visual feedback on the progress of the transition.

### Fader Bar

The fader bar is used as an alternative to the AUTO button and allows the operator to manually control the transition with a mouse. The AUTO button illuminates red for the duration of the transition and the 'rate' display updates to indicate the number of frames remaining as the transition progresses. If an ATEM advanced panel is connected, the fader bar indicator on the panel updates to provide visual feedback on the progress of the transition.

### Transition Style

The transition style buttons allow the operator to select one of five types of transitions; mix, dip, wipe, DVE, and stinger. The selected transition style is indicated by a yellow illuminated button. Selection of these buttons will be reflected by the corresponding tab in the Transitions processing palette. For example, when you have the transitions processing palette open and click on 'wipe', the palette will automatically reveal the 'wipe' tab so you can make adjustments to the transition such as duration or pattern style.

## Preview Transition

The PREV TRANS button enables the preview transition mode, allowing the operator to verify a mix, dip, wipe or DVE transition by performing it on the preview output using the fader bar. When the PREV TRANS is selected you will see the preview output match the program output, and then it's simple to practice your selected transition with the fader bar to confirm you are going to get what you want. This is a very helpful feature to avoid mistakes on air!

## Next Transition

The BKGD, KEY 1, KEY 2, KEY 3, KEY 4 buttons are used to select the elements which will transition on air or off air with the next transition. The number of available keyers depends on your switcher model. All keys can be faded on and off when the main transition occurs, or you can select just keys to transition individually, so the main transition control can be used to fade keys on and off.

When selecting the elements of the next transition, the switcher operator should look at the preview video output because it provides an accurate representation of what the program output will look like after the transition is completed. When only the BKGD button is selected, a transition from the current source on the program bus to the source selected on the preview bus will occur without any keyers. You can also select only keyers to transition, leaving the current background live throughout the transition.

## On Air

The ON AIR indicator buttons indicate which of the keys are currently on air and can also be used to immediately cut a key on or off air.

## Downstream Keyers

### Tie

The TIE button will enable the DSK on the preview output, along with the next transition effects, and tie it to the main transition control so that the DSK can be taken to air with the next transition.

The DSK will transition at the rate specified in the RATE display of the transition control block. If the DSK is tied, the signal routing to the clean feed 1 is unaffected.

### On Air

The ON AIR button is used to cut the DSK on or off air and indicates whether the DSK is currently on or off air. The button is illuminated if the DSK is currently on air.

### Auto

The AUTO button will mix the DSK on or off air at the rate specified in the DSK RATE window. This is similar to the main AUTO rate on the transition control block, however it's limited only to the specific downstream keyer. This can be used to fade up and down bugs and logos, such as live or replay bugs during production, without interfering with the main program production transitions.



Downstream Key  
and Fade to Black

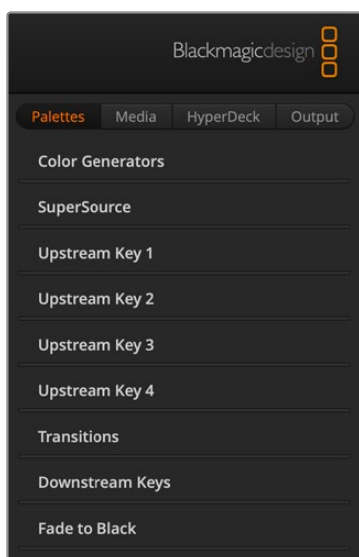
## Fade to Black

The FTB button will fade the whole program video output to black at the rate specified in the fade to black RATE window. Once the program output has been faded to black, the FTB button will flash red until it is pressed again. Doing so will fade up from black at the same rate, or you can enter a new rate in the rate window. Fade to black is mostly used at the start of your production, and at the end of your production, or when cutting to commercial breaks. It ensures all layers in the switcher are faded down together. A fade to black cannot be previewed. You can also set the audio mixer to fade the audio with your fade to black by selecting the AFV button on the master audio output fader.

## Processing Palettes

The software control panel features tabs for the processing palette, media player, and output options. The palettes show the order of the processing in the switcher. You can expand and minimize palettes to save space and scroll them up and down to get the adjustments you need to set.

The Palettes tab contains the following processing controls.



### Color Generator 1 and 2

The ATEM switcher has two color matte generators which can be configured from the color generator palette using a color picker or by setting hue, saturation, and luminance levels.

### SuperSource

ATEM 2 M/E, 4 M/E and Constellation 8K switchers include a feature referred to as SuperSource that will allow you to arrange multiple sources on the monitor at one time. For more information refer to the section 'Using SuperSource' later in this manual.

### Upstream Keys

There are four upstream keyers per M/E which can be configured from the upstream key palettes. Each keyer has its own palette. Within each palette the keyer can be configured as a luma key, chroma key, pattern key or DVE.

The selected palette will display all the parameters that are available to configure the keyer. More information on how to use upstream keyers is included later in this manual.

With ATEM switchers that have 1 M/E, these keyers are all for M/E 1. On ATEM 2 M/E, 4 M/E and 8K model switchers, the labels will show which M/E these keys are connected to.

### Transitions

The transitions palette is where you can configure the parameters of each transition style. For example, for the dip transition the palette has a drop down menu where you can select the dip source and for the wipe transition the palette displays all the available wipe patterns. There are

lots of variations of transitions, and a large number of transitions can be created by combining settings and features in the transitions palette.

**NOTE** It's worth noting that simply selecting a specific style of transition in this palette will only adjust the settings for these transitions, and you still need to select the style of transition you want to perform in the transition control section on the software or hardware control panel. For ease of use, some people like to use the hardware based panel for switching, while using the software panel palettes for setting up the transition. The software and hardware panels work together and mirror all settings, so you can use any combination you like!

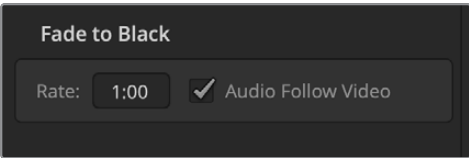
### Downstream Keys

The downstream keyers which can be configured from the downstream keys palette. The palette has drop down boxes for selecting the fill and key signals to the keyer, sliders to set the clip and gain values, pre-multiplied, and mask settings. Each ATEM Constellation switcher has a different number of downstream keyers available.

Model		Downstream Keyers
ATEM Constellation 8K	HD	4
	Ultra HD	4
	8K	2
ATEM 4 M/E Constellation 4K Plus		4
ATEM 4 M/E Constellation 4K		4
ATEM 2 M/E Constellation 4K		2
ATEM 1 M/E Constellation 4K		1
ATEM 4 M/E Constellation HD		4
ATEM 2 M/E Constellation HD		2
ATEM 1 M/E Constellation HD		1

### Fade to Black

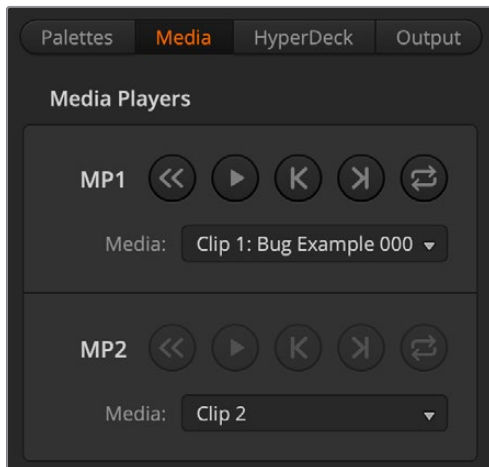
The Fade to Black palette is where you can set the fade to black transition rate. An 'audio follow video' checkbox is also provided as a shortcut for the audio mixer's master fader AFV button. Selecting this feature lets you fade your audio with your fade to black.





## Media Tab

The media tab contains controls for your ATEM switcher's media players.

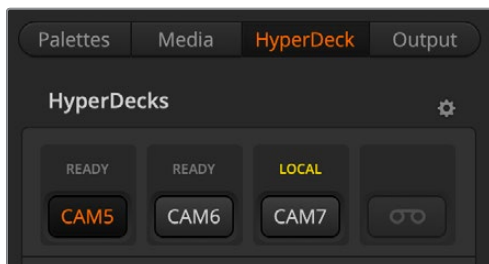


### Media Players

Your ATEM switcher has media players which play back the clips and stills that are stored in the media pool memory built into the switcher. The media list is used to select the still or clip that will be played or made available on the media player input to the switcher. When a clip is selected, the transport controls in the media player can be used to play, pause and loop the clip. Controls are also provided to step forward and backward through frames of the clip. ATEM 1 M/E and 2 M/E Constellation switchers have 2 media players, ATEM 4 M/E Constellation model switchers have 4 media players and ATEM Constellation 8K switchers have 4 media players in HD and Ultra HD mode and 2 media players in 8K mode.

## HyperDeck Tab

The HyperDeck tab lets you control up to ten HyperDecks.

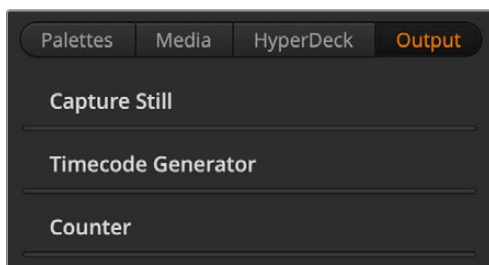


### HyperDecks

You can connect up to 10 HyperDeck disk recorders and control them using ATEM Software Control's HyperDecks palette. To change the number of HyperDecks displayed click on the cog icon and select the number from the list. For more information refer to the 'HyperDeck control' section of this manual.

## Output Tab

Use the output tab to adjust the timecode and counter settings as well as to capture stills.



### Capture Still

If you need to capture a still image from your broadcast simply click on the 'capture still' button. This acts like a still store which lets you add capture files to the media pool. You can then immediately load a still into the media player and use it in your broadcast, or save the media pool to your computer.

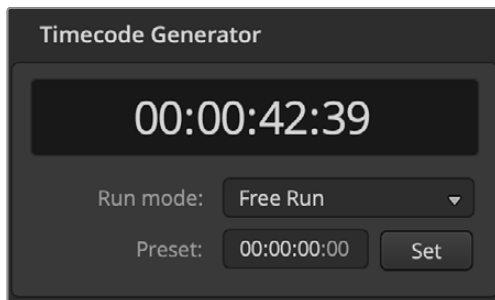
To save the media pool:

- 1 Go to the menu bar at the top of your screen and click on 'file/save as'.
- 2 Choose the location you want to save to.
- 3 Click 'save'.

Now that your media pool is saved on your computer, you can access the captured stills and use them in your graphics software.

## Timecode Generator

The timecode generator automatically runs time of day timecode from the moment you power on the Constellation switcher. However, you can reset the counter to zero, or manually enter a new timecode value to start from.



To manually set a preset timecode value:

- 1 Click in the 'run mode' menu and select 'free run'.
- 2 In the smaller timecode counter, type in a defined timecode value. As you type, the new values will appear green.
- 3 To confirm the change and set the timecode running, click 'set'.

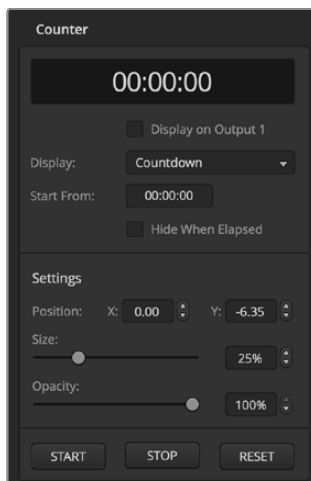
The timecode generator can be set to time of day, or free run timecode where you can set a manual preset timecode

When ATEM Constellation model switchers are connected to your computer, the unit will sync time of day timecode with your computer. The unit has a built in clock that can continue running for approximately 6 days, so once you disconnect the switcher from your computer, the time of day timecode will continue until the battery is depleted. The battery will charge while connected to your computer via USB.

You can disable the timecode for all SDI outputs using the timecode setting in the general tab of the settings menu.

## Counter

ATEM Constellation 1 M/E, 2 M/E and 4 M/E switchers feature a counter option so you can overlay a timer on output 1. This can be useful for a presenters monitor, where you can display a countdown if there is a time limit for the lecture, or a count up if there is no limit, but to monitor how long the lecture has been going.

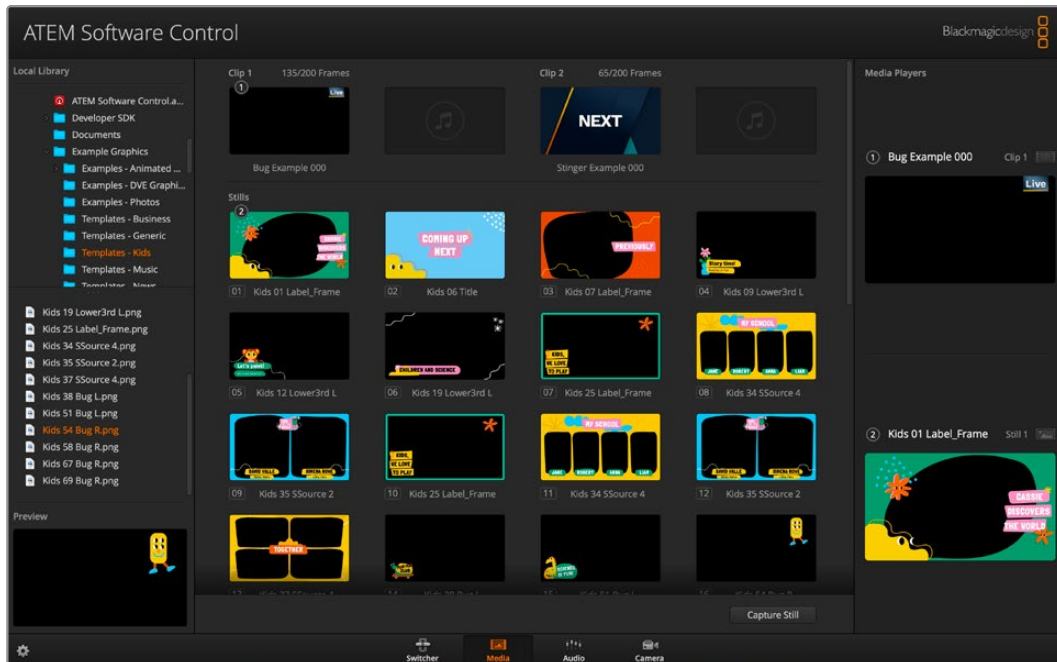


To set the counter:

- 1 Choose countdown or count up.
- 2 To set a time limit for the countdown, enter the start from time.
- 3 Using the settings, you can position the location of the counter on the overlay along with setting the size and opacity.
- 4 Once the settings are complete, you can start the counter. Make sure the counter overlay is selected by going to the outputs menu in the upper toolbar and check 'counter overlay' is selected on output 1.

## ATEM Media Pool

Press the media icon in the lower toolbar of the switcher view to open the media window. The media window on ATEM switchers is where you can add graphics such as stills and video clips to your switcher and assign them to any of your switchers media players. There are two main areas on the switcher window, the browse window on the left hand side and the media pool and media players window to the right .



Click on the media tab at the bottom of the panel to open the media pool

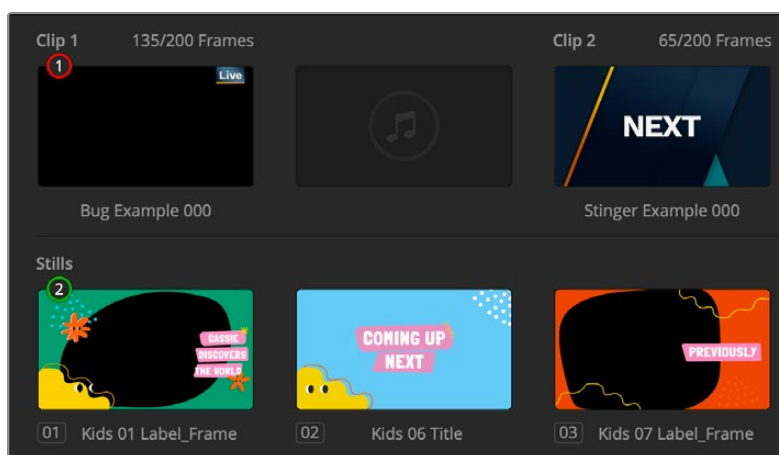
### The Browse Window

The browse window is a simplified file browser that lets you navigate your computer to look for image files. All attached drives on your computer are displayed and you can select folders from them. View sub folders by clicking on the arrows next to each folder. The Preview window in the lower left corner will show any selected files. The ATEM media pool supports PNG, TGA, BMP, GIF, JPEG and TIFF still image formats. Audio files must be WAV, MP3 or AIFF. These files can then be added to the media pool.

### The Media Pool Window

When files have been loaded into the media pool, the still and clip slots will show a thumbnail image. Clip slots will display the image from the middle of its loaded sequence. Above the clip slots you'll see information showing the number of frames in a loaded clip, plus the maximum number of frames that can be loaded for your selected video format. Stills are marked with a slot number so you can identify them when assigning a still image. The file name for each loaded still or clip is displayed underneath the slot so you can keep track of stills and clips you have loaded. The list of loaded clips and stills along with their name and number will appear in the media player palette in the switcher tab, in the media players view on ATEM hardware panels as well as in the Photoshop plug-in. On the switcher front panel, only the still name will appear unless the slot is empty.

Numbers will appear in the top left corner of the thumbnail to clearly show which slots are assigned to the relevant media players. When a media player slot is switched to the program output, the circle surrounding the number changes to red to indicate the slot is on air. When a slot is on the preview output, the color changes to green.



When using ATEM 4 M/E and Constellation 8K switchers, hold the shift button down on your keyboard to reveal the additional media player buttons on the preview and program rows of the software control panel.

## Browsing and loading files

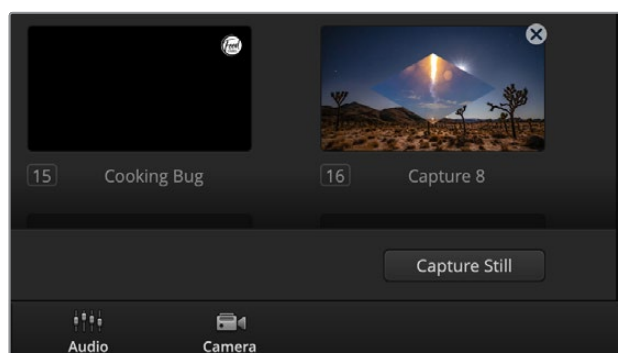
Loading a still is as easy as dragging it from the browse window and dropping it into an empty slot in the Media Pool. To load a motion clip, you'll need to load a sequence of still images. If the sequence is within a folder, click and drag the folder from the browse window and release over either of the two clip slots. If the sequence is not within its own folder, click on the first file in the sequence, scroll down and shift click on the last file in the sequence. Now the highlighted file sequence can be dragged into any of the two clip slots in the media pool. You can load audio files to accompany your clip, for example when playing a stinger transition, by dragging the audio file from the browser and dropping it into the audio slot next to the clip slot. You can identify the audio slot by its audio icon.

When dropping a still, clip or audio file into a slot, a progress indicator will show the loading status. You can drop multiple files into the media pool, even if the first images have not yet completed loading, as they will continue to load one after the other. If a clip or still is dropped into a window which already has content loaded, the existing content will be replaced.

You can change the media player assignment from the media players tab by selecting your desired clip or still from the 'media' list. Simply click on the arrow in the player 'media' list to select from a list of media pool slots.

You can also change the media assignment using the media players menu on the front panel, from an ATEM advanced panel, or even when exporting via the ATEM Switcher Media Pool option within Photoshop. For more information on using the Photoshop export plugin, see 'using Adobe Photoshop with ATEM' later in this manual.

## Capture Still



Click the capture still button to save a still from the broadcast

You can also capture a still from your broadcast using the capture still button in the lower right hand side of the media pool. Click the button and the still will populate into the next available image slot on your media pool.

## Using the Audio Mixer

The audio tab is used to mix audio sources connected to the ATEM switcher via SDI, analog audio and also from the built-in media players. On ATEM 4 M/E and Constellation 8K model switchers you can also mix the MADI audio.

Cameras, media players and external audio sources are listed along the top of the audio mixer along with the master audio output for the program outputs of the switcher.

Below each audio source is an audio level meter, a fader for setting the maximum audio level, and a knob for setting the left/right audio channel balance. The master fader on the right side of the audio mixer is used to set the gain on the audio level on the SDI program outputs and has its own audio level meter. The monitor fader and buttons appear below the master fader and set independent audio levels.

The buttons below each audio level meter determine whether audio is always available for mixing or only when the source is on air.



The audio mixer displays tally lights for any audio sources that are currently on air or when AFV is selected, as well as audio level, audio balance and buttons for selecting which audio should be used.

### Tally

Any source whose audio is on air is lit with a red tally light in the software. External audio is on air by default so the EXT tally light is usually lit red. In the example on this page, Cam4 and Cam7 are lit because their audio is set to be always on. The tally light will be illuminated dull yellow when AFV is selected and the channel's associated camera is off air. This also applies to the master fader tally light when the master fader AFV button is selected. When FTB is activated, the master fader tally light will blink red.

### Audio Level

Drag the audio level fader to set the gain on the audio level for each camera and audio source. The orange number under each audio level meter shows the maximum audio level set by the fader.

The number above the audio meter shows the peak audio level reached by the audio source. A green number represents low to medium audio levels. If the audio meter is regularly showing red, and the red number above it is not changing, then you should reduce the audio level to avoid audio distortion. After adjusting the audio level, you may wish to reset the red number by clicking on it once. Observe the new number to make sure it changes for a while and does not immediately shoot up and become stuck on a red number. If it does, you may need to reduce the audio level even further.

### Audio Balance

The audio mixer supports stereo audio from each audio source. If you wish to change the left/right audio channel balance for a camera or other audio source, adjust the knob to the desired balance point.



The audio meter for Cam1 is shown in gray to indicate that its audio will not be used as neither of its ON or AFV buttons are enabled. Cam2 has AFV selected but its audio is not currently being used as the camera is not on air as is indicated by its dull yellow tally light. Cam4 and Cam7 have their direct mix set to ON so their mixed audio is always used, and their tally lights remain lit, even if another camera is currently on air. The audio level meters for Cam3, Cam5, Cam6 and Cam8 show that no audio is present on these cameras.

### Audio Source Selection

Below each audio level meter, you will find the ON and AFV buttons that select which audio sources are sent to the program output of the switcher.

<b>ON</b>	Selecting the direct mix to ON allows an audio input to be permanently mixed into the program output, even when the associated video source is not on air. The red tally light will always be lit because the audio is always on air. Selecting this option automatically disables AFV.
<b>AFV</b>	Audio-follow-video (AFV) allows audio to crossfade when inputs change. The audio will only be sent to the program output when the input is on air, lighting the red tally light above. When off air, the tally light is lit dull yellow. Selecting this option automatically disables the direct mix ON setting.

### Master Audio Level Output

The master fader on the right side of the audio mixer is used to set the gain on the audio level on the SDI program outputs and has its own audio level meter. Select the AFV button on the master audio output fader to enable the AFV fade to black feature. This lets you fade your master audio when you click on the Fade to Black button.

## Headphones Settings



The headphones settings are used to adjust the audio mix for the headphones. A headset can be connected via the 5 pin XLR connector on the front panel for communicating with camera operators. However, the headset is not just limited to talkback use as you can also use the headset microphone for doing voice overs and you can use the headset headphones for program audio monitoring.

Headphones settings let you mix the levels of each monitoring output. For example, you may want to increase or decrease the level of the talkback audio against the program audio.

### Master

Adjust the master level slider to set the program audio level in the headset and if you don't want to listen to program audio, then slide this control fully to the left.

### Talkback

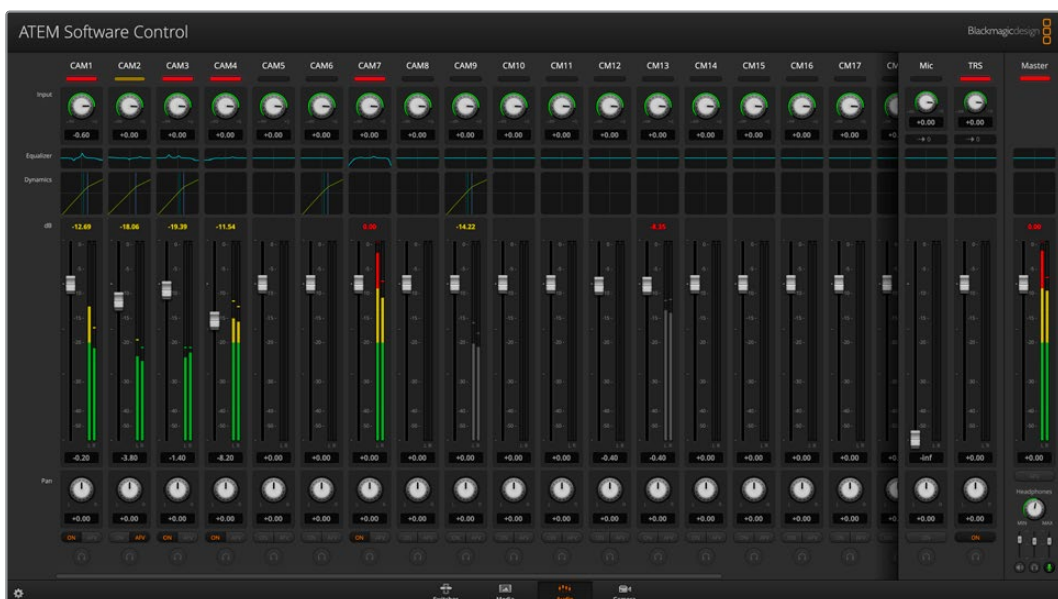
The talkback level slider sets the audio level of camera operators who are talking to you and by setting the master and talkback sliders you can get your preferred balance of talkback and program audio into your headset.

### Sidetone

The sidetone level slider lets you mix your voice from your headset mic into the monitor output. This is helpful when wearing a headset that supports noise canceling.

## Shaping your Audio Mix using Advanced Fairlight Controls

ATEM Constellation switchers have advanced Fairlight audio controls that let you enhance and refine the quality of sound on each input and master output, including input level controls, a 6 band parametric equalizer and powerful dynamics settings. This section of the manual shows the different Fairlight audio controls you can use to shape and optimize the audio mix in your live production.





## Input Level

Generally, when setting up your audio mix, the first step is to normalize all your inputs. This means adjusting the input level knob on each input so you can optimize all the levels to their highest strength without clipping.

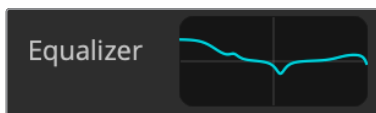
This control is at the top of each track under the tally light. Change the level by clicking on the knob and dragging left to decrease the level, or right to increase. By setting the input control, it brings all the inputs up to a common signal strength so they are all at their strongest without clipping. Then you can start making advanced changes and refinements.

After you have normalized all your input levels, you can now begin optimizing and shaping the qualities in each audio input using the 6 band parametric equalizer and dynamics controls.'

## Using the 6 Band Parametric Equalizer

Each input and the master output, has a 6 band parametric equalizer which can be used to control specific frequencies. This could include reducing low frequency hum or noise on a microphone input, or boosting the low frequencies on a thin sounding track, or even to add uniqueness to each input so they are more distinct in the final mix. You have many creative options.

### Parametric Equalizer



Click on an input's equalizer indicator to open a 6 band parametric equalizer

To open the parametric equalizer for an input or the master output, click on the corresponding equalizer indicator.

The first item you will notice is the graph along the top of the window with numbered indicators from 1 to 6. These numbered indicators are adjustable handles that correspond to bands 1 to 6.

Each band of the 6 band parametric equalizer has a column of settings. These settings will differ based on which band you are controlling and what filter type you are using.



Each audio input has its own 6 band parametric equalizer



If you want to make changes to a setting, you will first need to make sure the band is enabled. Click on a band label to enable it. When enabled, the button label is illuminated blue. Now you can change the settings for that band, or click and drag the handles to make fast adjustments.

**TIP** You can learn more about band filters later in this section.

## Handles

Each band handle is positioned along the line curve displayed in the graph. You can click and drag each handle to choose the frequency you wish to adjust for that band and the gain you want to set. When moving a handle with your mouse, both the frequency and gain settings are affected simultaneously, which gives you a fast way to make quick adjustments to each band across the entire range of frequencies.

**NOTE** To make changes using a handle, ensure the band is enabled. Simply click on the band you want to adjust. The band label will illuminate blue when enabled.

As you drag a handle left or right, you will notice the frequency and decibels update in the band settings. This will also be reflected by the frequency range preset buttons for low, medium low, medium high and high.

## Frequency Knobs

Alternatively, you can use the frequency knobs for each band to select a specific frequency to adjust.

## Range Presets

The frequency range for each band is defined by the range preset buttons. For example, low is labeled 'L' and covers the frequency range from 30 to 395 Hz.

As a quick example of how the range presets define the frequency range, select a notch filter from the band filter list and then click on each range preset. You will see the filter effect move to a position along the graph curve that corresponds to the range preset you choose. This lets you quickly define a specific range of frequencies you want the filter to affect.

Below is a table showing the range of frequencies for each range preset setting.

Range Preset	Frequency Range
Low	30 Hz to 395 Hz
Mid Low	100 Hz to 1.48 kHz
Mid High	450 Hz to 7.91 kHz
High	1.4 kHz to 21.7 kHz

## Gain Knobs

Click and drag the gain knob left or right to decrease or increase the volume level for the selected frequency.

## Q Factor

The Q factor control is available when the bell filter is applied to bands 2, 3, 4 and 5. This sets the range of frequencies the filter will affect. For example, setting the minimum will allow the filter to affect a wide range of surrounding frequencies and the maximum setting will narrow the effect down to a tiny point. This is important if you have sound qualities in surrounding frequencies that you want to either include or exclude from the change you are making.

As you adjust the Q factor, watch the shape of the effect on the line curve change from a broad, rounded edge to a sharp point. This is a visual representation showing how the regions of frequencies surrounding the target frequency are affected.

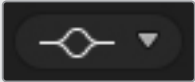

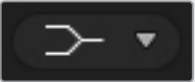



**TIP** Compare the audio with changes against the original unaltered audio by clicking on the bypass button at the very top of the equalizer window. This lets you turn the equalizer on or off.

## Band Filters

There are six different types of band filters you can choose from. These filters include bell, high shelf, low shelf, notch, high pass and low pass. These filters let you control specific zones within the frequency range. For example, a low shelf filter lets you increase or decrease the level of volume for lower frequencies on the graph, and a high shelf filter controls the higher frequencies.

Try setting a low shelf filter to band 3 and make changes to the gain setting. You will see the changes are weighted towards the low end frequencies on the graph.

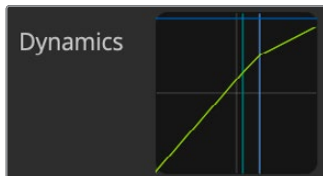
A description for each filter type is provided below.

<b>Bell</b>  <p>This filter is used to increase or decrease a range of frequencies surrounding a defined frequency.</p>	<b>High Shelf</b>  <p>Lets you increase or decrease the level of volume for higher frequencies along the graph.</p>	<b>Low Shelf</b>  <p>Lets you increase or decrease the level of volume for lower frequencies along the graph.</p>
<b>Notch</b>  <p>This filter lets you remove, or cut, a defined frequency.</p>	<b>High Pass</b>  <p>Smoothly removes extreme low end frequencies, allowing the high end frequencies to pass unaffected.</p>	<b>Low Pass</b>  <p>Smoothly removes extreme high end frequencies, allowing the low end frequencies to pass unaffected.</p>

**TIP** It's not uncommon to have filters on each band overlapping on the graph curve with adjustments working together. For example, you may have a low shelf filter applied to band 4 and a notch filter on band 5 reducing a frequency within the same range.

## Dynamics Controls

In addition to the 6 band parametric equalizer, you can also enhance and finesse the input and master output audio using dynamics controls. Where the equalizer lets you control the frequencies within a signal, dynamics controls let you set how various levels behave. Levels within the signal can be adjusted including expanding the dynamic range between low levels and high levels, gating an input so you can choose what is stronger or softer within a signal, or you can even use the compressor and limiter so that audio can be generally lifted and made stronger without clipping.



The dynamics controls can be opened for each input and the master output by clicking on its corresponding dynamics indicator

Combined with equalizer controls, these features are extremely powerful, giving you the ability to precisely shape and define the audio to generally optimize the sound of the master output.

This section describes the expander, gate, compressor and limiter controls.

### Common Dynamics Settings

The expander/gate, compressor and limiter share common settings that let you shape how each function affects the audio. For example the level at which the function initiates, how long the function is applied, the strength of the function, etc. The settings available differ depending on the dynamics control you are using.

<b>Threshold</b>	Sets the sound level at which the function activates. For example, setting the threshold for the compressor to -20dB tells your switcher to activate compression when the signal rises above -20dB. Alternatively, setting the expander to -40dB means the switcher will only initiate the expander once the signal level drops below -40dB.
<b>Range</b>	This setting defines the range of decibels affected by the function.
<b>Ratio</b>	Defines the maximum strength of the function once initiated.
<b>Attack</b>	Sets the smoothness of the function when it initiates. For example, a long attack will allow the function to fade into the signal, blending in better without drawing too much attention, whereas a short attack may be better for complex sound activity with many quick variations where a longer attack may cause artifacts.
<b>Hold</b>	Sustains the dynamics function over an adjustable period of time.
<b>Release</b>	Similar to attack but occurs at the end of the function activity. For example, lets the dynamics function ease out gradually, or fall away rapidly, once the level moves out of the threshold.

## Expander/Gate

The first set of dynamics parameters can be switched between expansion and gating.

Expansion emphasizes differences in volume by lowering the level of soft parts of the signal relative to the level of louder parts. You can use an expander to emphasize the differences between quiet and loud parts of a track, or to increase the dynamic range of a signal and minimize unwanted noise.

Gating is like an exaggerated expander, reducing the level or even silencing parts of a signal that fall below a certain level in order to reduce or eliminate noise in quiet parts of a recording. For example, a range of 15 to 20 dB can reduce breathing in a vocal track but leaves just enough to sound natural.

Gating is extremely effective, but it's also very powerful so requires careful attention. If the gate threshold is set too high it can cause artifacts, such as cutting off the start of a syllable or the quiet end of a word. You can compensate by reducing the threshold slightly, or by increasing the attack or release time.

## Compressor

Compression lets you reduce peaks in an audio signal, reducing the dynamic range of a signal, so you can boost the overall level without clipping. This is helpful when you want to make sure the loud elements in a signal don't diminish the strength of quieter sounds, or to smoothen changes in audio levels within the signal.

**TIP** It's a good idea to apply the compressor after you have set the EQ controls.

## Make Up

The make up setting lets you increase the overall signal in combination with compression settings. With loud parts of the audio reduced using compression, you can now use the make up control to boost the overall sound without clipping.

## Limiter

The limiter prevents peaks of the signal from exceeding a set maximum level. A limiter is helpful to prevent hard clipping. For example, if you set the limiter to -8 dB, the input signal will never exceed that level. Adjusting the attack, hold and release settings will set how gentle the limiter affects the signal.

## Dynamics Controls Characteristics

Control	Minimum	Default	Maximum
<b>Expander/Gate</b>			
Expander Controls*			
Threshold	-50dB	-45dB**	0dB
Range	0dB	18dB	60dB
Ratio	1.0:1	1.1:1	10:1
Attack	0.5ms	1.4ms	30ms
Hold	0.0ms	0.0ms	4s
Release	50ms	93ms	4s
Gate Controls*			
Threshold	-50dB	-45dB**	0dB
Range	0dB	18dB	60dB
Attack	0.5ms	1.4ms	30ms
Hold	0.0ms	0.0ms	4s
Release	50ms	93ms	4s
<b>Compressor</b>			
Compressor Controls			
Threshold	-50dB	-35dB	0dB
Ratio	1.0:1	2.0:1	10:1
Attack	0.7ms	1.4ms	30ms
Hold	0.0ms	0.0ms	4s
Release	50ms	93ms	4s
<b>Limiter</b>			
Limiter Controls			
Threshold	-50dB	-12dB	0dB
Attack	0.7ms	0.7ms	30ms
Hold	0.0ms	0.0ms	4s
Release	50ms	93ms	4s

\* Master Dynamics expander/gate controls are unused in Master Dynamics.

\*\* Master Dynamics expander/gate threshold default is -35dB. Mic Dynamics and XLR Dynamics expander/gate threshold default is -45dB.

## Fairlight Controls Workflow Guide

This section describes a basic workflow to help you get started using the Fairlight controls to refine and enhance your audio mix.

- 1 Generally, the first step to optimizing your mix is to normalize all the inputs so they are all at their maximum strength without clipping. This is normally done by increasing or decreasing the input gain level for each input so their signal peaks just below 0dB on the channel strip's level indicator.
- 2 If you want to split any mono inputs into two separate channels for stereo output, go to the general switcher settings and navigate to the audio tab. Enable the checkboxes for the mono inputs you want to change to stereo. Click 'done'.

**TIP** If you want to split mono inputs into two separate channels, it's best to do this before normalizing the input as described in step 1, so that you can normalize both channels after they have been split.

- 3 Now, click on the EQ indicators below input level controls and make equalization changes to each input. You can move the windows into a better position, or close them if needed.
- 4 After setting EQ, open the dynamics controls for each input by clicking on their respective dynamics indicator. Make the required dynamics changes to generally improve and refine the input audio.
- 5 With EQ and dynamics set for each input, you can now open the EQ controls for the master output and sweeten the final audio mix.
- 6 Now open the master output's dynamics controls and make any required changes to improve the final output.

Once all the Fairlight controls are set, you can then increase or decrease the faders on the audio mixer to set them at their best levels for the live mix and make adjustments where necessary during the production. You can also go back to any of the settings and make further adjustments if needed, but it's best to follow the same order as described above to get the best results from each function. For example, it's important to set EQ controls before making dynamics changes as the processing chain in your switcher applies dynamics to the audio after equalization.

Most important of all is to apply the effects carefully so your audio still sounds natural but exciting too!

# Using Camera Control

Clicking on the 'camera' button in ATEM Software Control opens the camera control feature that lets you control Blackmagic cameras including Blackmagic Studio Camera 4K Pro and URSA Broadcast G2 from your ATEM switcher. Blackmagic camera settings such as iris, gain, focus, detail and zoom control are easily adjusted using compatible lenses, plus you can color balance cameras and create unique looks using the DaVinci Resolve primary color corrector that's built into the camera.

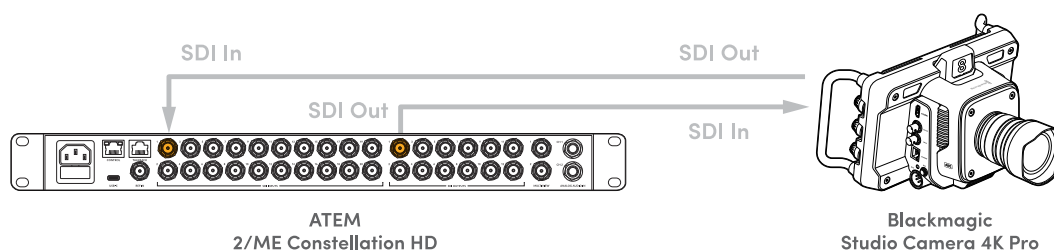
ATEM camera control works by broadcasting camera control packets via all the non down converted SDI outputs of your ATEM switcher. This means you can connect an SDI output from your switcher to your camera's SDI return input and the camera will detect the control packets in the SDI link and allow you to control features in the camera itself.



ATEM Camera Control.

To connect cameras:

- 1 Connect your Blackmagic camera's SDI output to any SDI input on your ATEM switcher.
- 2 Connect any one of your ATEM switcher's SDI outputs, except multiview outputs, to your camera's program SDI input. Camera control signals are not sent via the multiview outputs.
- 3 In your camera's settings, set the camera ID number to match your switcher input. For example, if studio camera 1 is connected to 'input 1' on your ATEM switcher, the camera number in your camera settings must also be set to 1. This ensures tally is sent to the correct camera.



## Camera Control Panel

Launch ATEM Software Control and click on the 'camera' button located at the bottom of the software window. You'll see a row of labeled Blackmagic camera controllers containing tools to adjust and refine each camera's image. The controllers are easy to use. Simply click the buttons using your mouse, or click and drag to adjust.

### Camera Control Selection

The button row at the top of the camera control page lets you select the camera number you would like to control. If you have more cameras that fit onto the window size, or you are running the color corrector window, then you can use these buttons to select between which camera you would like to control. If you are using an output for monitoring your camera control, pushing these buttons to change the camera to control will also send that camera's video output to the output setup in the switcher preferences.

### Channel Status

The channel status at the top of each camera controller displays the camera label, On Air indicator and lock button. Press the lock button to lock all the controls for a specific camera. When on air, the channel status illuminates red and displays the On Air alert.

### Camera Settings

The camera settings button near the bottom left of the master wheel lets you turn on the color bars setting on Blackmagic Studio Camera, URSA Mini and URSA Broadcast, plus adjust detail settings for each camera's picture signal.



Each camera controller displays the channel status so you know which camera is on air. Use the color wheels to adjust each YRGB channel's lift, gamma and gain settings.

### Show/Hide Color Bars

Blackmagic cameras have a color bars setting built in which you can turn on or off by selecting 'show' or 'hide' color bars. This feature can be very useful for visually identifying individual cameras while setting up for your live production. Color bars also provide an audio tone so you can easily check and set the audio levels from each camera.

### Detail

Use this setting to sharpen the image from your cameras live. Decrease or increase the level of sharpening by selecting: Detail off, low detail, medium detail and high detail.

### Color Wheel

The color wheel is a powerful feature of the DaVinci Resolve color corrector and used to make color adjustments to each YRGB channel's lift, gamma and gain settings. You can select which setting to adjust by clicking on the three selection buttons above the color wheel.

### Master Wheel

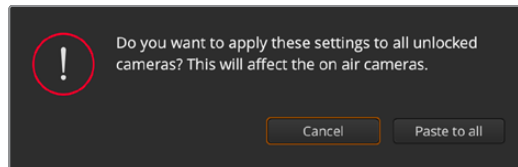
Use the master wheel below the color wheel to make contrast adjustments to all YRGB channels at once, or luminance only for each lift, gamma or gain setting.

### Reset Buttons

The reset button near the bottom right of each camera controller lets you easily choose color correction settings to reset, copy or paste. Each color wheel also has its own reset button. Press to restore a setting to its default state, or copy/paste a setting. Locked controllers are not affected by the Paste feature.



The master reset button on the bottom right corner of the color corrector panel lets you reset lift, gamma and gain color wheels plus Contrast, Hue, Saturation and Lum Mix settings. You can paste color correction settings to camera controllers individually, or all cameras at once for a unified look. Iris, focus, coarse and pedestal settings are not affected by the Paste feature. When applying Paste to all, a warning message will appear asking you to confirm your action. This is so you don't accidentally paste new settings to any unlocked cameras that are currently on air.



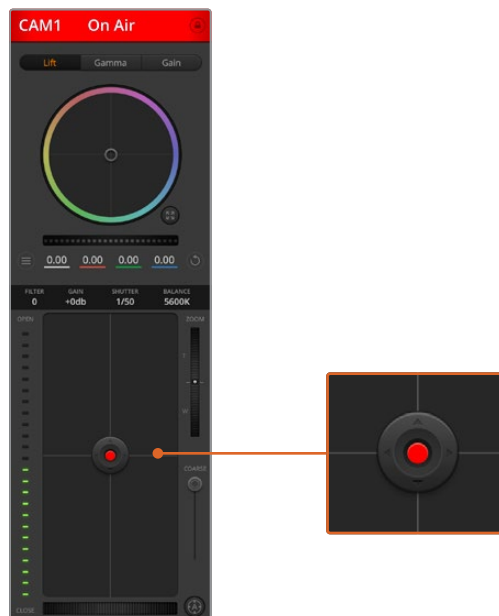
When applying 'paste to all', a warning message will appear asking you to confirm your action. This is so you don't accidentally paste new settings to any unlocked cameras that are currently on air.

## Iris/Pedestal Control

The iris/pedestal control is located within the cross hairs of each camera controller. The control illuminates red when its camera is on air.

To open or close the iris, drag the control up or down. Holding the shift key allows only iris adjustments.

To darken or lift the pedestal, drag the control left or right. Holding the command key on a Mac, or the Control key on Windows, allows only pedestal adjustments.



The iris/pedestal control illuminates red when its respective camera is on air.

## Zoom Control

When using compatible lenses with an electronic zoom feature, you can zoom your lens in and out using the Zoom control. The controller works just like the zoom rocker on a lens, with telephoto on one end and wide angle on the other. Click on the zoom control, located above the Coarse slider and drag up to zoom in, or drag down to zoom out.

## Coarse Setting

The coarse setting is located to the right of the iris/pedestal control and is used to limit the iris range. This feature helps you prevent over exposed images from going to air.

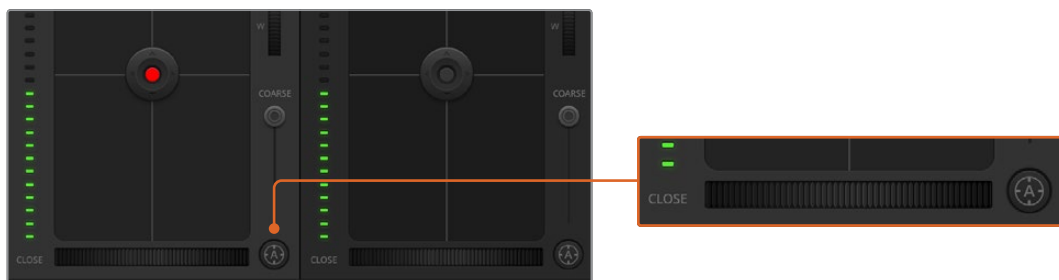
To set your coarse threshold, completely open the iris using the iris control, then drag the coarse setting up or down to set optimum exposure. Now when you adjust the iris, the coarse threshold will prevent it from going above optimum exposure.

## Iris Indicator

The iris indicator is located to the left of the iris/pedestal control and displays a visual reference so you can easily see how open or closed the lens aperture is. The iris indicator is affected by the coarse setting.

## Auto Focus Button

The auto focus button is located at the bottom right corner of each camera controller. Press to automatically set the focus when you have an active lens that supports electronic focus adjustments. It's important to know that while most lenses support electronic focus, some lenses can be set to manual or auto focus modes and so you need to ensure your lens is set to auto focus mode. Sometimes this is set by sliding the focus ring on the lens forward or backward.



Click on the auto focus button or drag the manual focus adjustment left or right to focus a compatible lens.

## Manual Focus Adjustment

When you want to adjust the focus on your camera manually, you can use the focus adjustment located at the bottom of each camera controller. Drag the wheel control left or right to manually adjust focus while viewing the video feed from the camera to ensure your image is nice and sharp.

## Filter

This setting lets you change filters on Blackmagic Design cameras that feature built in electronically controlled neutral density filters, such as Blackmagic Studio Camera 6K Pro and Blackmagic Pocket Cinema Camera 6K Pro. Together with a clear filter, these filters allow you to reduce the amount of light reaching your camera's sensor. With more control over exposure, you can be more selective with your aperture to optimize your lens's sharpness and image quality.

Select the ND filter setting by clicking the arrows to the right or left of the filter indicator.

## Camera Gain

The camera gain setting allows you to turn on additional gain in the camera. This is important when you are operating in low light conditions and need extra gain in the front end of the camera to avoid your images being under exposed. You can decrease or increase gain by clicking on the left or right arrows on the dB gain setting.

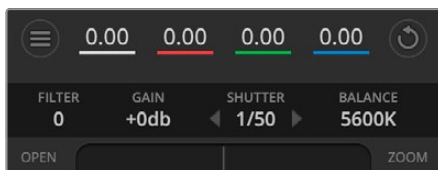
You can turn on some gain when you need it, such as outdoor shoots when the light fades at sunset and you need to increase your image brightness. It's worth noting that adding gain will increase noise in your images.

## Shutter Speed Control

The shutter speed control is located in the section between the color wheel and the iris/pedestal control. Decrease or increase the shutter speed by hovering your mouse pointer over the shutter speed indicator and then clicking on the left or right arrows.

If you see flicker in lights you can decrease your shutter speed to eliminate it. Decreasing shutter speed is a good way to brighten your images without using camera gain because you are increasing the exposure time of the image sensor. Increasing shutter speed will reduce motion blur so can be used when you want action shots to be sharp and clean with minimal motion blur.

## White Balance



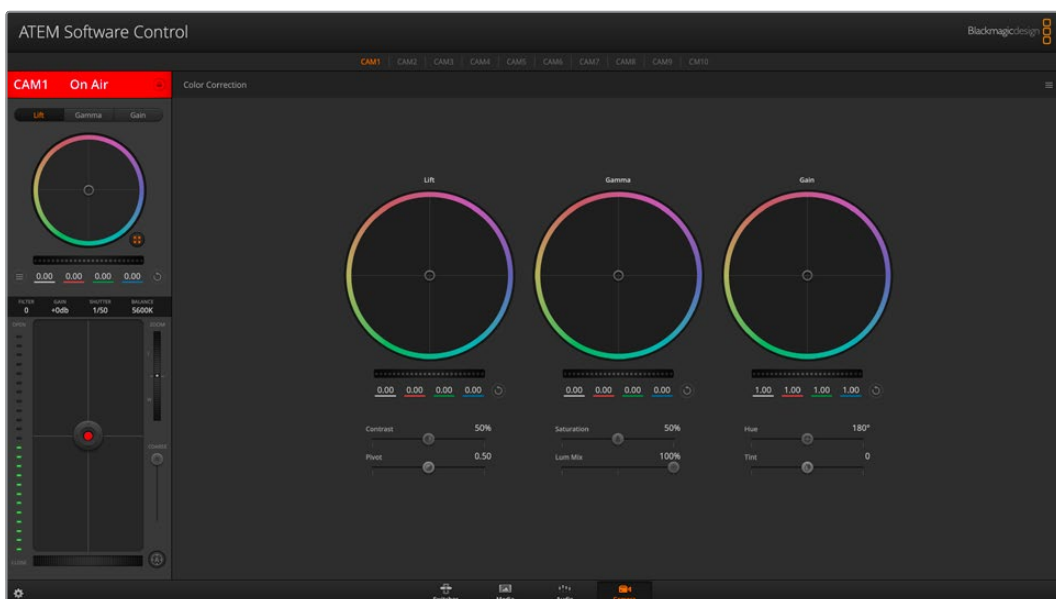
The white balance setting next to the shutter speed control can be adjusted by clicking on the left or right arrows on each side of the color temperature indicator. Different light sources emit warm or cool colors, so you can compensate by adjusting the white balance. This ensures the whites in your image stay white.

Hovering your mouse pointer over the filter, gain, shutter speed and white balance indicators reveal arrows you can click on to adjust their respective settings.

## DaVinci Resolve Primary Color Corrector

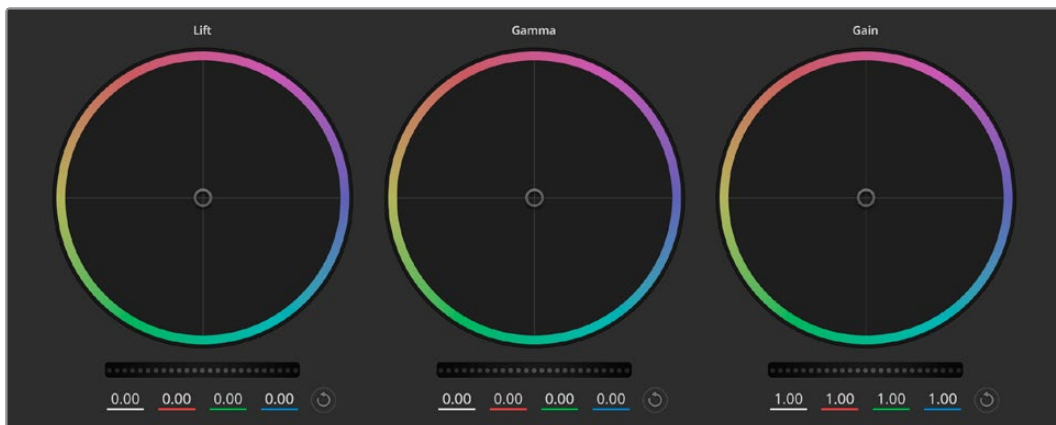
If you have a color correction background, then you can change your camera control from a switcher style CCU interface to a user interface that's more like a primary color corrector on a post production color grading system.

Blackmagic cameras feature a DaVinci Resolve primary color corrector built in. If you have used DaVinci Resolve, then creatively, grading in the Blackmagic camera will be identical so you can use your color grading experience for live production. The color corrector panel can be expanded out of any camera controller and provides expanded color correction control with extra settings and a full primary color corrector interface.



Click on the DaVinci Resolve primary color corrector button to expand the color correction window and adjust settings.

You have color wheels and settings such as saturation available and you can see shadows, mid tones and highlight settings all at the same time. Simply switch between cameras using the camera selection controls at the top of the window as you need.



Lift, gamma and gain color wheels in the color corrector panel.

## Color Wheels

### Click and drag anywhere within the color ring

Note that you don't need to drag the color balance indicator itself. As the color balance indicator moves, the RGB parameters underneath change to reflect the adjustments being made to each channel.

### Shift-Click and drag within the color ring

Jumps the color balance indicator to the absolute position of the pointer, letting you make faster and more extreme adjustments.

### Double-click within the color ring

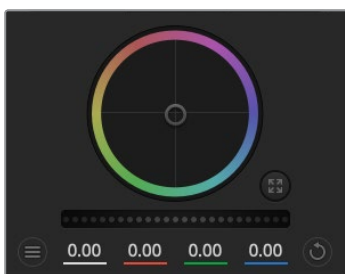
Resets the color adjustment without resetting the master wheel adjustment for that control.

### Click the reset control at the upper-right of a color ring

Resets both the color balance control and its corresponding master wheel.

## Master Wheels

Use the master wheels below the color wheels to adjust each YRGB channels' lift, gamma and gain controls.



Dragging to the left darkens the selected parameter of the image, dragging to the right lightens that parameter. As you make an adjustment, the YRGB parameters underneath change to reflect the adjustment you're making. To make a Y-only adjustment, hold down the ALT or Command key and drag left or right. Because the color corrector uses YRGB processing, you can get quite creative and create unique affects by adjusting the Y channel only. Y channel adjustments work best when the Lum Mix setting is set to

the right side to use YRGB processing vs the left side to use regular RGB processing. Normally, most DaVinci Resolve colorists use the YRGB color corrector as you get a lot more control of color balance without affecting overall gain, so you spend less time getting the look you want.

## Contrast Setting

The Contrast setting gives you control over the distance between the darkest and lightest values of an image. The effect is similar to making opposing adjustments using the lift and gain master wheels. The default setting is 50%.

## Pivot Setting

Once the contrast setting is adjusted, modifying the pivot value will adjust the midpoint of the contrast. The Pivot control establishes the contrast balance by placing more or less priority on either side of the luminance scale. By lifting the control, you will increase the overall brightness and clarity of the image, although at the inverse expense of the shadows, which will be reduced.

## Saturation Setting

The Saturation setting increases or decreases the amount of color in the image. The default setting is 50%.

## Lum Mix Setting

The color corrector built into Blackmagic cameras is based on the DaVinci Resolve primary color corrector. DaVinci has been building color correctors since the early 1980's and most Hollywood films are color graded on DaVinci Resolve than any other method.

This means that your color corrector built into the camera has some unique and creatively powerful features. The YRGB processing is one of those features.

When color grading, you can choose to use RGB processing, or YRGB processing. High end colorists use YRGB processing because you have more precise control over color and you can independently adjust the channels with better separation and more creative options.

When the Lum Mix control is set to the right side, you have the 100% output of the YRGB color corrector. When you have the Lum Mix control set to the left side, you get 100% output of the RGB corrector. You can set the Lum Mix to any position between the left and right to get a blend of output from both the RGB and YRGB correctors.

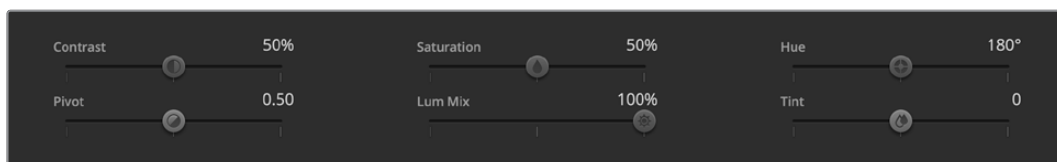
Which is the correct setting to use? That's up to you, as color correction is a pure creative process and there is no right and wrong. The best setting is what you like the most and what you think looks good!

## Hue Setting

The Hue setting rotates all hues of the image around the full perimeter of the color wheel. The default setting of 180 degrees shows the original distribution of hues. Raising or lowering this value rotates all hues forward or backward along the hue distribution as seen on a color wheel.

## Tint Setting

Adjusting the tint setting will add green or magenta to the image to help balance the color. This can assist when filming with artificial lighting sources such as fluorescent and sodium vapor lighting fixtures.



Drag the sliders left or right to adjust Contrast, Saturation, Hue and Lum Mix settings.

## Synchronizing Settings

When connected, camera control signals are sent from your ATEM switcher to the Blackmagic camera. If a setting is accidentally adjusted from your camera, camera control will automatically reset that setting to maintain synchronization.

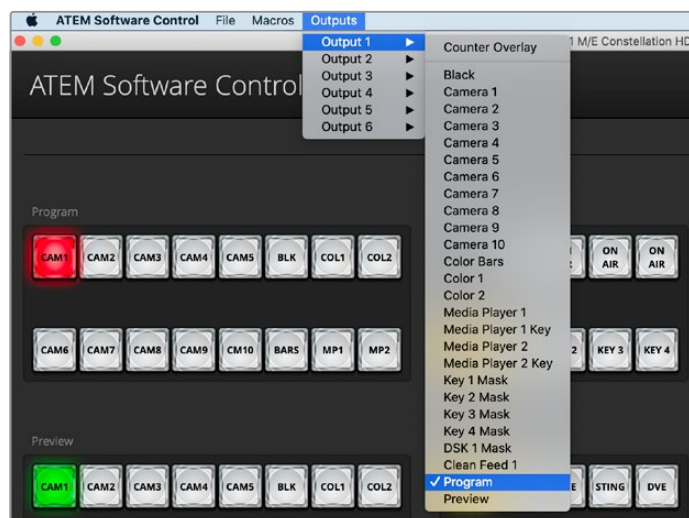
# Using Outputs

ATEM Constellation model switchers have an abundance of general purpose outputs that can have various inputs and internal sources routed to them. They are very similar to router outputs and all video inputs, color generators, media players, program, preview and even color bars can be output.

If you need an extra program output these are ideal, or if you need a clean feed before all of the down stream keys, then you can even select this to the output. This will give you a program feed without a logo or bug, so you can capture this as a broadcast master for later post production or transmission.

The outputs are extremely powerful and can be routed on the software control panel, as well as the hardware based advanced panel. The outputs menu available in the menu bar at the top of the software control panel regardless of the window currently selected so they are always available. The 'outputs' menu in the software control panel has flexible routing options for all outputs. When ATEM Constellation 8K video format is set to 4320p the 24 connectors are automatically configured as 6 quad link outputs. The switcher inputs and outputs use the two sample interleave technique, also known as 2SI. It is important to connect your quad link SDI cables in the correct order.

The switcher will always perform a clean switch when an output changes sources so this means you can use the switcher to cut between sources on the output cleanly and without glitches. If you route a source to an output that's set to follow an M/E in the bus mapping tab, it will display the selected source until the next transition, when the M/E takes control of that output again.



ATEM Software Control menus for routing outputs for ATEM Constellation

## Routing the Output using an ATEM Hardware Panel

On ATEM hardware panels, you can route the auxiliary output using the auxiliary settings in the system control menu. To do this:

- 1 Press the 'aux' button in the system control 'home' menu to open the outputs menu.
- 2 In the outputs menu, select output 1.
- 3 Press a source button on the corresponding M/E's source select row or rotate the corresponding knob to select from the complete list. Depending on the panel you are using, you may need to hold the shift button down to access your desired source.
- 4 Press the 'home' system control button to return to the home menu.

## Available Sources

There are a range of sources available, and these include:

<b>Black</b>	Black source generated internally in the switcher.
<b>Inputs</b>	These are all the sources connected to the SDI inputs. In ATEM Software Control, you will see the video inputs of the switcher listed in the outputs menu. These will be listed as the current labels you have set in the settings window of the switcher.
<b>Color Bars</b>	Color bar source generated internally in the switcher.
<b>Color</b>	Color sources internally generated by the switcher.
<b>Media Player</b>	This is the fill output of media player 1, and is derived from the still's RGB content.
<b>Media Player Key</b>	This is the key output from media player 1, and is derived from the still's alpha content.
<b>Media Player 2</b>	This is the fill output of media player 2, and is derived from the still's RGB content. ATEM 4 M/E and 8K models also have fill outputs for media player 3 and 4 in HD and Ultra HD.
<b>Media Player 2 Key</b>	This is the key output from media player 2, and is derived from the still's alpha content. ATEM 4 M/E and 8K models also have key outputs for media player 3 and 4 in HD and Ultra HD.
<b>Key Mask</b>	This is the key output from key signal when using luma, linear, chroma, pattern or DVE keyers.
<b>DSK Key</b>	This is the output derived from the downstream key.
<b>SuperSource</b>	Use SuperSource to arrange multiple sources on the monitor at one time. ATEM 2 M/E Constellation switchers have 1 SuperSource and ATEM 4 M/E Constellation switchers feature 2. ATEM Constellation 8K has two SuperSources in HD and Ultra HD and one in 8K.
<b>Clean Feed 1</b>	This is identical to the program output, however does not include any of the downstream keyer contents. It's useful when you want to record a master output without logos or bugs on the downstream keyers.
<b>Clean Feed 2</b>	<p>This is the same as above, however this output is taken from between the two down stream keyers. On ATEM 2 M/E switchers, this includes down stream keyer 1, but not down stream keyer 2's output. On ATEM 4 M/E Constellation switchers it includes down stream keyer 1 and 2, but not 3 or 4. ATEM 4 M/E Constellation 4K Plus there are an additional two clean feeds, DSK clean feed 3 that includes down stream keyer 3 but not down stream keyer 4's output and DSK clean feed 4 which includes down stream keyer 4's output.</p> <p>Routing clean feeds to outputs allows ultimate flexibility in the use of your program video. From the output you can record a version of your program free from any local broadcast branding you might have applied from the down stream keyer. This 'clean' version could then be easily used for an international broadcast. This is a very powerful feature!</p>
<b>ME Clean Feed</b>	ATEM 4 M/E Constellation 4K Plus switchers feature 2 clean feeds per mix effects. ME clean feed 1 includes the mix effects output before any upstream key. ME clean feed 2 includes the mix effects and upstream key 1 and 2 but not upstream key 3 or 4. These two clean feeds are available for every mix effects program row.

<b>Program</b>	This is the switcher program out, and is the same as the main program SDI output on the switcher. On switchers with more than 1 M/E, each M/E program output will be available.
<b>Preview</b>	This is the preview output and shows the source selected on the preview bus, and is the same as the preview window in the multiview. On ATEM switchers with more than 1 M/E, each M/E preview output will be available.

## Audio Output Channel Mapping

You can map the embedded audio channels in the video output of the switcher. This means you can route various audio sources into channels in the SDI video output so it can be recorded on HyperDeck recorders.

For example, you might want to connect a microphone to a camera and then route this specific input to embedded audio channels 3&4 on the program output. Then if you select to record 4 or more channels of audio in the HyperDeck settings, the recording will have a raw recording of the camera microphones independent of the audio mix, and any audio engineer can get to those specific audio sources when doing an audio mix in post production.

This audio routing feature allows you control over all embedded audio channels in the SDI video output and is very powerful.

Your ATEM switcher can route the program out audio channels individually using the audio menu.

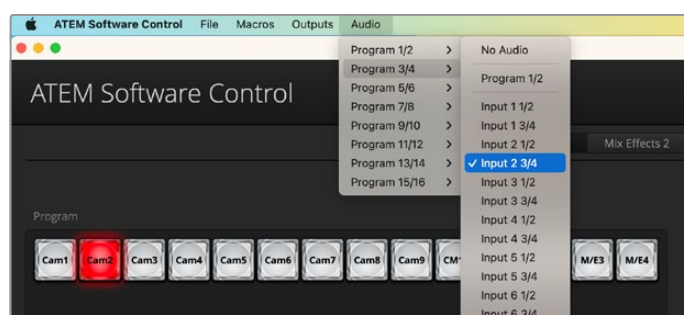


Program mix will always be assigned to channels 1 and 2, engineering talkback to 13 and 14 and production talkback to channels 15 & 16, but all other channels can be mapped separately using any of the SDI, MADI or microphone inputs.

Routing program audio using ATEM Software Control

- 1 Click on the audio menu in the upper toolbar.
- 2 Select a pair of program audio out channels and from the menu on the right hand side select the SDI input audio you want to route.

For example, to route channels 3 and 4 from SDI input 2 to channels 3 and 4 on the program out, select 'audio out 3/4' in the first list menu and 'SDI input 2 audio 3/4' from the second list.





## Using SuperSource

ATEM 2 M/E, 4 M/E and Constellation 8K switchers include a feature referred to as SuperSource that will allow you to arrange multiple sources on the monitor at one time. For example, if you are broadcasting a discussion between four presenters, you can superimpose them all over a background. The SuperSource processor appears on your ATEM switcher as a single video input. You can even select the M/E 2 program or preview output as a box source for your selected layout. On ATEM 4 M/E and Constellation 8K switchers in HD or Ultra HD mode you can also select M/E 3 and M/E 4 program or preview outputs.

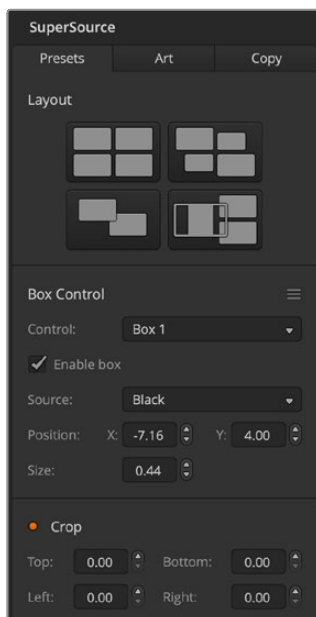
### Setting up SuperSource

You can set up SuperSource using the palettes tab in ATEM Software Control or by pressing the SuperSource button on an ATEM Advanced Panel.

### Viewing SuperSource

To set up SuperSource, first you need to be able to view it on your monitor. Do this by either assigning SuperSource to one of the SDI outputs using the outputs menu or by placing SuperSource on one of the windows of your multiview layout.

### Positioning Sources



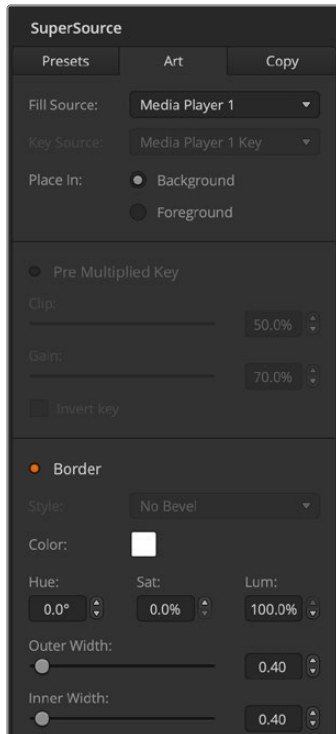
SuperSource settings

Open the SuperSource palette and choose one of the four preset layouts that is closest to the look you want. This will automatically arrange the boxes into the positions indicated in the software. Using the control menu, select which box you want to adjust. You can now change the x and y position along with the size of each box, or uncheck the 'enable box' to remove that box from the SuperSource view. The crop settings allow you to crop the sides of the boxes. Tick the crop checkbox and adjust the parameters for the top, bottom, left or right sides. To reset the position, size or crop of the box or all of the parameters, click the icon to the right of box control.

If you are using an ATEM Advanced Panel, press the button marked SuperSource and use the system control arrow buttons to navigate through the SuperSource settings. On the second page of the SuperSource menu, rotate the preset knob to pick the layout and then press the soft 'apply preset' button above the LCD. Once a box is selected, all the additional settings will apply to that box along with the joystick control.

Adjusting the size and position of the box can be done via the soft knobs below the LCD on the third menu page but it is much quicker using the panel joystick. Push the joystick around to change both the x and y position together. Twist the joystick clockwise to increase the size or counter clockwise to reduce the size of the box.

## Background and Foreground Art



Art Background controls

Click on the 'art' tab to reveal the art settings. Choose your fill source from the menu. If you are using an advanced panel, you can select the fill source using the source select bus. Place the source in the background or foreground. With foreground selected you can now select the key source from the menu or the source select bus on an advanced panel.

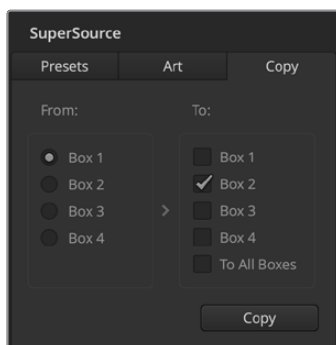
When the foreground radio button is selected, you will need to choose whether your graphic is pre multiplied or not. If it is pre multiplied then click the checkbox. This will now allow the art to be placed over the enabled boxes. If your art is not pre multiplied then you can use the clip and gain controls as discussed in the 'keying' section of this manual to achieve the desired result. You can also invert the key.

When the background radio button is selected, 2D borders can be added by checking the border radio button.

Border settings include color, hue, saturation, luminance and width settings and are applied to all boxes. It's worth noting that if you are using the 'art in foreground' mode then the borders button is disabled as any borders would not be visible. Also note that ATEM Constellation 8K presents SuperSource without borders in 8K.

On an advanced panel navigate to the 5th menu page using the system control arrow buttons or press the 5 button on the numeric keypad. Using the fill source knob select your art and then whether you want it in the foreground or background using the soft buttons above the LCD. If the fill source is pre multiplied then proceed to the following page of settings and make sure the 'pre multi key on' button is shown. This will now allow the art to be placed over the enabled box or boxes. If your art is not pre multiplied then you can use the clip and gain controls as discussed in the keying section of this manual to achieve the desired result. You may also need to invert the key.

## Copying Settings



Copying the settings of Box 1 to Box 2

To perform the copy function using ATEM Software Control, click the copy tab and the copy box settings dialogue will appear. You can quickly and easily copy the settings of the currently selected box to any of the other boxes, making an exact clone in just one click. The copied boxes will appear directly behind the master box and will also share the same source as the master.

If you are using an ATEM advanced panel, navigate to the final page of the SuperSource menu and using the soft knobs below the LCD select the box to copy from and the box you want to copy to. You can also choose to copy to all boxes using the knob.

## Putting SuperSource On Air

The entire SuperSource processor appears on your ATEM Switcher as a video input. Simply select the SuperSource on the program bus using either ATEM Software Control or an advanced panel to use the composite you have just made.

# Operating your ATEM Switcher

You can control ATEM Constellation switchers with either ATEM Software Control or an ATEM hardware panel. The following section describes how to work with your ATEM switcher using both options.

## Internal Video Sources

In addition to the SDI inputs, the switcher also has 8 internal sources that can be used in a production. The internal source names are represented on the software control panel using both long and short names. On the advanced panel, a long name is used to represent the internal sources and the labels represent what the sources are, so they are easy to understand.



### Black

Internally generated black is available as a source and can be used as a black matte in the production.



### Color Bars

Internally generated color bars are available as a source. Color bars can be useful for verifying signals going out of the switcher and can also be useful when setting up a chroma key with a vectorscope monitor.

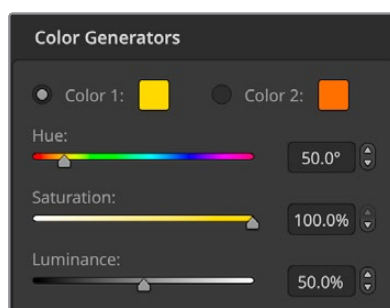


### Color Generators

ATEM switchers have two color sources that can be customized to generate any color matte for use in the production. Color sources can be used to add color borders for wipe transitions or as dip through colors for a dip transition such as dip through white.

To adjust a color source on the software control panel, simply go to the color palette and click the color chip and the color picker will appear and you can select colors. On the advanced panel, select color on the system control and adjust hue, saturation and luminance.

It's important to know that the deepest colors are set at 50% luminance.



ATEM switchers have two color sources that can be customized to generate any color matte for use in the production

## Media Players

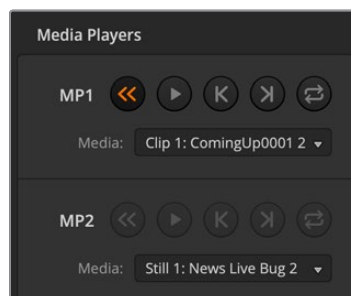
ATEM 1 M/E and 2 M/E switchers have 2 media player sources and ATEM 4 M/E Constellation switchers have 4 media players. ATEM Constellation 8K has one media player in 8K mode and four media players in HD and Ultra HD mode. Each media player source has a fill and key (cut) output. Media player fill sources are called media player 1, 2, 3 or 4. Media player key sources are called media player 1 key, media player 2 key, etc.

If you are using an ATEM 4 M/E Constellation or Constellation 8K switcher in HD or Ultra HD mode, media players 3 and 4 can be accessed in ATEM Software Control by holding down the shift button on your computer keyboard.

The media player sources are used to play stills and clips from the media pool. The fill sources show the color channels of the selected clip or still while the key sources show the black and white alpha channel of the selected clip or still. Media players can be used in many parts of the production.

Controlling media players on the software control panel:

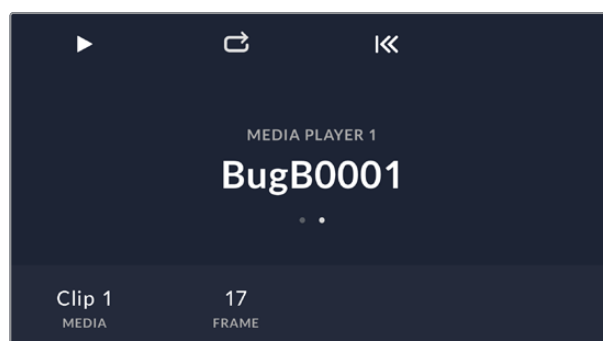
- 1 From the switcher window, select the media player palette.
- 2 Use the select media drop down list to select a clip or still from the media pool.
- 3 If you have selected a motion clip, the begin, step back, play/pause, step forward and loop transport controls will be enabled for controlling the clip. If you want to loop a clip, then select the loop button and press play. The media player will keep looping until selected to stop.



Media players showing a clip loaded into each on ATEM software control

Controlling media players on ATEM advanced panel:

- 1 From the system control menu buttons, navigate to the media player menu by pressing the 'media players' button.
- 2 Select the media player you want to control from the soft buttons above the LCD.
- 3 Use the control knob to select the clip or still from the media pool.
- 4 If you have selected a motion clip, press the right arrow button twice. The play/stop, loop, step back and frame controls will be enabled for controlling the clip.



## Performing Transitions

One of the primary functions of a broadcast switcher is performing transitions from one video source to another. The combinations of transition effects and styles provide endless creative options that can enhance your production in just the right way for the right moment.

You can perform transitions using ATEM Software Control or an ATEM Advanced Panel. This section shows you how to perform the various transitions available on your switcher.

### Cut Transitions

The cut is the most basic transition that can be performed on the switcher. In a cut transition the program output is immediately changed from one source to another.



Program output for a cut transition.

A cut transition can be performed directly from the program bus, or using the CUT button in the transition control block.

### Program Bus

When a cut transition is performed from the program bus, only the background will be changed and all upstream and downstream keys will maintain their current state.

To perform a cut transition from the program bus on the software control panel:

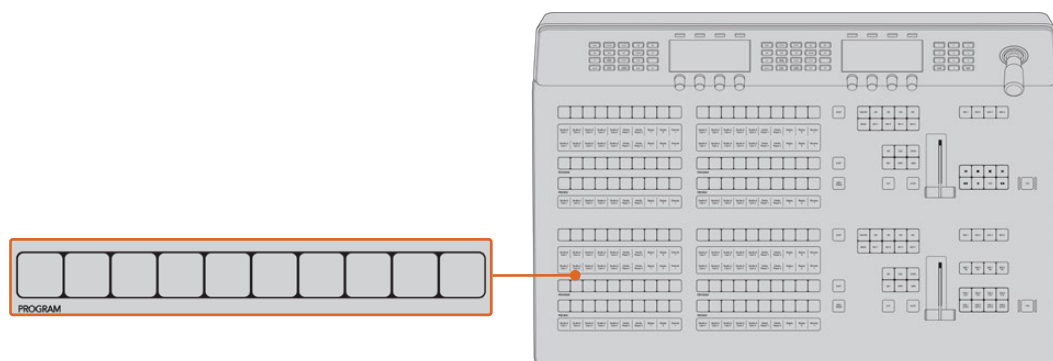
On the program bus, select the video source that you want on the program output next. The program output will immediately change to the new source.

To perform a cut transition on the software control panel using a keyboard:

- 1 Enable <caps lock> or press and hold the <shift> key.
- 2 Press the number key on the keyboard corresponding to the video source that you want on the program output. The program output will immediately change to the new source.

To perform a cut transition from the program bus on an ATEM advanced panel:

On the program bus, select the video source that you want on the program output. The program output will immediately change to the new source.



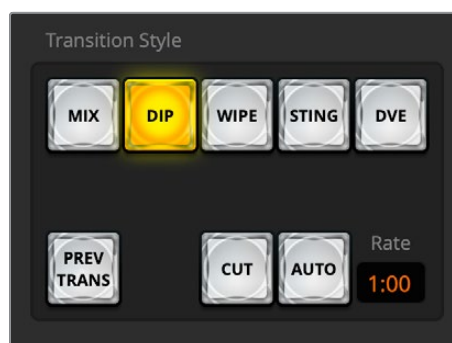
Press any of the source buttons on the program row to perform a cut transition from the program bus

## Cut Button

When a cut transition is performed using the CUT button, any upstream keys that were selected in the next transition and any downstream keys that were tied to the transition control will also change state. For example, a downstream key tied to the transition control will cut ON if off air, or cut OFF if on air. Similarly, any upstream keys selected in the next transition will be cut on if they were off air, or cut off if they were on air.

To perform a cut transition using the CUT button on the software control panel:

- 1 On the preview bus, select the video source that you want on the program output. The program output will remain unchanged.
- 2 In the transition control block, press the CUT button. The sources selected on the program and preview buses are exchanged to indicate that the video source that was on preview is now on program and vice versa.



The Cut transition button is part of the Transitions Style group

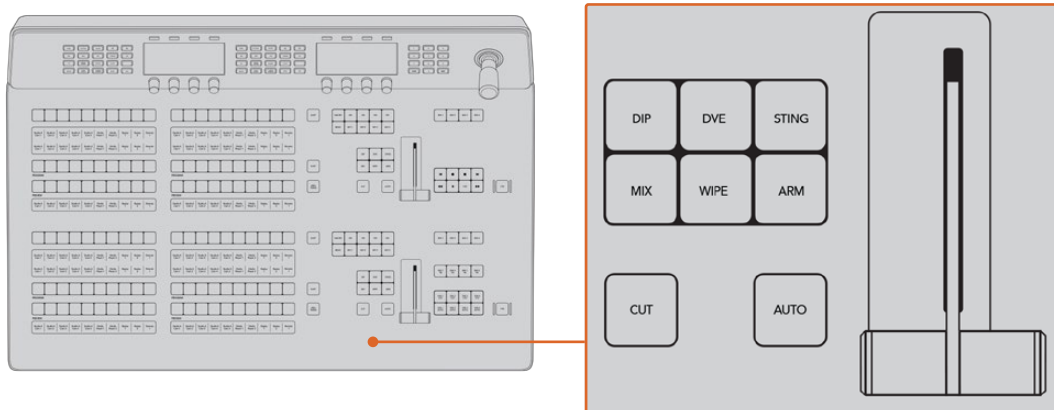
To perform a cut transition on the software control panel using a keyboard:

- 1 Ensure that <caps lock> is off.
- 2 Press the number key on the keyboard corresponding to the video source that you want on the program output. The source will be selected on preview and the program output will remain unchanged.
- 3 Press <spacebar>. The sources selected on the program and preview buses are exchanged to indicate that the video source that was on preview is now on program and vice versa.

To perform a cut transition using the CUT button on an ATEM advanced panel:

- 1 On the preview bus, select the video source that you want on the program output. The program output will remain unchanged.
- 2 In the transition control block, press the CUT button. The sources selected on the program and preview buses are exchanged to indicate that the video source that was on preview is now on program and vice versa.

It's recommended to use the transition control block to perform transitions because it provides the opportunity to verify the video content on the preview output before sending it to the program output, for example to verify that a camera is in focus.



## Auto Transitions

An auto transition allows you to automatically transition between program and preview sources at a predetermined rate. Any upstream keys that were selected in the next transition and any downstream keys that were tied to the transition control will also change state. Auto transitions are performed using the auto button in the transition control block. Mix, dip, wipe, DVE and stinger transitions can all be performed as an AUTO transition.



The Auto transition button is part of the Transitions Style group

To perform an auto transition on the software control panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the transition type using the transition style buttons in the transition control block.
- 3 In the transition palette, select the settings tab for the same transition type as the transition control block.
- 4 Set the transition rate and adjust any other parameter for the transition as needed.

- 5 Press the AUTO button in the transition control block to initiate the transition.
- 6 During the transition, the red and green buttons on the program and preview buses both turn red to indicate that you are in the middle of a transition. The virtual fader bar automatically follows the progress of the transition and the rate display updates to indicate the number of frames remaining as the transition progresses.
- 7 At the end of the transition, sources selected on the program and preview buses are exchanged to indicate that the video source that was on preview is now on program and vice versa.

To perform an auto transition on the software control panel using a keyboard:

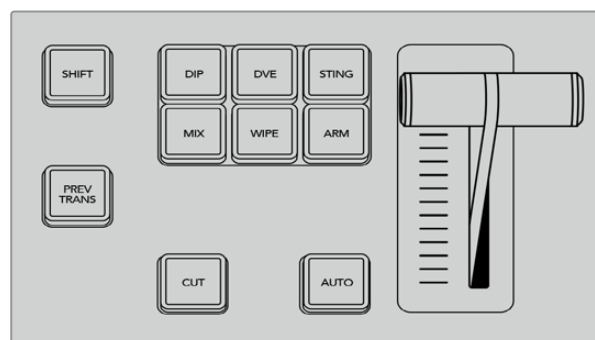
- 1 Ensure that <caps lock> is off.
- 2 Press the number key on the keyboard corresponding to the video source that you want on the program output. The source will be selected on preview and the program output will remain unchanged.
- 3 Select the transition type using the transition style buttons in the transition control block.
- 4 In the transition palette, select the settings tab for the same transition type as the transition control block.
- 5 Set the transition rate and adjust any other parameter for the transition as needed.
- 6 Press the <return> or <enter> key to initiate the transition.

During the transition, the red and green buttons on the program and preview buses both turn red to indicate that you are in the middle of a transition. The virtual fader bar automatically follows the progress of the transition and the rate display updates to indicate the number of frames remaining as the transition progresses.

At the end of the transition, sources selected on the program and preview buses are exchanged to indicate that the video source that was on preview is now on program and vice versa.

To perform an auto transition on an ATEM advanced panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the transition type using the transition type buttons in the transition control block.
- 3 In the system control, set the transition rate and adjust any other parameter for the transition as needed.
- 4 Press the AUTO button in the transition control block to initiate the transition.



Transition types, for example dip, mix and wipe, have their own independent selection button



During the transition, the red and green buttons on the program and preview buses both turn red to indicate that you are in the middle of a transition. The fader bar indicator displays the position and progress of the transition and the transition rate display updates to indicate the number of frames remaining as the transition progresses.

At the end of the transition, sources selected on the program and preview buses are exchanged to indicate that the video source that was on preview is now on program and vice versa.

Each transition type has its own independent transition rate allowing the operator to perform faster transitions by simply selecting the transition type and pressing the AUTO button. The previously used transition rate is remembered for that transition type until it is changed.

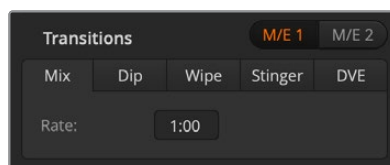
A production switcher provides multiple methods of transitioning from one shot to another. Generally, you use a simple cut transition to move from one background source to another. Mix, dip, wipe and DVE transitions allow you to transition between two background sources by gradually phasing out one and phasing in another. Stinger and Graphic Wipe are special transitions which will be covered in a later section. Mix, dip, wipe and DVE transitions are performed as an auto transition or manual transition using the transition control block.

## Mix Transitions

A mix is a gradual transition from one source to another and is achieved by interpolating gradually between two sources, effectively overlapping the sources for the duration of the effect. The length of the transition or length of the overlap can be adjusted by changing the mix rate.



Program output for a mix transition.



Mix Transition rate setting

To perform a mix transition on the software control panel:

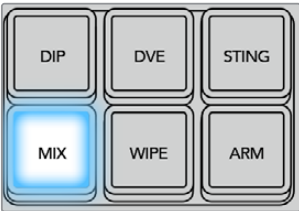
- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the mix transition style in the transition control block.
- 3 Expand the transition palette and select mix from the transition types bar.
- 4 Adjust the mix rate by entering a number in the rate window. The rate display in the transition control block will update.
- 5 Perform the transition as an auto transition or manual transition from the transition control block.

To perform a mix transition on an ATEM advanced panel:


- 1 On the preview bus, select the video source that you want on the program output.
- 2 Press the DIP/MIX or MIX button to select the mix transition type. The system control automatically navigates to the transition menu.
- 3 Using the LCD panel, use the soft control knob to adjust the mix rate. The transition rate display in the advanced panel's transition control block will update dynamically. You can also enter a rate duration using the number pad.
- 4 Perform the transition as an auto transition or manual transition from the transition control block.

## Mix Transition Parameters

<b>Rate</b>	The mix transition rate in seconds : frames.
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Press the 'mix' button and set the transition rate using the LCD menu and control knob

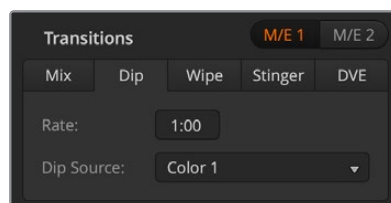


## Dip Transitions

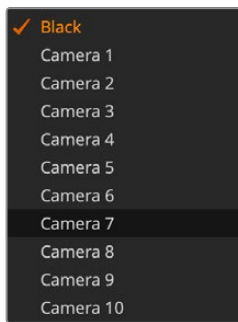
A DIP is similar to a mix in that it is a gradual transition that transitions from one source to another. However, a dip transition gradually mixes through a third source, the dip source. For example, the dip transition can be used for a transition that calls for a white flash or a transition that quickly flashes the sponsor logo. The length of the dip transition and the dip source can both be customized.



Program output for a dip transition.



Dip Transition Settings



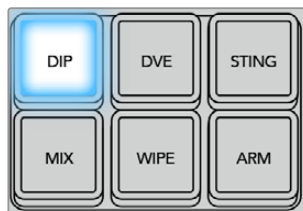
Dip Source Menu

To perform a dip transition on the software control panel:

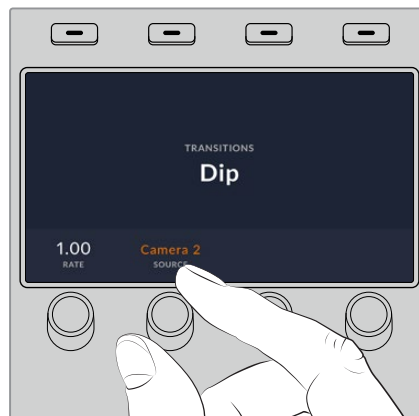
- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the DIP transition style in the transition control block.
- 3 Expand the transition palette and select dip from the transition types bar.
- 4 Adjust the dip rate by entering a number in the rate window. The rate display in the transition control block will update.
- 5 Select the dip source.
- 6 Perform the transition as an auto transition or manual transition from the transition control block.

To perform a dip transition on an ATEM advanced panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Press the DIP button to select the dip transition type. The LCD menu will automatically display the transition settings.
- 3 Under the LCD use the control knob to adjust the dip rate. You can also enter a rate duration using the number pad.
- 4 Use the corresponding control knob to select the dip source. You can also use the select bus to select a dip source.
- 5 Perform the transition as an auto transition or manual transition from the transition control block.



Press the 'dip' button in the transition control block, then set the dip source and transition rate using the LCD menu and control knobs

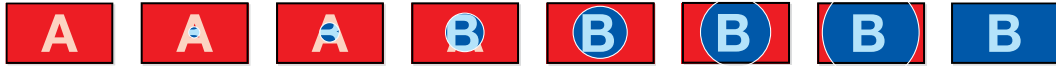


## Dip Transition Parameters

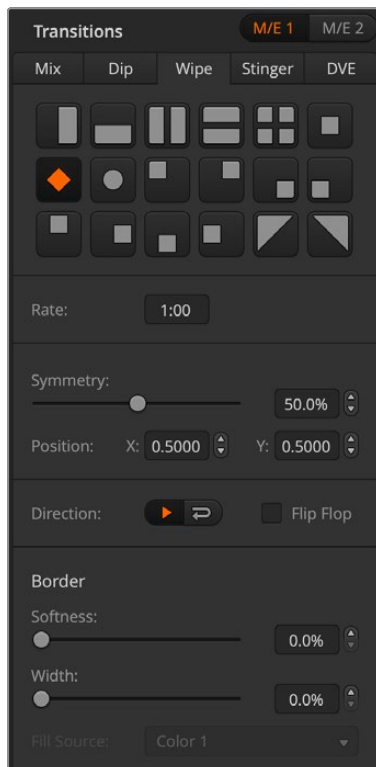
<b>Rate</b>	The dip transition rate in seconds and frames.
<b>Dip Source</b>	The dip source is any video signal in the switcher that will be used as the intermediate picture for the dip transition, usually a color generator or media player.

## Wipe Transitions

A wipe is a transition from one source to another and is achieved by replacing the current source by another source with a pattern that forms a shape. For example an expanding circle or diamond.



Program output for a wipe transition.



Wipe Transition Settings

To perform a wipe transition on the software control panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the WIPE transition style in the transition control block.
- 3 Expand the transition palette and select wipe from the transition types bar.
- 4 Use the settings in the wipe palette to customize the wipe transition.
- 5 Perform the transition as an auto transition or manual transition from the transition control block.

To perform a wipe transition on an ATEM advanced panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Press the WIPE button to select the wipe transition type. The LCD menu will automatically display the transition settings.
- 3 Use the system control knob to select the wipe pattern and rate. The buttons can be used to select the wipe direction.
- 4 Use the arrow buttons to the left of the LCD button to navigate all the available wipe properties including position, symmetry and border source.
- 5 Perform the transition as an auto transition or manual transition from the transition control block.

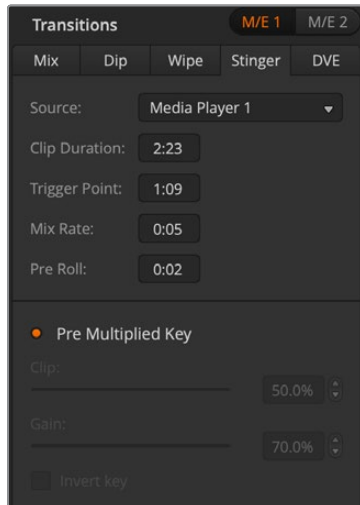
## Wipe Transition Parameters

<b>Rate</b>	The length of the wipe transition in seconds and frames.
<b>Symmetry</b>	Symmetry can be used to control the aspect ratio of the pattern.  For example, adjusting the symmetry will allow you to change a circle into an ellipse. On the advanced panel symmetry can be adjusted using the z axis of the joystick or via the control knob.
<b>Position</b>	If the wipe pattern has positioning then the joystick or control knobs on the advanced panel or the x position: and y position: boxes in the transition palette of the software control panel can be used to move the center of the pattern. Moving the joystick dynamically updates the x and y position display in the software control panel.
<b>Reverse Direction</b>	Reverse changes the progression of closed patterns such as circles, diamonds and boxes so that the pattern closes in from the edges of the screen toward the center. The text will illuminate orange when selected.
<b>Flip Flop</b>	When flip flop mode is toggled on, the transition changes between normal to reverse every time the transition is executed. The text will illuminate orange when selected.
<b>Border Softness</b>	The edges of the wipe pattern can be adjusted between sharp and fuzzy by adjusting the softness parameter.
<b>Border</b>	Width of the border.
<b>Border Fill Source</b>	The border source used in a wipe transition can be any source in the switcher. For example, a thick border with the media player as its source can be used for sponsorship or branding.

## Stinger Transitions

The stinger transition uses a clip from the media player to perform a transition. The clip is normally a graphic animation that is keyed over the background. As the animation plays, when it is full screen, a cut or mix of the background is performed under the animation. For example, this type of transition is very popular in sports productions for transitioning in and out of instant replays. The stinger transition takes advantage of a special keyer that is built into the transition block, leaving all of the upstream and downstream keyers available for compositing your output. The following section explains how to build and perform stinger transitions.

## Performing a Stinger Transition



Stinger Transition Settings

To perform a stinger transition on the software control panel:

- 1 Select the STING transition style button in the transition control block.
- 2 If the transition is on the PGM M/E, the corresponding transition tab will appear in the transition palette. For ME 2, ME 3 or ME 4, select the stinger transition tab.
- 3 From the source menu select the media player for the transition. Make sure the media player source has the clip you plan to use.
- 4 Adjust the clip duration, trigger point, mix rate and pre roll parameters if required.
- 5 Perform the transition as an auto transition from the transition control block.

You cannot perform a manual stinger transition using the fader bar.

To perform a stinger transition on an ATEM advanced panel:

- 1 Press the 'sting' transition type button in transition control block.
- 2 Rotate the LCD menu soft control knob labeled 'source' to select the desired media player. Use the arrow buttons to reveal the additional settings to adjust the preroll, trigger, mix and duration times as needed.
- 3 Now that you have set the stinger transition to use the correct media player, press the 'media players' button in the system control menu buttons next to the LCD to configure the media player.
- 4 In the media players menu, select the still or clip you want to use from the media pool by rotating the 'media' soft control knob. If required, set which frame you want to start the clip from using the corresponding 'frame' soft control knob.

**NOTE** You can also use a HyperDeck as a source for the stinger if you have a HyperDeck connected to your switcher and configured correctly. Refer to the 'HyperDeck control' section of the manual for more information.

- 5 Perform the transition as an auto transition from the transition control block.

## Stinger Transition Parameters

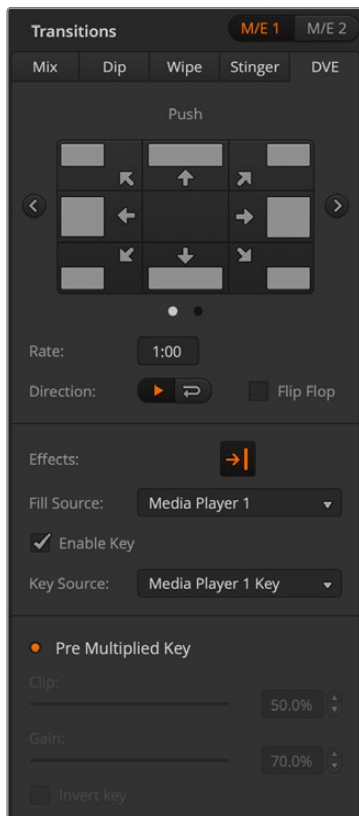
<b>Source</b>	The media player which will be used to play the clip for the animated transition.
<b>Clip Duration</b>	Clip duration refers to the length of the animation. The duration should normally match the length of the animation. It can also be used to trim out the end of the clip.
<b>Trigger Point</b>	Trigger point is the time at which the switcher will start the background mix transition, which will occur under the animation. Usually, this is the point when the animation is full screen.
<b>Mix Rate</b>	The mix rate specifies the duration of the mix that will occur between preview and program under the animation. To specify a cut instead of a mix simply set the rate to 1 frame.
<b>Pre Roll</b>	Pre roll is a trim in that can be used to trim the beginning of the clip. The maximum preroll time is 3:00 seconds.
<b>Pre Multiplied Key</b>	Identifies the key signal of the media player clip as a pre-multiplied key.
<b>Clip</b>	The clip level adjusts the threshold at which the key cuts its hole into the clip that is playing back through the media player. Decreasing the clip level reveals more of the background. If the background video is completely black then the clip value is too low.
<b>Gain</b>	The gain adjustment electronically modifies the value which allows the softening of the edges of the key in the clip that is playing back on the media player. Adjust the gain value until the edge softness is desirable but the background video luminance (brightness) is not affected.
<b>Invert Key</b>	Inverts the key.

It is important to understand that the trigger, mix and duration times are dependent on one another. For example the trigger + mix rate cannot be larger than the overall duration. Note also that the time displayed in the transition rate window is equal to the overall duration + preroll.

## DVE Transitions

Your switcher includes a powerful digital video effects processor for DVE transitions. A DVE transition displaces the image in various ways to transition from one picture to another. For example, a DVE transition can be used to squeeze the current picture off screen revealing a new video under it.

<b>Model</b>	<b>DVE Channels</b>
ATEM Constellation 8K	4
ATEM 4 M/E Constellation 4K Plus	4
ATEM 4 M/E Constellation 4K	4
ATEM 2 M/E Constellation 4K	2
ATEM 1 M/E Constellation 4K	1
ATEM 4 M/E Constellation HD	4
ATEM 2 M/E Constellation HD	2
ATEM 1 M/E Constellation HD	1



DVE Transition Settings

To perform a DVE transition on the software control panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the DVE transition style in the transition control block.
- 3 Expand the transition palette and select DVE from the transition types bar.

If the DVE is being used in an upstream key, the DVE transition style button will be unavailable for selection until the key is taken off air and off next transition. Refer to sharing DVE resources below for more information.

Use the settings in the DVE palette to customize the transition.

- 4 Perform the transition as an auto transition or manual transition from the transition control block.

To perform a DVE transition on an ATEM advanced panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Press the DVE transition type button to select the DVE transition. The DVE settings will appear on the LCD menu.

**NOTE** If the DVE is already being used in an upstream key, the DVE transition type will not be available for selection until the key is taken off air and off next transition. Refer to 'sharing DVE resources' later in this section for more information.

- 3 In the DVE LCD menu, use the soft control knobs and buttons to configure the DVE parameters. For example, select the DVE pattern, movement, direction and adjust the DVE transition rate. Use the 'left' and 'right' arrow buttons to the side of the LCD to navigate to the additional settings.
- 4 Perform the transition as an auto or manual transition using the auto button or fader bar.



## DVE Transition Parameters

<b>Pattern</b>	Select between push and squeeze for the DVE pattern
<b>Movement</b>	Movement lets you set the direction for the pattern transition.
<b>DVE Rate</b>	The duration of the DVE transition in seconds and frames. On ATEM advanced panels rotate the DVE rate knob to adjust the DVE transition rate. The new rate is immediately displayed in the transition rate window in the transition control block.
<b>Direction</b>	The normal direction applies the DVE effect on program, revealing the preview channel.
<b>Reverse Direction</b>	Reverse changes the direction so that the DVE effect is applied on the preview channel. In the case of reverse, program is covered by a DVE effect with the preview video.
<b>Flip Flop</b>	When flip flop mode is toggled on, the transition changes between normal and reverse every time the transition is executed.

## DVE key parameters

<b>Enable key</b>	Enables/disables the DVE key. The DVE key is enabled when the button is illuminated.
<b>PreMult</b>	Selects the DVE key as a pre-multiplied key.
<b>Clip</b>	The clip level adjusts the threshold at which the key cuts its hole. Decreasing the clip level reveals more of the background. If the background video is completely black then the clip value is too low.
<b>Gain</b>	The gain adjustment electronically modifies the angle between on and off thereby softening the edges of the key. Adjust the gain value until the edge softness is desirable but the background video luminance (brightness) is not affected.
<b>Invert Key</b>	When the key is not pre-multiplied, inverts the key signal.

## Sharing DVE resources

ATEM features DVE channels which can be used to perform DVE transitions or used in an upstream keyer. When you select a DVE transition, if the DVE is used elsewhere in the system, the DVE transition type will not be available and, on the advanced panel the DVE button will be disabled. In order to use the DVE transition you must free the DVE from where it is currently used. Verify that the upstream keys currently on program or preview are not DVE keys and do not have flying key enabled. To free DVE from the upstream keyer, change the key type to anything other than DVE or disable flying key. The DVE will be released and therefore available for use as a DVE transition.

The graphic transition is a popular transition that uses the DVE and moves a graphic across the screen over a background transition. For example, the graphic wipe moves a graphic over a horizontal wipe, essentially replacing the wipe border. A graphic mix spins the graphic across the screen over a mix transition. Graphic transitions are perfect for wiping the station logo or spinning a football across the screen revealing a new background. Graphic transitions use a special keyer built into the transition block, leaving all of the upstream and downstream keyers available for compositing the output. The following section explains how to build and perform graphic transitions.



The above image sequence provides an example of the program output for a graphic wipe transition.

## Performing a Graphic Transition

To perform a graphic transition on the software control panel:

- 1 Select the DVE transition style button in the transition control block.  
If the DVE is being used in an upstream key, the DVE transition style button will be unavailable for selection until the key is taken off air and off next transition. Refer to sharing DVE resources in the next section for more information.
- 2 Expand the transition palette and select the DVE transition type. Use the previous or next arrows to select a different DVE type.
- 3 From the effects options select the graphic wipe transition.
- 4 Select the fill source and key source for the graphic from the drop down list.
- 5 Adjust the key parameters if required.
- 6 Perform the transition as an auto transition or manual transition from the transition control block.

To perform a graphic transition on an ATEM advanced panel:

- 1 Press the DVE transition type button in the transition control block. The DVE settings menu will appear on the LCD.

If the DVE is already being used in an upstream key, the DVE transition type will not be available for selection until the key is taken off air and off next transition. Refer to 'sharing DVE resources' later in this section for more information.

- 2 Press the 'effect' soft button in the LCD menu to open the effect settings.

The default direction is left to right, but you can change the direction by selecting 'reverse direction'. You can also enable 'flip flop' which will let the effect move forwards and backwards with each performance of the transition, rather than repeating the same movement direction.



- 3 Press the right arrow in the system control buttons to adjust the key settings. Enable the key and select the fill and key source. If you need to make adjustments to the key, for example adjusting clip and gain settings, press the right arrow in the system control buttons to access the key parameters.

**TIP** Typically, for a graphic transition, the source would normally be a graphic loaded in a media player. By default, when you select a media player for the fill source, the key source will automatically select the media player key channel and set pre multiplied key to 'on'. This means a graphic with a key matte embedded in the alpha channel will automatically be selected by the switcher. You can disable pre multiplied key and change the key source if you want to use a separate media file on a different media player, or a different input source.

- 4 Press the auto button to perform the transition as an auto transition, or use the fader bar for a manual transition.

## Description of Graphic Wipe Parameters

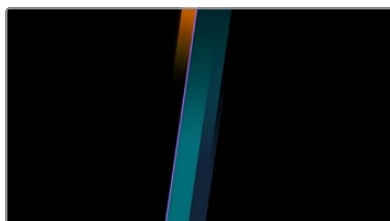
<b>Rate</b>	Rate specifies the length of the transition in seconds and frames. The rate can be adjusted using the rate knob or by entering a number on the number pad and pressing the set rate button.
<b>Normal</b>	The normal direction moves the graphic from left to right. On ATEM advanced panels, normal is indicated by a white 'reverse direction' setting.
<b>Reverse Direction</b>	Reverse changes the direction so that it moves the graphic from right to left. On ATEM advanced panels, reverse direction will be orange to indicate it is enabled.
<b>Flip Flop</b>	When flip flop mode is toggled on, the transition changes between normal and reverse every time the transition is executed. The 'Normal' or 'Reverse' light indicates the direction of the next transition.
<b>Fill Source</b>	The fill signal is the graphic used to move across the top of the transition.
<b>Key Source</b>	The key signal is a grayscale image that defines the region in the graphic that will be removed so that the fill signal can be correctly stacked on top of the wipe.

## Sharing DVE resources

The DVE channels available in the switcher can be used to perform DVE transitions or it can be used in an upstream keyer. When you select a DVE transition, if the DVE is used elsewhere in the system, the DVE transition type will not be available to select on the advanced panel or software control. In order to use the graphic wipe transition you must free the DVE from where it is currently used. Verify that the upstream keys currently on program or preview are not DVE keys and do not have flying key enabled. To free DVE from the upstream keyer, change the key type to anything other than DVE or disable flying key. The DVE will be released and therefore available for use as a graphic wipe.

## Graphic wipe images

The graphic wipe feature requires a static graphic that is used as a moving border for a horizontal wipe. This graphic should be a vertical 'banner' type graphic that is no more than 16% of the total screen width.



## Graphic Wipe Screen Width Requirements

<b>4320p</b>	If ATEM Constellation 8K switcher is operating at 4320p then the graphic should be no wider than 460 pixels.
<b>2160p</b>	If ATEM Constellation models are operating at 2160p then the graphic should be no wider than 230 pixels.
<b>1080i</b>	If the switcher is operating at 1080i then the graphic should be no wider than 116 pixels.
<b>720p</b>	If the switcher is operating at 720p then the graphic should be no wider than 77 pixels.

## Manual Transitions

Manual transitions let you manually transition between program and preview sources using the fader bar in the transition control block. Mix, dip, wipe and DVE transitions can all be performed as a manual transition.

To perform a manual transition on the software control panel or ATEM advanced panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the transition type using the transition type buttons in the transition control block.
- 3 Manually move the fader bar from one end to the other to execute the transition. The next fader bar move will begin a new transition.
- 4 During the transition the red and green buttons on the program and preview buses both turn red to indicate that you are in the middle of a transition. On the advanced panel, the fader bar indicator also displays the position and progress of the transition. On the software control panel, the virtual fader bar displays the position and progress of the transition.
- 5 At the end of the transition sources selected on the program and preview buses are exchanged to indicate that the video source that was on preview is now on program and vice versa.

## Preview Transition

ATEM switchers have a powerful feature which allows you to review and adjust a transition on the preview output. The preview transition mode lets you verify a transition before actually performing it on air.

To preview a transition on the software control panel or ATEM advanced panel:

- 1 On the preview bus, select the video source that you want on the program output.
- 2 Select the transition type using the transition type buttons in the transition control block.
- 3 Press the PREV TRANS button to put the switcher into preview transition mode. The PREV TRANS button will illuminate red and the preview output will change so that it is a copy of the program output.
- 4 Manually move the fader bar from one end to the other to preview the transition on the preview output. The program output will remain unchanged.
- 5 Press the PREV TRANS button to turn off preview transition mode.

# Keying using ATEM Switchers

Keyers are a powerful production tool that allow the arrangement of visual elements from different sources on the same video image.

To do this, multiple layers of video or graphics are stacked on top of the background video. Altering the transparency of various parts of these layers allows the background layer to be visible. This process is called keying. Various techniques are used to create this selective transparency and these correspond to the different types of keyers available on your switcher.

The following section explains luma and linear keyers, which are available either upstream or downstream. It also explains chroma, pattern and DVE keys, which are upstream keyers.

## Understanding Keying

A key requires two video sources; the fill signal and the key or cut signal. The fill signal contains a video image which is to be stacked on top of the background, while the key signal is used to select regions of the fill signal to be made transparent. The fill and key signals can be selected from any of the switcher's external inputs or internal sources, allowing both still and moving images to be used as fill or key sources.

Fill and key signals are selected on the software control panel from drop down lists in the upstream and downstream key palettes. On the advanced panel, fill and key signals are selected using the select bus.

There are two types of keyers used in the switcher; upstream keyers and downstream keyers. Four upstream keyers, also known as effects keyers, are available in the switcher's M/E block. Each upstream keyer can be set up as a luma, linear, pre-multiplied, chroma, pattern or DVE key. Two downstream keyers are available in the dedicated DSK block. Each downstream keyer can be set up as a luma or linear key.

On DVEs and upstream keys using DVEs, you can also select the ME 2 program or preview output as the DVE fill source. This gives you a tremendous amount of creative options when keying.

## Luma Key

A luma key or self key consists of one video source containing the video image that will be stacked on top of the background. All of the black areas defined by the luminance in the video signal will be made transparent so that the background can be revealed underneath. Since only one image is used to define the areas to be cut out, a luma key uses the same signal for fill and key. The following images are an example of what background, luma key signals and the resulting combined image might look like.



Combining a background and fill/key in a luma key

## Background

A full screen image, often a camera source.

## Fill

The graphic you plan to display on top of your background video. Notice that the final composition does not retain any black from the graphic because all of the black parts have been cut out of the image.

## Linear Key

A linear key consists of two video sources; the fill signal and the key or cut signal. The fill signal contains a video image which is to be stacked on top of the background, while the key signal contains a grayscale mask that is used to define regions of the fill signal to be made transparent. Since both the fill and key signals are video inputs, both signals can be in motion while on screen. The following images are examples of what background, fill, key signals and the resulting combined image might look like.



Combining a background, fill and key in a linear key

## Background

A full screen image, often a camera source.

## Fill

The graphic you plan to display on top of your background video. Notice that the black parts of the graphic remain intact because the key signal is used to determine the transparency of the fill signal. The fill signal is often provided by a graphics system.

## Key

A grayscale image that defines the region in the image that will be removed so that the fill signal can be correctly stacked on top of the background. The key signal is often provided by a graphics system.

## Pre multiplied Key

A modern graphics system or character generator that offers fill and key outputs will most likely provide what is known as a pre-multiplied or shaped key. A pre-multiplied key is a special combination of the fill and key signal where the fill signal has been pre-multiplied with the key signal over a black background. Photoshop generated images that contain an alpha channel are pre-multiplied.

ATEM switchers have an auto key adjustment for pre-multiplied keys so that when the pre-multiplied key setting is enabled, the clip and gain parameters are automatically set by the system.

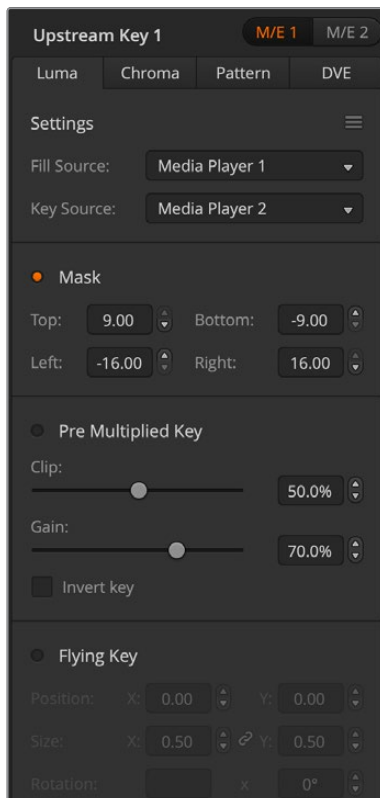
When using a Photoshop generated image, generate graphics over a black background layer and place all content on the upper layers. Add an alpha channel in your Photoshop document that the ATEM can use for blending the graphic over the live video. Then, when saved as a

Targa image file, or downloaded direct to the media pool, you can select pre-multiplied in the keyer and you should have a great key!

Photoshop documents are pre-multiplied by nature, so you should always use the pre-multiplied settings on the ATEM switcher when keying them.

## Performing an Upstream Luma/Linear Key

Since luma and linear keys use the same parameters, they are set up on the software control panel and advanced panel using a common menu, called the luma key menu. What defines the key as being either luma or linear is in the selection of fill and key sources. In a luma key, fill and key sources are the same. For a linear key, fill and key sources are different.



The Upstream Key palette has a menu for resetting parameters at the top of each tab. Select the sections you wish to reset from the menu.

To set up a luma/linear key on upstream keyer 1 on the software control panel:

- 1 Expand the upstream key 1 M/E 1 palette and select luma tab.
- 2 Select the fill source and key source.

If performing a luma key, select the same source for both fill and key.

Adjust the key parameters to refine the key. For a description of luma key parameters, refer to the table below.

To set up a luma/linear key on upstream keyer 1 on an ATEM advanced panel:

- 1 Press the 'key 1' button to enable the keyer on the preview output. This automatically selects the keyers menu on the system control LCD, but you can also press the 'keyers' button to enter the menu directly.
- 2 Select the desired M/E keyer by pressing the corresponding soft button along the top edge of the LCD menu.

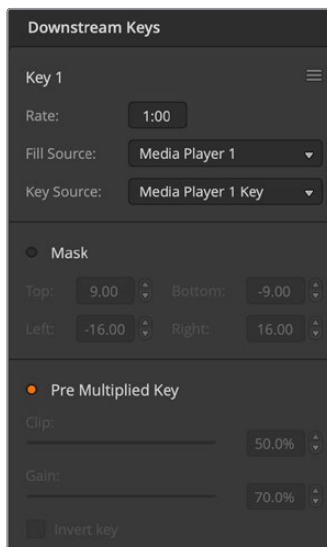
- 3 Use the control knob underneath the 'key type' indicator to choose the 'luma' key.
- 4 Rotate the 'fill source' and 'key source' control knobs to choose a fill and key source.

**TIP** You can also press the corresponding buttons on the source select bus to select the fill and key source.

- 5 Once you have chosen a key type, fill and source, press the 'right' arrow button to scroll through to the next menu item and use the control knobs to adjust key parameters such as mask, gain, clip, enable or disable pre multiplied key, etc.

## Upstream key luma/linear key parameters

<b>Mask</b>	Enables a rectangular mask that can then be adjusted using the top, bottom, left and right parameters.
<b>Pre-Mult</b>	Identifies the key signal as a pre-multiplied key.
<b>Clip</b>	The clip level adjusts the threshold at which the key cuts its hole. Decreasing the clip level reveals more of the background. If the background video is completely black then the clip value is too low.
<b>Gain</b>	The gain adjustment electronically modifies the angle between on and off thereby softening the edges of the key. Adjust the gain value until the edge softness is desirable but the background video luminance or brightness is not affected.
<b>Invert Key</b>	Inverts the key signal.
<b>Flying Key</b>	Enables/disables DVE effects.



Downstream Keyer Settings

### Performing a Downstream Luma/Linear Key

To set up a luma/linear key on downstream keyer 1 on the software control panel:

- 1 Select the downstream key 1 palette.
- 2 Use the drop down controls labeled fill source and key source to specify the fill and key sources. If performing a luma key, select the same source for both fill and key.
- 3 Adjust the key parameters to refine the key.

To set up a luma/linear key on downstream keyer 1 on an ATEM advanced panel:

- 1 Press the 'DSK 1 tie' button to enable the downstream keyer on the preview output. This automatically selects the downstream key menu on the system control LCD, but you can also press the 'keyers' button and press the right arrow to enter the menu directly.
- 2 Press the 'DSK 1' or 'DSK 2' soft button to select which downstream keyer you wish to use.

**TIP** You don't have to select the key type as the downstream keyer is always a luma key.

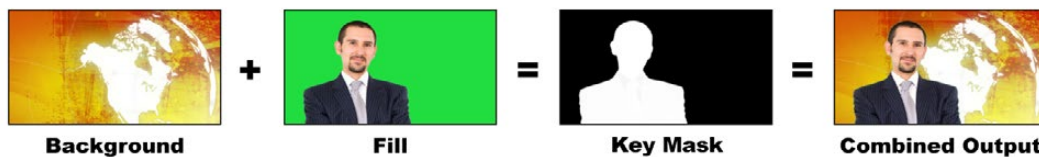
- 3 Use the control knobs under the LCD menu to select the fill source and key source. You can also use the corresponding source select buttons to select the fill and key source.
- 4 Once you have chosen the fill source and key source, use the 'left' and 'right' control buttons to scroll through additional menu screens containing key parameters such as mask, gain, clip, pre multiplied key settings and more.



## Chroma Key

Chroma key is commonly used for weather broadcasts, where the meteorologist appears to be standing in front of a large map. In the studio the presenter is actually standing in front of a blue or green background. In a chroma key two images are combined using a special technique and a color from one image is removed, revealing another image behind it. This technique is also referred to as color keying, color-separation overlay, green screen, or blue screen.

A very common use for chroma keys for backgrounds is computer generated graphics. It's simple to connect an external computer to your ATEM switcher using the HDMI output of the computer or a video card such as the Blackmagic Design DeckLink or Intensity range and then play back video clips to your ATEM switcher. If you render a green background on your animations, you can then key this green to create fast and clean animations of any length. Keying is easy as the green is computer generated so it's a very flat color that's easy to key.



Combining a background with a fill and chroma key/cut

### Background

A full screen image; in the case of a chroma key it is often a weather map.

### Fill

The image you plan to display on top of your background video. In the case of a chroma key, this is video of the meteorologist in front of the green screen.

### Key/Cut

In the case of a chroma key the key/cut signal is generated from the fill signal.

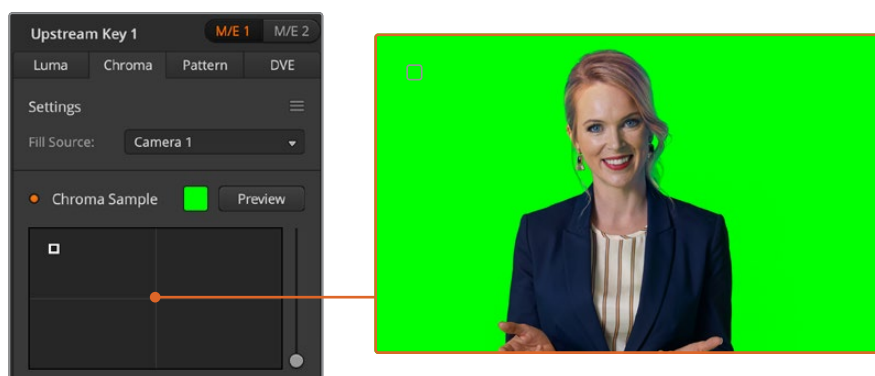
## Performing an Advanced Chroma Key

ATEM Constellation switchers feature advanced chroma keying, with more detailed chroma sampling and adjustment options. These controls help you achieve the best key, improving the blend of foreground and background so you can create a more convincing visual effect.

To set up a chroma key on upstream key 1 on the software control panel:

- 1 Expand the upstream key 1 M/E 1 palette and select 'chroma' from the key types bar.
- 2 Select the fill source. Typically, this source would be from a camera facing a presenter in front of a green screen, or a graphic loaded in a media player.
- 3 Click the 'chroma sample' button.

With the chroma sample selected, you'll see a new panel appear with a box cursor. This cursor is also visible on the M/E 1 preview output.



The chroma sample setting lets you position a cursor over the screen area you want to sample

- 4 Click and drag on the box cursor to move it to the position you want to sample.

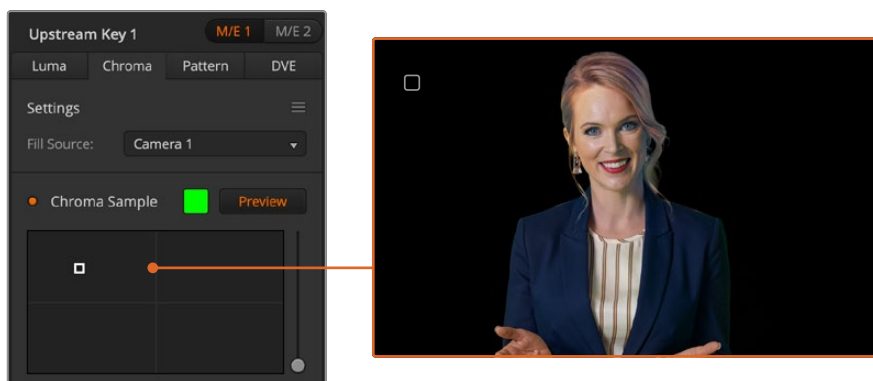
To set up a chroma key on upstream keyer 1 on an ATEM Advanced Panel:

- 1 Press the 'key 1' button to enable keyer 1 on the preview output. This automatically selects the keyers menu on the system control LCD, but you can also press the 'keyers' button to enter the menu directly.
- 2 Select the 'chroma' key type using the corresponding 'key type' control knob.
- 3 Select your fill source by turning the corresponding LCD control knob. Typically, this source would be from a camera facing a presenter in front of a green screen, or a graphic loaded in a media player. You can also select a fill source by pressing the corresponding button in the source select bus.
- 4 Use the 'right' arrow buttons to access the chroma adjustments screen.
- 5 Click the 'sample chroma' button.

Choose a representative area of your green screen that covers as much of the luminance range of the screen as possible. The default size of the box cursor is well suited to most green screens that are relatively evenly lit, however if there is a lot of variance in your green screen, you can adjust the size of the box by clicking on the slider to the right of the sample window and dragging it up or down. On ATEM advanced panel, use the joystick to move the position of the box and the z axis to increase or decrease the size.

**TIP** When sampling uneven green screens, we recommend sampling the darkest area first before increasing the size of the sample box. This can give you a more accurate key.

You can preview your key at any time by clicking the 'preview' button above the chroma sample panel or by pressing the 'preview chroma' button above the LCD screen on the advanced panel.



Use the preview button to check what your key will look like in the M/E 1 PVW output

## Fine Tuning your Key using Key Adjustments

Once you have achieved a good chroma sample that removes most of your green screen while generally retaining foreground elements, it is time to fine tune your key with the 'key adjustments' controls. If you are using an ATEM advanced panel, press the right arrow to navigate to the 'chroma adjustments' menu.

### Foreground

Use the 'foreground' slider or control knob to adjust how opaque the foreground mask is. This determines the strength of the foreground against the background. By increasing the slider, you can fill in any small areas of transparency inside your foreground image. We recommend moving this slider and stopping as soon as the foreground becomes solid.

### Background

The 'background' slider and control knob adjusts the opacity of the keyed area. Use this slider to fill in any small foreground artifacts left over in the area of the image you want to remove. We recommend moving the slider until your keyed area is consistently opaque.

### Key Edge

The 'key edge' slider and control knob moves the edge of your keyed area in or out, helping to remove background elements from the very edge of your foreground or extending the foreground out a little if your key is too aggressive. This can be especially useful with fine details like hair. We recommend moving this slider until the edge of your key is generally clean, without any background artifacts visible.

Using the key or chroma adjustment controls, your foreground elements should be cleanly separated from the background.

While making key and chroma adjustments, it can be useful to assign one of your multiview windows to show your key mask. For example, if you're performing a chroma key on M/E 1, set one of the outputs to "ME 1 KEY MASK 1." This will give you a clearer view of your key for fine adjustments.



Displaying your key mask in a separate MultiView window can make fine tuning a key much easier.

## Chroma Correction using Color Spill and Flare Suppression

Light bouncing off a green screen can create a green edge to foreground elements as well as a general tint to the foreground, or fill image. This is called color spill and flare. The 'chroma correction' settings let you improve the areas of the foreground that are affected by color spill and flare. You can correct these areas in the key using the 'chroma correction' settings.

### Spill

Adjust the spill slider to remove colored tint from the edges of foreground elements. For example, green reflections bouncing off a green screen.

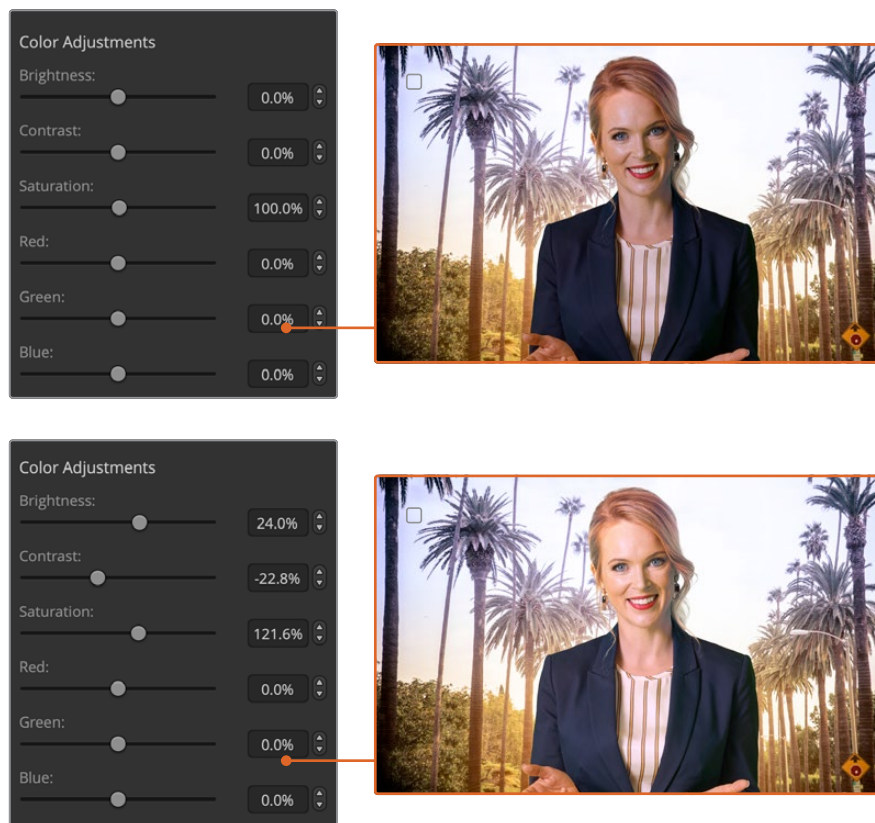
### Flare Suppression

Flare suppression removes overall green tint evenly across all foreground elements.

## Matching your foreground and background

Once your foreground is properly separated from your green screen and you have adjusted spill and flare suppression, use the 'color adjustments' controls to match your foreground with the background.

Adjusting the brightness, contrast, saturation and color balance of your foreground image will help blend it with the background so the effect is more convincing.



Use the color adjustments controls to match your foreground with the background

## Pattern Key

A pattern key is used to display a geometric cut out of one image on top of another image. In a pattern key the key or cut signal is generated using the switcher's internal pattern generator. The internal pattern generator can create 18 shapes that can be sized and positioned to produce the desired key signal.



Combining a background with a fill and pattern key

### Background

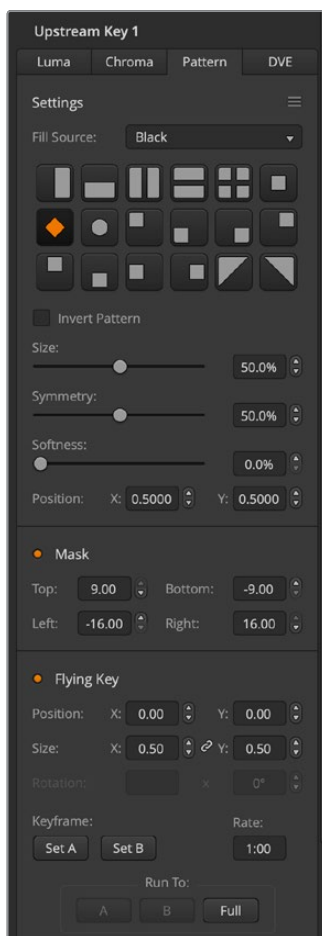
A full screen image.

### Fill

Another full screen image you wish to overlay on top of the background.

### Key/Cut

In the case of a pattern key the key/cut signal is generated by the switcher's internal pattern generator.



Pattern Key Settings

### Performing an Upstream Pattern Key

To set up a pattern key on upstream keyer 1 on the software control panel:

- 1 Expand the upstream key 1 M/E 1 palette and select pattern from the key types bar.
- 2 Select the fill source.
- 3 Select the key pattern.
- 4 Adjust the key parameters to refine the key. For a description of pattern key parameters, refer to the table below.

To set up a pattern key on upstream keyer 1 on an ATEM advanced panel:

- 1 Press the KEY 1 next transition button to enable the key on the preview output. This automatically selects the keyers menu on the system control LCD. Pressing the KEY 1 next transition button ties the key to the next transition so it will transition to air when the next transition is performed.
- 2 In the keyers LCD menu, select the 'pattern' key type using the corresponding 'key type' control knob.
- 3 Select the fill source using the corresponding soft control knob or by pressing a source button on the source select bus.
- 4 Turn the corresponding soft control knobs to choose the 'pattern' you want for the pattern key and set the 'size' of the pattern.

- 5 Press the system control left and right arrow buttons to navigate through the pattern key parameters and adjust settings using the control knobs. Watch the preview output as you refine the key.

**TIP** Some patterns can have their center point repositioned. Use the joystick to move the position of the pattern. If you need to reset the position, navigate to the 'pattern type' setting, change it to another pattern and then return to your chosen pattern to reset the position to its default.

<b>Size</b>	Increases and decreases the size of the selected pattern.
<b>Symmetry</b>	Some patterns may have their symmetry or aspect ratio adjusted. Circle patterns may be adjusted to become horizontal or vertical ellipses. Twist the joystick knob to adjust its symmetry.
<b>Softness</b>	Changes the softness of the edge of the key signal.
<b>Invert Pattern</b>	This button inverts which the region filled with the fill source. For example, fill a region outside of a circle by positioning the circle wipe as desired and then selecting invert pattern.
<b>Flying Key</b>	Enables/disables DVE effects

## Adjusting the X/Y Position of a Pattern

Some of the patterns may have their center point repositioned. To position a pattern, navigate to the pattern selection page of the keyer you are setting up. Use the joystick or control knobs to move the pattern vertically and horizontally. To re-center the pattern, press the pattern select button of the current pattern in the menu. This will reset the position and symmetry of the pattern.

## DVE Key

DVEs (digital video effects) are used to create picture-in-picture boxes with borders. Most models have 1 channel of 2D DVE that allows scaling, borders and offers a drop shadow.



Combining a background, DVE fill and DVE key/cut

### Background

A full screen image.

### Fill

Another full screen that has been scaled or has added borders and will be overlaid on top of the background.

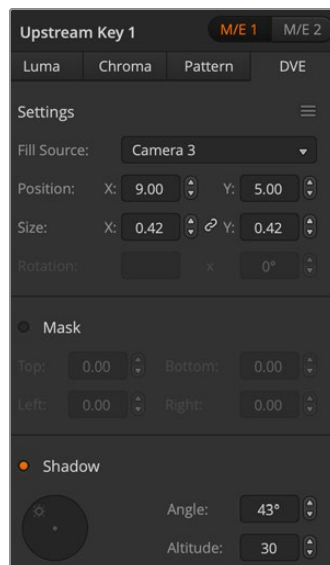
### Key/Cut

In the case of a DVE key, the key/cut signal is generated by the switcher's internal DVE processor.

## Performing an Upstream DVE Key

To set up a DVE key on upstream keyer 1 on the software control panel:

- 1 Expand the upstream key 1 M/E 1 palette and select DVE from the key types bar.
- 2 Select the fill source. You can even select the ME 2 program or preview output as the DVE fill source which gives you a tremendous amount of control and creative options.
- 3 Adjust the key parameters to refine the key. For a description of DVE key parameters, refer to the table below.



DVE Key Settings

To set up a DVE key on upstream keyer 1 on an ATEM advanced panel:

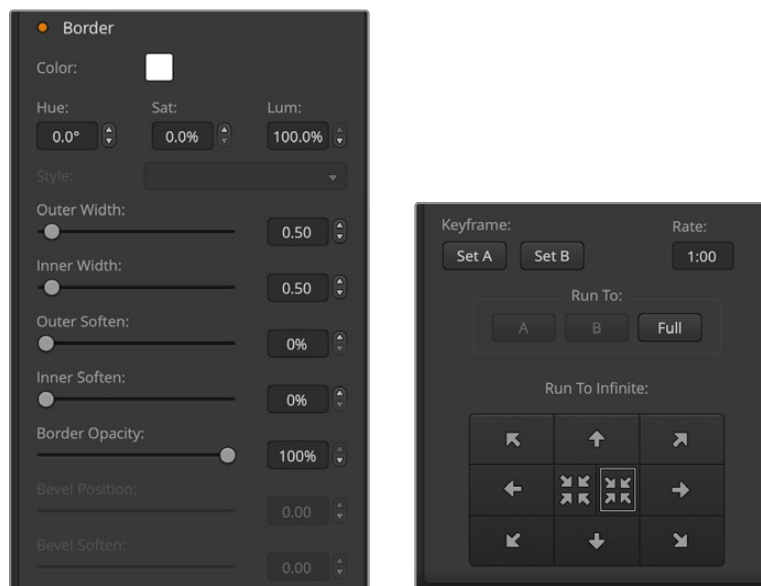
- 1 Press the KEY 1 next transition button to enable the keyer on the preview output.
- 2 In the keyers LCD menu, select the DVE key type using the corresponding soft control knob.
- 3 Select the fill source using the corresponding control knob or via the a source button on the source select bus.
- 4 Press the system control left and right arrow buttons to navigate through the DVE parameters and use the soft control knobs to adjust settings, such as position, size, mask settings, light source, border and key frames for movement.

**TIP** When using the number pad to enter numeric values for settings, hold the 'reset' button down for several seconds to enable negative values. Hold down again to return to standard values.

## DVE parameters

<b>Fill Source</b>	The source for the DVE to be adjusted.
<b>Size</b>	X and Y values adjust horizontal and vertical size of the DVE.
<b>Mask</b>	Enables a rectangular mask that can then be adjusted using the top, bottom, left and right parameters.
<b>Shadow</b>	Adjusts the direction of the light source on the DVE or picture in picture. Both the border and drop shadow, if available, are affected by changes to this setting.

## Adding DVE Borders



## DVE border parameters

The knobs and soft buttons in the system control are used to adjust the border parameters. There are multiple parameters, each requiring an adjustment, therefore the soft/color button and SHIFT button is used to toggle the parameters that each knob adjusts.

<b>Border</b>	Enables or disables the border.
<b>Color</b>	Adjusts the color of the border.
<b>Hue</b>	Changes the border color. The hue value is a location on the color wheel.
<b>Sat</b>	Changes the intensity of the border color.
<b>Luma</b>	Change the brightness of the border color.
<b>Outer Width</b>	Adjusts the outside width of the border.
<b>Inner Width</b>	Adjusts the inside width of the border.
<b>Outer Soften</b>	Outside softness adjusts the outside edge of the border, the edge that touches the background video.
<b>Inner Soften</b>	Adjusts inside softness. This softness parameter adjusts the inside edge of the border, the edge that touches the video.



<b>Border Opacity</b>	Opacity adjusts the transparency of the border, use this setting to create interesting colored glass borders.
<b>Light Angle</b>	Adjusts the direction of the light source on the DVE or picture in picture. Both the border and drop shadow, if available, are affected by changes to this setting.

## Key Masking

Both upstream and downstream keyers have an adjustable rectangular mask that can be used to crop out harsh edges and other artifacts in the video signal. The mask consists of left, right, top and bottom crop controls. Masking can also be used as a creative tool to build rectangular cut outs on screen.

On the hardware panel the mask is set up for each upstream and downstream key from the system control mask menu which is available from the EFFECTS KEYS or DSK KEYS menus.

On the software control panel the mask is set up for each upstream or downstream key from the palettes in the settings tab.

## Flying Key

Luma, chroma and pattern upstream key types include a flying key setting. If a DVE channel is available the Flying Key setting allows DVE effects to be applied to the key.

## Performing Upstream Keyer Transitions

The upstream keyers are accessible from the transition control block or the system control. The upstream keyers are taken on and off the program output using the next transition buttons or ON buttons.

### On buttons

Take the upstream keyers on or off the program output using the ON (on air) buttons as follows:

- 1 Press the ON button above the corresponding next transition KEY button to immediately turn on or turn off the upstream key on the program output.
- 2 The ON button also indicates if the upstream keyer is currently on or off the program output.

### Next transition buttons

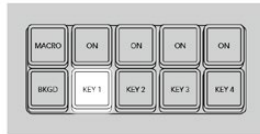
Take the upstream keyers on or off the program output using the next transition buttons as follows:

- 1 Select the elements you wish to transition using the BKGD, KEY 1, KEY 2, KEY 3 and KEY 4 next transition buttons.
- 2 Verify the preview output, which will show you exactly what your program output will look like after you perform the transition.
- 3 Press CUT, AUTO, or use the fader bar to perform the transition.

In order to help you understand the various ways in which multiple keys can be taken on and off the program output, we have provided a few examples. In the examples below KEY 1 contains a live bug on the top left of the screen while KEY 2 contains a bug at the bottom right hand side of the screen.

### Example 1:

In this example none of the upstream keyers are currently on-air. The next transition has key 1 selected, therefore the next transition will change the state of key 1 and turn it ON so that it is visible on the program output.



Control panel next transition buttons before transition.



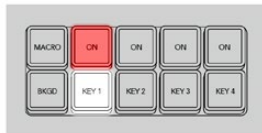
Program output before transition.



Program output after transition.

### Example 2:

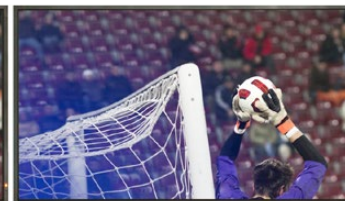
In this example, key 1 is currently on air, indicated by the illuminated ON button. The next transition has Key 1 selected, therefore the next transition will change the state of key 1 and turn it OFF so that it is not visible on the program output.



Control panel next transition buttons before transition.



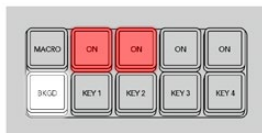
Program output before transition.



Program output after transition.

### Example 3:

In this example, key 1 and key 2 are on-air, indicated by the illuminated ON buttons. The next transition has the background selected, indicated by the illuminated BKGD button, therefore the next transition will only transition the background leaving both key 1 and key 2 on-air.



Control panel next transition buttons before transition.



Program output before transition.



Program output after transition.

### Example 4:

In this example, key 1 and key 2 are on-air. The next transition has the background and key 2 selected, therefore the next transition will transition the background and change the state of key 2 turning it OFF so that it is not visible on the program output.



Control panel next transition buttons before transition.



Program output before transition.



Program output after transition.

There are multiple ways to transition a key to the program output. The key can be cut on or off, it can be mixed on or off, or it can be mixed along with a background transition. Upstream keys are transitioned to the program output using the next transition block. Downstream keyers can be transitioned using their own transition buttons or by using the DSK TIE button to link the transition with the main transition control block.

## Performing Downstream Keyer Transitions

The downstream keyers have their own transition buttons and transition rate windows. Once a downstream keyer is configured it can be easily taken on and off the program output using one of the following three methods:

- 1 Press the DSK CUT button to immediately turn on or turn off the downstream key on the program output.
- 2 Use the DSK AUTO button to gradually transition the downstream key on or off the program output at the rate displayed in the DSK rate window.
- 3 Use the DSK TIE button to link the downstream key with the main transition control block. Once linked the DSK will be mixed on or off along with any transition type selected in the main transition control block at the rate specified by the transition control block.

Pressing the DSK TIE button shows the downstream keyer on the preview output.

It is not possible to preview a downstream keyer transition when linked with the main transition block. If the DSK TIE button is on when you switch to preview transition mode the tie functionality will be ignored until the preview transition mode is turned off.

### DSK parameters

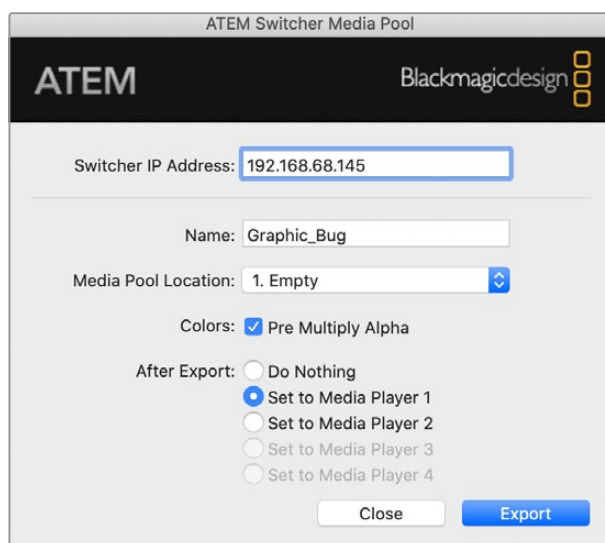
<b>Clip</b>	The clip level adjusts the threshold at which the key cuts its hole. Decreasing the clip level reveals more of the background. If the background video is completely black then the clip value is too high.
<b>Gain</b>	The gain adjustment electronically modifies the angle between on and off thereby softening the edges of the key. Adjust the gain value until the edge softness is desirable but the background video luminance (brightness) is not affected.
<b>Rate</b>	The mix rate at which the downstream keyer transitions on or off.
<b>Invert Key</b>	Inverts the key signal.
<b>Pre-Mult</b>	Identifies the key signal as a pre-multiplied key.

# Using Adobe Photoshop with ATEM

Installing the ATEM software on your computer also installs a Photoshop plug-in that lets you download Photoshop graphics direct to the ATEM media pool.

This means you can accept graphics from designers in the application that 100% of the world's designers use, Adobe Photoshop! You can even use the layers in a Photoshop image to keep variations of graphics, such as different titles in a graphic, then select the layers in Photoshop you want and then simply download them at the press of a button. When downloading the layers are automatically flattened in real time before download. This happens in the background and your document in Photoshop is unchanged by the export.

The ATEM export plug-in requires Adobe Photoshop CS5 or later. Install or reinstall the ATEM software after Photoshop is installed, to ensure the ATEM export plug-in is installed.



ATEM export plug-in

## Setting up Plug-in Switcher Location

The first time the Photoshop export plug-in is run, it will ask you to select your switcher location. This is the IP address of the switcher so the plug-in can find the switcher to communicate with. By default, the IP is set to 192.168.10.240, which is what the switcher IP address is originally set to when first sold. If you want to export several versions of the same Photoshop file, you can use the export plug-in window to name each exported file and also choose whether to set the files to a Media Player after export.

## Preparing Graphics for Download

For best results, you will want to use a Photoshop document resolution that matches the video standard you're using with your ATEM switcher. For 1080 HD you should use 1920 x 1080 pixels in resolution. For 720p HD formats you should use 1280 x 720 pixels. For Ultra HD you should use 3840 x 2160 pixels. For 8K formats you should use 7680 x 4320 pixels.

When working with Photoshop documents for ATEM, you should not put any content on the background layer, but add all content to the layers above. The background layer should always be plain full frame black and you should use a pre-multiplied key setting in the ATEM keyers for keying graphics from Photoshop.

To help you get started, we've included a guide and some graphic template files in the Example Graphics folder which was installed on your computer along with the ATEM Switchers software.

To download the graphic to the ATEM media pool, simply select the export menu in Photoshop and then select ATEM Switcher Media Pool to export. A window will appear asking you to choose which position in the media pool you want to download to. The list includes all the file names of graphics currently loaded in the media pool. Select which position you would like to download to and then select export.

If you're in a hurry to get your graphics on air, then you can select to automatically copy this graphic to any of the media players after export. This lets you get images to air fast! If you don't want to interfere with the media player graphic sources, simply select not to copy the media players to this graphic.

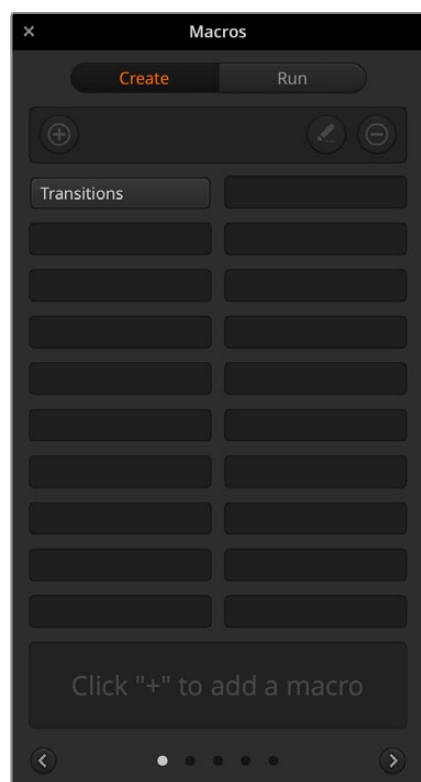
Pre Multiply Alpha should almost always be enabled and requires that you also switch on the Pre Multiplied Key setting in ATEM Software Control or on the optional ATEM Advanced Panel. Premultiplying mixes the graphic color with its alpha channel when exporting to ensure your graphic has smooth edges which blend in to the video.

# Using Macros

## What is a Macro?

A macro is an easy way to automate a sequence of switcher actions so you can repeat the sequence at the press, or click, of a button. For example, you can record a sequence of transitions between several video sources, including key effects, audio mixer adjustments, camera control settings and more. Record all your actions to a macro button, then when you press that button all your recorded actions will be instantly performed. Macros are recorded using the macros window in ATEM Software Control, an ATEM Advanced Panel, or a combination of the two and are stored inside your ATEM switcher. Macros are common to all control panels, they can be triggered using any control panel you like.

## The Macros Window in ATEM Software Control



To open the macros window in ATEM Software Control, click on macros in the title bar, or you can also press shift/command/M for Mac, or shift/control/M for Windows. The macros window is a floating window you can move freely about your desktop. This is so you can always access the window when moving between the switcher, media, audio and camera pages. While recording a macro, you can even reduce the size of the window by clicking on the minimize icon at the top right corner.

Macros can be recorded to any of the 100 macro slots. Up to 20 macro slots are visible on each page. Move forwards and backwards through pages by clicking on the arrows on the bottom sides of the window. Clicking on the create and run buttons lets you swap between the create and run pages so you can record your macros and then run them during your live production.

### Recording Macros

Macros need to be recorded comprehensively, in clearly defined sequences from start to finish without error. This is because your macro will record every setting, press of a button and switcher action you perform. When you run a macro, all the switcher actions you recorded in that macro will be repeated precisely.

It's worth highlighting that a macro will only record the settings you change. For example, if you want a 3:00 second transition and your switcher's transition rate is already set to 3:00 seconds, you'll need to change the duration, then set it back to 3:00 seconds to record the setting. If not, your desired transition rate will not be recorded and when the macro is run it will simply use the transition rate your switcher was last set to. So you can see why precision is important!

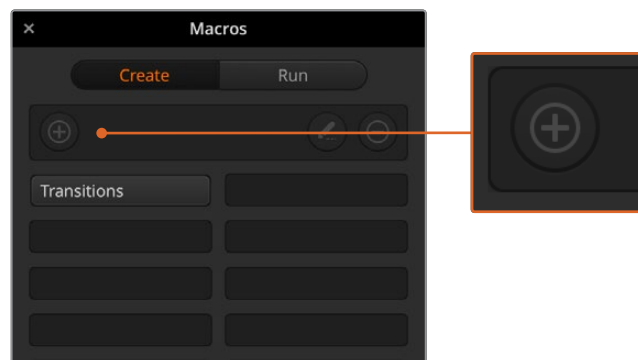
If settings are changed while recording a macro and you want them restored to a particular state, simply restore those settings while recording the final steps of the macro. You can even record macros to restore settings for various projects. You have lots of choices. The important thing to remember when recording a macro is that you change all the settings you need to so you can create the specific effects you want.

## Recording a Macro using ATEM Software Control

In the example below, we're going to create a macro that will set your ATEM switcher to perform a 3 second mix transition from color bars to color 1, pause for 2 seconds, then perform a 3 second mix transition to black. Try building this macro on your ATEM switcher so you can learn the steps in creating macros.

- 1 Launch ATEM Software Control and open the macros window.
- 2 Click on the create button in the macros window to select the create page.
- 3 Click on a macro slot you want to record your macro to. In this example, click on macro slot 1. An orange border will appear around the slot you have selected.
- 4 Click on the create macro button ('plus' icon) to open the create macro popup window.

If you want to, you can enter the name of your macro and type a description. This lets you easily keep track of your macros and quickly see what each macro does. When you click on a macro, your notes will appear in the status window.

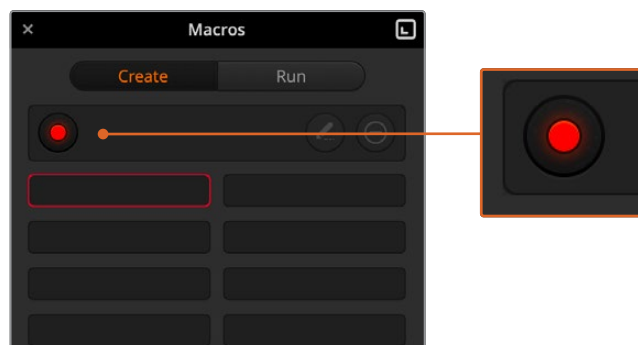


To start recording a macro, select a macro slot, then click on the create macro button. Type in your notes and click 'record'.

- 5 Click the 'record' button.

The popup window will close and a red border will appear around your ATEM Software Control panel indicating your macro is now recording. Notice the red 'add pause' button at the top of the border.

Now that your macro is recording, you can start performing your switcher actions.



While recording, the create macro button will change to a 'record' button. When you have completed your switcher actions, click on the 'record' button to stop recording.

- 6 Click on the bars button in the program panel on the switcher page. This sets bars to your switcher's program output.

**7** Select color 1 on the preview panel.

**8** Open the transitions palette and set it to mix.

If mix is already selected, make sure your macro records the setting by selecting a different transition type, for example the wipe transition, then clicking on mix again.

**9** Now change the transition Rate to 3:00. This sets the mix transition duration to 3 seconds.

**10** Click on the auto button in the transition style panel. Your switcher will perform a mix transition from color bars to color 1.

**11** To set the switcher to wait for 2 seconds before applying another transition, click on the add pause button at the top of the red border. The 'insert pause' window will open. Set the pause to 5 seconds and 0 frames and click 'add pause' to confirm.

Why set a 5 second pause when you only want a 2 second pause? That's because when the mix transition occurs, it takes 3 seconds to complete. So if you want to add a pause, you need to consider the transition duration, plus the pause you want to happen before the next transition occurs.

In this example, it takes 3 seconds for the transition to complete, then 2 seconds for your 2 second pause, so you should enter a pause of 5 seconds. Another way is to add two separate pauses, one for the duration of the transition and then another for the pause you want. It's up to you.

**12** Now select black on the preview panel and click the auto button in the transition style panel. Your ATEM switcher will perform a mix transition to black.

**13** Click the record icon in the macros window to stop recording your macro.

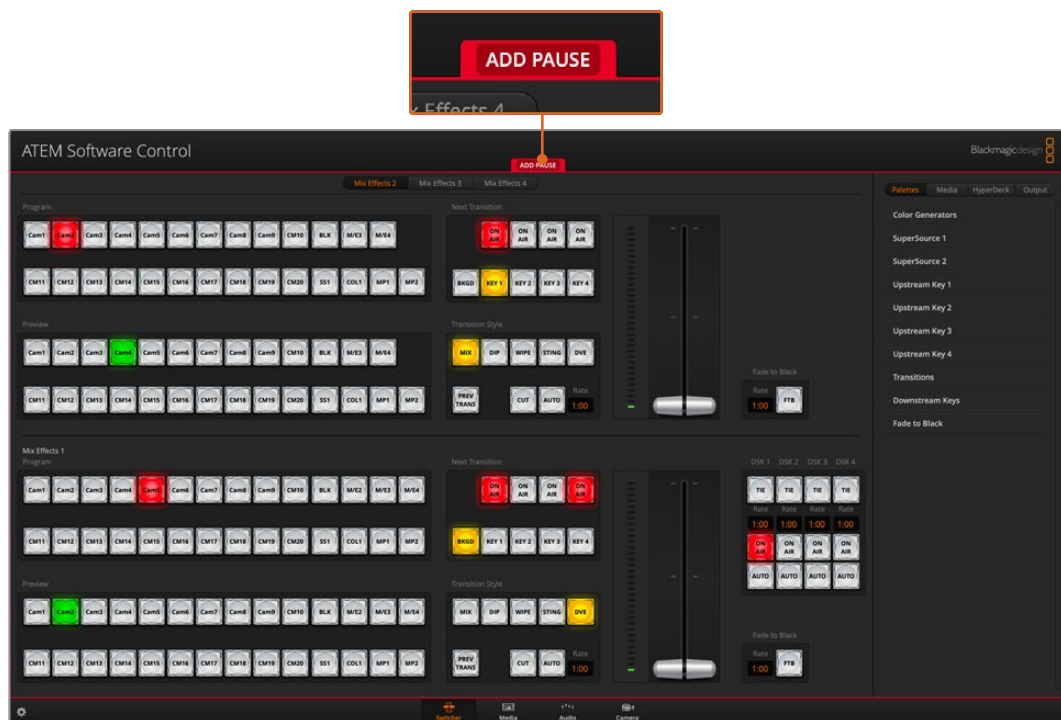
The macro you just recorded will now appear as a button in your selected macro slot. To preview your macro, click the run button in the macros window to enter the run page. Select recall and run, which sets the macros window to run a macro as soon as you click on a macro button. Now click on your new macro button, named 'Transitions'.

**14** If you want your macro to instantly run as soon as you select it, click on the 'recall and run' button. By enabling this feature you can load and play your macros with only one click of a button.

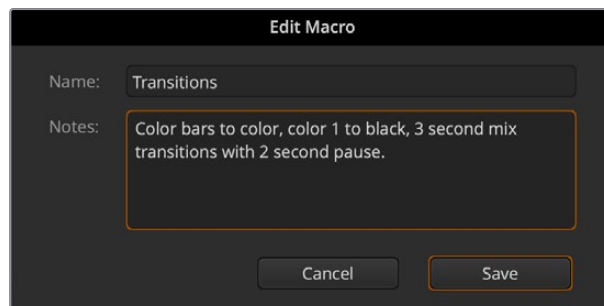
Congratulations! If your macro was successful, you should see your ATEM switcher perform a mix from color bars to color 1 using a 3 second transition, pause for 2 seconds, then perform another 3 second mix transition to black, all by clicking one button in the macros window! Your ATEM switcher will also display an orange border around your software control panel to indicate a macro is playing.

If your macro doesn't perform the way you expect it to, simply rerecord the macro you just created following the previous steps.





ATEM Software Control displays a red border to indicate when you are recording a macro. The 'add pause' button located at the top of the red border lets you enter durations for pauses between switcher actions.



Enter a name for your macro and a description so you can keep track of the switcher actions recorded in the macro.

## Building Large Macros

Macros can even include triggering other macros as part of recording a macro. This lets you easily build larger macros from multiple smaller macros, i.e., recording macros with limited actions, then compiling them into a large macro. This is because if there are any mistakes while recording a large macro in one complete sequence, you'll need to go back to the start of your sequence and rerecord it. It's a lot easier to work with segments containing a small number of actions.

By recording a large macro using small macros, you can also edit your large macro by rerecording only the small macros you want to change, then compiling your small macros back into your large macro.

To compile small macros into a large macro:

- 1 Start recording a new macro, then while the macro is recording, click on the 'run' button to enter the run page.
- 2 Select 'recall and run' to automatically run macros at the push or click of a button, or deselect to load a macro and play it manually.
- 3 Run your sequence of small macros, with pauses between each one to cover the duration of each small macro, until you've completed the large macro.
- 4 Stop recording. You now have a complex, powerful large macro built from small macros you can easily change later if you need to.

There is no limit to the amount of actions you can perform. You can easily build complex transitions, create unique repeatable effects using keyers, or set up frequently used Blackmagic Studio Camera settings, graphic overlays and DVEs so you don't have to reconstruct them every time you start a new program. Macros are fun and will save you a lot of time!

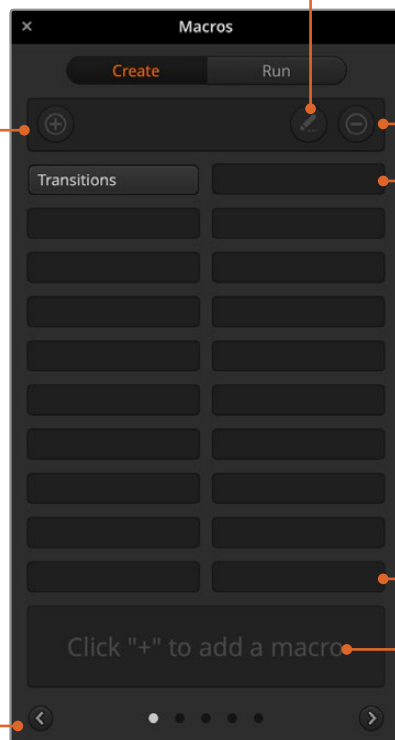
## Macros Window Create Page

### Create macro button:

Click this button to open the create macro popup window. From here you can name a new macro to be recorded, write a description of your macro in the notes section, and click record to start recording your macro.

### Arrow buttons and page icons:

To access or record more than 20 macros, simply click on the right arrow at the bottom corner of the macros window to open a new page of macros. To move to the previous page of macros, click on the left arrow. You can see which page of macros you are viewing by observing the page icons between the arrows.



### Edit macro button:

First select the macro you want to edit, then click on the edit macro button to edit the name and description of the macro.

**Delete macro button:** Select the macro you want to delete, then click on the delete macro button to delete the selected macro.

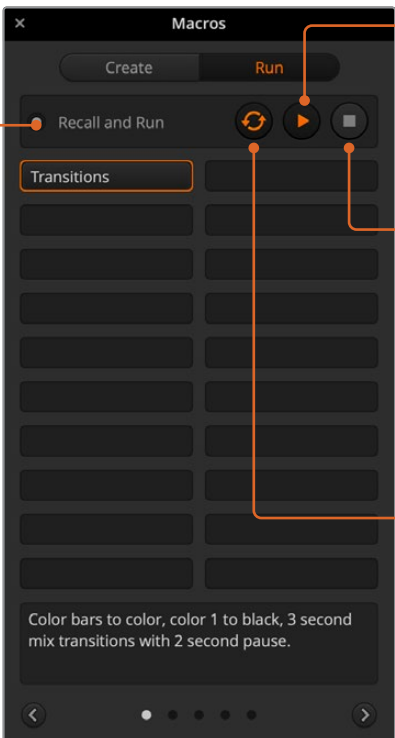
### Macro buttons:

After recording a macro to a selected macro slot, your macro will appear as a macro button. 20 macro buttons can be displayed on one page. If a macro is unnamed when recording, the number of the selected macro slot will be used.

### Status window:

This window provides helpful prompts and status messages to help you get started recording and running your macros. When a macro is selected, it also displays any notes you have included.

## Macros Window Run Page



**Recall and Run:**  
Selecting the Recall and Run feature lets you instantly run a macro by clicking a macro button. Deselecting the Recall and Run feature lets you load a macro by clicking on your macro button. Run the macro by clicking the play button.

**Play:**  
When Recall and Run is deselected and you have loaded a macro by clicking on a macro button, click the play icon to start playing the macro.

**Stop:**  
Clicking the stop button will stop the playback of a macro, but will complete the current action first. For example, if you press stop half way into a transition, the switcher will finish the transition and then stop.

**Loop:**  
When the loop button is selected and you run a macro, your macro will run continuously until you click the stop button. When loop is deselected, your macro will run until it is completed.

The screenshot shows the 'Macros' window with a 'Create' button and a 'Run' button. Below these are three icons: a circular arrow (Loop), a play button (Play), and a square button (Stop). A 'Recall and Run' checkbox is also present. The main area displays a list of macro slots, with the first slot labeled 'Transitions'. A description at the bottom reads: 'Color bars to color, color 1 to black, 3 second mix transitions with 2 second pause.'

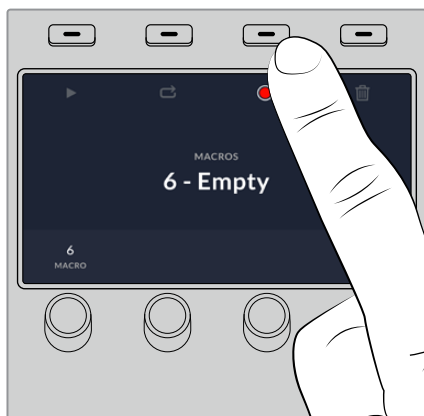
## Recording Macros using ATEM Advanced Panel

You can record and run macros using an ATEM Advanced Panel independently of ATEM Software Control. All actions on the ATEM Software Control switcher page can be performed using your hardware panel. If you need to arrange graphics in the media pool, or adjust camera settings, simply access those settings using ATEM Software Control.

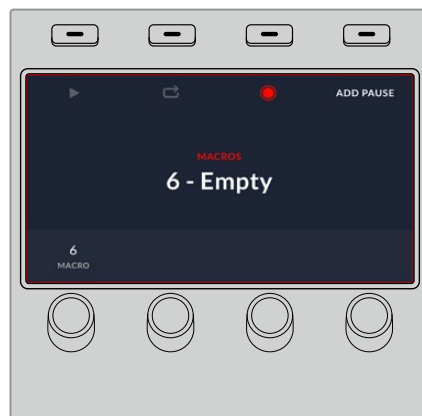
The buttons used to record and run macros on ATEM advanced panels are located in the system control buttons. The names of your macro buttons are displayed in the source select names display.

Follow the steps below to create the 'transitions' macro demonstrated earlier using ATEM Software Control. This time you will create a macro in macro slot 6.

- 1 Press the 'macro' soft button to open the macros LCD menu.
- 2 Using the 'macro' knob under the LCD, select the macro slot you want to record to. For this example, select slot '6 - Empty'.
- 3 Press the 'record' soft button at the top of the LCD to start recording. The record icon appears as a red circle. When recording, this icon becomes a red square and a red border will appear around the LCD.



Press the 'record' soft button to start recording your macro



While recording, a red border will appear around the LCD

- 4 Shift select 'color bars' on the program bus. The button will flash indicating it's a shifted source.
- 5 Shift select 'color 1' on the preview bus. If you wish, you can map buttons such as color bars, black and color generators to any of the main 10 buttons of the program and preview bus for easier access. See the 'button mapping' section of this manual for instructions.
- 6 Press the wipe button in transition control to ensure the macro records the wipe transition selection.
- 7 In the 'wipe' LCD menu, set the rate to 2:00 seconds.
- 8 Press the 'auto' button in transition control to perform the wipe transition from color bars to color 1.
- 9 Press the 'macro' button to return to the macro screen.
- 10 To set the macro to wait for 2 seconds before applying the next transition, press the 'add pause' soft button in the LCD menu and set the duration to 2 seconds by rotating the 'seconds' knob. Press the 'confirm' soft button to record the pause.
- 11 Now shift select 'black' on the preview bus, press the 'mix' button in transition control and press the 'auto' transition button. Your ATEM switcher will perform a mix transition to black.
- 12 Press the macro button to navigate back to the macro menu, then press the 'stop' soft button to stop recording.

You have just recorded a macro using an ATEM Advanced Panel. The macro will appear as a macro button named 'macro 6' because it is located in macro slot 6. You can name your macro and add notes by clicking on the 'edit macro' button in ATEM Software Control.

To run the macro, press the macro button to set your panel's source select row to macro mode. The buttons will illuminate blue when in macro mode. Now press the macro 6 button. You can easily see when a macro is running because the macro button will flash green and an orange border appears around the LCD menu.

If your macro was successful, you should see your ATEM switcher mix from color bars to color 1 using a 2 second mix transition, pause for 2 seconds, then perform another 2 second mix transition to black, all by pressing one button on your ATEM Advanced Panel. If you want the macro to loop so it keeps running, press the 'loop' soft button to enable loop. Press again to disable loop.

It's worth frequently testing your macros using different switcher settings to make sure the macro performs all the specific functions you intended and doesn't miss any instructions or produce something unexpected.

# HyperDeck Control

## Introducing HyperDeck Control

You can connect up to 10 HyperDeck disk recorders to your switcher and control them using the HyperDecks palette in ATEM Software Control, or from the system control buttons on an ATEM advanced panel. This is a very powerful feature! With ten HyperDecks connected to your switcher, it's like having a portable videotape department able to record outputs from your switcher, play back graphics, or you can even set your switcher to roll prerecorded segments at the press of a button!

Transport controls are located in the HyperDecks palette in ATEM Software Control, or in the system control menu on an ATEM advanced panel, which lets you play back video, jog and shuttle, skip clips, pause and more. You can also record video.

When you combine this feature with ATEM's powerful macros feature, it opens up a world of creative possibilities that can really enhance your live production!

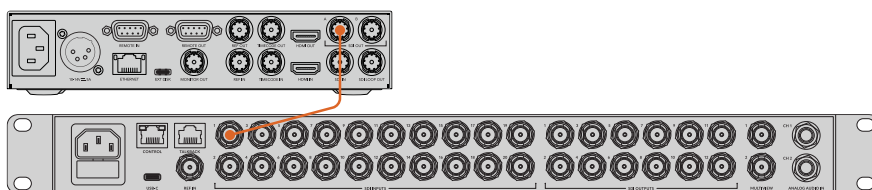


HyperDeck Studio HD Plus

## Connecting HyperDecks

Connecting HyperDecks to your switcher is very similar to connecting cameras and other video sources via your switcher's SDI inputs. The only additional connection is Ethernet which lets your ATEM switcher communicate with the HyperDeck disk recorder.

- 1 Using the Ethernet connector, connect your HyperDeck disk recorder to the same network your ATEM switcher is connected to.
- 2 Press the remote button marked 'REM' on the HyperDeck's control panel. The 'REM' button will illuminate which means the HyperDeck has remote control enabled. If you are using a HyperDeck Studio HD Mini, turn remote on via the settings tab on the LCD menu.
- 3 Plug the SDI output of your HyperDeck into the SDI inputs of your ATEM switcher. If you are using quad link SDI with ATEM Constellation 8K and a HyperDeck Extreme 8K disk recorder, it's important to connect each input and output in the correct order.
- 4 If you want to record your ATEM switcher's program output with your HyperDeck, plug one of the switcher's SDI outputs into the SDI input of your HyperDeck.
- 5 Repeat the process for each HyperDeck you want to connect.



Plugging the SDI output from HyperDeck Studio HD Plus into an SDI input on ATEM 2 M/E Constellation HD

Now all you have to do is tell your ATEM software or ATEM hardware panel which input and IP address each HyperDeck is using. You can do this in the HyperDeck tab in ATEM Software Control switcher settings, or using the system control soft buttons on an ATEM advanced panel.

## HyperDeck Settings

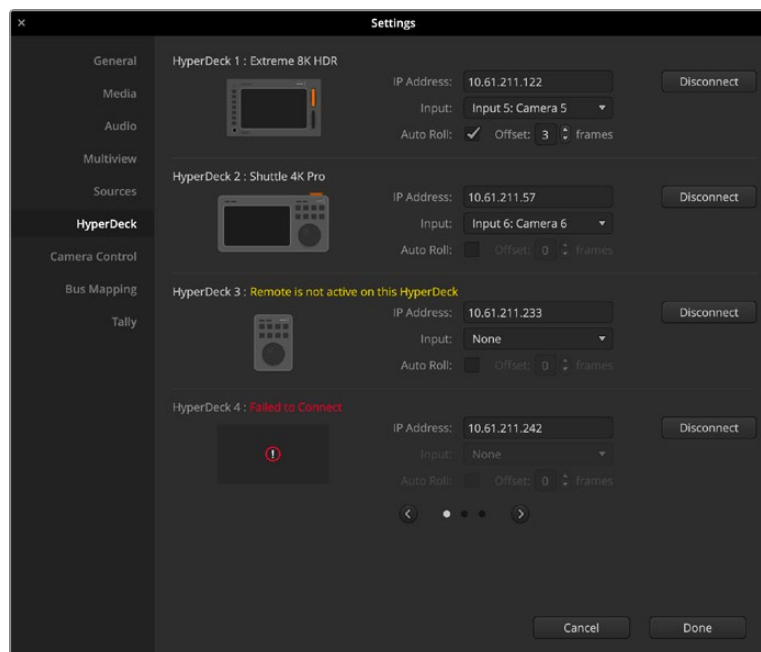
HyperDeck connection settings are located in the 'HyperDeck' tab of the ATEM Software Control switcher settings. Here you'll see setup options for up to ten HyperDecks.

Entering the necessary details is as easy as typing in your HyperDeck's IP address in the 'IP Address' box and choosing the source it's plugged into from the 'input' menu. Click 'connect' and your HyperDeck is ready to be controlled.

Status indicators appear above and below each HyperDeck icon to let you know the connection status. A green tick means your HyperDeck is connected, in remote and ready to go.

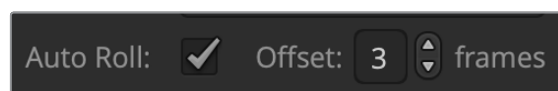
If your HyperDeck is connected and recognized, but does not have its remote button enabled, you will see an indicator letting you know remote is not active.

If your HyperDeck is not recognized, you will see a 'failed to connect' indicator. If you see this indicator, check the HyperDeck's Ethernet port is connected to your network and the IP address is entered correctly.



### Auto Roll

You can set a HyperDeck disk recorder to automatically roll video when it is switched to the program output. For example, you can cue a HyperDeck to the point you want your source to begin, then roll the source by pressing its input button on the mix effects program row.



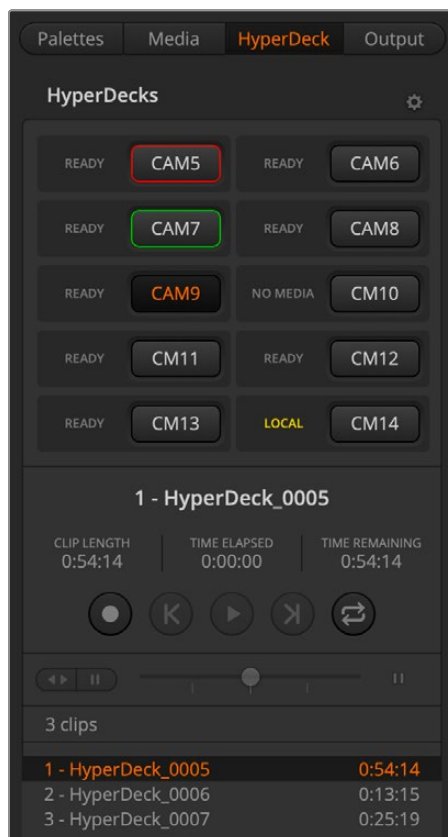
As HyperDecks must buffer a couple of frames before commencing playback, the actual cut will be delayed a preset number of frames to ensure a clean transition. This is just like setting a preroll on a videotape machine. You can adjust the length of this delay by changing the number in the 'offset' box. We've found that five frames usually ensures a clean cut.

If you want to cue to a still frame of video or manually trigger video playback on your HyperDeck, you can also deselect the 'auto roll' feature.

## Controlling HyperDecks with ATEM Software Control

To control the HyperDecks connected to your switcher, click the 'HyperDeck' tab in the software control panel and choose the 'HyperDecks' palette.

Here you can choose between each of the HyperDecks connected to your system by clicking one of the buttons along the top of the panel. These are named according to the labels entered in ATEM settings. Available HyperDecks are shown with white text, while the HyperDeck you are currently controlling is shown in orange.









Choose from up to ten HyperDecks by clicking their selection buttons in the HyperDecks palette.

In addition to the text color, each HyperDeck's selection button also has a tally indicator. To change the number of HyperDecks displayed, click on the cog icon at the top right of the HyperDeck tab.

<b>Green Outline</b>	Indicates a HyperDeck that is currently switched to the preview output.
<b>Red Outline</b>	Indicates a HyperDeck that is currently switched to the program output, meaning it is currently live to air. You may also see one of the following status indicators above the selection buttons for your HyperDecks.
<b>Ready</b>	HyperDeck is set to remote and a disk is inserted. It is ready for playback and recording if space is available.
<b>Record</b>	HyperDeck is currently recording.
<b>No Disk</b>	HyperDeck has no disk inserted.
<b>Local</b>	HyperDeck is not set to 'remote' and cannot currently be controlled by your ATEM switcher.

When you select a HyperDeck, you'll see information about the currently selected clip such as the name and length, as well as time elapsed and time remaining. Below this you'll see the control buttons.

	<b>Record</b> Click on this button to start recording on your HyperDeck. Click again to stop recording.
	<b>Previous Clip</b> Moves to the previous clip in your HyperDeck's media list.
 	<b>Play</b> Clicking 'play' once initiates playback of the current clip, clicking it again stops playback. If you have 'auto roll' enabled in your HyperDeck settings, playback will commence automatically when your HyperDeck is switched to the program output. To play all clips on the current timeline, press the shift button and then 'play'. The icon surround will illuminate when playing all clips on the timeline.
	<b>Next Clip</b> Moves to the next clip in your HyperDeck's media list.
	<b>Loop</b> Click 'loop' to loop the current playback. This will loop either a single clips or the timeline depending on the status of the play button.

To move through a clip use the shuttle/jog slider underneath your HyperDeck's control buttons. This lets you move quickly, or shuttle through a selected clip, or jog frame by frame. You can switch between these modes with the buttons next to the shuttle/jog slider.





Choose between shuttle and jog transport controls with the buttons to the left of the transport slider. Adjust the slider left and right to move forward or backwards through your clip.

The clip list below the transport control shows all of the clips currently available on the selected HyperDeck. You can expand or collapse the list by pressing the arrow to the right of the clip list.

## Playback

Playing media on your HyperDeck is easy. Switch your HyperDeck to the preview output and select the clip you want to show. Use the transport controls to cue to the preferred point in your clip. When you switch your HyperDeck to program output, the 'auto roll' feature will automatically start playback from this point.

If you want to manually trigger the playback, for example holding on a still frame then rolling, disable the respective HyperDeck's auto roll checkbox in the 'HyperDeck' tab in ATEM software's 'settings' menu.

## Recording

To record to a HyperDeck with a formatted disk inserted, press the 'record' button in the HyperDeck palette transport controls. The 'time remaining' indicator in the HyperDeck palette will let you know the approximate recording time remaining in the SSD.

# Using Tally

## Sending Tally Signals via a GPI and Tally Interface

Your ATEM switcher can send tally signals to monitors and cameras to make it clear which source is on the program output, i.e. which source is on air.

Tally is commonly used to light the red light on top of a camera or monitor so the talent knows they are on air. Tally can also illuminate a border on a monitor such as a Blackmagic SmartView 4K. The border allows production staff to know which camera is on air.

The GPI and Tally Interface by Blackmagic Design, is an Ethernet device which provides eight mechanical relay contact closures to ground that can be used for tally. Tally signals are sent from the Ethernet port of your ATEM switcher to a GPI and Tally Interface on the same network as the switcher. By following the wiring guide on the back of the GPI and Tally Interface, a breakout cable can be connected to video equipment that supports contact closure tally signals, such as Blackmagic SmartView Duo and SmartView HD. Up to 8 tally receiving devices can be supported with a single GPI and Tally Interface. Only one GPI and Tally Interface unit is needed when used with an ATEM switcher that has 1 M/E. Up to 3 units will be needed for the 20 inputs of ATEM 2 M/E Constellation switchers, up to 5 for the 40 inputs on ATEM 4 M/E Constellation and 40 Ultra HD and HD inputs of the ATEM Constellation 8K. ATEM 4 M/E Constellation 4K Plus will need up to 10 GPI and Tally Interface units for the 80 inputs.

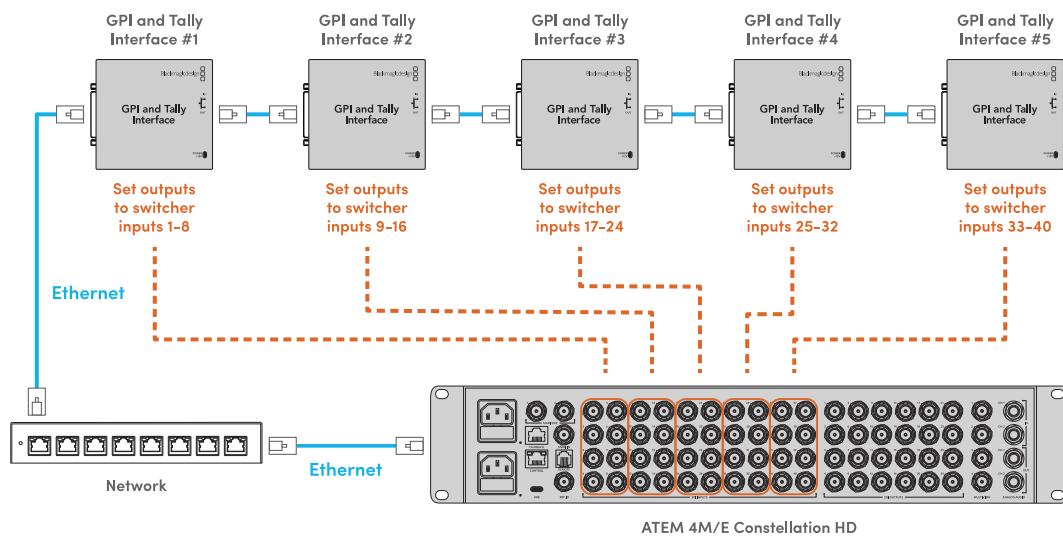


GPI and Tally Interface

The GPI inputs are optical isolators which are triggered by connection to ground with a maximum of 5V at 14mA.

The tally outputs are mechanical relay contact closures to ground with a maximum of 30V at 1A.

The following illustrates which tally signal is sent when a switcher input is selected on the program output. When using GPI and Tally Interface with a 2 M/E or 4 M/E switcher, use ATEM Setup to set each unit to signal on different tally outputs. For example, set the first unit to signal on tally outputs 1-8, the second unit to signal on tally outputs 9-16 and the third to signal on tally outputs 17-24.



## Changing the Network and Tally Settings

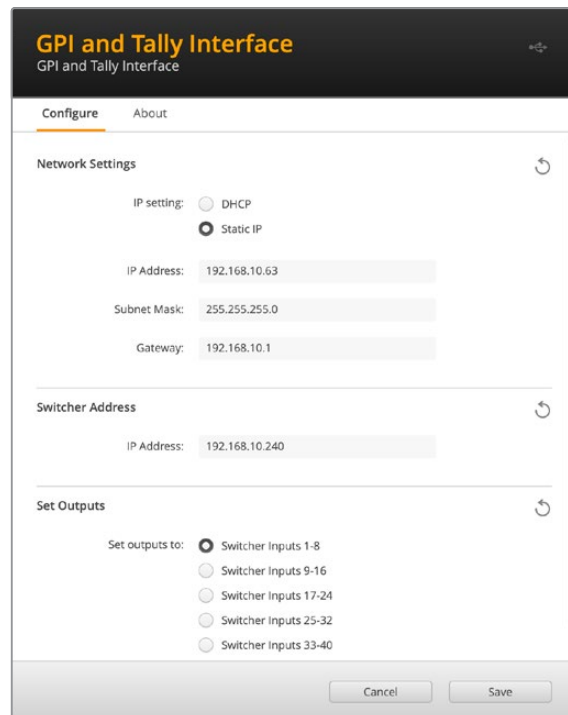
ATEM Setup is used to configure the network settings in the GPI and Tally Interface so it will communicate with your ATEM switcher. The GPI and Tally Interface must be connected via USB in order to configure its settings with ATEM Setup.

- 1 Connect the GPI and Tally Interface to the same Ethernet network as your ATEM switcher.
- 2 Connect the GPI and Tally Interface to a USB port on your computer and also connect the included power supply.
- 3 Launch ATEM Setup.
- 4 If your ATEM switcher connects directly to your computer or ATEM advanced panel without an Ethernet network switch, choose to “Configure Address Using Static IP”. The GPI and Tally Interface defaults to a fixed IP address of 192.168.10.2 when shipped and we suggest you use this number for simplicity.

If you want to choose a different static IP address, you can set it to anything you like that’s in the same range as the ATEM switcher, so long as it’s not already in use by another device on your network. Default IP addresses for ATEM products are best avoided for this reason, including: 192.168.10.1, 192.168.10.2, 192.168.10.3, 192.168.10.10, 192.168.10.50, 192.168.10.60 and 192.168.10.240.

If your ATEM switcher connects via an existing Ethernet network switch, you may wish to choose “Configure Address Using DHCP” as this setting automatically obtains the IP Address, Subnet Mask and Gateway information from your DHCP server.

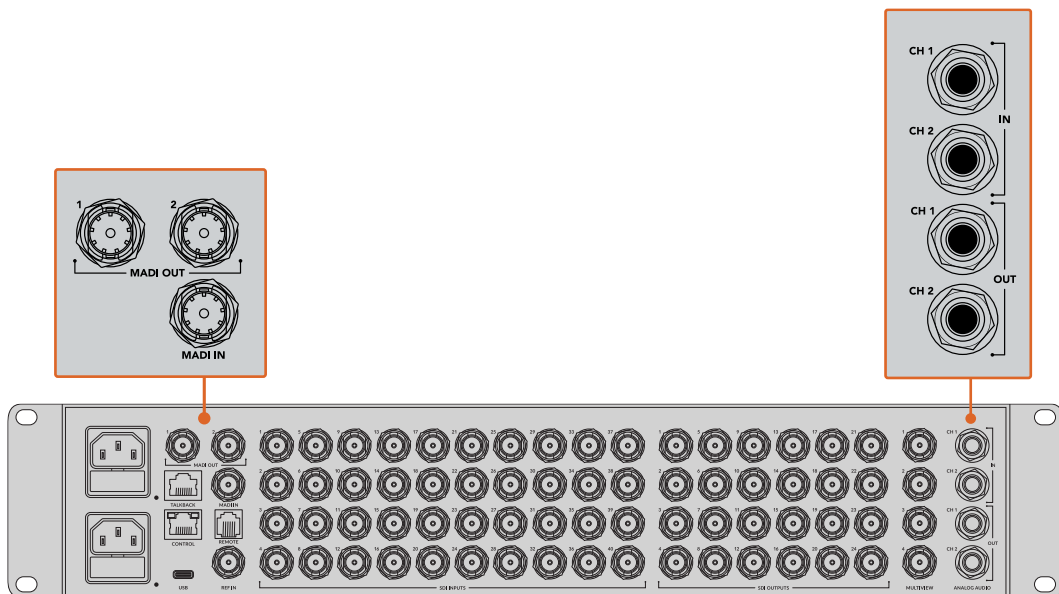
- 5 Type in the IP address of your ATEM switcher in the “Switcher Address” field. Your ATEM switcher defaults to DHCP when shipped or you can set it to a static IP address.
- 6 “Set tally outputs” should be set to “Switcher Inputs 1-8”.
- 7 Click “Apply”. The white LED to the right of the USB port should stop flashing and remain on to indicate it has successfully found the ATEM switcher. The GPI and Tally Interface is now ready.
- 8 Close ATEM Setup and disconnect your USB cable.



Network and output settings for the GPI and Tally Interface

## Using MADI with ATEM 4 M/E and 8K Switchers

ATEM 4 M/E Constellation and Constellation 8K model switchers support digital audio with the MADI protocol, also known as Multichannel Audio Digital Interface. MADI is popular with most professional audio manufacturers, broadcasters and high end recording facilities. These MADI ports have robust BNC connectors and transmit audio data over 75 ohm coaxial cables up to 100 meters long.



ATEM 4 M/E Constellation switchers have BNC connectors for MADI audio, plus 1/4" TRS connectors for analog audio in and out.

## MADI In

MADI channels 1-64 receive digital audio at 24 bit depth with a sampling rate of 48 kHz. These are connected to an extra 64 channels in the audio mixer that you can mix into the program output with the same EQ and dynamics as the video input audio mixing channels. These additional 64 audio inputs mean you can do very complex audio mixing all within ATEM 4 M/E and Constellation 8K switchers.

## MADI Out 1

In HD and Ultra HD, MADI Out 1 sends these sources:

<b>Channels 1–60</b>	Channels 1 and 2 of SDI inputs 1-30.
<b>Channels 61–62</b>	External mic.
<b>Channels 63–64</b>	TRS analog audio input.

## MADI Out 1

ATEM Constellation 8K in 8K mode, MADI Out 1 sends these sources:

<b>Channels 1–20</b>	Channels 1 and 2 of SDI inputs 1-10.
<b>Channels 21–22</b>	Media player audio.
<b>Channels 23–24</b>	External mic.
<b>Channels 25–26</b>	TRS analog audio input.
<b>Channels 27–28</b>	PGM audio.

## MADI Out 2

In HD and Ultra HD, MADI Out 2 sends these sources:

<b>Channels 1–60</b>	Channels 3 and 4 of SDI inputs 1-30.
<b>Channels 61–62</b>	External mic.
<b>Channels 63–64</b>	PGM audio.

## MADI Out 2

ATEM Constellation 8K in 8K mode, MADI Out 2 sends these sources:

<b>Channels 1–20</b>	Channels 3 and 4 of SDI inputs 1-10.
<b>Channels 21–22</b>	Media player audio.
<b>Channels 23–24</b>	External mic.
<b>Channels 25–26</b>	TRS analog audio input.
<b>Channels 27–28</b>	PGM audio.

ATEM 4 M/E Constellation 4K Plus features 4 MADI out connectors on the rear of the switcher.

## MADI Out 3

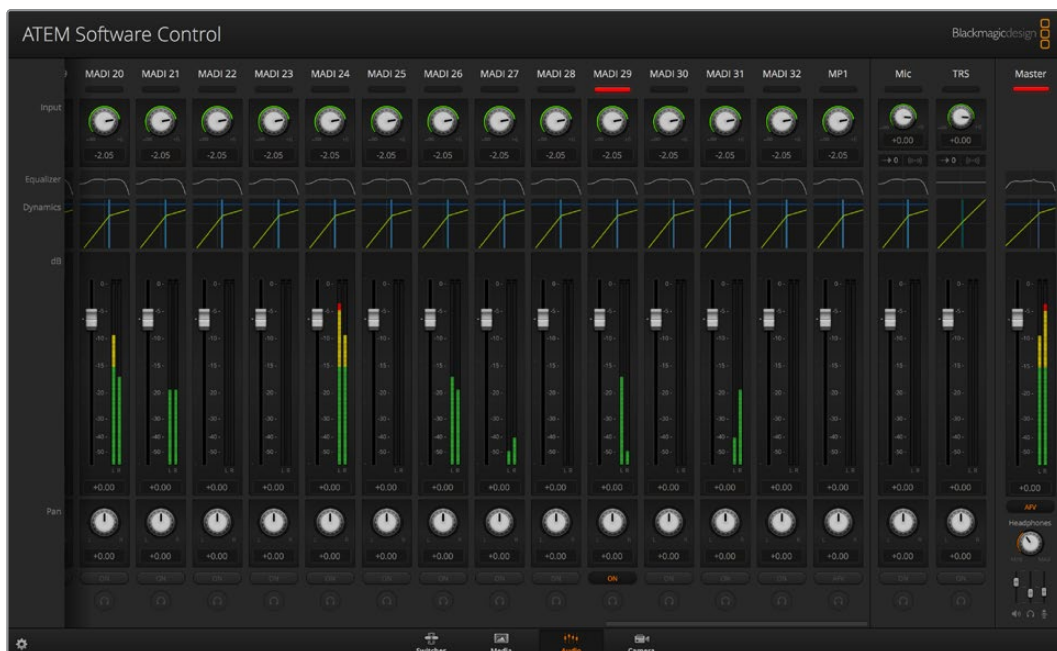
In HD and Ultra HD, MADI Out 3 sends these sources:

<b>Channels 1–60</b>	Channels 1 and 2 of SDI inputs 31 - 60
<b>Channels 61–62</b>	Media Player 1
<b>Channels 63–64</b>	Media Player 2

## MADI Out 4

In HD and Ultra HD, MADI Out 4 sends these sources:

<b>Channels 1–60</b>	Channels 3 and 4 of SDI inputs 31 - 60
<b>Channels 61–62</b>	Media Player 3
<b>Channels 63–64</b>	Media Player 4



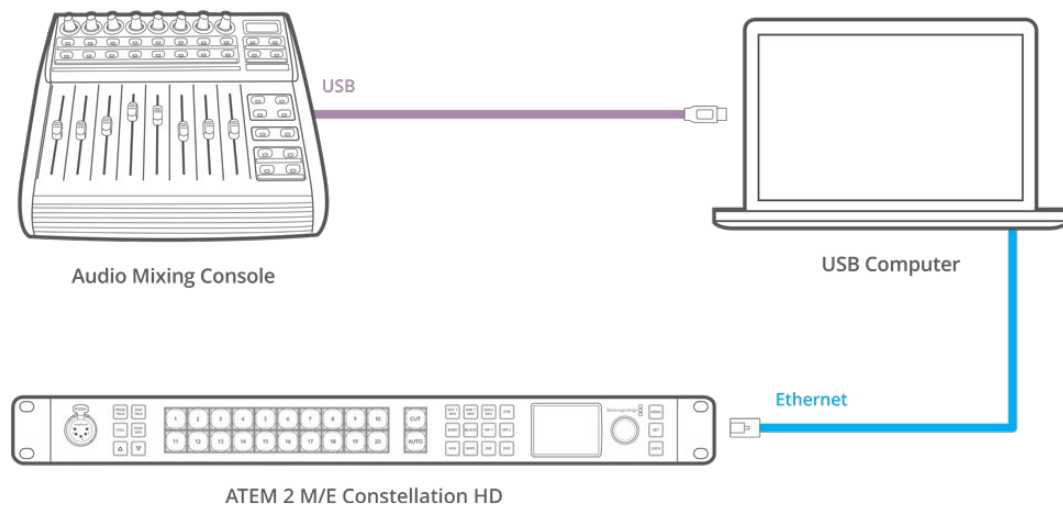
## Using a Third Party Audio Mixer Control Surface

### Using an Audio Mixer Control Surface

In the fast-paced world of live TV production, using a mouse to make adjustments can sometimes feel too slow! If you need to mix more than one audio source at a time on your ATEM switcher then here's an idea that can really help. Connecting a hardware audio mixer control surface to your ATEM switcher provides you with the ability to use both hands and adjust multiple audio levels at the same time.

An audio mixer control surface can be connected to your Mac or PC as a MIDI device using Mackie Control commands to communicate with the ATEM switcher.

Many third party MIDI control surfaces are compatible with your ATEM switcher but please check with the manufacturer of your control surface if in doubt.



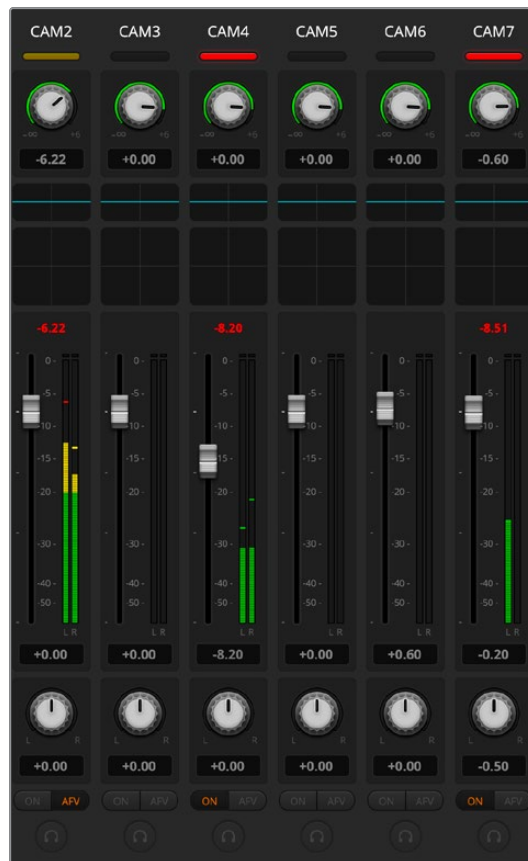
You can adjust multiple audio levels at the same time by connecting a hardware audio mixer to the computer which is running ATEM Software Control.

## Connecting Your Audio Mixer Control Surface

- 1 Connect your compatible MIDI control surface to your Mac or PC. Most modern control surfaces use USB.
- 2 Verify your control surface is recognized by your computer as a MIDI device.  
  
For Mac computers, go to Applications/Utilities/Audio MIDI Setup and launch the application. Go to the Window menu and choose Show MIDI Window. Ensure your control surface appears as a MIDI device in this window.  
  
For Windows computers, go to Device Manager/Sound, Video and Game Controllers and ensure your control surface appears in the list of icons.
- 3 The ATEM audio mixer is designed to communicate with your control surface using Mackie Control commands so your control surface will need to support Mackie Control. You'll also need to make sure your control surface is configured to use native Mackie Control or Mackie Control emulation. Please refer to your control surface's user manual for configuration details.

Some control surfaces offer several types of Mackie Control emulation and you should choose the one that activates the most features on your control surface. For example, with the Behringer BCF 2000, choosing "Mackie Control Mapping for Cakewalk Sonar 3 [MCS0]" enables level faders, bank selectors, balance control, AFV and ON/MUTE functions and also activates the LED screen which displays which bank of faders you have selected for your audio mix. The LED screen will not activate if you choose another Mackie Control emulation.

- 4 Launch ATEM Software Control and it will automatically look for your control surface using the first port on the first MIDI device that it finds. Click on the Audio tab in ATEM Software Control to display the ATEM audio mixer. Try sliding the gain faders up and down on your hardware control surface and verify that the audio mixer faders show a corresponding increase and decrease in the software on your computer screen. If so, you have successfully configured your control surface to work with the ATEM switcher.



Try sliding the gain faders up and down on your hardware control surface and verify that the audio mixer faders show a corresponding movement in the software on your computer screen

## The MUTE button

In the ATEM audio mixer interface, audio is always on, or present in the mix, when the ON button is selected. When the ON button is deselected, audio is not present or is muted. To match the software interface, you'll find the MUTE button on your audio mixer control surface will be lit when audio is always on or present in the mix. The MUTE button will be unlit when audio is not present or is muted.

## Decibel Scales

All hardware mixers are made differently and the scale printed on your control surface may not match the scale in the ATEM audio mixer interface. Always refer to the ATEM audio mixer levels for the true decibel scales.



## Using a DaVinci Resolve Micro Panel

The DaVinci Resolve primary color corrector in each camera controller can be controlled using a DaVinci Resolve Micro panel. This lets you make fast and precise color adjustments using a hardware control panel.

### To set up the panel:

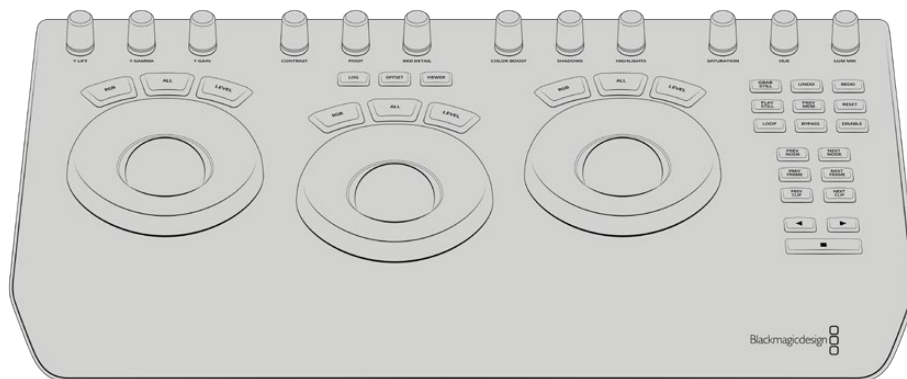
- 1 Connect the DaVinci Resolve Micro Panel to your computer via USB-C and launch ATEM Software Control.
- 2 Click on the 'camera' tab and select a camera by clicking anywhere in the desired camera controller.
- 3 On the DaVinci Resolve Micro Panel, rotate the trackballs and turn the knobs to adjust the corresponding controls in the primary color corrector.

### Making Color Correction Adjustments

The DaVinci Resolve Micro panel is primarily designed for use with DaVinci Resolve software, but you can also use it to make adjustments in the color corrector panel of ATEM Software Control in the following way:

### The Trackballs

The three trackballs control the lift, gamma and gain color wheels in the color corrector panel. The ring surrounding each trackball adjusts the corresponding master wheels beneath the color wheels.



DaVinci Resolve Micro Panel

## Control Knobs

As you change settings with the hardware panel, you will see the corresponding settings on the software panel change as well. Use the following control knobs to make adjustments.

<b>Y Lift</b>	Allows you to modify image contrast via a Y-only adjustment for the black level.
<b>Y Gamma</b>	Allows you to modify image contrast via a Y-only adjustment for gamma.
<b>Y Gain</b>	Allows you to modify image contrast via a Y-only adjustment for highlights.
<b>Contrast</b>	Rotate clockwise to increase contrast and counterclockwise to reduce contrast.
<b>Highlights</b>	The 'highlights' knob controls the iris on your selected camera. Rotate the knob clockwise to open the iris and counterclockwise to close.
<b>Saturation</b>	Rotate clockwise or counterclockwise to increase or decrease color saturation.
<b>Hue</b>	Adjust the hue along the hue distribution as seen on a color wheel by rotating the 'hue' knob clockwise or counterclockwise.
<b>Lum Mix</b>	Rotate clockwise or counterclockwise to set the output blend between the RGB and YRGB correctors.

## Control Buttons

<b>Left Arrow</b>	Select the previous camera number
<b>Right Arrow</b>	Select the next camera number

For more information on how each control affects the image, refer to the details provided earlier in this section.

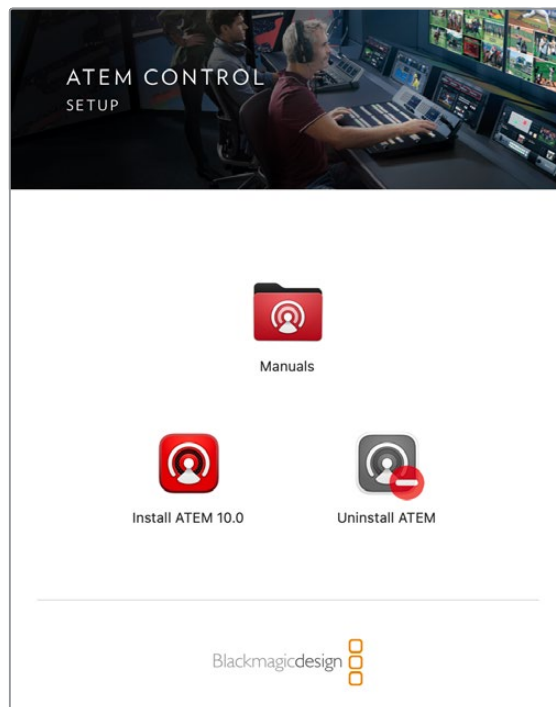
# Updating the Software

## How to update the ATEM Software

From time to time Blackmagic Design will release new software for your ATEM switcher and hardware panel, with new features, bug fixes, and increased compatibility with third party software and video devices.

To update your ATEM switcher with new software, you need to use ATEM Setup to connect to the ATEM switcher and hardware panels. ATEM Setup will check your switcher's internal software and will ask if you wish to update if you have a newer version installed on your computer.

Always update all your equipment at the same time so it's all running the same version of software.



ATEM Software Installer

To perform an update, you can directly connect your ATEM switcher or advanced panel to the computer via USB.

Alternatively, if you already have your switcher connected to your computer via Ethernet, you can simply update via the Ethernet connection.

First, download the latest Blackmagic ATEM Switcher software and install it on your Mac or PC using the instructions listed previously in the Installing Software section of this manual. Once installed, the new software for your ATEM switcher and advanced panel will be included in the ATEM setup utility.

## Updating the Switcher Software

- 1 Connect the switcher via the USB port.

If you already have your switcher connected to your computer via Ethernet, you can update via the Ethernet connection.

When upgrading software via USB, make sure the switcher is the only ATEM device connected via USB to the computer running the setup utility software. If more than one ATEM device is connected, the switcher may not be recognized.

- 2 Launch ATEM Setup.
- 3 If the switcher software requires updating, you will be prompted by a window asking if you would like to update the software. Click 'update' to initiate the update process, which may take a few minutes. It's important you don't unplug the power from the switcher during the software update.
- 4 Once the software update is complete, a window will prompt you to cycle power on the switcher. Turn your switcher off and on, then 'close' the dialog box.

## Updating an ATEM Hardware Panel

- 1 Connect the ATEM hardware panel to your computer via USB. If you already have your panel connected to your computer via Ethernet, you can update via the Ethernet connection.

**NOTE** When upgrading software via USB, make sure the advanced panel is the only ATEM device connected via USB to the computer running the setup utility software. If more than one ATEM device is connected, the panel may not be recognized.

- 2 Launch ATEM Setup.
- 3 If the panel requires updating, you will be prompted by a window asking if you would like to update the software. Click 'update' to initiate the update process. It's important you don't unplug the power from the panel during the software update.
- 4 Once the software update is complete, the advanced panel will power cycle automatically.

## Updating via Ethernet

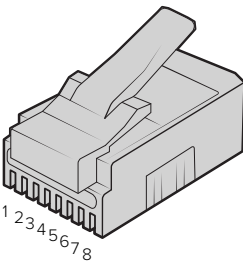
Updating your ATEM switcher or advanced panel via Ethernet is generally faster and easier, however there are some instances, such as those below, where it may not be possible and you will need to update via USB:

- Updating the internal software for the first time.
- Your ATEM network settings are already configured to work straight away, however if you are connecting to a network with other video equipment, there may be potential IP address conflicts which may prevent communication between your computer and your switcher. Network settings can only be set via USB.

# Adapter Cables for Talkback and Camera Control

## Talkback Pin Connections

The 'talkback' connector on the back panel of ATEM Constellation switchers is for routing engineering talkback and production talkback. You can make an adapter cable with an RJ45 connector using this pinout diagram.



Eng TX+	Eng TX-	Prod TX+	Prod RX+	Prod RX-	Prod TX-	Eng RX+	Eng RX-
1	2	3	4	5	6	7	8

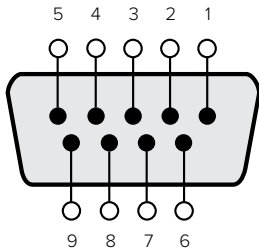
RJ45 pinout for 'talkback' connector on the back panel of ATEM Constellation model switchers

## Serial Port Pin Connections for Control Cables

### RS-422 Pin Connections for Control Cables

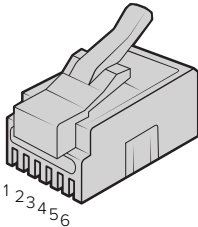
RS-422 is a broadcast standard using a common DE 9 or RJ12 connector. You can easily rewire these types of connectors in a custom built PTZ control unit if you want to design one yourself.

A pinout diagram of the RS-422 DE 9 and RJ12 connector is provided below.



Receive (-)	Receive (+)	Transmit (-)	Transmit (+)	Ground Pins
8	3	2	7	1, 4, 6, 9

RS-422 PTZ pin connections



TX+	TX-	GND	GND	RX-	RX+
1	2	3	4	5	6

RJ12 Pinout for PTZ remote on ATEM 4 M/E Constellation and Constellation 8K model switchers

# Developer Information

## Blackmagic SDI Camera Control Protocol

### Version 1.3

If you are a software developer you can use the SDI Camera Control Protocol to construct devices that integrate with our products. Here at Blackmagic Design our approach is to open up our protocols and we eagerly look forward to seeing what you come up with!

### Overview

The Blackmagic SDI Camera Control Protocol is used by ATEM switchers, Blackmagic 3G-SDI Shield for Arduino and the Blackmagic Camera Control app to provide Camera Control functionality with supported Blackmagic Design cameras. Please refer to the 'Understanding Studio Camera Control' chapter section of this manual, or the ATEM Switchers Manual and SDK manual for more information. These can be downloaded at [www.blackmagicdesign.com/support](http://www.blackmagicdesign.com/support).

This document describes an extensible protocol for sending a uni directional stream of small control messages embedded in the non-active picture region of a digital video stream. The video stream containing the protocol stream may be broadcast to a number of devices. Device addressing is used to allow the sender to specify which device each message is directed to.

### Assumptions

Alignment and padding constraints are explicitly described in the protocol document. Bit fields are packed from LSB first. Message groups, individual messages and command headers are defined as and can be assumed to be 32 bit aligned.

### Blanking Encoding

A message group is encoded into a SMPTE 291M packet with DID/SDID x51/x53 in the active region of VANC line 16.

### Message Grouping

Up to 32 messages may be concatenated and transmitted in one blanking packet up to a maximum of 255 bytes payload. Under most circumstances, this should allow all messages to be sent with a maximum of one frame latency.

If the transmitting device queues more bytes of message packets than can be sent in a single frame, it should use heuristics to determine which packets to prioritize and send immediately. Lower priority messages can be delayed to later frames, or dropped entirely as appropriate.

### Abstract Message Packet Format

Every message packet consists of a three byte header followed by an optional variable length data block. The maximum packet size is 64 bytes.

<b>Destination device (uint8)</b>	Device addresses are represented as an 8 bit unsigned integer. Individual devices are numbered 0 through 254 with the value 255 reserved to indicate a broadcast message to all devices.
<b>Command length (uint8)</b>	The command length is an 8 bit unsigned integer which specifies the length of the included command data. The length does NOT include the length of the header or any trailing padding bytes.

<b>Command id (uint8)</b>	The command id is an 8 bit unsigned integer which indicates the message type being sent. Receiving devices should ignore any commands that they do not understand. Commands 0 through 127 are reserved for commands that apply to multiple types of devices. Commands 128 through 255 are device specific.
<b>Reserved (uint8)</b>	This byte is reserved for alignment and expansion purposes. It should be set to zero.
<b>Command data (uint8[])</b>	The command data may contain between 0 and 60 bytes of data. The format of the data section is defined by the command itself.
<b>Padding (uint8[])</b>	Messages must be padded up to a 32 bit boundary with 0x0 bytes. Any padding bytes are NOT included in the command length.

Receiving devices should use the destination device address and or the command identifier to determine which messages to process. The receiver should use the command length to skip irrelevant or unknown commands and should be careful to skip the implicit padding as well.

## Defined Commands

### Command 0 : change configuration

<b>Category (uint8)</b>	The category number specifies one of up to 256 configuration categories available on the device.
<b>Parameter (uint8)</b>	The parameter number specifies one of 256 potential configuration parameters available on the device. Parameters 0 through 127 are device specific parameters. Parameters 128 through 255 are reserved for parameters that apply to multiple types of devices.
<b>Data type (uint8)</b>	The data type specifies the type of the remaining data. The packet length is used to determine the number of elements in the message. Each message must contain an integral number of data elements.

#### Currently defined values are:

<b>0: void / boolean</b>	A void value is represented as a boolean array of length zero. The data field is a 8 bit value with 0 meaning false and all other values meaning true.
<b>1: signed byte</b>	Data elements are signed bytes
<b>2: signed 16 bit integer</b>	Data elements are signed 16 bit values
<b>3: signed 32 bit integer</b>	Data elements are signed 32 bit values
<b>4: signed 64 bit integer</b>	Data elements are signed 64 bit values
<b>5: UTF-8 string</b>	Data elements represent a UTF-8 string with no terminating character.

#### Data types 6 through 127 are reserved.

<b>128: signed 5.11 fixed point</b>	Data elements are signed 16 bit integers representing a real number with 5 bits for the integer component and 11 bits for the fractional component. The fixed point representation is equal to the real value multiplied by $2^{11}$ . The representable range is from -16.0 to 15.9995 (15 + 2047/2048).
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Data types 129 through 255 are available for device specific purposes.

<b>Operation type (uint8)</b>	The operation type specifies what action to perform on the specified parameter. Currently defined values are:
<b>0: assign value</b>	The supplied values are assigned to the specified parameter. Each element will be clamped according to its valid range. A void parameter may only be 'assigned' an empty list of boolean type. This operation will trigger the action associated with that parameter. A boolean value may be assigned the value zero for false and any other value for true.
<b>1: offset / toggle value</b>	Each value specifies signed offsets of the same type to be added to the current parameter values. The resulting parameter value will be clamped according to their valid range. It is not valid to apply an offset to a void value. Applying any offset other than zero to a boolean value will invert that value.

Operation types 2 through 127 are reserved.

Operation types 128 through 255 are available for device specific purposes.

<b>Data (void)</b>	The data field is 0 or more bytes as determined by the data type and number of elements.
--------------------	--

The category, parameter, data type and operation type partition a 24 bit operation space.

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Lens	0.0	Focus	fixed16	–	0	1	0.0 = near, 1.0 = far
	0.1	Instantaneous autofocus	void	–	–	–	trigger instantaneous autofocus
	0.2	Aperture (f-stop)	fixed16	–	-1	16	Aperture Value (where fnumber = $\sqrt{2^{AV}}$ )
	0.3	Aperture (normalised)	fixed16	–	0	1	0.0 = smallest, 1.0 = largest
	0.4	Aperture (ordinal)	int16	–	0	n	Steps through available aperture values from minimum (0) to maximum (n)
	0.5	Instantaneous auto aperture	void	–	–	–	trigger instantaneous auto aperture
	0.6	Optical image stabilisation	boolean	–	–	–	true = enabled, false = disabled
	0.7	Set absolute zoom (mm)	int16	–	0	max	Move to specified focal length in mm, from minimum (0) to maximum (max)
	0.8	Set absolute zoom (normalised)	fixed16	–	0	1	Move to specified focal length: 0.0 = wide, 1.0 = tele
	0.9	Set continuous zoom (speed)	fixed16	–	-1	+1.0	Start/stop zooming at specified rate: -1.0 = zoom wider fast, 0.0 = stop, +1 = zoom tele fast



Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Video	1.0	Video mode	int8	[0] = frame rate	–	–	24, 25, 30, 50, 60
				[1] = M-rate	–	–	0 = regular, 1 = M-rate
				[2] = dimensions	–	–	0=NTSC, 1=PAL, 2=720, 3=1080, 4=2K DCI, 5=2K 16:9, 6=UHD, 7=3k Anamorphic, 8=4k DCI, 9=4k 16:9, 10=4.6k 2.4:1, 11=4.6k
				[3] = interlaced	–	–	0 = progressive, 1 = interlaced
				[4] = Color space	–	–	0 = YUV
	1.1	Gain (up to Camera 4.9)	int8		1	16	1 = 100 ISO, 2 = 200 ISO, 4 = 400 ISO, 8 = 800 ISO, 16 = 1600 ISO
	1.2	Manual White Balance	int16	[0] = color temp	2500	10000	Color temperature in K
			int16	[1] = tint	-50	50	tint
	1.3	Set auto WB	void	–	–	–	Calculate and set auto white balance
	1.4	Restore auto WB	void	–	–	–	Use latest auto white balance setting
	1.5	Exposure (us)	int32		1	42000	time in us
	1.6	Exposure (ordinal)	int16	–	0	n	Steps through available exposure values from minimum (0) to maximum (n)
	1.7	Dynamic Range Mode	int8 enum	–	0	1	0 = film, 1 = video,
	1.8	Video sharpening level	int8 enum	–	0	3	0 = off, 1 = low, 2 = medium, 3 = high
	1.9	Recording format	int16	[0] = file frame rate	–	–	fps as integer (eg 24, 25, 30, 50, 60, 120)
				[1] = sensor frame rate	–	–	fps as integer, valid when sensor-off-speed set (eg 24, 25, 30, 33, 48, 50, 60, 120), no change will be performed if this value is set to 0
				[2] = frame width	–	–	in pixels
				[3] = frame height	–	–	in pixels
				[4] = flags	–	–	[0] = file-M-rate
					–	–	[1] = sensor-M-rate, valid when sensor-off-speed-set
					–	–	[2] = sensor-off-speed
					–	–	[3] = interlaced
					–	–	[4] = windowed mode
	1.10	Set auto exposure mode	int8	–	0	4	0 = Manual Trigger, 1 = Iris, 2 = Shutter, 3 = Iris + Shutter, 4 = Shutter + Iris
	1.11	Shutter angle	int32	–	100	36000	Shutter angle in degrees, multiplied by 100
	1.12	Shutter speed	int32	–	24	2000	Shutter speed value as a fraction of 1, so 50 for 1/50th of a second
	1.13	Gain	int8	–	-128	127	Gain in decibel (dB)
	1.14	ISO	int32	–	0	2147483647	ISO value

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Audio	2.0	Mic level	fixed16	–	0	1	0.0 = minimum, 1.0 = maximum
	2.1	Headphone level	fixed16	–	0	1	0.0 = minimum, 1.0 = maximum
	2.2	Headphone program mix	fixed16	–	0	1	0.0 = minimum, 1.0 = maximum
	2.3	Speaker level	fixed16	–	0	1	0.0 = minimum, 1.0 = maximum
	2.4	Input type	int8	–	0	2	0 = internal mic, 1 = line level input, 2 = low mic level input, 3 = high mic level input
	2.5	Input levels	fixed16	[0] ch0	0	1	0.0 = minimum, 1.0 = maximum
				[1] ch1	0	1	0.0 = minimum, 1.0 = maximum
	2.6	Phantom power	boolean	–	–	–	true = powered, false = not powered
Output	3.0	Overlay enables	uint16 bit field	–	–	–	bit flags: [0] = display status, [1] = display frame guides Some cameras don't allow separate control of frame guides and status overlays.
	3.1	Frame guides style (Camera 3.x)	int8	[0] = frame guides style	0	8	0 = HDTV, 1 = 4:3, 2 = 2.4:1, 3 = 2.39:1, 4 = 2.35:1, 5 = 1.85:1, 6 = thirds
	3.2	Frame guides opacity (Camera 3.x)	fixed16	[1] = frame guide opacity	0.1	1	0.0 = transparent, 1.0 = opaque
	3.3	Overlays (replaces .1 and .2 above from Cameras 4.0)	int8	[0] = frame guides style	–	–	0 = off, 1 = 2.4:1, 2 = 2.39:1, 3 = 2.35:1, 4 = 1.85:1, 5 = 16:9, 6 = 14:9, 7 = 4:3, 8 = 2:1
				[1] = frame guide opacity	0	100	0 = transparent, 100 = opaque
				[2] = safe area percentage	0	100	percentage of full frame used by safe area guide (0 means off)
				[3] = grid style	–	–	bit flags: [0] = display thirds, [1] = display cross hairs, [2] = display center dot

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Display	4.0	Brightness	fixed16	–	0	1	0.0 = minimum, 1.0 = maximum
	4.1	Overlay enables	int16 bit field	–	–	–	0x4 = zebra
				–	–	–	0x8 = peaking
	4.2	Zebra level	fixed16	–	0	1	0.0 = minimum, 1.0 = maximum
	4.3	Peaking level	fixed16	–	0	1	0.0 = minimum, 1.0 = maximum
	4.4	Color bars display time (seconds)	int8	–	0	30	0 = disable bars, 1-30 = enable bars with timeout (s)
	4.5	Focus Assist	int8	[0] = focus assist method	–	–	0 = Peak, 1 = Colored lines
				[1] = focus line color	–	–	0 = Red, 1 = Green, 2 = Blue, 3 = White, 4 = Black
Tally	5.0	Tally brightness	fixed16	–	0	1	Sets the tally front and tally rear brightness to the same level. 0.0 = minimum, 1.0 = maximum
	5.1	Front tally brightness	fixed16	–	0	1	Sets the tally front brightness. 0.0 = minimum, 1.0 = maximum
	5.2	Rear tally brightness	fixed16	–	0	1	Sets the tally rear brightness. 0.0 = minimum, 1.0 = maximum Tally rear brightness cannot be turned off
Reference	6.0	Source	int8 enum	–	0	2	0 = internal, 1 = program, 2 = external
	6.1	Offset	int32	–	–	–	+/- offset in pixels
Confi- guration	7.0	Real Time Clock	int32	[0] time	–	–	BCD - HHMMSSFF (UCT)
				[1] date	–	–	BCD - YYYYMMDD
	7.1	System language	string	–	–	–	ISO-639-1 two character language code
	7.2	Timezone	int32	–	–	–	Minutes offset from UTC
	7.3	Location	int64	[0] latitude	–	–	BCD - s0DDddddddddddd where s is the sign: 0 = north (+), 1 = south (-); DD degrees, ddddddddddd decimal degrees
				[1] longitude	–	–	BCD - sDDDddddddddddd where s is the sign: 0 = west (-), 1 = east (+); DDD degrees, ddddddddddd decimal degrees

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Color Correction	8.0	Lift Adjust	fixed16	[0] red	-2	2	default 0.0
				[1] green	-2	2	default 0.0
				[2] blue	-2	2	default 0.0
				[3] luma	-2	2	default 0.0
	8.1	Gamma Adjust	fixed16	[0] red	-4	4	default 0.0
				[1] green	-4	4	default 0.0
				[2] blue	-4	4	default 0.0
				[3] luma	-4	4	default 0.0
	8.2	Gain Adjust	fixed16	[0] red	0	16	default 1.0
				[1] green	0	16	default 1.0
				[2] blue	0	16	default 1.0
				[3] luma	0	16	default 1.0
	8.3	Offset Adjust	fixed16	[0] red	-8	8	default 0.0
				[1] green	-8	8	default 0.0
				[2] blue	-8	8	default 0.0
				[3] luma	-8	8	default 0.0
	8.4	Contrast Adjust	fixed16	[0] pivot	0	1	default 0.5
				[1] adj	0	2	default 1.0
	8.5	Luma mix	fixed16	–	0	1	default 1.0
	8.6	Color Adjust	fixed16	[0] hue	-1	1	default 0.0
				[1] sat	0	2	default 1.0
	8.7	Correction Reset Default	void	–	–	–	reset to defaults

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Media	10.0	Codec	int8 enum	[0] = basic codec	–	–	1 = DNxHD, 2 = ProRes, 3 = Blackmagic RAW
				[1] = codec variant	–	–	ProRes: 0 = HQ, 1 = 422, 2 = LT, 3 = Proxy, 4 = 444, 5 = 444XQ
					–	–	Blackmagic RAW: 0 = Q0, 1 = Q5, 2 = 3:1, 3 = 5:1, 4 = 8:1, 5 = 12:1
	10.1	Transport mode	int8	[0] = mode	–	–	0 = Preview, 1 = Play, 2 = Record
				[1] = speed	–	–	-ve = multiple speeds backwards, 0 = pause, +ve = multiple speeds forwards
				[2] = flags	–	–	1<<0 = loop, 1<<1 = play all, 1<<5 = disk1 active, 1<<6 = disk2 active, 1<<7 = time-lapse recording
				[3] = slot 1 storage medium	–	–	0 = CFast card, 1 = SD, 2 = SSD Recorder
				[4] = slot 2 storage medium	–	–	0 = CFast card, 1 = SD, 2 = SSD Recorder
PTZ Control	11.0	Pan/Tilt Velocity	fixed 16	[0] = pan velocity	-1.0	1.0	-1.0 = full speed left, 1.0 = full speed right
				[1] = tilt velocity	-1.0	1.0	-1.0 = full speed down, 1.0 = full speed up
	11.1	Memory Preset	int8 enum	[0] = preset command	–	–	0 = reset, 1 = store location, 2 = recall location
			int8	[1] = preset slot	0	5	–

## Example Protocol Packets

Operation	Packet Length	Byte															
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		header command data															
		destination	length	command	reserved	category	parameter	type	operation								
trigger instantaneous auto focus on camera 4	8	4	4	0	0	0	1	0	0								
turn on OIS on all cameras	12	255	5	0	0	0	6	0	0	1	0	0	0				
set exposure to 10 ms on camera 4 (10 ms = 10000 us = 0x00002710)	12	4	8	0	0	1	5	3	0	0x10	0x27	0x00	0x00				
add 15% to zebra level (15 % = 0.15 f = 0x0133 fp)	12	4	6	0	0	4	2	128	1	0x33	0x01	0	0				
select 1080p 23.98 mode on all cameras	16	255	9	0	0	1	0	1	0	24	1	3	0	0	0	0	0
subtract 0.3 from gamma adjust for green & blue (-0.3 ~= 0xfd9a fp)	16	4	12	0	0	8	1	128	1	0	0	0x9a	0xfd	0x9a	0xfd	0	0
all operations combined	76	4	4	0	0	0	1	0	0	255	5	0	0	0	6	0	0
		1	0	0	0	4	8	0	0	1	5	3	0	0x10	0x27	0x00	0x00
		4	6	0	0	4	2	128	1	0x33	0x01	0	0	255	9	0	0
		1	0	1	0	24	1	3	0	0	0	0	0	4	12	0	0
		8	1	128	1	0	0	0x9a	0xfd	0x9a	0xfd	0	0				

# Blackmagic Embedded Tally Control Protocol

## Version 1.0 (30/04/14)

This section is for third party developers or users who may wish to add support for the Blackmagic Embedded Tally Control Protocol to their products or system. It describes the protocol for sending tally information embedded in the non-active picture region of a digital video stream.

### Data Flow

A master device such as a broadcast switcher embeds tally information into its program feed which is broadcast to a number of slave devices such as cameras or camera controllers. The output from the slave devices is typically fed back to the master device, but may also be sent to a video monitor.

The primary flow of tally information is from the master device to the slaves. Each slave device may use its device id to extract and display the relevant tally information.

Slave devices pass through the tally packet on their output and update the monitor tally status, so that monitor devices connected to that individual output may display tally status without knowledge of the device id they are monitoring.

### Assumptions

Any data alignment / padding is explicit in the protocol. Bit fields are packed from LSB first.

### Blanking Encoding

One tally control packet may be sent per video frame. Packets are encoded as a SMPTE 291M packet with DID/SDID x51/x52 in the active region of VANC line 15. A tally control packet may contain up to 256 bytes of tally information.

### Packet Format

Each tally status consists of 4 bits of information:

- uint4
- bit 0: program tally status (0=off, 1=on)
- bit 1: preview tally status (0=off, 1=on)
- bit 2-3: reserved (0x0)

The first byte of the tally packet contains the monitor device tally status and a version number.

Subsequent bytes of the tally packet contain tally status for pairs of slave devices. The master device sends tally status for the number of devices configured/supported, up to a maximum of 510.

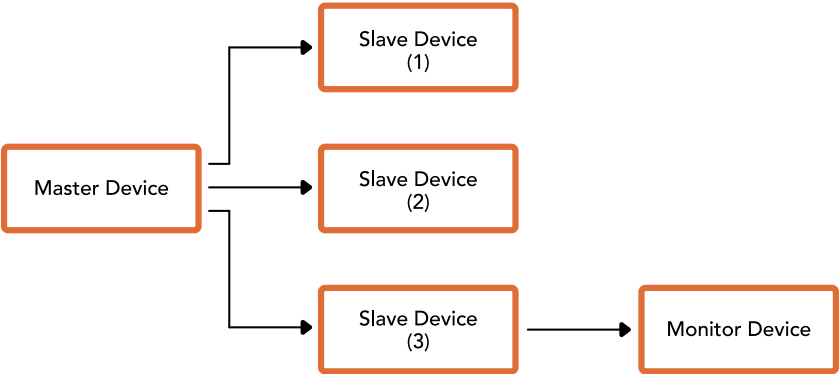
struct tally

```
uint8
bit 0:  monitor device program tally status (0=off, 1=on)
bit 1:  monitor device preview tally status (0=off, 1=on)
bit 2-3: reserved (0b00)
bit 4-7: protocol version (0b0000)

uint8[0]
bit 0:  slave device 1 program tally status (0=off, 1=on)
bit 1:  slave device 1 device preview tally status (0=off, 1=on)
bit 2-3: reserved (0b00)
bit 4:  slave device 2 program tally status (0=off, 1=on)
bit 5:  slave device 2 preview tally status (0=off, 1=on)
bit 6-7: reserved (0b00)

uint8[1]
bit 0:  slave device 3 program tally status (0=off, 1=on)
bit 1:  slave device 3 device preview tally status (0=off, 1=on)
bit 2-3: reserved (0b00)
bit 4:  slave device 4 program tally status (0=off, 1=on)
bit 5:  slave device 4 preview tally status (0=off, 1=on)
bit 6-7: reserved (0b00)
```

...



Byte	7 MSB	6	5	4	3	2	1	0 LSB
0	Version (0b0)	Version (0b0)	Version (0b0)	Version (0b0)	Reserved (0b0)	Reserved (0b0)	Monitor Preview	Monitor Program
1	Reserved (0b0)	Reserved (0b0)	Slave 1 Preview	Slave 1 Program	Reserved (0b0)	Reserved (0b0)	Slave 0 Preview	Slave 0 Program
2	Reserved (0b0)	Reserved (0b0)	Slave 3 Preview	Slave 3 Program	Reserved (0b0)	Reserved (0b0)	Slave 2 Preview	Slave 2 Program
3	...							



# Visca Commands for PTZ control via SDI

<b>Pan-tiltDrive</b>	Up	8x 01 06 01 VV WW 03 01 FF	<b>VV:</b> Pan speed 01 to 18 <b>WW:</b> Tilt speed 01 to 17 <b>YYYY:</b> Pan position F725 to 08DB (center 0000) <b>ZZZZ:</b> Tilt position FE70 to 04B0 (image flip: OFF) (center 0000) Tilt position FB50 to 0190 (image flip: ON) (center 0000)
	Down	8x 01 06 01 VV WW 03 02 FF	
	Left	8x 01 06 01 VV WW 01 03 FF	
	Right	8x 01 06 01 VV WW 02 03 FF	
	UpLeft	8x 01 06 01 VV WW 01 01 FF	
	UpRight	8x 01 06 01 VV WW 02 01 FF	
	DownLeft	8x 01 06 01 VV WW 01 02 FF	
	DownRight	8x 01 06 01 VV WW 02 02 FF	
	Stop	8x 01 06 01 VV WW 03 03 FF	
	AbsolutePosition	8x 01 06 02 VV WW 0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	
	RelativePosition	8x 01 06 03 VV WW 0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	
	Home	0Y 0Y 0Y 0Y 0Z 0Z 0Z 0Z FF	
	Reset	8x 01 06 05 FF	
<b>CAM_Memory</b>	Reset	8x 01 04 3F 00 0p FF	<b>p:</b> Memory number (=0 to 5) Corresponds to 1 to 6 on the remote commander.
	Set	8x 01 04 3F 01 0p FF	
	Recall	8x 01 04 3F 02 0p FF	

Compatible motorized heads include the following:

- KXWell KT-PH180BMD
- PTZOptics PT-Broadcaster
- RUSHWORKS PTX Model 1

# Blackmagic HyperDeck Ethernet Protocol

The Blackmagic HyperDeck Ethernet Protocol is a text based protocol accessed by connecting to TCP port 9993 on HyperDeck Extreme. If you are a software developer you can use the protocol to construct devices that integrate with our products. Here at Blackmagic Design our approach is to open up our protocols and we eagerly look forward to seeing what you come up with!

You can connect to your HyperDeck recorder using the HyperDeck Ethernet Protocol using a command line program on your computer, such as Terminal on a Mac and putty on a Windows computer.

The HyperDeck Ethernet Protocol lets you schedule playlists and recordings. The following is an example of how to play 7 clips from clip number 5 onwards via the HyperDeck Ethernet Protocol. If your recorder is installed out of reach, you can also turn on the 'remote' feature via Ethernet.

## On a Mac

- 1 Open the Terminal application which is located with the applications > utilities folder.
- 2 Type in "nc" and a space followed by the IP address of your HyperDeck Extreme another space and "9993" which is the HyperDeck Ethernet Protocol port number. For example type: nc 192.168.1.154 9993. The Protocol preamble will appear.
- 3 Type "playrange set: clip id: 5 count: 7" and press 'return'.  
If you look on the timeline on the front panel of the HyperDeck Extreme, you will see in and out points marked around clips 5 through the end of clip 11.
- 4 Type "play". Clips 5 through 11 will now play back.
- 5 To clear the playrange, type "playrange clear"
- 6 To exit from the protocol, type 'quit'.

## Protocol Commands

Command	Command Description
help	Provides help text on all commands and parameters
commands	return commands in XML format
device info	return device information
disk list	query clip list on active disk
disk list: slot id: {n}	query clip list on disk in slot {n}
quit	disconnect ethernet control
ping	check device is responding
preview: enable: {true/false}	switch to preview or output
play	play from current timecode
play: speed: {-5000 to 5000}	play at specific speed
play: loop: {true/false}	play in loops or stop-at-end

Command	Command Description
play: single clip: {true/false}	play current clip or all clips
playrange	query play range setting
playrange set: clip id: {n}	set play range to play clip {n} only
playrange set: clip id: {n} count: {m}	set play range to {m} clips starting from clip {n}
playrange set: in: {inT} out: {outT}	set play range to play between: - timecode {inT} and timecode {outT}
playrange set: timeline in: {in} timeline out: {out}	set play range in units of frames between: - timeline position {in} and position {out}
playrange clear	clear/reset play range setting
play on startup	query unit play on startup state
play on startup: enable: {true/false}	enable or disable play on startup
play on startup: single clip: {true/false}	play single clip or all clips on startup
play option	query play options
play option: stop mode: {lastframe/nextclip/black}	set output frame when playback stops
record	record from current input
record: name: {name}	record named clip (supports UTF-8 name)
record spill	spill current recording to next slot
record spill: slot id: {n}	spill current recording to specified slot use current slot id to spill to same slot
stop	stop playback or recording
clips count	query number of clips on timeline
clips get	query all timeline clips
clips get: clip id: {n}	query a timeline clip info
clips get: clip id: {n} count: {m}	query m clips starting from n
clips get: version: {1/2/3}	query clip info using specified output version: version 1: id: name startT duration version 2: id: startT duration inT outT name version 3: id: startT duration inT outT folder/filename
clips add: name: {name}	append a clip to timeline
clips add: clip id: {n} name: {name}	insert clip before existing clip {n}
clips add: in: {inT} out: {outT} name: {name}	append the {inT} to {outT} portion of clip
clips remove: clip id: {n}	remove clip {n} from the timeline (invalidates clip ids following clip {n})
clips clear	empty timeline clip list
transport info	query current activity
slot info	query active slot
slot info: slot id: {n}	query slot {n}

Command	Command Description
slot select: slot id: {n}	switch to specified slot
slot select: video format: {format}	load clips of specified format
slot unblock	unblock active slot
slot unblock: slot id: {n}	unblock slot {n}
cache info	query cache status
dynamic range	query dynamic range settings
dynamic range: playback override: {off/Rec709/Rec2020_SDR/ HLG/ ST2084_300/ST2084_500/ ST2084_800/ST2084_1000/ ST2084_2000/ST2084_4000/ST2048}	set playback dynamic range override
dynamic range: record override: {off/Rec709/Rec2020_SDR/ HLG/ST2084_300/ST2084_500/ ST2084_800/ST2084_1000/ ST2084_2000/ST2084_4000/ST2048}	set record dynamic range override
notify	query notification status
notify: remote: {true/false}	set remote notifications
notify: transport: {true/false}	set transport notifications
notify: slot: {true/false}	set slot notifications
notify: configuration: {true/false}	set configuration notifications
notify: dropped frames: {true/false}	set dropped frames notifications
notify: display timecode: {true/false}	set display timecode notifications
notify: timeline position: {true/false}	set playback timeline position notifications
notify: playrange: {true/false}	set playrange notifications
notify: cache: {true/false}	set cache notifications
notify: dynamic range: {true/false}	set dynamic range notifications for input or playback video
notify: slate: {true/false}	set digital slate notifications
notify: clips: {true/false}	set timeline clips notifications where two types of changes can occur: add: partial update with list of clips and insert positions snapshot: complete update of all clips on timeline
notify: disk: {true/false}	set disk clips notifications where two types of changes can occur: add: partial update with list of clips and insert positions snapshot: complete update of all clips on timeline
notify: device info: {true/false}	set device info notifications
notify: nas: {true/false}	set nas notifications triggered by commands such as “nas add” or “nas remove”
goto: clip id: {start/end}	goto first clip or last clip
goto: clip id: {n}	goto clip id {n}

Command	Command Description
goto: clip id: +{n}	go forward {n} clips
goto: clip id: -{n}	go backward {n} clips
goto: clip: {start/end}	goto start or end of clip
goto: clip: {n}	goto frame position {n} within current clip
goto: clip: +{n}	go forward {n} frames within current clip
goto: clip: -{n}	go backward {n} frames within current clip
goto: timeline: {start/end}	goto first frame or last frame of timeline
goto: timeline: {n}	goto frame position {n} within timeline
goto: timeline: +{n}	go forward {n} frames within timeline
goto: timeline: -{n}	go backward {n} frames within timeline
goto: timecode: {timecode}	goto specified timecode
goto: timecode: +{timecode}	go forward {timecode} duration
goto: timecode: -{timecode}	go backward {timecode} duration
goto: slot id: {n}	goto slot id {n} equivalent to "slot select: slot id: {n}"
jog: timecode: {timecode}	jog to timecode
jog: timecode: +{timecode}	jog forward {timecode} duration
jog: timecode: -{timecode}	jog backward {timecode} duration
shuttle: speed: {-5000 to 5000}	shuttle with speed
remote	query unit remote control state
remote: enable: {true/false}	enable or disable remote control
remote: override: {true/false}	session override remote control
configuration	query configuration settings
configuration: video input: {SDI/HDMI/component/composite}	change the video input
configuration: audio input: {embedded/XLR/RCA}	change the audio input
configuration: file format: {format}	switch to one of the supported formats: DNxHR_HQX QuickTimeDNxHR_HQX DNxHR_SQ QuickTimeDNxHR_SQ DNxHR_LB QuickTimeDNxHR_LB QuickTimeProResLT QuickTimeProRes QuickTimeProResHQ H.264Low H.264Medium H.264High H.264High10_422 H.265Low H.265Medium H.265High

Command	Command Description
configuration: audio codec: {PCM/AAC}	switch to specific audio codec
configuration: timecode input: {external/embedded/preset/clip}	change the timecode input
configuration: timecode output: {clip/timeline}	change the timecode output
configuration: timecode preference: {default/dropframe/nondropframe}	whether or not to use drop frame timecodes when not otherwise specified
configuration: timecode preset: {timecode}	set the timecode preset
configuration: audio input channels: {n}	set the number of audio channels recorded to {n}
configuration: record trigger: {none/recorderbit/timecoderun}	change the record trigger
configuration: record prefix: {name}	set the record prefix name (supports UTF-8 name)
configuration: append timestamp: {true/false}	append timestamp to recorded filename
configuration: genlock input resync: {true/false}	enable or disable genlock input resync
configuration: xlr input id: {n} xlr type: {line/mic}	configure xlr input type multiple xlr inputs can be configured in a single command
uptime	return time since last boot
format: slot id: {n} prepare: {exFAT/HFS+} name: {name}	prepare formatting operation filesystem type with volume name {name} "slot id" can be omitted for the current mounted slot "name" defaults to current volume name if mounted (supports UTF-8)
format: confirm: {token}	perform a pre-prepared formatting operation using token
identify: enable: {true/false}	identify the device
watchdog: period: {period in seconds}	client connection timeout
reboot	reboot device
slate clips	slate clips information
slate project	slate project information
slate lens	slate lens information
nas list	list all the NAS shares that have been added
nas discovered	list all NAS servers that have been discovered via mDNS
nas deselect	unmount the currently selected NAS share

Command	Command Description
connection protocol: response version: {version}	<p>change the output of “clips get”, “disk list” and related responses (this command does not affect other client connections)</p> <p>version 1</p> <p>205 clips get</p> <p>id: filename startT duration</p> <p>519 clips info</p> <p>id: startT duration inT outT filename</p> <p>206 disk list</p> <p>id: filename codec format duration</p> <p>520 disk list info</p> <p>id: filename codec format duration</p> <p>version 2</p> <p>205 clips get</p> <p>id: startT duration inT outT folder/filename</p> <p>519 clips info</p> <p>id: startT duration inT outT folder/filename</p> <p>206 disk list</p> <p>id: codec format duration folder/filename</p> <p>520 disk list info</p> <p>id: codec format duration folder/filename</p>
Multiline only commands:	Command Description
authenticate:↵	authenticate user for secure access
username: {username}	case sensitive username
password: {password}	case sensitive password
slate clips:↵	set slate clips information:
reel: {n}	slate reel number, where {n} is in [1, 999]
scene id: {id}	slate scene id value, where {id} is a string
shot type: {WS/MS/BCU/MCU/ECU/none}	slate shot type
take: {n}	slate take number, where {n} is in [1, 99]
take scenario: {PU/VFX/SER/none}	slate take scenario
take auto inc: {true/false}	slate take auto increment
good take: {true/false}	slate good take
environment: {interior/exterior}	slate environment
day night: {day/night}	slate day or night
slate project:↵	set slate project information:
project name: {name}	project name (can be empty, supports UTF-8)
camera: {index}	set camera index e.g. A
director: {name}	director (can be empty, supports UTF-8)
camera operator: {name}	camera operator (can be empty, supports UTF-8)
slate lens:↵	set lens information:
lens type: {type}	lens type (can be empty, supports UTF-8)

Command	Command Description
iris: {type}	camera iris (can be empty, supports UTF-8)
focal length: {length}	focal length (can be empty, supports UTF-8)
distance: {distance}	lens distance (can be empty, supports UTF-8)
filter: {filter}	lens filter (can be empty, supports UTF-8)
nas add:↵	add a NAS share, to be selected by the GUI or the nas select command
url: {url}	URL of the NAS share e.g. smb://server.local/path/to/share
username: {username}	username to connect as (can be empty, defaults to guest)
password: {password}	password to connect with (can be empty)
nas remove:↵	remove a previously added NAS share
url: {url}	URL of the NAS share e.g. smb://server.local/path/to/share
nas select:↵	mount a previously added NAS share asynchronously.
url: {url}	URL of the NAS share e.g. smb://server.local/path/to/share Use "slot info" or "notify: slot: true" to determine when share is mounted."

### Command Combinations

You can combine the parameters into a single command, for example:

```
play: speed: 200 loop: true single clip: true
```

Or for configuration:

```
configuration: video input: SDI audio input: XLR
```

Or to switch to the second disk, but only play NTSC clips:

```
slot select: slot id: 2 video format: NTSC
```

### Using XML

While you can use the Terminal to talk to HyperDeck, if you are writing software you can use XML to confirm the existence of a specific command based on the firmware of the HyperDeck you are communicating with. This helps your software user interface adjust to the capabilities of the specific HyperDeck model and software version.

## Protocol Details

### Connection

The HyperDeck Ethernet server listens on TCP port 9993.

### Basic syntax

The HyperDeck protocol is a line oriented text protocol. Lines from the server will be separated by an ascii CR LF sequence. Messages from the client may be separated by LF or CR LF.

New lines are represented in this document as a "↵" symbol.



### Command syntax

Command parameters are usually optional. A command with no parameters is terminated with a new line:

```
{Command name}↵
```

If parameters are specified, the command name is followed by a colon, then pairs of parameter names and values. Each parameter name is terminated with a colon character:

```
{Command name}: {Parameter}: {Value} {Parameter}: {Value} ...↵
```

### Response syntax

Simple responses from the server consist of a three digit response code and descriptive text terminated by a new line:

```
{Response code} {Response text}↵
```

If a response carries parameters, the response text is terminated with a colon, and parameter name and value pairs follow on subsequent lines until a blank line is returned:

```
{Response code} {Response text}:↵  
{Parameter}: {Value}↵  
{Parameter}: {Value}↵  
...  
↵
```

### Successful response codes

A simple acknowledgement of a command is indicated with a response code of 200:

```
200 ok↵
```

Other successful responses carry parameters and are indicated with response codes in the range of 201 to 299.

### Failure response codes

Failure responses to commands are indicated with response codes in the range of 100 to 199:

```
100 syntax error  
101 unsupported parameter  
102 invalid value  
103 unsupported  
104 disk full  
105 no disk  
106 disk error  
107 timeline empty  
108 internal error  
109 out of range  
110 no input  
111 remote control disabled  
112 clip not found  
120 connection rejected  
150 invalid state  
  
151 invalid codec  
160 invalid format  
161 invalid token  
162 format not prepared  
163 parameterized single line command not supported
```

### Asynchronous response codes

The server may return asynchronous messages at any time. These responses are indicated with response codes in the range of 500 to 599:

```
5xx {Response Text}:↵
{Parameter}: {Value}↵
{Parameter}: {Value}↵
↵
```

### Connection response

On connection, an asynchronous message will be delivered:

```
500 connection info:↵
protocol version: {Version}↵
model: {Model Name}↵
↵
```

### Connection rejection

Only one client may connect to the server at a time. If other clients attempt to connect concurrently, they will receive an error and be disconnected:

```
120 connection rejected↵
```

### Timecode syntax

Timecodes are expressed as non-drop-frame timecode in the format:

```
HH:MM:SS:FF
```

### Handling of deck "remote" state

The "remote" command may be used to enable or disable the remote control of the deck. Any attempt to change the deck state over ethernet while remote access is disabled will generate an error:

```
111 remote control disabled↵
```

To enable or disable remote control:

```
remote: enable: {"true", "false"} ↵
```

The current remote control state may be overridden allowing remote access over ethernet irrespective of the current remote control state:

```
remote: override: {"true", "false"} ↵
```

The override state is only valid for the currently connected ethernet client and only while the connection remains open.

The "remote" command may be used to query the remote control state of the deck by specifying no parameters:

```
remote↵
```

The deck will return the current remote control state:

```
210 remote info:↵
enabled: {"true", "false"}↵
override: {"true", "false"}↵
↵
```

Asynchronous remote control information change notification is disabled by default and may be configured with the "notify" command. When enabled, changes in remote state will generate a "510 remote info:" asynchronous message with the same parameters as the "210 remote info:" message.

### Closing connection

The "quit" command instructs the server to cleanly shut down the connection:

```
quit↵
```

### Checking connection status

The "ping" command has no function other than to determine if the server is responding:

```
ping↵
```

### Getting help

The "help" or "?" commands return human readable help text describing all available commands and parameters:

```
help↵
```

Or:

```
?↵
```

The server will respond with a list of all supported commands:

```
201 help:↵
{Help Text}↵
{Help Text}↵
↵
```

### Switching to preview mode

The "preview" command instructs the deck to switch between preview mode and output mode:

```
preview: enable: {"true", "false"}↵
```

Playback will be stopped when the deck is switched to preview mode. Capturing will be stopped when the deck is switched to output mode.

### Controlling device playback

The "play" command instructs the deck to start playing:

```
play↵
```

The play command accepts a number of parameters which may be used together in most combinations.

By default, the deck will play all remaining clips on the timeline then stop.

The "single clip" parameter may be used to override this behaviour:

```
play: single clip: {"true", "false"}↵
```

By default, the deck will play at normal (100%) speed. An alternate speed may be specified in percentage between -5000 and 5000:

```
play: speed: {% normal speed}↵
```

By default, the deck will stop playing when it reaches to the end of the timeline. The "loop" parameter may be used to override this behaviour:

```
play: loop: {"true", "false"}↵
```

The "playrange" command returns the current playrange setting if any:

```
playrange↵
```

To override this behaviour and select a particular clip:

```
playrange set: clip id: {Clip ID}↵
```

To only play a certain number of clips starting at a particular clip:

```
playrange set: clip id: {n} count: {m}↵
```

To only play a certain timecode range:

```
playrange set: in: {in timecode} out: {out timecode}↵
```

To play a certain timeline range:

```
playrange set: timeline in: {in} timeline out: {out}↵
```

To clear a set playrange and return to the default value:

```
playrange clear↵
```

The “play on startup command” instructs the deck on what action to take on startup. By default, the deck will not play. Use the “enable” command to start playback after each power up.

```
play on startup: enable {"true", "false"}↵
```

By default, the unit will play back all clips on startup. Use the “single clip” command to override:

```
play on startup: single clip: {"true", "false"}↵
```

The “play option” command queries the output frame for when playback stops:

```
play option↵
```

By default, the deck will display the last frame when playback stops. To override this behaviour, the “stop mode” parameter can be used:

```
play option: stop mode: {"lastframe", "nextframe", "black"}↵
```

### Stopping deck operation

The “stop” command instructs the deck to stop the current playback or capture:

```
stop↵
```

### Changing timeline position

The “goto” command instructs the deck to switch to playback mode and change its position within the timeline.

To go to the start of a specific clip:

```
goto: clip id: {Clip ID}↵
```

To move forward/back {count} clips from the current clip on the current timeline:

```
goto: clip id: +/-{count}↵
```

Note that if the resultant clip id goes beyond the first or last clip on timeline, it will be clamp at the first or last clip.

To go to the start or end of the current clip:

```
goto: clip: {"start", "end"}↵
```

To go to the start of the first clip or the end of the last clip:

```
goto: timeline: {"start", "end"}↵
```

To go to a specified timecode:

```
goto: timecode: {timecode}↵
```

To move forward or back a specified duration in timecode:

```
goto: timecode: {"+", "-"}{duration in timecode}↵
```

To specify between slot 1 and slot 2:

```
goto: slot id: {Slot ID}↵
```

Note that only one parameter/value pair is allowed for each goto command.

### Enumerating supported commands and parameters

The “commands” command returns the supported commands:

```
commands↵
```

The command list is returned in a computer readable XML format:

```
212 commands:
<commands>↵
  <command name="..."><parameter name="...">...</command>↵
  <command name="..."><parameter name="...">...</command>↵
  ...
</commands>↵
↵
```

More XML tokens and parameters may be added in later releases.

### Controlling asynchronous notifications

The "notify" command may be used to enable or disable asynchronous notifications from the server.

To enable or disable transport notifications:

```
notify: transport: {"true", "false"}↵
```

To enable or disable slot notifications:

```
notify: slot: {"true", "false"}↵
```

To enable or disable remote notifications:

```
notify: remote: {"true", "false"}↵
```

To enable or disable configuration notifications:

```
notify: configuration: {"true", "false"}↵
```

Multiple parameters may be specified. If no parameters are specified, the server returns the current state of all notifications:

```
209 notify:↵
transport: {"true", "false"}↵
slot: {"true", "false"}↵
remote: {"true", "false"}↵
configuration: {"true", "false"}↵
dropped frames: {"true", "false"}↵
display timecode: {"true", "false"}↵
timeline position: {"true", "false"}↵
playrange: {"true", "false"}↵
cache: {"true", "false"}↵
dynamic range: {"true", "false"}↵
slate: {"true", "false"}↵
clips: {"true", "false"}↵
disk: {"true", "false"}↵
device info: {"true", "false"}↵
↵
```

### Retrieving device information

The "device info" command returns information about the connected deck device:

```
device info↵
```

The server will respond with:

```
204 device info:↵
protocol version: {Version}↵
model: {Model Name}↵
unique id: {unique alphanumeric identifier}↵
slot count: {number of storage slots}↵
software version: {software version}↵
name: {device name}↵
↵
```

### Retrieving slot information

The "slot info" command returns information about a slot. Without parameters, the command returns information for the currently selected slot:

```
slot info↵
```

If a slot id is specified, that slot will be queried:

```
slot info: slot id: {Slot ID}↵
```

The server will respond with slot specific information:

```
slot name: {"slot name"}
status: {"empty", "mounting", "error", "mounted"}↵
volume name: {Volume name}↵
recording time: {recording time available in seconds}↵
video format: {disk's default video format}↵
blocked: {"true", "false"}↵
total size: {total size in bytes}
↵
```

Asynchronous slot information change notification is disabled by default and may be configured with the "notify" command. When enabled, changes in slot state will generate a "502 slot info:" asynchronous message with the same parameters as the "202 slot info:" message.

### Retrieving clip information

The "disk list" command returns the information for each playable clip on a given disk. Without parameters, the command returns information for the current active disk:

```
disk list↵
```

If a slot id is specified, the disk in that slot will be queried:

```
disk list: slot id: {Slot ID}↵
```

The server responds with the list of all playable clips on the disk in the format of: Index, name, formats, and duration in timecode:

```
206 disk list:↵
slot id: {Slot ID}↵
{clip index}: {name} {file format} {video format} {Duration timecode}↵
{clip index}: {name} {file format} {video format} {Duration timecode}↵
...
↵
```

Note that the clip index starts from 1.

### Retrieving clip count

The "clips count" command returns the number of clips on the current timeline:

```
clips count ↵
```

The server responds with the number of clips:

```
214 clips count: ↵
clip count: {Count}↵
```

### Retrieving timeline information

The “clips get” command returns information for each available clip on the current timeline. Without parameters, the command returns information for all clips on timeline:

```
clips get↵
```

The server responds with a list of clip IDs, names and timecodes:

```
205 clips info:↵
clip count: {Count}↵
{Clip ID}: {Name} {Start timecode} {Duration timecode}↵
{Clip ID}: {Name} {Start timecode} {Duration timecode}↵
...
↵
```

The “clips get” command provides a more detailed response when using the “version: 2” parameter:

```
clips get: version: 2↵
```

The server responds with a list of clip IDs, timecodes, in points, out points and names. Clip name is the last field making it simpler to parse when names have embedded spaces.

```
{Clip ID}: {Start timecode} {Duration timecode} {inTimecode} {outTimecode}
{name}↵
{Clip ID}: {Start timecode} {Duration timecode} {inTimecode} {outTimecode}
{name}↵
...
↵
```

### Retrieving transport information

The “transport info” command returns the state of the transport:

```
transport info ↵
```

The server responds with transport specific information:

```
208 transport info:↵
status: {"preview", "stopped", "play", "forward", "rewind",
"jog", "shuttle","record"}↵
speed: {Play speed between -5000 and 5000 %}↵
slot id: {Slot ID or "none"}↵
slot name: {"slot name"}↵
clip id: {Clip ID or "none"}↵
single clip: {"true", "false"}↵
display timecode: {timecode}↵
timecode: {timecode}↵
video format: {Video format}↵
loop: {"true", "false"}↵
timeline: {n}↵
input video format: {Video format}↵
dynamic range: {"off", "Rec709", "Rec2020 _ SDR", "HLG",
"ST2084 _ 300", "ST2084 _ 500", "ST2084 _ 800", "ST2084 _ 1000",
"ST2084 _ 2000", "ST2084 _ 4000", "ST2048" or "none"}↵
↵
```

The “timecode” value is the timecode within the current timeline for playback or the clip for record. The “display timecode” is the timecode displayed on the front of the deck. The two timecodes will differ in some deck modes.

Asynchronous transport information change notification is disabled by default and may be configured with the “notify” command. When enabled, changes in transport state will generate a “508 transport info:” asynchronous message with the same parameters as the “208 transport info:” message.

## Video Formats

The following video formats are currently supported on HyperDeckExtreme HDR:

NTSC, PAL, NTSCp, PALp  
720p50, 720p5994, 720p60  
1080p23976, 1080p24, 1080p25, 1080p2997, 1080p30  
1080i50, 1080i5994, 1080i60  
2160p23.98, 2160p24, 2160p25, 2160p29.97, 2160p30, 2160p50, 2160p59.94, 2160p60  
4Kp23976, 4Kp24, 4Kp25, 4Kp2997, 4Kp30  
4Kp50, 4Kp5994, 4Kp60

The following video formats are currently supported on HyperDeckExtreme 8K HDR:

4320p23.98, 4320p24, 4320p25, 4320p29.97, 4320p30, 4320p50, 4320p59.94, 4320p60  
8Kp23976, 8Kp24, 8Kp25

Video format support may vary between models and software releases.

## File Formats

HyperDeck Extreme HDR supports the following file formats:

H.265Low  
H.265Medium  
H.265High  
H.264High\_SDI  
H.264High  
H.264Medium  
H.264Low  
QuickTimeProResHQ  
QuickTimeProRes  
QuickTimeProResLT  
QuickTimeDNxHR\_HQX  
DNxHR\_HQX  
QuickTimeDNxHR\_SQ  
DNxHR\_SQ  
QuickTimeDNxHR\_LB  
DNxHR\_LB

Supported file formats may vary between models and software releases.



## Querying and updating configuration information

The “configuration” command may be used to query the current configuration of the deck:

```
configuration↵
```

The server returns the configuration of the deck:

```
211 configuration:↵
audio input: {"embedded", "XLR", "RCA"}↵
audio mapping: {audio input source}↵
video input: {"SDI", "HDMI", "component"}↵
file format: {File format}↵
audio codec: {"PCM","AAC"}↵
timecode input: {"external", "embedded", "internal", "preset", "clip"}↵
timecode output: {"clip", "timeline"}↵
timecode preference: {"default", "dropframe", "nondropframe"}↵
timecode preset: {"timecode"}↵
audio input channels: {"n"}↵
record trigger: {"none","recordbit", "timecoderun"}↵
record prefix: {"name"}↵
append timestamp: {"true", "false"}↵
genlock input resync: {"true", "false"}↵
xlr input id: {"n"}↵
xlr type: {"line","mic"}↵
↵
```

One or more configuration parameters may be specified to change the configuration of the deck.

To change the current video input:

```
configuration: video input: {"SDI", "HDMI", "component"}↵
```

Valid video inputs may vary between models. To configure the current audio input:

```
configuration: audio input: {"embedded", "XLR", "RCA"}↵
```

Valid audio inputs may vary between models.

To configure the current file format:

```
configuration: file format: {File format}↵
```

Note that changes to the file format may require the deck to reset, which will cause the client connection to be closed. In such case, response code 213 will be returned (instead of 200) before the client connection is closed:

```
"213 deck rebooting"
```

Asynchronous configuration information change notification is disabled by default and may be configured with the “notify” command. When enabled, changes in configuration will generate a “511 configuration:” asynchronous message with the same parameters as the “211 configuration:” message.

## Selecting active slot and video format

The “slot select” command instructs the deck to switch to a specified slot, or/and to select a specified output video format. To switch to a specified slot:

```
slot select: slot id: {slot ID}↵
```

To select the output video format:

```
slot select: video format: {video format}↵
```

Either or all slot select parameters may be specified. Note that selecting video format will result in a rescan of the disk to reconstruct the timeline with all clips of the specified video format.

### Clearing the current timeline

The "clips clear" command instructs the deck to empty the current timeline:

```
clips clear↵
```

The server responds with

```
200 ok↵
```

### Adding a clip to the current timeline

The "clips add:" command instructs the deck to add a clip to the current timeline:

```
clips add: name: {"clip name"}↵
```

The server responds with

```
200 ok↵
```

or in case of error

```
1xx {error description}↵
```

### Configuring the watchdog

The "watchdog" command instructs the deck to monitor the connected client and terminate the connection if the client is inactive for at least a specified period of time.

To configure the watchdog:

```
watchdog: period: {period in seconds}↵
```

To avoid disconnection, the client must send a command to the server at least every {period} seconds.

Note that if the period is set to 0 connection monitoring will be disabled.

### Network Area Storage

On networks using multicast DNS the "nas discovered" command will list network servers the HyperDeck has discovered:

```
nas discovered↵  
224 nas info:  
CloudStoreMini.local. CloudStoreMini  
CloudStore80.local. CloudStore80  
CloudStore320.local. CloudStore320
```

A network share can be added to the HyperDeck using 'nas add'. For guest logins username and password can be omitted.

```
nas add:  
url: smb://CloudStore80.local/Studio1
```

For shares that require a username and password consider using the secure mode of the HyperDeck Ethernet protocol to avoid passwords being sent as plaintext.

```
nas add:  
url: smb://192.168.1.1/Main  
username: user1234  
password: Password1234
```

Once a share has been added it can be mounted using 'nas select' to make it available for recording and playback. Many shares can be added with 'nas add' but only one share can be mounted at a time using 'nas select'.

# HyperDeck Control REST API

If you are a software developer you can build custom applications or leverage ready to use tools such as REST client or Postman to seamlessly control and interact with HyperDeck disk recorders using HyperDeck Control REST API. This API enables you to perform a wide range of operations, such as starting or stopping recordings, managing playback, accessing disk information and much more. Whether you're developing a custom application tailored to your specific needs or utilizing existing tools, this API empowers you to unlock the full potential of HyperDeck disk recorders with ease. We look forward to seeing what you come up with!

## Transport Control API

API for controlling Transport on Blackmagic Design products.

### GET /transports/0

Get device's basic transport status.

#### Response

##### 200 - OK

The response is a JSON object.

Name	Type	Description
mode	string	Transport mode. Possible values are: InputPreview, InputRecord, Output.

### PUT /transports/0

Set device's basic transport status.

#### Parameters

Name	Type	Description
mode	string	Transport mode. Possible values are: InputPreview, Output.

#### Response

##### 204 - No Content

### GET /transports/0/stop

Determine if transport is stopped.

#### Response

##### 200 - OK

The response is a JSON object.

PUT /transports/0/stop

Stop transport.

**Response**

**204 - No Content**

GET /transports/0/play

Determine if transport is playing.

**Response**

**200 - OK**

The response is a JSON object.

PUT /transports/0/play

Start playing on transport.

**Response**

**204 - No Content**

GET /transports/0/playback

Get playback state.

**Response**

**200 - OK**

The response is a JSON object.

Name	Type	Description
type	string	Possible values are: Play, Jog, Shuttle, Var.
loop	boolean	When true playback loops from the end of the timeline to the beginning of the timeline
singleClip	boolean	When true playback loops from the end of the current clip to the beginning of the current clip
speed	number	Playback Speed, 1.0 for normal forward playback
position	integer	Playback position on the timeline in units of video frames

## PUT /transports/0/playback

Set playback state.

### Parameters

Name	Type	Description
type	string	Possible values are: Play, Jog, Shuttle, Var.
loop	boolean	When true playback loops from the end of the timeline to the beginning of the timeline
singleClip	boolean	When true playback loops from the end of the current clip to the beginning of the current clip
speed	number	Playback Speed, 1.0 for normal forward playback
position	integer	Playback position on the timeline in units of video frames

### Response

#### 204 - No Content

## GET /transports/0/record

Get record state.

### Response

#### 200 - OK

The response is a JSON object.

Name	Type	Description
recording	boolean	Is transport in Input Record mode

## PUT /transports/0/record

Set record state.

### Parameters

Name	Type	Description
recording	boolean	Is transport in Input Record mode
clipName	string	Used to set the requested clipName to record to, when specifying "recording" attribute to True

### Response

#### 204 - No Content

## System Control API

API for controlling the System Modes on Blackmagic Design products.

### GET /system

Get device system information.

#### Response

##### 200 - OK

The response is a JSON object.

Name	Type	Description
codecFormat	object	
codecFormat.codec	string	Currently selected codec
codecFormat.container	string	Multimedia container format
videoFormat	object	
videoFormat.name	string	Video format serialised as a string
videoFormat.frameRate	string	Frame rate Possible values are: 23.98, 24.00, 24, 25.00, 25, 29.97, 30.00, 30, 47.95, 48.00, 48, 50.00, 50, 59.94, 60.00, 60, 119.88, 120.00, 120.
videoFormat.height	number	Height dimension of video format
videoFormat.width	number	Width dimension of video format
videoFormat.interlaced	boolean	Is the display format interlaced?

### GET /system/supportedCodecFormats

Get the list of supported codecs.

#### Response

##### 200 - OK

The response is a JSON object.

Name	Type	Description
codecs	array	
codecs[i]	object	
codecs[i].codec	string	Currently selected codec
codecs[i].container	string	Multimedia container format

### GET /system/codecFormat

Get the currently selected codec.

#### Response

##### 200 - OK

The response is a JSON object.

Name	Type	Description
codec	string	Currently selected codec
container	string	Multimedia container format

## PUT /system/codecFormat

Set the codec.

### Parameters

Name	Type	Description
codec	string	Currently selected codec
container	string	Multimedia container format

### Response

#### 204 - No Content

## GET /system/videoFormat

Get the currently selected video format.

### Response

#### 200 - OK

The response is a JSON object.

Name	Type	Description
name	string	Video format serialised as a string
frameRate	string	Frame rate Possible values are: 23.98, 24.00, 24, 25.00, 25, 29.97, 30.00, 30, 47.95, 48.00, 48, 50.00, 50, 59.94, 60.00, 60, 119.88, 120.00, 120.
height	number	Height dimension of video format
width	number	Width dimension of video format
interlaced	boolean	Is the display format interlaced?

## PUT /system/videoFormat

Set the video format.

### Parameters

Name	Type	Description
frameRate	string	Frame rate Possible values are: 23.98, 24.00, 24, 25.00, 25, 29.97, 30.00, 30, 47.95, 48.00, 48, 50.00, 50, 59.94, 60.00, 60, 119.88, 120.00, 120.
height	number	Height dimension of video format
width	number	Width dimension of video format
interlaced	boolean	Is the display format interlaced?

### Response

#### 204 - No Content

## GET /system/supportedVideoFormats

Get the list of supported video formats for the current system state.

### Response

#### 200 - OK

The response is a JSON object.

Name	Type	Description
formats	array	
formats[i]	object	
formats[i].frameRate	string	Frame rate Possible values are: 23.98, 24.00, 24, 25.00, 25, 29.97, 30.00, 30, 47.95, 48.00, 48, 50.00, 50, 59.94, 60.00, 60, 119.88, 120.00, 120.
formats[i].height	number	Height dimension of video format
formats[i].width	number	Width dimension of video format
formats[i].interlaced	boolean	Is the display format interlaced?

## Media Control API

API for controlling media devices in Blackmagic Design products.

## GET /media/workingset

Get the list of media devices currently in the working set.

### Response

#### 200 - OK

The response is a JSON object.

Name	Type	Description
size	integer	The fixed size of this device's working set
workingset (required)	array	
workingset[i]	object	
workingset[i].index	integer	Index of this media in the working set
workingset[i].activeDisk	boolean	Is this current item the active disk
workingset[i].volume	string	Volume name
workingset[i].deviceName	string	Internal device name of this media device
workingset[i].remainingRecordTime	integer	Remaining record time on media device in seconds
workingset[i].totalSpace	integer	Total space on media device in bytes
workingset[i].remainingSpace	integer	Remaining space on media device in bytes
workingset[i].clipCount	integer	Number of clips currently on the device



## GET /media/active

Get the currently active media device.

### Response

#### 200 - OK

The response is a JSON object.

Name	Type	Description
workingsetIndex	integer	Working set index of the active media device
deviceName	string	Internal device name of this media device

## PUT /media/active

Set the currently active media device.

### Parameters

Name	Type	Description
workingsetIndex	integer	Working set index of the media to become active

### Response

#### 204 - No Content

## GET /media/devices/doformatSupportedFilesystems

Get the list of filesystems available to format the device.

### Response

#### 200 - OK

The response is a JSON object.

## GET /media/devices/{deviceName}

Get information about the selected device.

### Parameters

Name	Type	Description
{deviceName}	string	

### Response

#### 200 - OK

The response is a JSON object.

Name	Type	Description
state	string	The current state of the media device. Possible values are: None, Scanning, Mounted, Uninitialised, Formatting, RaidComponent.

## GET /media/devices/{deviceName}/doformat

Get a format key, used to format the device with a put request.

### Parameters

Name	Type	Description
{deviceName}	string	

### Response

#### 200 - OK

The response is a JSON object.

Name	Type	Description
deviceName	string	Internal device name of this media device
key	string	The key used to format this device, it must be fetched with the GET request and then provided back with a PUT request

## PUT /media/devices/{deviceName}/doformat

Perform a format of the media device.

### Parameters

Name	Type	Description
{deviceName}	string	

Name	Type	Description
key	string	The key used to format this device, it must be fetched with the GET request and then provided back with a PUT request
filesystem	string	Filesystem to format to (supportedFilesystems returns list of supported fileSystems)
volume	string	Volume name to set for the disk after format

### Response

#### 204 - No Content

## Timeline Control API

API for controlling playback timeline.

### GET /timelines/0

Get the current playback timeline.

#### Response

##### 200 - OK

The response is a JSON object.

Name	Type	Description
clips	array	
clips[i]	object	
clips[i].clipUniqueId	integer	Unique ID used to identify this clip
clips[i].frameCount	integer	Number of frames in this clip on the timeline

### DELETE /timelines/0

Clear the current playback timeline.

#### Response

##### 204 - No Content

### POST /timelines/0/add

Add a clip to the end of the timeline.

#### Parameters

This parameter can be one of the following types:

Name	Type	Description
clips	integer	Unique ID used to identify this clip

Name	Type	Description
clips	array	
clips[i]	integer	Unique ID used to identify this clip

#### Response

##### 204 - No Content

## Event Control API

API For working with built-in websocket.

### GET /event/list

Get the list of events that can be subscribed to using the websocket API.

#### Response

##### 200 - OK

The response is a JSON object.

Name	Type	Description
events	array	
events[i]	string	List of events that can be subscribed to using the websocket API

## Notification websocket - 1.0.0

Service that notifies subscribers of device state changes.

### messages

Subscribe (The messages from the server/device)

#### (JSON)

Name	Type	Description
.data	object	
.data.action	string	Possible values are: subscribe, unsubscribe, listSubscriptions, listProperties .
.data.properties	array	
.data.properties[i]	string	Device property the user can subscribe to. The user can either choose a value from the predefined enum or provide a wildcard string. Possible values are: /media/active, /system, /system/codecFormat, /system/videoFormat, /timelines/0, /transports/0, /transports/0/stop, /transports/0/play, /transports/0/playback, /transports/0/record . Must match the pattern: *.
.data.values	object	An object with property names as the key and a property value as json. Check the next section for a the device properties and their return values.
.data.success	boolean	
.type	string	Possible values are: response .
.id	number	Optional parameter that repeats the id in the output for tracking messages

**(JSON)**

Name	Type	Description
.data	object	
.data.action	string	Possible values are: propertyValueChanged .
.data.property	string	Device property the user can subscribe to. The user can either choose a value from the predefined enum or provide a wildcard string. Possible values are: /media/active, /system, /system/codecFormat, /system/videoFormat, /timelines/0, /transports/0, /transports/0/stop, /transports/0/play, /transports/0/playback, /transports/0/record . Must match the pattern: .*
.data.value	object	An object with property names as the key and a property value as json. Check the next section for a the device properties and their return values.
.type	string	Possible values are: event .

Publish (The messages that user can send to the server/device)

**(JSON)**

Name	Type	Description
.data	object	
.data.action	string	Possible values are: subscribe, unsubscribe, listSubscriptions, listProperties .
.data.properties	array	
.data.properties[i]	string	Device property the user can subscribe to. The user can either choose a value from the predefined enum or provide a wildcard string. Possible values are: /media/active, /system, /system/codecFormat, /system/videoFormat, /timelines/0, /transports/0, /transports/0/stop, /transports/0/play, /transports/0/playback, /transports/0/record . Must match the pattern: .*
.data.values	object	An object with property names as the key and a property value as json. Check the next section for a the device properties and their return values.
.data.success	boolean	
.type	string	Possible values are: response .
.id	number	Optional parameter that repeats the id in the output for tracking messages

## Device Properties

### /media/active

The value JSON returned via the eventResponse when the /media/active property changes on the device:

Name	Type	Description
.workingsetIndex	integer	Working set index of the active media device
.deviceName	string	Internal device name of this media device

### /system

The value JSON returned via the eventResponse when the /system property changes on the device:

Name	Type	Description
.codecFormat	object	Currently selected codec
.codecFormat.codec	string	Currently selected codec
.codecFormat.container	string	Multimedia container format
.videoFormat	object	Currently selected video format
.videoFormat.frameRate	string	Frame rate Possible values are: 23.98, 24.00, 24, 25.00, 25, 29.97, 30.00, 30, 47.95, 48.00, 48, 50.00, 50, 59.94, 60.00, 60, 119.88, 120.00, 120 .
.videoFormat.height	number	Height dimension of video format
.videoFormat.width	number	Width dimension of video format
.videoFormat.interlaced	boolean	Is the display format interlaced?
.videoFormat.name	string	Video format serialised as a string

### /system/codecFormat

Currently selected codec

The value JSON returned via the eventResponse when the /system/codecFormat property changes on the device:

Name	Type	Description
.codec	string	Currently selected codec
.container	string	Multimedia container format

## /system/videoFormat

Currently selected video format

The value JSON returned via the eventResponse when the /system/videoFormat property changes on the device:

Name	Type	Description
.frameRate	string	Frame rate Possible values are: 23.98, 24.00, 24, 25.00, 25, 29.97, 30.00, 30, 47.95, 48.00, 48, 50.00, 50, 59.94, 60.00, 60, 119.88, 120.00, 120 .
.height	number	Height dimension of video format
.width	number	Width dimension of video format
.interlaced	boolean	Is the display format interlaced?
.name	string	Video format serialised as a string

## /timelines/0

The value JSON returned via the eventResponse when the /timelines/0 property changes on the device:

Name	Type	Description
.clips	array	
.clips[i]	object	
.clips[i].clipUniqueId	integer	Unique ID used to identify this clip
.clips[i].frameCount	integer	Number of frames in this clip on the timeline

## /transports/0

The value JSON returned via the eventResponse when the /transports/0 property changes on the device:

Name	Type	Description
.mode	string	Transport mode Possible values are: InputPreview, InputRecord, Output .

## /transports/0/stop

true when transport mode is InputPreview or when in Output mode and speed is 0

The value JSON returned via the eventResponse when the /transports/0/stop property changes on the device:

## /transports/0/play

True when transport is in Output mode and speed is non-zero

The value JSON returned via the eventResponse when the /transports/0/play property changes on the device:

## /transports/0/playback

The value JSON returned via the eventResponse when the /transports/0/playback property changes on the device:

Name	Type	Description
.type	string	Possible values are: Play, Jog, Shuttle, Var .
.loop	boolean	When true playback loops from the end of the timeline to the beginning of the timeline
.singleClip	boolean	When true playback loops from the end of the current clip to the beginning of the current clip
.speed	number	Playback speed, 1.0 for normal forward playback
.position	integer	Playback position on the timeline in units of video frames

## /transports/0/record

The value JSON returned via the eventResponse when the /transports/0/record property changes on the device:

Name	Type	Description
.recording	boolean	Is transport in Input Record mode



# Help

## Getting Help

The fastest way to obtain help is to go to the Blackmagic Design online support pages and check the latest support material available for your ATEM switcher.

### Blackmagic Design online support pages

The latest manual, software and support notes can be found at the Blackmagic Design support center at [www.blackmagicdesign.com/support](http://www.blackmagicdesign.com/support).

### Contacting Blackmagic Design support

If you can't find the help you need in our support material, please use the "Send us an email" button on the support page to email a support request. Alternatively, click on the "Find your local support team" button on the support page and call your nearest Blackmagic Design support office.

### Checking the version currently installed

To check which version of ATEM software is installed on your computer, open the About ATEM Software Control window.

- On Mac, open ATEM Software Control from the Applications folder. Select About ATEM Software Control from the application menu to reveal the version number.
- On Windows, open ATEM Software Control from your 'start' menu. Click on 'help' in the menu bar and select 'about' to reveal the version number.

### How to get the latest updates

After checking the version of ATEM software installed on your computer, please visit the Blackmagic Design support center at [www.blackmagicdesign.com/support](http://www.blackmagicdesign.com/support) to check for the latest updates. While it is usually a good idea to run the latest updates, it is a wise practice to avoid updating any software if you are in the middle of an important project.

# Regulatory Notices



## **Disposal of Waste of Electrical and Electronic Equipment Within the European Union.**

The symbol on the product indicates that this equipment must not be disposed of with other waste materials. In order to dispose of your waste equipment, it must be handed over to a designated collection point for recycling. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city recycling office or the dealer from whom you purchased the product.



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 instructions, may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference.
- 2 This device must accept any interference received, including interference that may cause undesired operation.



R-R-BMD-20210202001  
R-R-BMD-20220209001  
R-R-BMD-20220209002  
R-R-BMD-20250522001  
R-R-BMD-201906002  
R-R-BMD-20230419001  
R-R-BMD-20240212001  
R-R-BMD-20240212002



## **ISED Canada Statement**

This device complies with Canadian standards for Class A digital apparatus.

Any modifications or use of this product outside its intended use could void compliance to these standards.

This equipment has been tested for compliance with the intended use in a commercial environment. If the equipment is used in a domestic environment, it may cause radio interference.

# Safety Information

For protection against electric shock, the equipment must be connected to a mains socket outlet with a protective earth connection. In case of doubt contact a qualified electrician.

To reduce the risk of electric shock, do not expose this equipment to dripping or splashing.

Product is suitable for use in tropical locations with an ambient temperature of up to 40°C.

Ensure that adequate ventilation is provided around the product and that it is not restricted.

When rack mounting, ensure that the ventilation is not restricted by adjacent equipment.

No operator serviceable parts inside product. Refer servicing to your local Blackmagic Design service center.



Use only at altitudes not more than 2000m above sea level.

## State of California statement

This product can expose you to chemicals such as trace amounts of polybrominated biphenyls within plastic parts, which is known to the state of California to cause cancer and birth defect or other reproductive harm.

For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## European Office

Blackmagic Design Europe B.V.  
Rijnlanderweg 766, Unit D  
2132 NM Hoofddorp  
NL

## Warning for Authorized Service Personnel



Disconnect power from both power inlets before servicing!



### Caution — Double Pole/ Neutral Fusing

The power supply contained in this equipment has a fuse in both line and neutral conductors and is suitable for connection to the IT power distribution system in Norway.

# Warranty

## 12 Month Limited Warranty

Blackmagic Design warrants that this product will be free from defects in materials and workmanship for a period of 12 months from the date of purchase. If a product proves to be defective during this warranty period, Blackmagic Design, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, you the Customer, must notify Blackmagic Design of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Customer shall be responsible for packaging and shipping the defective product to a designated service center nominated by Blackmagic Design, with shipping charges pre paid. Customer shall be responsible for paying all shipping charges, insurance, duties, taxes and any other charges for products returned to us for any reason.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Blackmagic Design shall not be obligated to furnish service under this warranty: a) to repair damage resulting from attempts by personnel other than Blackmagic Design representatives to install, repair or service the product, b) to repair damage resulting from improper use or connection to incompatible equipment, c) to repair any damage or malfunction caused by the use of non Blackmagic Design parts or supplies, or d) to service a product that has been modified or integrated with other products when the effect of such a modification or integration increases the time or difficulty of servicing the product.

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