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Installation and Operation Manual

Blackmagicdesign

Blackmagic Micro Studio Camera 4K G2



Blackmagic Micro Studio Camera 4K G2

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Welcome

Thank you for purchasing your Blackmagic Micro Studio Camera 4K G2!

Your micro studio camera features a high ISO wide dynamic range 4K sensor for shooting cinematic images in studio lighting and even dimly lit environments. Your camera supports Blackmagic Design's generation 5 color science for live production, plus when recording Blackmagic RAW to external disks via the USB expansion port you can even edit and color grade later in post production!

Even though your camera is very small, it has the features of a full size studio camera with 12G-SDI for HD and Ultra HD images up to 2160p60. Small HD-BNC connectors and the HDMI monitor output provide tally and camera control when connected to ATEM switchers. The HDMI monitor output can also be used to view your shot on set and to change settings using the menu overlay.

Your Blackmagic Micro Studio Camera 4K G2 is so small you can hide it in hard to reach locations and extreme angles, or even connect optional accessories like the Blackmagic Focus and Zoom Demand and operate the camera like a full size studio camera!

This instruction manual shows you how to get started with Blackmagic Micro Studio Camera 4K G2. Check the support page on our website at www.blackmagicdesign.com for the latest version of this manual and for updates to your camera's internal software. When downloading the software, be sure to register with your information so we can keep you updated when new software is released. We are continually working on new features and improvements, so we are keen to hear from you!

We hope you use your new camera for some amazing live productions and produce some fantastic looking work! We are extremely excited to see what creative work you produce!

Grant Petty

CEO Blackmagic Design

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Getting Started

This section of the manual shows you how to get started with your Blackmagic Micro Studio Camera 4K G2.

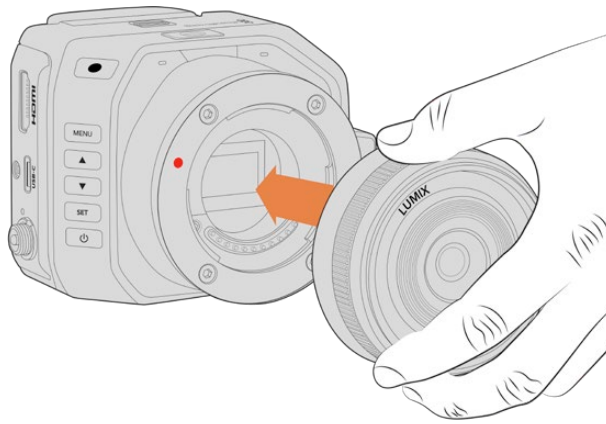
Getting started is quick and easy! All you need to do is attach a lens and plug in power.

Attaching a Lens

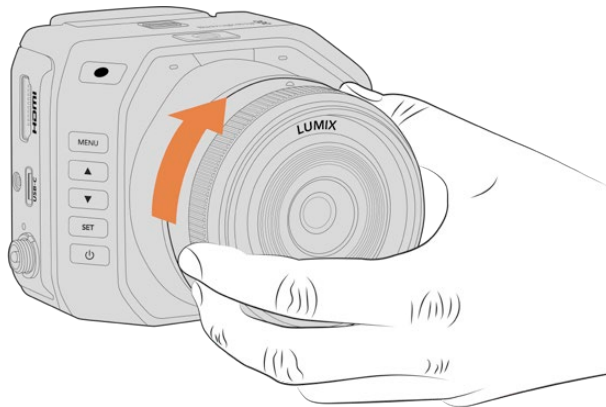
Your Blackmagic Micro Studio Camera 4K G2 uses Micro Four Thirds lenses. To attach a lens, begin by removing the protective dust cap. To remove the dust cap, hold down the locking button and rotate the cap counterclockwise until it's released. We recommend always turning your camera off before attaching or removing a lens.

To attach a lens:

- 1 Align the dot on your lens with the dot on the camera mount. Many lenses have a visual indicator, for example, a blue, red or white dot.



- 2 Press the mount of the lens against the camera mount and twist clockwise until the lens clicks into place.



- 3 To remove the lens, hold down the locking button, rotate the lens counterclockwise until its dot or indicator reaches the 10 o'clock position, and gently remove.

NOTE When you don't have a lens attached to your camera, it's a good idea to keep the dust cap on to protect the glass filter covering the sensor from dust and other debris.

Powering Your Camera

Now that you've attached a lens, you will need to supply power to your camera.

You can power your Blackmagic Micro Studio Camera 4K G2 using the supplied AC power adapter or from an optional LP-E6 battery.

Connecting a Power Adapter

Plug the supplied power adapter into the power input on your camera's side panel. Tightening the locking ring secures the power cable to prevent accidental disconnection.

The supplied AC power adapter can be used to simultaneously power your Micro Studio Camera 4K G2 and charge an optional rechargeable battery when attached to your camera.



Connect power to your camera's power input using the supplied cable



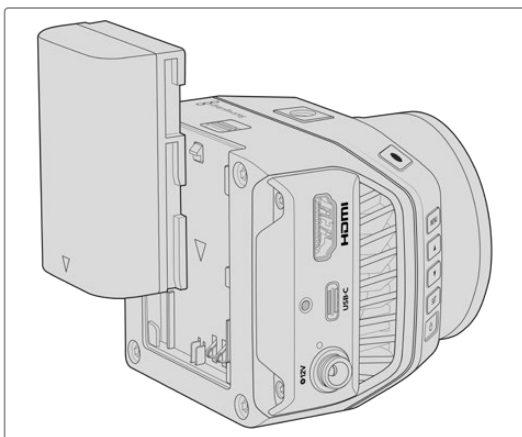
Secure the connector by tightening the connector screw

TIP Micro Studio Camera 4K G2 powers up automatically when power is supplied via the AC adapter. This means that if you have the camera installed in a remote location or mounted in a position that is difficult to access, you don't have to manually turn the camera on because as long as it is connected to an external power supply, it will always stay powered on.

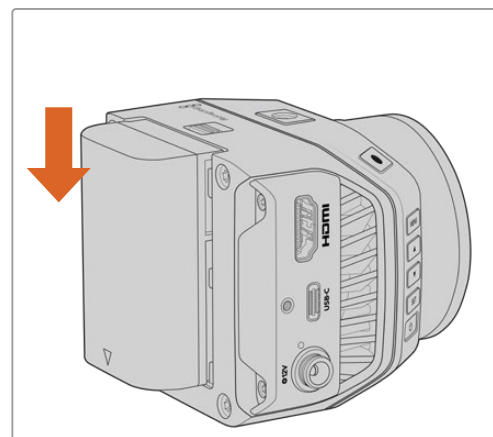
Attaching a Battery

Your Micro Studio Camera 4K G2 uses an optional LP-E6 or LP-E6N battery. Batteries can be purchased from your Blackmagic Design reseller or from most video or photography equipment stores.

To attach a battery, align the contacts so they are facing the bottom of the camera and gently press against the battery slot. Slide the battery down until you feel it click and lock into place.



Align the battery contacts with the bottom of the camera

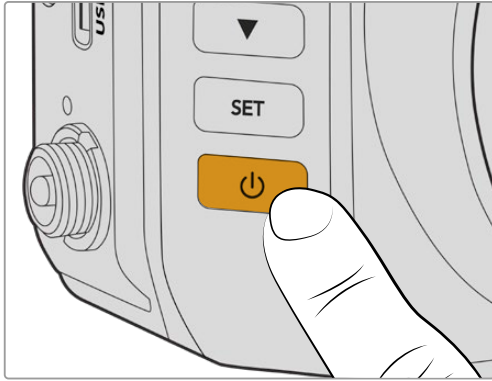


Push the battery down to lock it into place

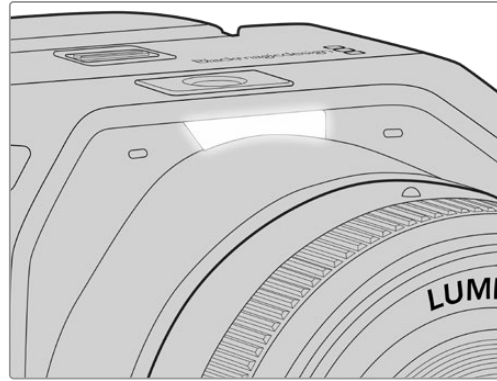
To remove the battery, slide the battery release latch on the top panel forward and slide the battery out of the slot.

Turning Your Camera On

To turn your camera on, press the power button on the left panel. When powered on your camera's tally light will illuminate white.



Press the power button to turn your camera on



When powered the tally light will illuminate white

To turn your camera off, press and hold the power button down for 3 seconds.

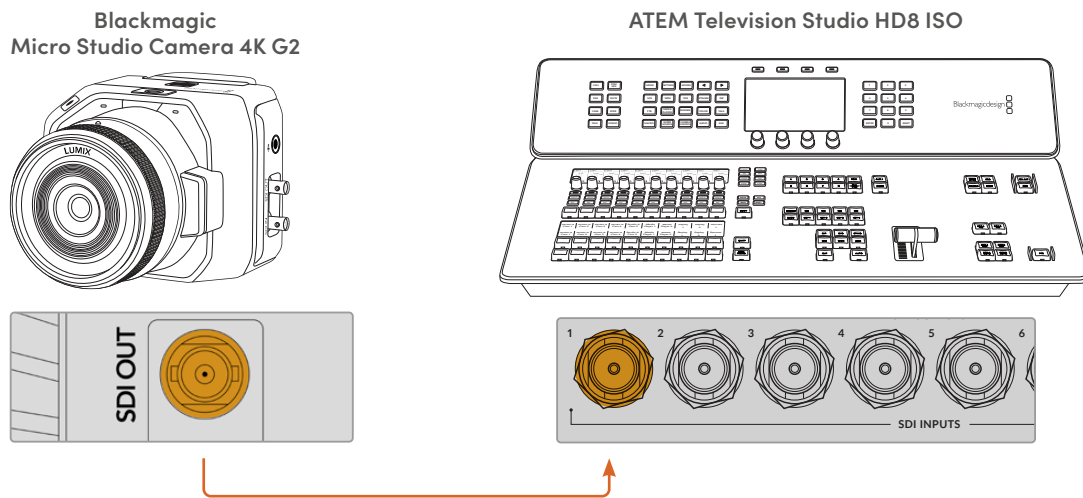
Connecting to an ATEM Switcher

Connecting to an ATEM switcher lets you switch multiple cameras in your live production and control them using the switcher's built in control panel or ATEM Software Control. Tally signals are sent back to your camera via HDMI or SDI so your camera's tally light illuminates when it is switched on air. For more information on ATEM Software Control, refer to the 'Using ATEM Software Control' section later in this manual.

NOTE Your camera's settings are visible on the HDMI output via a head up display. The HUD is a video overlay that shows you important information like shutter speed, iris, histogram, focus assist, frame guides, zebra and more. The HUD is always on by default and if you are connected to an ATEM switcher you will likely want to turn it off. You can disable the HUD by selecting 'clean feed' in your camera's menu settings. For information on how to change the HUD settings, refer to the 'monitor menu' section in this manual.

Connecting via SDI

Plug your Blackmagic Micro Studio Camera 4K G2's SDI output into the corresponding SDI input on the ATEM switcher, for example ATEM Television Studio HD8 ISO.

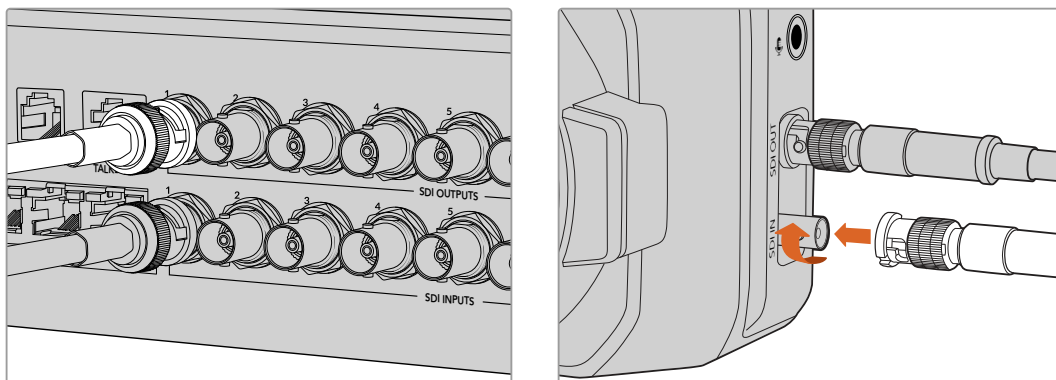


When connected via SDI, the tally and camera control data is sent back to your camera using a separate SDI return feed.

Connecting the SDI Return Feed

The SDI return contains tally, camera control data, plus timecode and reference signals.

To connect the SDI return feed, connect any of the ATEM switcher's SDI outputs to your camera's SDI input. If there is not enough program outputs, you can use any of the auxiliary outputs. Some ATEM switchers have extra program outputs to help ensure you have enough outputs for multiple cameras. On ATEM Constellation switchers, program return can be set to any of the switcher's outputs.



Connect the switcher's SDI output to your camera's SDI input

NOTE All outputs carry camera control data except for the multiview and any down converted outputs.

Setting the ATEM Camera ID

The ATEM camera ID is a setting in your camera's menu settings that determines which SDI input your camera is connected to on the ATEM switcher. When the camera ID corresponds to the switcher's input number, your camera will detect tally data for that input and the tally light will work correctly on your camera.

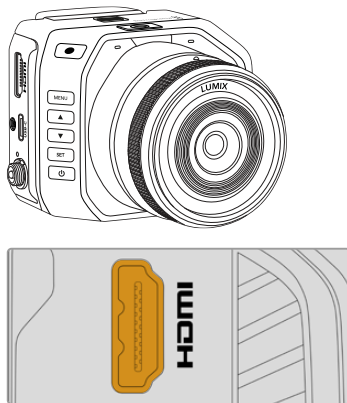
For more information on changing the ATEM camera ID, refer to the 'setup menu' section later in this manual.

Connecting via HDMI

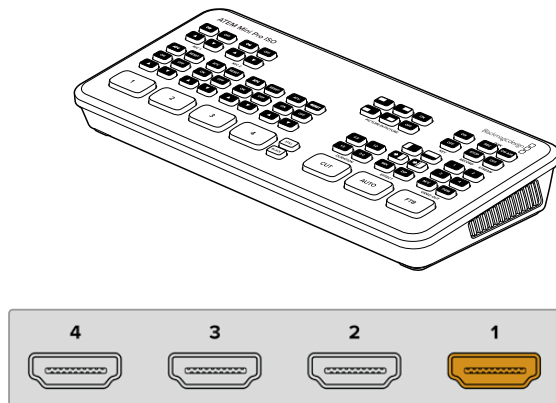
Plug your Blackmagic Micro Studio Camera 4K G2's HDMI output into the corresponding HDMI input on the ATEM switcher, such as ATEM Mini Pro ISO. We recommend matching your cameras with their corresponding input number. For example, camera 1 to input 1 and camera 2 to input 2.

NOTE When connecting via HDMI to an ATEM Mini switcher, your camera's ATEM camera ID is set automatically.

Blackmagic
Micro Studio Camera 4K G2



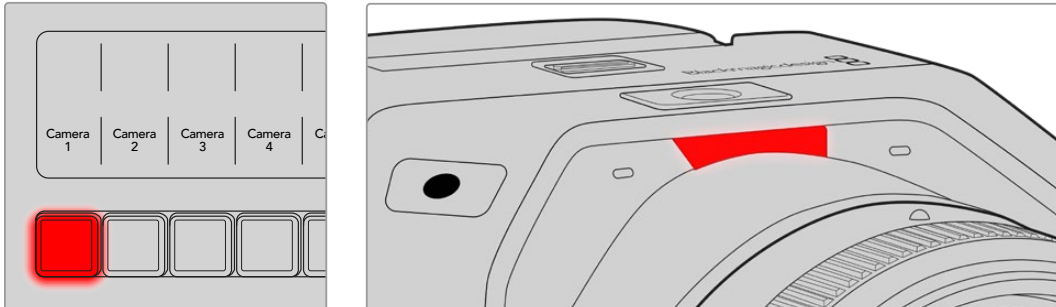
ATEM Mini Pro ISO



When connected via HDMI, all tally and camera control data is sent back to your camera using the same HDMI cable.

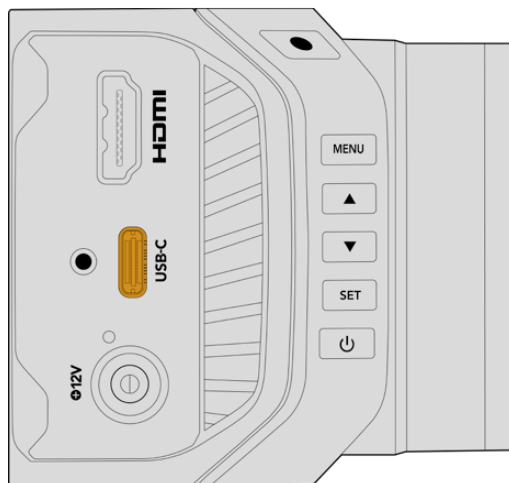
Testing Tally

Your Micro Studio Camera 4K G2 has a built in tally light so you can check that tally is working. To do this, switch camera 1 to the program output on your ATEM switcher. If not, double check your ATEM camera ID is set to the corresponding input on the switcher. Your camera is now successfully connected to the ATEM switcher.



Recording Blackmagic RAW to USB

Finally, if you want to record to Blackmagic RAW on your camera, all you need to do is plug a USB-C flash disk formatted to Mac OS Extended or exFAT into your camera's USB connector and press the record button! Press again to stop recording. For more information about recording to a USB-C flash disk, refer to the 'settings' section later in this manual.



Connect a USB-C flash disk to your camera's USB-C port to record Blackmagic RAW

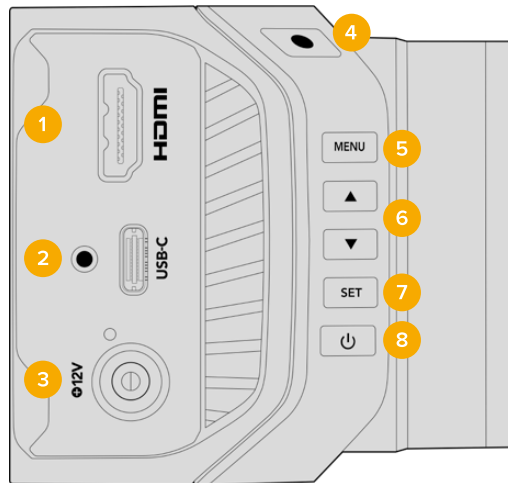
TIP When connected to ATEM Mini or ATEM SDI Extreme and Pro model switchers, you can simultaneously trigger record in all cameras from ATEM Software Control. For more information, refer to the ATEM Mini or ATEM SDI manual.

That's all there is to getting started! Please keep reading this manual for more comprehensive information about all the controls and settings on your Blackmagic Micro Studio Camera 4K G2.

Camera Features

This section contains details about all the connectors and buttons on your Blackmagic Micro Studio Camera 4K G2.

Left Panel



1 HDMI

Use the HDMI port to connect to an external monitor, disk recorder or ATEM Mini switcher.

The HDMI port on your Blackmagic Micro Studio Camera 4K G2 outputs 10-bit 4:2:2 1080p HD video with 2 channels of embedded audio. The frame rate of the HDMI output will match the 'project frame rate' your camera is set to. For example, if the camera's 'project frame rate' is set to 30 frames per second the HDMI output will be 1080p30.

Your camera's settings are visible on the HDMI output via a head up display. The HUD is a video overlay that shows you important information like shutter speed, iris, histogram, focus assist, frame guides, zebra and more. The HUD is always on by default, but you can turn it off by selecting 'clean feed' in your camera's menu settings. Press the 'menu' button on your camera to access the menu settings overlay and press it again to turn it off. For more information on how to change settings refer to the 'HUD controls' and 'settings' sections later in this manual.

TIP Switch your camera's 'clean feed' setting on to disable all status text and overlays for the HDMI output. For more information, refer to the 'monitor menu' section.

2 USB

The USB-C expansion port allows for direct local recording onto USB-C flash disks and can be used for connecting accessories such as Blackmagic Zoom and Focus Demands or Blackmagic PYXIS Monitor. The USB-C port is also used for updating your camera's internal software.

Blackmagic Micro Studio Camera 4K G2 can be connected to a network using a USB-C to Ethernet adapter. Connecting to a network allows you to control your camera via REST APIs. For more information, refer to the 'camera control REST API' section later in this manual.

The locking point is compatible with USB cables that have a built in locking screw. This lets you secure the USB connector to the camera so it can't be accidentally removed.

3 12V DC Power Input

Connect the supplied AC power supply to power your camera. The AC power supply can also be used to charge an optional rechargeable battery when connected to your camera. The locking ring prevents accidental disconnection.

The small LED light above your camera's power input illuminates white when your camera is powered on. When your camera is powered off and has a rechargeable battery attached, the LED indicator will display the charging status of the battery.



The connected battery is charging.



The connected battery is fully charged.



A battery error has occurred.

Custom Power Solutions

Some customers have been creating custom made power devices as a means to power their Blackmagic Micro Studio Camera 4K G2. If you are creating your own power solution with a dummy battery, caution needs to be taken to make sure you are not supplying too much voltage to your camera, as this can cause permanent damage. The voltage requirements of the Blackmagic Micro Studio Camera 4K G2 are as follows:

- The battery input connection is rated from 6.2V to 10V max.
- The DC input is rated from 10.8V to 20V max, with a current rating of 3A.
- The camera requires 16W when in standby and is not charging the battery.
- The camera requires 30W when charging a connected battery.
- When powering your camera with a custom made power source, we recommend removing its connected battery.
- When recording to external media with an active lens, full tally brightness, high frame rates and not charging the battery, Blackmagic Micro Studio Camera 4K G2 requires approximately 25W.

4 Record

Press the 'record' button to start and stop recording to external flash disks via the USB-C expansion port.

5 Menu

Press the 'menu' button to open your camera's settings menu when connected to an HDMI television or monitor. Press the 'menu' button again to exit the menu settings. For more information, refer to the 'settings' section later in this manual.

6 Arrow Buttons

Use the up and down arrow buttons to navigate the menu settings and head up display controls. The arrow buttons are also used to adjust settings.

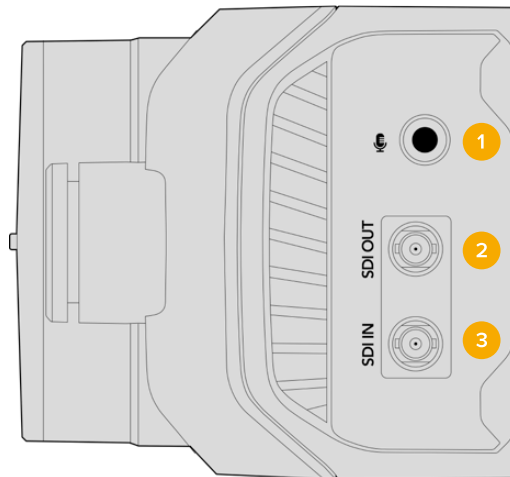
7 Set

Press the 'set' button to select menu items and to confirm setting changes.

8 Power

Press the 'power' button to switch your camera on. Press and hold the 'power' button for 3 seconds to switch your camera off.

Right Panel



1 3.5mm Microphone Jack

Connect a microphone to your camera's 3.5mm stereo connector. Mic and line level audio are supported. The microphone level audio is lower than the line level, so if you are connecting a microphone to the camera and have line level selected, you will find the levels are too low. The microphone input also accepts SMPTE compliant LTC timecode from an external source on the left channel. Valid timecode will be detected automatically and embedded in your video file as timecode metadata. We recommend sending LTC timecode via a line level output, especially if you are not recording timecode as an audio track.

2 SDI Out

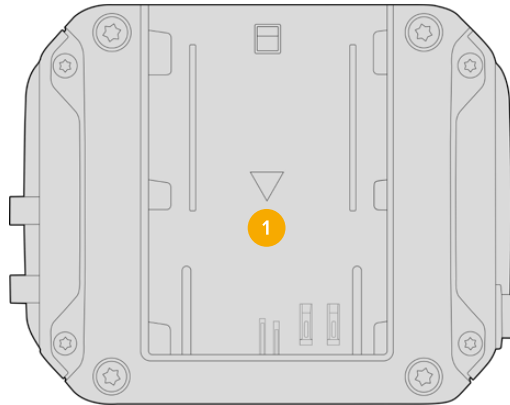
Your camera's 12G-SDI output is used to send HD and Ultra HD video up to 2160p60 to SDI equipment such as routers, monitors, SDI capture devices and ATEM switchers. You can also connect the 12G-SDI output to an external recorder such as the Blackmagic Video Assist or HyperDeck disk recorder. The SDI output on your Blackmagic Micro Studio Camera 4K G2 is always a clean feed.

NOTE The SDI connectors on your camera are small HD-BNC connectors with locking pins. This means you need to terminate SDI cables with a bayonet lock small HD-BNC connector, or you can use an HD-BNC to BNC adapter cable. Cables and adapters can be purchased from your nearest professional video equipment stores.

3 SDI In

Use the SDI input connector to control your Micro Studio Camera 4K G2 via a program return feed from an SDI ATEM switcher. For more information, refer to the 'Connecting to an ATEM Switcher' section.

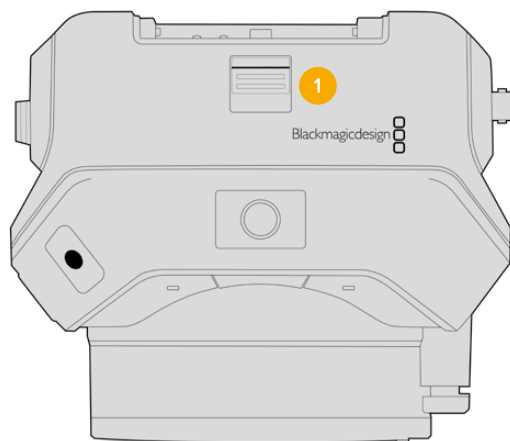
Rear Panel



1 Battery Slot

Blackmagic Micro Studio Camera 4K G2 can be powered from an optional LP-E6 or LP-E6N battery that fits into this slot. The battery will be charged while the camera is connected to power via the power adapter.

Top Panel



1 Battery Release

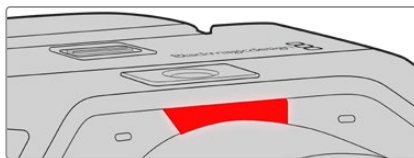
Slide the battery latch forward to release the battery.

Front Panel

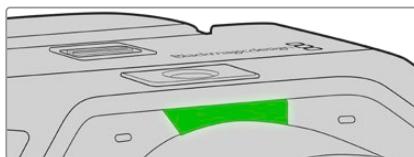


1 Tally Light

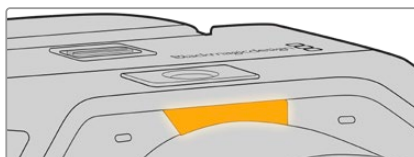
When your camera is connected to an ATEM switcher, the tally light lets the talent and camera operator know when the camera is on air or switched to the preview output, or if the camera is recording. When your camera is not connected to a switcher the tally light will illuminate red as a simple record tally indicator.



The camera is switched to the program output and is live on air.



The camera is switched to the preview output and about to go on air.



The camera is recording when connected to an ATEM switcher.

HDMI Output and HUD Controls

Your camera's HDMI output lets you connect to a monitor so you can frame shots and check important information via the head up display, or HUD. You can also use the HDMI output to connect to HDMI equipment such as ATEM switchers and external recorders.

There are two different ways to change settings on your camera and both use the HDMI output. You can turn on the menu settings by pressing the 'menu' button on your camera and navigate the settings using a menu overlay on the HDMI output.

Another way is to quickly change a setting using the HUD itself.



You can use your camera's HUD controls to change settings

TIP You can also access your camera's HUD and menu settings using an optional Blackmagic PYXIS Monitor. For more information on using PYXIS Monitor with your Micro Studio Camera 4K G2, refer to the 'Blackmagic PYXIS Monitor' section later in this manual.

Using the HUD Controls

Changing settings via the head up display is achieved using the buttons on the left panel of your camera.

	Use the 'set' button to open settings, confirm selections and to toggle settings on or off.
 	Press the arrow buttons to navigate between options and adjust settings.
	Press the menu button to step back through the options and return to the home screen.

Changing Settings using the HUD

The HUD lets you quickly adjust various camera settings including frame rate, shutter, gain and white balance. To access these settings, press the 'set' button once, the 'monitor' icon at the top left of the HDMI display will turn blue. You can now use your camera's arrow buttons to navigate along the settings bar at the top of the screen, press the 'set' button to open a setting.



Use your camera's arrow buttons to navigate through the settings

Frames Per Second

The 'FPS' indicator displays your currently selected frames per second.



Use the 'fps' indicator to access the frame rate settings

The 'FPS' indicator lets you change your camera's sensor and project frame rates via a menu at the bottom of the HDMI display. To open the menu, select the 'FPS' indicator and press your camera's 'set' button.

Project Frame Rate

The project frame rate is the camera's recording standard frame rate and provides a selection of common frame rates used in the film and television industry. This frame rate is normally set to match your post production workflow.

Eight project frame rates are available including 23.98, 24, 25, 29.97, 30, 50, 59.94 and 60 frames per second.

To adjust your camera's project frame rate while in the 'FPS' menu, use the arrow buttons to navigate to the current frame rate at the bottom of the screen and press 'set'. Use the arrow buttons to choose a different frame rate.

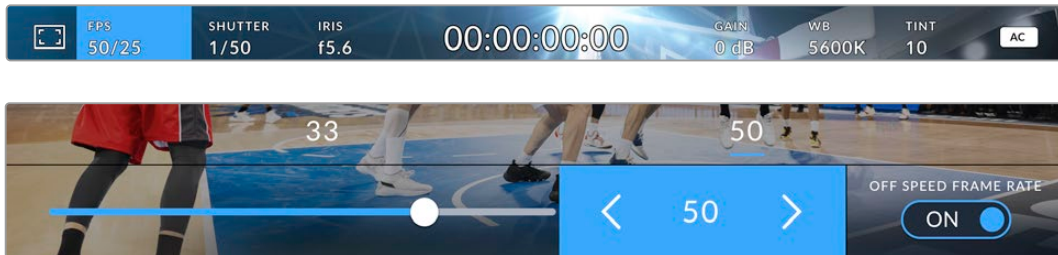


Use your Camera's arrow buttons to choose a project frame rate

TIP Your Blackmagic Micro Studio Camera 4k G2's project frame rate also sets the frame rate of the HDMI and SDI outputs.

Off Speed Frame Rate

The off speed frame rate sets how many actual frames from the sensor are recorded every second. This frame rate will affect how fast or slow your video will play back at your set project frame rate.



Use your camera's arrow buttons to choose an off speed frame rate

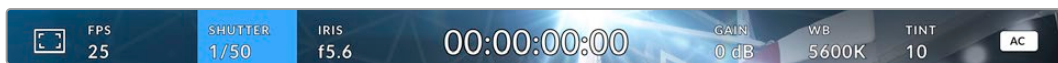
By default, the project and off speed frame rates are matched for a natural playback speed. However, by setting the 'off speed frame rate' switch to 'on', you can independently set the sensor frame rate.

To change the off speed frame rate, select the frame indicator at the bottom of the screen and press 'set'. Use the arrow buttons to increase or decrease the frame rate. You can also choose a common off speed frame rate from the row above the slider, these are based on your current project frame rate.

You can create dynamic and interesting speed effects in DaVinci Resolve by varying the off speed frame rate for your recorded video. Setting the off speed frame rate higher than your project frame rate will create slow motion during playback.

Shutter

The 'shutter' indicator displays your shutter speed or shutter angle. By selecting this indicator, you can manually change your camera's shutter values or configure shutter priority auto exposure modes. The shutter measurement setting can be used to select whether to display shutter information as 'shutter speed' or 'shutter angle'. See the 'setup menu' section in this manual for more information.



Shutter speed defines the level of motion blur in your video, and can be used to compensate for varying light conditions. The shutter speed setting for natural motion blur, and the settings available, depend on the frame rate you are using. For example, when shooting at 30p, a 1/60 of a second shutter speed is the equivalent of a 180 degree shutter angle, a very common setting for film projects. However, if you are shooting at 25p, you will need to set the shutter to 1/50 for the same look. As lighting conditions change, or the amount of movement in your scene increases, you may decide to adjust accordingly.

For natural motion blur you can calculate the shutter speed by doubling your frame rate. So at 30p, set your shutter speed to 1/60 of a second for natural motion blur.

If you need more light on the sensor, you can set the shutter at the slowest setting corresponding with your frame rate. For example, 1/25 for 25p, or 1/30 for 30p. At the slowest shutter speed, your motion blur will appear slightly exaggerated.

If you want to reduce the motion blur so action appears sharper and more defined, set the shutter to a faster speed, such as 1/120 of a second for 30p, or 1/100 of a second for 25p. If you are familiar with shutter angles, this equates to a shutter angle of 90 degrees.

NOTE When shooting under lights, your shutter can affect the visibility of flicker. Your camera will automatically calculate a flicker free shutter value for your current frame rate. Suggested flicker free shutter options will appear at the bottom of the HDMI display when adjusting your shutter. These shutter values are affected by mains power frequency in your region. You can set your local power frequency to 50Hz or 60Hz in the camera's setup menu. See the 'setup menu' section in this manual for more information.

Select the 'shutter' icon and press 'set' to bring up the suggested shutter values along the bottom of the HDMI display. If you have auto exposure set to 'off,' this screen will show you your currently selected shutter value, as well as the available flicker free shutter values, based on the mains power frequency you have selected in your camera's setup menu. The characteristics of individual light sources may still cause flicker even when using flicker free values. We recommend always performing a test shoot when not using continuous lights. For more information, see the 'setup menu' section in this manual.

To select a new shutter speed use the arrow buttons to select the current shutter value indicator at the bottom left of the screen and press 'set'. Change the shutter speed by pressing the arrow buttons, when your selected shutter speed matches one of the available flicker free shutter values, a blue line will be displayed under the matched value.



Your camera will suggest flicker free shutter values based on the mains power frequency you choose in the 'setup' menu

Your Blackmagic Micro Studio Camera 4K G2 has three shutter based auto exposure modes. To select one of these use the 'set' button to toggle the 'auto exposure' button to 'on', then use the arrow buttons to choose an auto exposure option.



Toggle 'auto exposure' to 'on' to access shutter based auto exposure modes

Shutter

This setting automatically adjusts shutter value to maintain a constant exposure while keeping iris aperture consistent. If you want to maintain a fixed depth of field, this is the setting to choose. It's worth mentioning that the subtle automatic adjustments of the shutter may have an effect on motion blur. It's also worth keeping an eye out for any flicker that may be introduced from various light fixtures on indoor shoots. The auto iris feature is not available when the 'shutter' auto exposure mode is selected.

Shutter + Iris

Maintains the correct exposure levels by adjusting the shutter, then the aperture. If the maximum or minimum available shutter value is reached and exposure still cannot be maintained, your camera adjusts the aperture to keep exposure consistent.

Iris + Shutter

Maintains the correct exposure levels by adjusting the aperture, then the shutter value. If the maximum or minimum available aperture is reached and exposure still cannot be maintained, your camera adjusts the shutter value to keep exposure consistent.

When an auto exposure mode that affects the shutter or iris is enabled, a small 'A' appears next to the shutter or iris indicator at the top of the HDMI display.

Iris

The 'Iris' indicator displays your current lens aperture. By selecting the indicator and pressing 'set', you can change the aperture of compatible lenses and configure iris based auto exposure modes.



Use the iris indicator to access the iris settings

The iris menu is shown at the bottom of the HDMI display. To change the aperture, use the arrow buttons to select the current aperture and press 'set', then use the arrow buttons to select a new aperture setting.



Use your camera's arrow buttons to adjust the aperture

Enabling the 'auto exposure' switch icon at the far right of the iris menu opens the iris auto exposure menu.

This gives you the following auto exposure options.

Iris

This setting automatically adjusts the aperture to maintain a constant exposure while keeping shutter speed consistent. This will keep motion blur unaffected, but may affect your depth of field.

Iris + Shutter

Maintains the correct exposure levels by adjusting the aperture, then the shutter value. If the maximum or minimum available aperture is reached and exposure still cannot be maintained, your camera adjusts the shutter value to keep exposure consistent.

Shutter + Iris

Maintains the correct exposure levels by adjusting the shutter, then the aperture. If the maximum or minimum available shutter value is reached and exposure still cannot be maintained, your camera adjusts the aperture to keep exposure consistent.

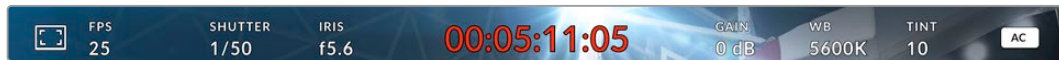


Select 'auto exposure' to access iris based auto exposure modes

When an auto exposure mode that affects the iris or shutter is enabled, a small 'A' appears next to the iris or shutter indicator at the top of the HDMI display.

Duration Display

At the top of the HDMI output, you'll see your camera's duration display.



Your camera's duration display will turn red while recording

The duration display provides a timecode counter for checking the duration of your clips and monitoring timecode during recording. The counter displays a time sequence showing Hours:Minutes:Seconds:Frames and will change accordingly as you record clips. During recording the timecode is red.

The displayed duration starts from 00:00:00:00. The clip duration of the current or last recorded clip is displayed on the HDMI output. Time of day timecode is embedded into clips for easier post production.

To see the timecode, simply use the arrow buttons to select the duration display and press 'set'. Press the 'set' button again to return to clip duration.

Additional status indicators may appear around the duration display:

TC	Appears to the right of the duration display when showing timecode.
EXT	Appears to the right of the duration display if an external timecode signal is connected and valid. This can be fed from an ATEM Mini via HDMI, an ATEM switcher via SDI Program return or from an analog mini jack timecode source.
INT	Appears to the right of the duration display if the camera is running off an internal timecode after being 'jam synced' and disconnected.
REF	Appears when a valid reference source is connected and locked, based on the reference input settings.

When connected to an ATEM switcher the timecode on your Micro Studio Camera 4K G2 is automatically synchronized to match the switcher's timecode. This makes it easier to perform accurate multi camera edits in DaVinci Resolve.

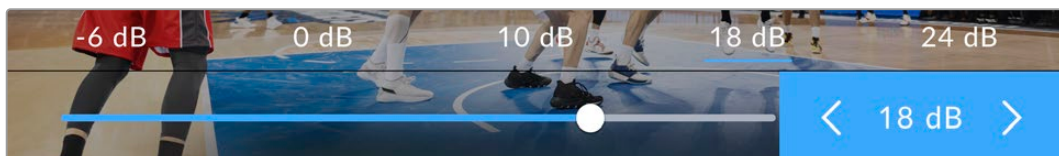
Gain

The 'gain' indicator displays your camera's current gain setting, or light sensitivity. The optimum setting for your camera is 0dB. Your camera has a dual native ISO sensor, meaning that 10dB and 18dB are excellent for low light situations, producing clean images with very little noise.

Selecting the gain indicator and pressing 'set' allows you to adjust your gain to suit varying lighting conditions. You can then select a preset or use your camera's arrow buttons to set a custom gain setting.



Select the gain indicator to access gain settings



The slider lets you adjust the gain

Depending on your situation, you may choose a lower or higher gain setting. For example, 32 or 36dB can be used in ultra low light but may cause noise.

Dual Native Gain

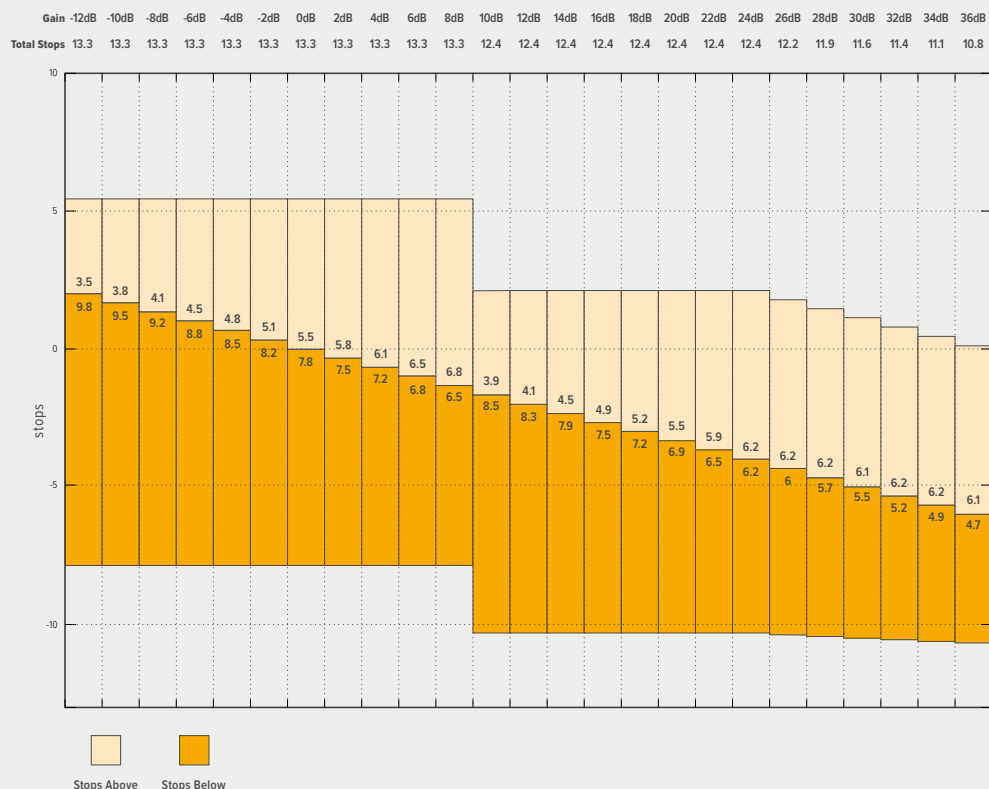
The sensor in your Blackmagic Micro Studio Camera 4K G2 is optimized for shooting in low light conditions as well as bright daylight.

Adjust the gain for the varying lighting conditions and the dual native gain feature will operate in the background to make sure your footage is clean and has minimal noise at low and high gain settings.

When the gain setting is between -12dB and 8dB the native gain of 0dB is used as a reference point. The gain range between 10dB and 36dB uses the native gain of 18dB as a reference. If you are shooting in conditions where you have a choice between 8dB or 10dB we suggest closing down one stop on your lens' iris so that you can select 10dB as it will engage the higher native gain and provide much cleaner results.

The dynamic range chart below shows the relationship between the gain selection and dynamic range allocation.

Dynamic Range



White Balance

The ‘WB’ and ‘TINT’ indicators display your camera’s current white balance and tint. Selecting these indicators lets you adjust your camera’s white balance and tint to suit varying lighting conditions.



Select the white balance and tint indicators to access white balance and tint settings

Every light source emits a color. For example, a candle flame emits a warm color, and an overcast sky emits a cool color. White balance settings are used to color balance your image so white stays white by adjusting the mix of orange and blue in your image. For example, when shooting under tungsten lamps which emit a warm, orange light, selecting 3200K adds some blue to the image. This balances the color so white is accurately recorded.

Your Blackmagic Micro Studio Camera 4K G2 comes with white balance presets for a variety of color temperature conditions. These are:

	Bright sunlight	(5600K)
	Incandescent bulbs	(3200K)
	Fluorescent bulbs	(4000K)
	Mixed light	(4500K)
	Cloud	(6500K)

To select a preset, use the arrow buttons and press the ‘set’ button. To customize the preset, select the temperature indicator and use the arrow buttons to make adjustments. Each button press moves the temperature up or down 50K.

To further dial in your image, you can adjust the ‘tint.’ This adjusts the mix of green and magenta in your image. For example, adding some magenta can compensate for the green cast of many fluorescent lights. Many of your camera’s white balance presets include some tint.

While in the ‘white balance’ menu, your camera’s current tint setting is shown at the bottom right of the screen. To adjust the tint, select the tint indicator use the arrow buttons to make adjustments. The available range is -50 to +50 in one unit increments.



The white balance and tint indicator on your Micro Studio Camera 4K G2 gives you access to five presets

NOTE Customizing the white balance or tint will change your preset to ‘CWB,’ or custom white balance. Custom white balances are persistent; your CWB settings will stay configured between power cycles, and when switching to a preset and back to CWB. This makes it easy to compare a custom white balance to the last preset used.

Auto White Balance

Your Micro Studio Camera 4K G2 can set white balance automatically. Selecting ‘AWB’ will bring up the white balance screen.

When setting white balance automatically, a square will be overlaid on the center of your image. Fill this square with a neutral surface such as a white or gray card, use the arrow buttons to select ‘update’ and press ‘set’.

Your camera will automatically adjust its white balance and tint values to ensure that the average of the white or gray within the white balance square is as neutral as possible. Once updated, this will be set as your camera’s custom white balance.



Use this with a white or neutral gray surface to automatically set a neutral white balance

Power

Your camera’s power status is displayed in the top right of the HDMI display.



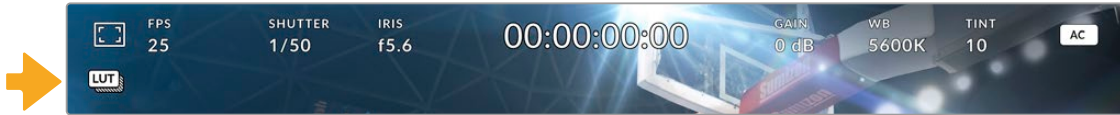
Your camera’s power indicator is at the top right of the display

There are four possible indicators:

	AC	Displays when your camera is plugged into mains power.
	Battery bars	When a battery is attached to your camera, a battery icon is displayed that drains in 25% steps. At 20% charge remaining, the battery bar turns red.
	AC and Battery	Displays when your camera is plugged into mains power and a battery is connected.
	AC / Charging	Displays when your camera is plugged into mains power, and is simultaneously charging an attached LP-E6 battery.

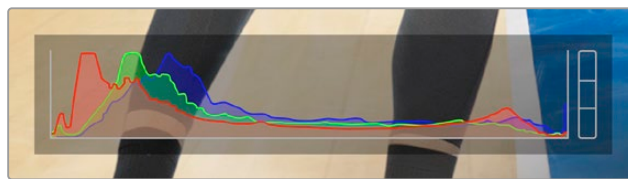
LUT Indicator

When you are using a LUT as a preview tool on set, a white LUT icon will be displayed in the top left corner of the screen to indicate that a LUT is currently active. This icon will be blue if you have 'Apply LUT in File' switched on in the 'record' settings. For more information, refer to the 'settings' section.



Histogram

At the bottom left of your camera's HDMI output you can see the histogram. The RGB histogram shows the tonal distribution of the image separated into individual red, green and blue channels.



The histogram gives you an indication of the tonal range between shadows and highlights in your clip

The left edge of the histogram displays shadows, or blacks, and the far right displays highlights, or whites. When you close or open the lens aperture, you'll notice the information in the histogram moves to the left or right accordingly. You can use this to check 'clipping' in your image shadows and highlights. When clipping occurs in the red, green or blue channel highlights, the respective indicator on the right side of the histogram lights up. If the left and right of your edges of the histogram come to an abrupt stop rather than falling off gradually, you may be losing highlight or shadow detail.

If you don't see a histogram in the bottom left of your HDMI display, your HDMI monitor settings may be set to 'director'. See the 'monitor menu' section for more information.

Record Button Indicator

Next to the histogram at the bottom of your camera's HDMI output is the record button indicator. While recording, the button, media bar icon and the timecode at the top of your camera's HDMI output will turn red.

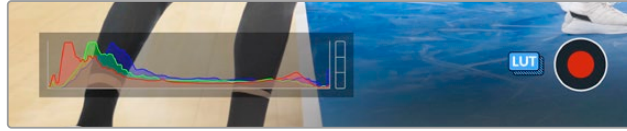


When recording, the record button and media bar illuminates red

Apply LUT in File

If you have chosen to apply a LUT to your recorded clips in the 'record' settings, a blue 'LUT' icon is displayed next to the record button. This icon will be displayed in the top left corner of the screen if you also have 'display 3D LUT' switched 'on' in the monitor settings.

The LUT indicator is displayed in both standby and record mode.



For more information on recording LUTs with Blackmagic RAW files, refer to the 'record menu' section later in this manual.

Dropped Frame Indicator

The record indicator button is overlaid with a flashing '!' indicator if your camera begins dropping frames while recording. The time remaining indicator for the USB-C flash disk also turns red. This lets you know if your USB-C flash disk is too slow for your currently selected codec and resolution. The 'dropped frame indicator' also appears if you have dropped a frame on the previously recorded clip. This indicator continues until another clip is recorded, or the camera is power cycled.



The dropped frame indicator appears when your camera's flash disk is dropping frames

NOTE You can set your Blackmagic Micro Studio Camera 4K G2 to stop recording if dropped frames are detected to avoid recording unusable footage. See the 'record menu' section in this manual for more information.

Storage Indicator

The storage indicator is visible at the bottom of HDMI display next to the 'record' button. This indicator displays information about the USB-C drive connected to your camera.

Record Time Remaining

When a USB-C flash disk is connected to your camera, the storage indicator at the bottom of the HDMI display will show how much recording time is left on the disk. The time is shown in hours and minutes and varies according to your selected frame rate and codec. The indicator automatically recalculates if either of these settings are changed.

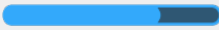
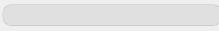
When there is approximately 5 minutes remaining on your flash disk, the storage indicator text will turn red, the indicator will blink slowly when there is 3 minutes remaining and blink quickly when there is less than 30 seconds of recording time remaining.



The storage indicator shows the name of your flash disk and the available record time

Media Bar

The media bar icon above the recording time will be either blue, white or red depending on its current status and will display the used space on the USB-C flash disk.

	A blue icon indicates that the flash disk is ready for recording. . A solid blue icon indicates the disk is full.
	A white icon indicates that there is a USB-C flash disk present, but not active.
	The bar will illuminate red during recording.

For more information about recording to USB-C flash disk, refer to the 'record menu' section of this manual.

Audio Meter

The peak audio meters display audio levels for channels 1 and 2 when using the internal microphone, or via external audio when connected. You can display PPM or VU meters. To change the meter type, see the 'settings' section later in this manual.

To achieve optimum audio quality using PPM meters, ensure your levels do not reach 0 dBFS. This is the maximum level that your camera can record before the audio is clipped and distortion occurs.

Alternatively, when using VU meters, levels can safely peak at 0, allowing you a little room beyond 0 before clipping occurs. To avoid clipping, make sure the levels do not reach +3 dBFS.



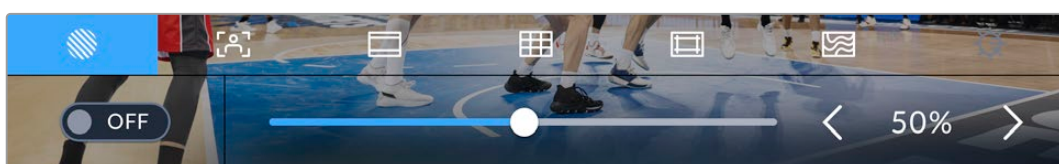
The colored bars on the VU audio meter represent peak audio levels. Ideally your peak audio levels should fall in the upper end of the green zone. If your peaks enter into the yellow zone your audio is near clipping. Audio in the red zone reaching +3 dBFS is at risk of clipping.

HDMI Monitor Options

The HDMI monitor options let you toggle and adjust the appearance of your camera's monitoring features, including zebra, focus assist, frame guides, grids, safe area guides and false color. To access these options, press the 'set' button twice. The controls appear in a tabbed menu along the bottom edge of the HDMI display. Use your camera's arrow and 'set' buttons to select a monitor option.



Press the 'set' button twice to open your camera's HDMI monitor options

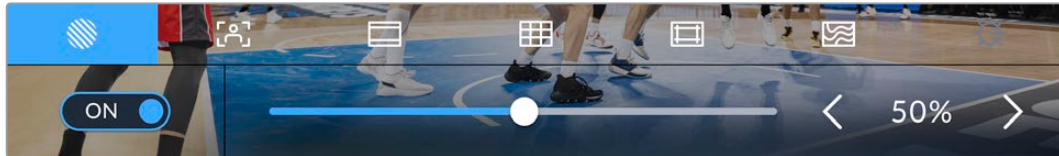


The HDMI monitor options appear at the bottom of the HDMI display

Zebra

The 'zebra' setting toggles the appearance of the zebra on the HDMI output, as well as setting the zebra level for the SDI output.

Zebra displays diagonal lines over areas of your image that exceed a set exposure level. For example, setting zebra to 100% shows which areas are completely overexposed. This is useful for achieving optimum exposure in fixed lighting conditions.



Use your camera's arrow buttons to adjust the zebra setting

To toggle zebra for the HDMI display, use the 'set' button to toggle the switch icon in the bottom left of the screen while in the 'zebra' tab.

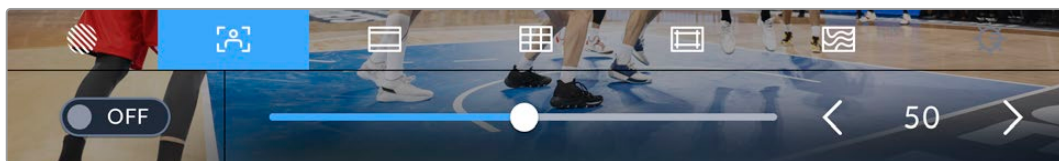
To set the level that zebra appears at, use the arrow buttons to select the percentage indicator on the bottom right of the screen and press 'set'. Then use the arrow buttons to adjust the zebra level. There are eight zebra presets available including middle gray and middle gray plus one stop, then in five percent increments from 75 to 100 percent exposure.

For information on enabling zebra on your camera's SDI output, see the 'monitor menu' section in this manual.

TIP If you're shooting in variable light such as outdoors on a partly overcast day, setting your zebra level lower than 100 can warn you of potential overexposure.

Focus Assist

The 'focus assist' setting toggles the appearance of focus assist on the HDMI output of your Blackmagic Micro Studio Camera 4K G2, as well as setting the level of focus assistance for the SDI output on your camera.



The focus assist setting set to 50%

To toggle focus assistance for the HDMI output, use the 'set' button to toggle the switch icon in the bottom left of the screen while in the 'focus assist' tab.

To set the level of focus assistance for the HDMI output of your Micro Studio Camera 4K G2, use the arrow buttons to select the percentage indicator on the bottom right of the screen and press 'set'. Then use the arrow buttons to adjust the focus assistance level. Press the 'menu' button to return to the home screen.

The optimum level of focus assistance varies shot by shot. When focusing on actors, for example, a higher level of focus assistance can help resolve edge detail in faces. A shot of foliage or brickwork, on the other hand, may show distracting amounts of focus information at higher settings.

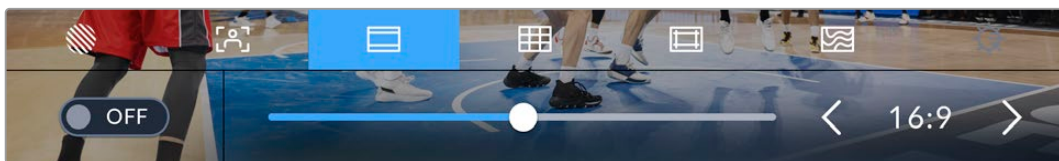
For information on enabling focus assist on your camera's SDI output, see the 'monitor settings' section in this manual.

TIP Your Micro Studio Camera 4K G2 has two focus assist modes. You can switch between 'peaking' and 'colored lines' focus assistance in the 'monitor' settings menu. For more information, see the 'monitor menu' section.

Frame Guides

The 'frame guide' setting toggles the appearance of frame guides on your camera's HDMI output. You can also choose frame guide options for your camera's SDI output. See the 'monitor menu' section for more information.

Frame guides include aspect ratios for various cinema, television and online standards.



Use the 'frame guides' setting to toggle frame guides for your camera's HDMI output

To toggle the appearance of frame guides on your Micro Studio Camera 4K G2's HDMI output, use the 'set' button to toggle the switch icon in the bottom left of the screen while in the 'frame guides' tab.

To select a frame guide, use the arrow buttons to navigate to the aspect ratio indicator on the bottom right of the display and press 'set'. Then choose the frame guide you want to use by pressing the arrow buttons.

The available guides are:

2.35:1, 2.39:1 and 2.4:1

Displays the broad widescreen aspect ratio compatible with anamorphic or flat widescreen cinema presentation. The three widescreen settings differ slightly based on the changing cinema standards over time. 2.39:1 is one of the most prominent cinema widescreen standards in use today.



The HDMI display with 2.40:1 frame guides enabled

2:1

Displays a ratio slightly wider than 16:9 but not as wide as 2.35:1.

1.85:1

Displays another common flat widescreen cinema aspect ratio. This ratio is slightly wider than HDTV 1.78:1 but not as wide as 2.39:1.

16:9

Displays a 1.78:1 aspect ratio compatible with 16:9 HD television and computer screens. This ratio is most commonly used for HD broadcasting and online videos. The same aspect ratio has also been adopted for Ultra HD broadcasting.

14:9

Displays a 14:9 aspect ratio used by some television broadcasters as a compromise between 16:9 and 4:3 television sets. Ideally, both 16:9 and 4:3 footage remains legible when center cropped to fit 14:9. You can use this as a compositional guide if you know your project may be broadcast by a television station that uses 14:9 cropping.

4:3

Displays the 4:3 aspect ratio compatible with SD television screens, or to help with framing when using 2x anamorphic adapters.

1:1

Displays a 1:1 ratio slightly narrower than 4:3. This square ratio is growing in popularity on social media.

4:5

Displays a 4:5 aspect ratio. This vertical aspect ratio is ideal for portraits and viewing on smartphones.

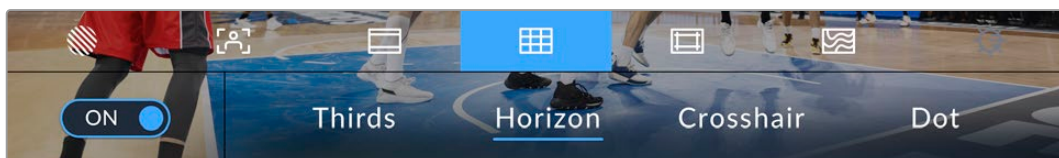
9:16

Displays a 9:16 aspect ratio. This vertical aspect ratio is useful for framing social media content.

TIP You can change the opacity and color of frame guide overlays. For more information see the 'monitor menu' section of this manual.

Grids

The 'grids' setting toggles the appearance of a rule of thirds grid, horizon meter, crosshair or center dot on the HDMI output, as well as setting the overlay that will be visible on the SDI output. For information on enabling grids on your SDI output, see the 'monitor menu' section in this manual.

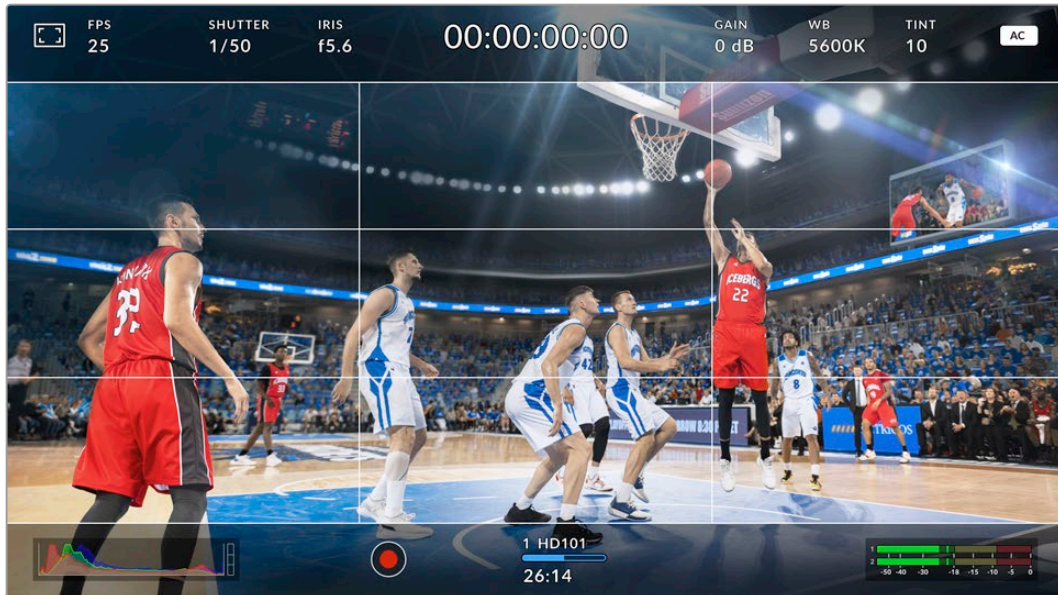


The 'grid' settings with the 'horizon' meter enabled

Grids and crosshair are overlays that can help with image composition. When 'grids' are enabled, your Micro Studio Camera 4K G2 can show a rule of thirds grid, horizon, crosshair or dot.

To toggle the appearance of grids on your Micro Studio Camera 4K G2's HDMI output, use the 'set' button to toggle the switch icon in the bottom left of the screen while in the 'grids' tab.

To set which overlay you want to display on the HDMI or SDI output, use the arrow buttons to select the 'thirds', 'horizon', 'crosshair' or 'dot' options and press 'set' to confirm your choice. With thirds selected, you can also display either the horizon, crosshair or dot indicators. For example thirds plus horizon, thirds plus crosshair, or thirds plus dot.



The rule of thirds grid automatically scales to any on screen frame guides

Thirds

The 'thirds' setting displays a grid with two vertical and horizontal lines placed in each third of the image. Thirds are an extremely powerful tool to help compose your shots. For example, the human eye typically looks for action near the points where the lines intersect, so it's helpful to frame key points of interest in these zones. An actor's eyeline is commonly framed along the top third of the screen, so you can use the top horizontal third to guide your framing. Thirds are also useful to maintain framing consistency between shots.

Horizon

The 'horizon' meter indicates when your camera is rolled left or right and tilted up or down. This can help you keep the horizon level during handheld shots and balance the camera tilt on a gimbal.

The gray vertical and horizontal indicators move away from the center as the camera is rolled and tilted. The distance the lines move away from the central crosshair is proportional to the amount of roll or tilt. After you calibrate the camera's motion sensor, the motion indicators will illuminate blue when the camera's roll and tilt become level.

Note that if the camera is tilted straight down for an overhead shot or straight up, the horizon meter takes this into account. If you roll the camera to shoot in portrait orientation, the horizon meter rotates its axes 90 degrees.

This table shows examples of the horizon meter indicating tilt and roll of the camera.

Horizon meter	Description
	Straight and level
	Tilted down and level
	Straight and rolled left
	Tilted up and rolled right

For normal use, calibrate the horizon meter for straight and level operation. If you want to use the horizon meter to help maintain a consistent 'dutch angle' or a consistent tilt for a low or high shot, you can calibrate the horizon meter at an incline. For information on how to calibrate the horizon meter, see the 'motion sensor calibration' section.

Crosshair

The 'crosshair' setting places a crosshair in the center of the frame. Like thirds, the crosshair is a very useful compositional tool, making it easy to frame the subject of a shot in the very center of a frame. This is sometimes used when filming scenes that will be assembled using very fast cuts. Keeping viewers' eyes focused on the center of a frame can make rapid editing easier to follow.

Dot

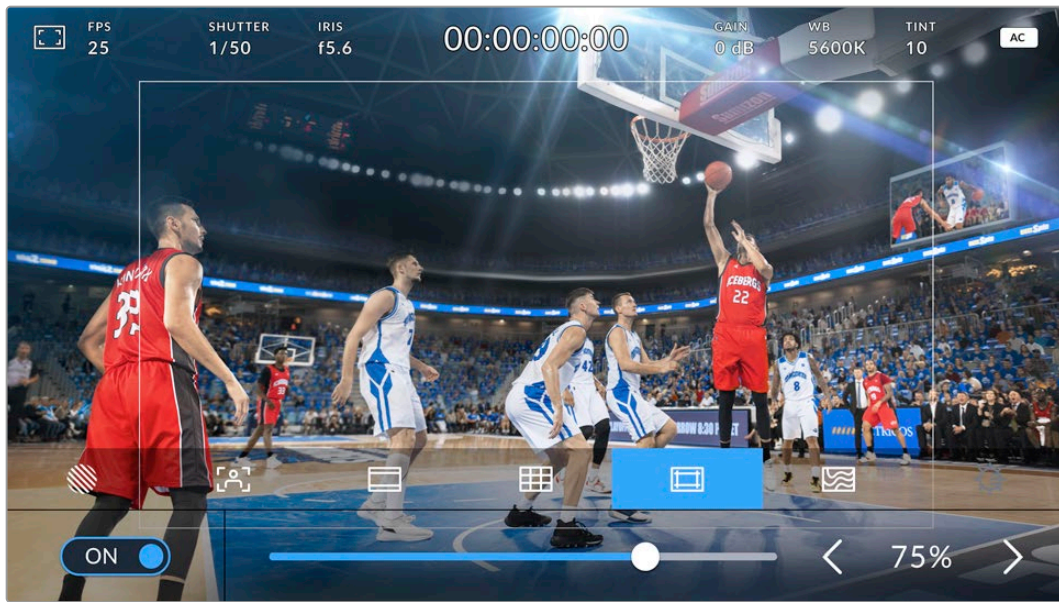
The 'dot' setting places a dot in the center of the frame. This works in exactly the same way as the 'crosshair' setting, albeit with a smaller overlay that you may find less intrusive.

Safe Area Guides

The 'safe area guides' setting toggles the safe area guides on or off for the HDMI output, as well as setting the size of safe area guides for the SDI output.

Safe areas can be used in broadcast production so the most important parts of a shot can be seen by viewers. By keeping the most important parts of your shot inside a central 'safe area,' you can avoid cropping on some televisions, as well as leaving space for a broadcaster to add bugs, news tickers and other overlays along the edges of the screen. Many broadcasters require footage to be submitted with important content, such as titles and graphics, contained inside the 90% safe area.

Safe area guides can also be used to assist with framing your shot where you know that the shot will be stabilized in post production, which can crop the edges of the image. They can also be used to indicate a specific crop. For example, by setting it to 50% when recording at Ultra HD 3840x2160 you can see what a 1920x1080 crop of the frame would look like. The safe area guides also scale to your frame guides, so they will adjust to indicate the chosen percentage of your target frame.

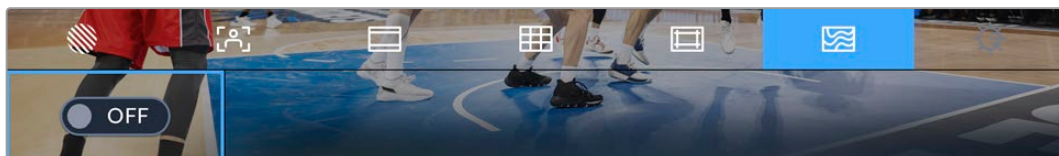


The safe area set to 75%

To toggle safe area guides for the HDMI output, select the switch icon in the bottom left of the screen while in the 'safe area guides' tab and press the 'set' button. To set the level of safe area guides for your camera's HDMI or SDI output, navigate to the percentage indicator in the bottom right of the screen, press 'set' and use the arrow buttons to select an option.

False Color

The 'false color' setting toggles the appearance of false color exposure assistance on the HDMI output.



False color overlays different colors onto your image that represent exposure values for different elements in your image. For example, pink represents optimum exposure for lighter skin tones, while green is a good match to darker skin tones. By monitoring the pink or green false color when recording people, you can maintain consistent exposure for their skin tones.

Similarly, when elements in your image change from yellow to red, that means they are now over exposed.



The IRE false color chart on the left side of your camera's display shows you how to interpret the different false colors.

False Color	Meaning
95%WC	White clipping
80%WC	Near white clipping
MG+1	One stop over middle gray
18%MG	Middle gray
NBDL	Near black detail loss
BDL	Black detail loss

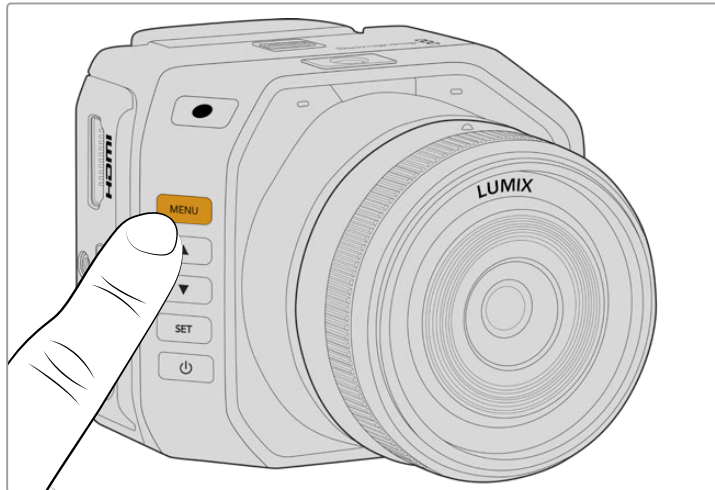


In a well exposed image, skin tones are represented by green and pink false colors

To enable or disable false color for the HDMI output, use the 'set' button to toggle the switch icon in the bottom left of the screen while in the 'false color' tab.

Settings Menu Controls

Pressing your camera's 'menu' button will open the settings menu, which will appear as a video overlay on the bottom left of your connected HDMI display.



Press the 'menu' button to open the settings menu



	Record >
Codec	Blackmagic RAW 3:1
Resolution	Ultra HD
Dynamic Range	Video

Use the arrow buttons to navigate to the submenu or setting



	Record >
Codec	Blackmagic RAW 3:1
Resolution	Ultra HD
Dynamic Range	Video

Press the 'set' button to select the submenu or setting

Adjust settings using the arrow buttons. Confirm the selection by pressing the 'set' button.
To leave the menu, press 'menu' to step back through the options and return to the home screen.

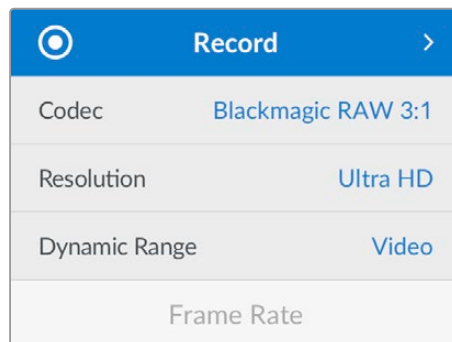
TIP You can position the menu to any of the four corners of your HDMI display. Refer to the 'setup menu' section for more information.

Settings

The settings menu is arranged into eight distinct categories, including record, monitor, audio, storage, setup, LUTs, presets and slate. Each of these submenus contains related settings.

Record Menu

The 'record' menu allows you to set your video codec as well as other settings that are important for your recorded video, such as dynamic range and detail sharpening.



Codec

The 'codec' menu lets you set the quality for Blackmagic RAW when recording to a USB-C flash disk. You can choose from a selection of constant bitrate settings, or constant quality. For example 3:1, 5:1, 8:1, 12:1, or Q0, Q1, Q3 and Q5 respectively. These provide options so you can set the amount of compression used. More information on Blackmagic RAW is provided later in this section.

Resolution

This setting displays the resolution being recorded if you are recording to an external flash disk via USB-C. Blackmagic Micro Studio Camera 4K G2 records clips in Ultra HD resolution.

Dynamic Range

Blackmagic Micro Studio Camera 4K G2 has three dynamic range settings:

Video	The 'video' setting is perfect for live to air broadcast and lets you work faster by recording to a high contrast look suitable for direct delivery or minimal post processing. Video uses Rec.709 primaries and has 6 stops over middle gray with another 3 stops in specular highlights. This is a good option if you want an accurate starting point that still has a pleasing gamma curve.
Extended Video	The 'extended video' setting is based on Blackmagic Wide Gamut with contrast and saturation applied. The most notable differences to the video mode come from the magenta/green axis having less saturation which is more typical of print film, and even more highlight roll off than video mode which causes highlights to desaturate more. It has a slightly flatter gamma curve that results in less saturation.
Film	The 'film' setting shoots video using a log curve that allows you to maintain the greatest dynamic range and maximizes the information in your video signal to help you get the most out of color grading software, such as DaVinci Resolve.

Blackmagic RAW

Blackmagic Micro Studio Camera 4K G2 supports the Blackmagic RAW file format. This format offers superior image quality, wide dynamic range and a broad selection of compression ratios. Blackmagic RAW features all the user benefits of RAW recording, but the files are very fast because most of the processing is performed in the camera where it can be hardware accelerated by the camera itself.

Blackmagic RAW also includes powerful metadata support so the software reading the files knows your camera settings. If you like shooting in video gamma because you need to turn around edits quickly and you don't have time for color correction, then this metadata feature means you can select video gamma, shoot in video gamma, and the file will display with video gamma applied when you open it in software. However underneath, the file is actually film gamma and the metadata in the file is what's telling the software to apply the video gamma.

So what all this means is if you want to color grade your images at some point, then you have all that film dynamic range preserved in the file. You don't have your images hard clipped in the whites or the blacks, so you retain detail and you can color grade to make all your images look cinematic. However, if you don't have time for color grading, that's fine because your images will have the video gamma applied and look like normal video camera images. You are not locked in on the shoot and you can change your mind later during post production. Blackmagic RAW files are extremely fast and the codec is optimized for your computer's CPU and GPU. This means it has fast smooth playback and eliminates the need for hardware decoder boards, which is important for laptop use. Software that reads Blackmagic RAW also gets the advantage of processing via Apple Metal, Nvidia CUDA and OpenCL.

This means that Blackmagic RAW plays back at normal speed like a video file on most computers, without needing to cache it first or lower the resolution.

It's also worth mentioning that lens information is recorded in the metadata on a frame by frame basis. For example, when using compatible lenses, any zoom or focus changes performed over the length of a clip will be saved, frame by frame, to the metadata in the Blackmagic RAW file.

Recording to Blackmagic RAW

Blackmagic RAW works in 2 different ways. You have a choice to use either the constant bitrate codec, or the constant quality codec.

The constant bitrate codec works in a similar way to most codecs. It tries to keep the data rate at a consistent level and won't let the data rate go too high. This means even if you are shooting a complex image that might need a bit more data to store the image, a constant bitrate codec will just compress the image harder to make sure the images fit within the space allocated. This can be fine for video codecs, however when shooting Blackmagic RAW you really want to ensure the quality is predictable. What would happen if the images you were shooting needed more data, but the codec just compresses harder to make a specified data rate? It's possible you could lose quality, but not be sure it's happening until you return from a shoot.

To solve this problem, Blackmagic RAW also has an alternative codec choice called constant quality. This codec is technically called a variable bitrate codec, but what it's really doing is allowing the size of the file to grow if your images need extra data. There is no upper limit on the file size if you need to encode an image but maintain quality.

So Blackmagic RAW set to the constant quality setting will just let the file grow as big as it needs to be to encode your images. It also means the files could be larger or smaller depending on what you are shooting. I guess if you leave your lens cap on the lens, you won't waste space on your media!

It is also worth noting that the quality settings for Blackmagic RAW are not obscure names, but are more meaningful as they are derived from what's happening technically. So for example when you have selected the constant bitrate codec, you will see quality settings of 3:1, 5:1, 8:1 and 12:1. These are the ratios of the uncompressed RAW file size vs the file sizes you should expect when shooting in Blackmagic RAW. 3:1 is better quality as the file is larger, while 12:1 is the smallest file size with the lowest quality. Many users of Blackmagic RAW find that 12:1 has been perfectly ok and they have not seen any quality limitations. However it's best to experiment and try various settings for yourself.

When using Blackmagic RAW in constant quality, the options are Q0, Q1, Q3 and Q5. These are the compression parameters passed to the codec and they are setting how much compression is applied in a more technical way. This setting is different because the codec operates differently between constant bitrate vs constant quality. In this constant quality setting, you really cannot tell what the file size ratio will become as it varies a lot based on what you are shooting. So in this case the setting is different and the file will become the size needed to store your media.

Constant Bitrate Settings

The names for 3:1, 5:1, 8:1 and 12:1 represent the compression ratio. For example, 12:1 compression produces a file size roughly 12 times smaller than uncompressed RAW.

Constant Quality Settings

Q0 and Q5 refer to different levels of quantization. Q5 has a greater level of quantization but offers a greatly improved data rate. As mentioned above, the constant quality setting can result in files that grow and shrink quite a lot, depending on what you are shooting. This also means it's possible to shoot something and see the file size increase to beyond what your media card can keep up with. It could result in dropped frames. However the benefit is that you can instantly see if this happens on a shoot and then investigate your settings vs quality.

Blackmagic RAW Player

The Blackmagic RAW player included in your Blackmagic camera's software installer is a streamlined application for reviewing clips. Simply double click on a Blackmagic RAW file to open it, and you can quickly play and scroll through the file with its full resolution and bit depth. When decoding frames, the CPU acceleration in the SDK library supports all main architectures, and also supports GPU acceleration via Apple Metal, Nvidia CUDA and OpenCL. It also works with the Blackmagic eGPU for extra performance. Blackmagic RAW player is available for Mac, Windows and Linux.

Sidecar Files

Blackmagic RAW sidecar files let you override metadata in a file without overwriting embedded metadata in the original file. This metadata includes the Blackmagic RAW settings as well as information on iris, focus, focal length, white balance, tint, color space, project name, take number and more. Metadata is encoded frame by frame over the duration of the clip, which is important for lens data if the lens is adjusted during a shot. You can add or edit metadata in sidecar files with DaVinci Resolve or even a text editor because it's a human readable format. Sidecar files can be used to automatically add new Blackmagic RAW settings to a playback simply by moving the sidecar file into the same folder as the corresponding Blackmagic RAW file. If you move the sidecar file out of the folder and reopen the Blackmagic RAW file, the changed settings are not applied and you see the file as it was originally shot. Any software that uses the Blackmagic RAW SDK can access these settings. Changes made are saved in the sidecar file and can then be seen by Blackmagic RAW Player or any other software capable of reading Blackmagic RAW files.

When shooting video gamma, the file stays in film gamma, and the metadata tells the Blackmagic RAW processing to display using video gamma. Video gamma is great when you don't want to grade the image and want to deliver content quickly, however if you want to pull up the black parts of the image, or pull down the white areas, all the detail is retained. You never clip the video and all the detail is still there if you want to access it at any time.

Blackmagic RAW in DaVinci Resolve

Settings can be adjusted for each Blackmagic RAW file, and then saved as a new sidecar file from the 'Camera RAW' tab in DaVinci Resolve for creative effect or optimized viewing. This also means you can copy your media for another DaVinci Resolve artist and they will have access to your modified gamma settings automatically on import. In addition to the other metadata your camera files contain, DaVinci Resolve can read your selected dynamic range, so your clips will automatically display in DaVinci Resolve with 'film', 'extended video' or 'video' dynamic range.

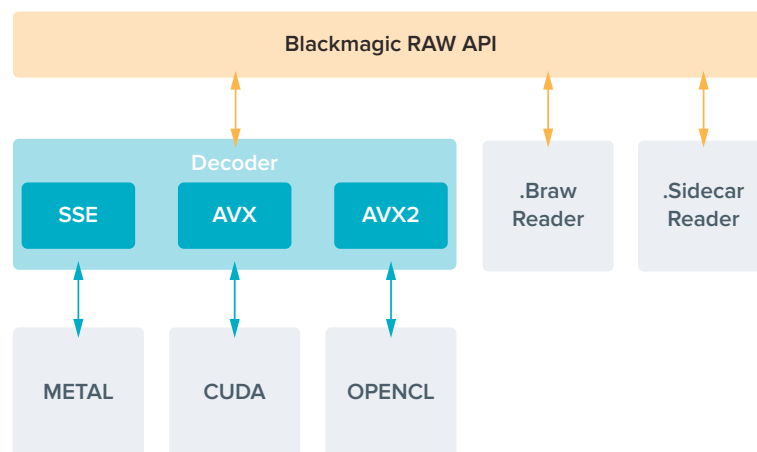
You can then customize these settings by adjusting the saturation, contrast and midpoint, as well as the highlight and shadow rolloff. Any adjustments can then be saved as a sidecar file, so the changes can be seen by anyone else working with the files in post. You can always return to the original camera metadata at any time.

You can also export a single Blackmagic RAW frame from the 'Camera RAW' tab in DaVinci Resolve, which contains all adjustments, metadata, full resolution and color information so it is easy to share a single frame grab or reference file with others.

Blackmagic RAW Software Development Kit

The Blackmagic RAW Software Development Kit is an API developed by Blackmagic Design. You can use the Blackmagic RAW SDK to write your own applications to use the Blackmagic RAW format. This SDK library can be used by any developer to add support for reading, editing, and saving Blackmagic RAW files. The Blackmagic RAW SDK includes all the generation 5 color science so you can achieve organic cinematic images across any app that supports it. The Blackmagic RAW SDK supports Mac, Windows and Linux, and is available as a free download from the developer page of the Blackmagic website at www.blackmagicdesign.com/developer

The following diagram illustrates the components of the Blackmagic RAW API:



Record Duration

The table in this section show approximate record duration in minutes based on format, project frame rate and flash disk size.

The maximum recording time for a flash disk can vary depending on the data capacity of your USB-C flash disk and the frame rate you choose. It should also be noted that the recording duration for a flash disk can vary slightly between different manufacturers and whether the storage media is formatted as exFAT or Mac OS Extended.

Simple scenes containing less detail tend to require less data than more dense compositions. The values in these tables assume shots with a high complexity, which means you may get slightly longer record times depending on the nature of your shoot.

ULTRA HD					
USB Flash Disk	Frame Rate	Blackmagic RAW 3:1	Blackmagic RAW 5:1	Blackmagic RAW 8:1	Blackmagic RAW 12:1
1 TB		Duration	Duration	Duration	Duration
	23.98	164 mins	274 mins	436 mins	652 mins
	24	164 mins	273 mins	436 mins	651 mins
	25	158 mins	262 mins	419 mins	625 mins
	30	131 mins	219 mins	349 mins	522 mins
	50	79 mins	131 mins	210 mins	314 mins
	60	65 mins	109 mins	175 mins	262 mins

Constant quality settings for Q0 and Q5 will display varying record time remaining durations. The estimated duration for Q0 is similar to constant bitrate 3:1, and Q5 will display a similar duration to 12:1, however, as the estimated duration updates every 10 seconds while recording, the best way to gauge how much recording time you have is to record for 20 seconds and monitor the duration in the media area of the HUD display.

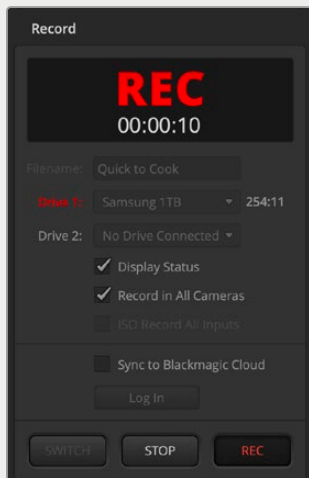
Trigger Record

Blackmagic Micro Studio Camera 4K G2 automatically sends a signal via the HDMI output that will trigger recording when connected to equipment that supports the trigger record feature, such as Blackmagic Video Assist.

This means that when you press record on your camera, your external recorder also starts recording and stops when you stop recording on the camera. Your camera also outputs timecode via HDMI, which means the clips recorded on your external recorder has the same timecode as the clips recorded in your camera.

If your external recorder supports trigger recording, you will need to enable it. This can usually be enabled via its settings menu.

Triggering Record using ATEM Mini or ATEM SDI



When recording ISO files from an ATEM Mini or ATEM SDI Extreme or Pro model switcher, you can also trigger record on all connected Blackmagic Micro Studio 4K G2 cameras.

For example, the 'record stream' palette in ATEM Software Control has a checkbox labeled 'record in all cameras'. When this checkbox is enabled and you click or press record, all connected cameras will start recording as well. This means you only have to click or press one button to start recording on all cameras simultaneously.

Refer to the ATEM Mini or ATEM SDI manual for more information.

Frame Rate

Frame Rate	
Project Frame Rate	24 fps
Off Speed Recording	Off
Off Speed Frame Rate	60 fps

Project Frame Rate

The project frame rate provides a selection of frame rates commonly used in the film and television industry. For example, 23.98 frames per second. This frame rate is normally set to match your playback speed and audio sync used in your post production workflow and delivery requirements.

Eight project frame rates are available, including 23.98, 24, 25, 29.97, 30, 50, 59.94 and 60 frames per second.

Off Speed Recording

By default, the project and sensor frame rates are matched for a natural playback speed. However, switching 'off speed recording' to 'on' lets you set your sensor frame rate independently.

Off Speed Frame Rate

When 'off speed recording' is enabled, select 'off speed frame rate' from the menu and press 'set'. You can then use your camera's arrow buttons to set the sensor frame rate.

The sensor frame rate sets how many actual frames from the sensor are recorded every second, and frame rate will affect how fast or slow your video will play back at your set project frame rate.

For more information about off speed frame rates, see the 'frames per second' section in the 'HUD controls' section of this manual.

Timelapse

Timelapse	
Timelapse	On
Capture One Frame Every	50s

Timelapse

This setting activates the Timelapse feature.

Capture One Frame Every

When the Timelapse feature is enabled, use this setting to automatically record a still frame at the following intervals:

Frames	2 – 10
Seconds	1 – 10, 20, 30, 40, 50
Minutes	1 – 10

For example, you can set the camera to record a still frame every 10 frames, five seconds, 30 seconds, five minutes etc.

The timelapse feature offers many creative options. For example, setting a two frame timelapse interval gives your recorded video a high speed effect when played back.

Start recording by pressing your camera’s record button. When you press the button again to stop recording, the timelapse sequence is saved as one single clip, matching the codec and frame rate set in your camera. This means you can drop the timelapse sequence into your post production timeline just like any other clip you have recorded.



Timelapse mode is indicated by an icon over the 'record' button

Detail Sharpening

Detail Sharpening	
Detail Sharpening	On
Detail Sharpening Level	Low

Detail Sharpening

This setting enables the detail sharpening feature.

Detail Sharpening Level

Use this setting to sharpen the image. When sharpening is enabled, decrease or increase the level of sharpening by selecting 'low', 'medium' or 'high'.

When enabled, sharpening will be applied to the HDMI and SDI outputs, but will not be recorded via USB-C. This is because you will have more options and greater control over your image using the sharpening tools in DaVinci Resolve.

Drop Frame

Drop Frame	
If Media Drops Frame	Alert

If Media Drops Frame

Use this setting to configure the behavior of your camera when dropped frames are detected. When set to 'alert,' recording continues with dropped frames. When set to 'stop recording,' your camera stops recording if dropped frames are detected. This can prevent you wasting time shooting unusable footage if you don't notice the dropped frame indicator.

Color

Color	
Apply LUT in File	On
Gamut Compression	On

Apply LUT in File

When the 'apply LUT in file' setting is set to 'on' your Blackmagic Micro Studio Camera 4K G2 will embed a LUT into the Blackmagic RAW file you are recording. The LUT is saved into the header of the file and can easily be applied to the clip in post production without needing to handle a separate file. The clip will open in Blackmagic RAW Player and DaVinci Resolve with the LUT applied. The LUT can easily be toggled 'on' or 'off' but will always travel with the Blackmagic RAW file as it is written into the clip itself.

DaVinci Resolve also has an 'apply LUT' checkbox in the RAW settings palette for enabling or disabling the 3D LUT in the Blackmagic RAW file. The 'Apply LUT' setting in DaVinci Resolve is the same setting as in the camera. This means that when shooting you can direct the colorist to use the LUT by setting it in the camera, but they can switch it off easily in DaVinci Resolve by deselecting the 'apply LUT' checkbox.

Gamut Compression

The 'gamut compression' setting is enabled by default and allows you to choose whether you want to compress and desaturate extreme colored highlights to stay within the display color space as they approach clipping.

This setting will affect the image sent from your camera's SDI and HDMI outputs as well as the recorded files. When shooting using Blackmagic RAW the 'gamut compression' setting is able to be adjusted in the RAW decode tab in the color page of DaVinci Resolve.

Turning this setting 'off' will allow colors to clip in a more saturated manner but can cause some color fringing from strong saturated monochromatic light sources like LEDs in some extreme cases.

File Naming Convention

Clips are always recorded to your USB-C flash disk using Blackmagic RAW. The table below shows an example of the file naming convention:

A001_08151512_C001.braw	Blackmagic RAW Filename
A001_08151512_C001.braw	Camera index
A 001 _08151512_C001.braw	Reel Number
A001_ 08 151512_C001.braw	Month
A001_08 15 1512_C001.braw	Day
A001_0815 15 12_C001.braw	Hour
A001_081515 12 _C001.braw	Minute
A001_08151512_ C001 .braw	Clip Number

When you are recording camera ISO files from an ATEM Mini ISO or ATEM SDI ISO model switcher, the clips' file name will be determined by the 'record stream' palette in ATEM Software Control. This means that the files can be identified and linked when the ATEM project is opened in DaVinci Resolve.

For more information, please refer to the 'ATEM Mini' or 'ATEM SDI' manual which can be downloaded from the Blackmagic Design support center at www.blackmagicdesign.com/support

Monitor Menu

The 'monitor' tab lets you adjust status text, overlays, and other monitoring options for your camera's HDMI and SDI outputs. Options are arranged by output between 'HDMI' and 'SDI' and contain identical settings for each output. For example, you can set 'zebra' on for the HDMI output, but off for the SDI output.

TIP If you have an optional Blackmagic PYXIS Monitor connected to your camera, you can access the monitor menu for your camera's USB-C output via the 'monitor' tab of your PYXIS Monitor's menu. For more information, refer to the 'Blackmagic PYXIS Monitor' section later in this manual.

Monitor

Monitor	
HDMI	
Clean Feed	Off
Display 3D LUT	On
Zebra	Off
Focus Assist	Off
Frame Guides	Off
Grid	Off

Clean Feed

Switch the 'clean feed' setting to 'on' to disable all status text and overlays for an output. When 'clean feed' is enabled, LUTs will still be applied. To disable LUTs, switch the 'display 3D LUT' option to 'off' in the 'monitor' menu.

It is a good idea to switch 'clean feed' on when connected to an ATEM Mini switcher or any external recorders connected via HDMI when using a multicam setup. 'Clean feed' is enabled by default on the SDI output.

Display 3D LUT

Your Micro Studio Camera 4K G2 can apply a 3D LUT to an output to approximate the look of color graded footage. This is especially useful when shooting with 'film' dynamic range as it can produce an intentionally 'flat' low contrast image.

For more information on loading and using 3D LUTs, see the 'LUTs' section of this manual.

Zebra

Use the 'zebra' setting to toggle zebra guides on or off for the HDMI or SDI output. For more information on zebra guides and setting zebra levels, see the 'HDMI monitor options' section in this manual.

Focus Assist

Switch 'focus assist' to 'on' to enable focus assist for the HDMI or SDI output. For more information on focus assist and setting focus assist levels, see the 'HDMI monitor options' section in this manual.

Frame Guides

Enable 'frame guides' to switch frame guides on for the 'HDMI' or 'SDI' output. For more information on frame guides and choosing different guides, see the 'HDMI monitor options' section in this manual.

Grid

Use the 'grid' setting to enable a rule of thirds grid for the HDMI or SDI output. For more information on the rule of thirds grid, see the 'HDMI monitor options' section in this manual.

 Monitor >	
Safe Area Guide	Off
False Color	Off
Status Text	Off
Display	Cinematographer
Zebra Level	95%

Safe Area Guide

Enable the 'safe area' setting to switch on safe area overlays for an output. For more information on the safe area guide, see the 'HDMI monitor options' section in this manual.

False Color

Use the 'false color' setting to enable false color exposure assistance for the HDMI or SDI output. For more information, see the 'HDMI monitor options' section in this manual.

Status Text

This setting can be useful to hide the status text and meters on your camera's SDI or HDMI output, leaving only the information necessary to compose or direct a shot. Overlays such as frame guides, grids, focus assist and zebra remain visible, if enabled.

Display

As well as displaying information such as ISO, white balance, and aperture that is useful to a camera operator or cinematographer setting up individual shots on that camera. Your camera's HDMI or SDI output can also show information useful to a director or script supervisor who is keeping track of multiple shots or cameras.



Setting 'display' to 'director' in the HDMI or SDI monitor settings changes the text overlay to show the following information.

- **FPS**
Displays the currently selected frames per second for the camera. If off speed frame rate is disabled, only the project frame rate is shown. If an off speed frame rate is being used, the sensor frame rate is shown, followed by the project frame rate.
- **CAM**
Displays the camera index as set in your camera's slate. For more information, see the 'slate' section.
- **DURATION DISPLAY**
Displays the duration of the current clip while recording, or the last recorded clip in the following format: hours:minutes:seconds.
- **REEL, SCENE, TAKE**
Displays the current reel, scene and take. For more information on reels, scenes, takes and their labeling conventions, refer to the 'slate' section.
- **DYNAMIC RANGE**
The bottom left hand corner of the monitor displays the currently applied LUT, if applied to that output. If no LUT is applied, 'film' or 'video' dynamic range is displayed.
- **TIMECODE**
The bottom right of the monitor displays your camera's timecode, in the following format: hours:minutes:seconds:frames.

Zebra Level

Use this setting to set the exposure level that zebra appears on an output. There are eight zebra level presets available, from middle gray through to 100 percent exposure.

 Monitor >	
Focus Assist Type	Peaking
Focus Assist Color	Red
Focus Assist Level	50
Frame Guide Type	2.40:1
Safe Area Size	50%
Guides Opacity	50%
Guides Color	White
Grids	Thirds

Focus Assist Type

Your Micro Studio Camera 4K G2 has two focus assist modes, 'peaking' and 'colored lines.'

Peaking

When 'peaking' style focus assist is selected, areas of the shot that are in focus are heavily sharpened in the HDMI or SDI output, but not in the recorded image itself. This causes focused parts of your shot to 'pop' out of the softer background on screen. As no additional overlays are used, this can be a very intuitive way to tell when focus is dialed in, especially when the subject you're focusing on is physically well separated from other elements in shot.

Colored Lines

When 'colored lines' style focus assist is selected, a colored line is superimposed around the parts of the image that are in focus. This can be a little more intrusive than 'peaking' style focus assistance as the lines are drawn over your image, but especially in busy shots with a lot of visible elements, it can be a precise focus tool.

Focus Assist Color

Use this setting to change the color of focus line overlays when using 'colored lines' style focus assistance. Changing the focus line color can make it easier to tell focus assistance lines apart from your image. The available options are 'white,' 'red,' 'green,' 'blue' and 'black.'

Focus Assist Level

To set the level of focus assistance for the HDMI or SDI output, use your camera's arrow buttons to move the slider from left to right.

Frame Guide Type

Open the 'frame guide type' menu setting to see the frame guide options. The options are detailed in the 'HDMI monitor options' section of this manual.

Safe Area Size

To adjust the size of the safe area overlay, use your camera's arrow buttons to adjust the safe area guide percentage. This percentage indicates the size of the safe area in relation to the image frame. Most broadcasters require a 90% safe area.

Guide Opacity

Use the 'guide opacity' menu setting to choose the opacity of the areas blocked out by frame guides on the HDMI or SDI output. The options are 25%, 50%, 75% and 100%.

Guides Color

Use the 'guides color' menu setting to choose a color for the guides.

Grids

To set which combination of grids and crosshair you want to display on an output, select the 'thirds,' 'horizon,' 'crosshair' or 'dot' options in this setting.

For more information, see the 'grids' guide in the 'HDMI monitor options' section.

SDI Output

SDI Output	
SDI Output	1080p
3G-SDI Output	Level B

SDI Output

Your camera's 12G-SDI output supports 2160p, 1080p and 1080i independently of your recording resolution. When set to 2160p or 1080p the video standard will match your camera's project frame rate.

Interlaced HD is available on your SDI output when your project frame rate is set to 50p, 59.94p or 60p and this will be sent as 1080i50, 59.94 or 60 accordingly.

3G-SDI Output

You can change the 3G-SDI output standard to maintain compatibility with equipment that can only receive level A or level B 3G-SDI video. This option will only be available when you are operating in 50, 59.94 or 60 frames per second and outputting 1080p.

Audio Menu

The 'audio' menu lets you adjust the audio input and monitoring settings on your Blackmagic Micro Studio Camera 4K G2.

Audio settings for your camera are divided between channels 1 and 2. You can map each audio channel to a different source, as well as adjusting various settings such as level control.

Audio

	Audio	>
CH 1 Source	3.5mm Left - Mic	
CH 1 Level	0.0 dB	
CH 2 Source	3.5mm Right - Mic	
CH 2 Level	0.0 dB	
Audio Meters	VU (-18dBFS)	

Channel Source

Use the 'CH 1 Source' and 'CH 2 Source' menus to select your source for each audio input. You can choose to record from your camera's internal microphones or from an external microphone connected via the 3.5mm microphone input.

Channel Level

Use your camera's arrow buttons to adjust the recording levels of your chosen 1 and 2 audio sources.

Audio Meters

Audio Meters	
VU (-18dBFS)	✓
VU (-20dBFS)	
PPM (-18dBFS)	
PPM (-20dBFS)	

You can select from VU or PPM meter types. While the VU meter has now become standardized, PPM and loudness meters provide scaling systems and measurements for perceived loudness.

VU	This meter averages out short peaks and troughs in your audio signal. It's mostly used to monitor peaks in a signal, however, because of its averaging capability it can also be used to monitor the perceived loudness of your audio.
PPM	This meter displays a 'peak hold' feature that momentarily holds the signal peaks, and a slow fall back so you can easily see where your audio is peaking.

Storage Menu

The 'storage' menu displays media connected to your Blackmagic Micro Studio Camera 4K G2. You can also use this menu to format a connected USB-C flash disk.

Storage	
Media 1	USB: SanDisk 250GB
Format Media	>

Media 1

Displays the USB-C flash disk that your camera is set to record to. If you have more than one USB-C flash disk connected to your camera, use this menu to select a different disk for recording.

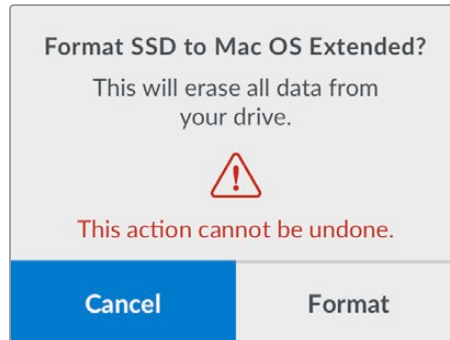
Format Media

USB-C flash disks can be formatted directly by the camera or via a Mac or Windows computer.

Preparing Media on Blackmagic Micro Studio Camera 4K G2:

- 1 Using the arrow and set buttons, select format media and press 'set'.
- 2 Use the arrow buttons to select the drive you want to format and press 'set'. On the next page select 'Mac OS Extended' or 'exFAT' and press 'set'.

- 3 A confirmation screen will ask you to confirm your selection, select 'format' to continue or 'cancel' to return to the previous screen.



- 4 A formatting message and progress bar will be displayed. Once completed, select 'ok'.

You camera will format USB-C flash disks as HFS+, this is also known as Mac OS X Extended and is the recommended format as it supports 'journaling'. Data on journaled media is more likely to be recovered in the rare event that your storage media becomes corrupted. HFS+ is natively supported by Mac. exFAT is supported natively by Mac and Windows without needing any additional software but does not support journaling.

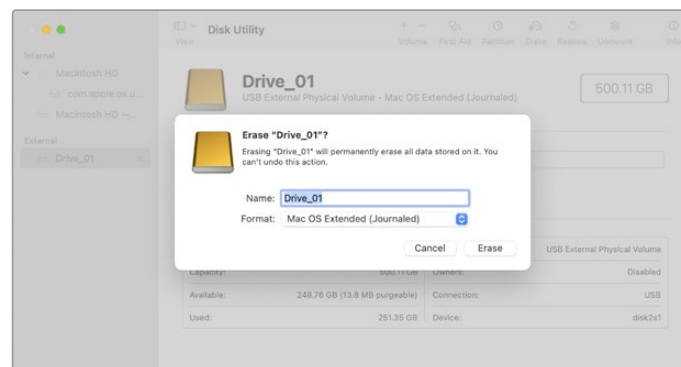
Preparing Media on a Mac

The Disk Utility application included with the Mac operating system can format your USB-C flash disks in the HFS+ and exFAT formats.

Make sure you back up anything important from your media as all data will be lost when it is formatted.

To format your disk:

- 1 Connect the USB-C flash disk to your computer and dismiss any message offering to use your media for Time Machine backups.
- 2 Go to applications/utilities and launch Disk Utility.
- 3 Click on the disk icon for your USB-C flask disk and then click the 'erase' tab.
- 4 Set the 'format' to 'Mac OS extended (journaled)' or 'exFAT'.
- 5 Type a 'name' for the new volume and then click 'erase'. Your USB-C flash disk will quickly be formatted and made ready for use with your camera.

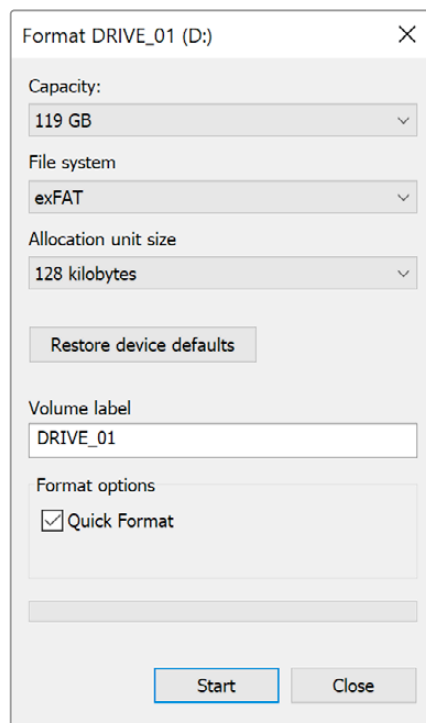


Preparing Media on a Windows PC

Windows PCs provide a 'format' option when you right click on the drive. Make sure you back up anything important from your USB-C flash disk as you will lose everything on it when it is formatted.

To format your disk:

- 1 Connect a USB-C flash disk to your computer.
- 2 Open the start menu or start screen and choose computer. Right-click on your USB-C flash disk.
- 3 From the contextual menu, choose 'format'.
- 4 Set the file system to exFAT and the allocation unit size to 128 kilobytes.
- 5 Type a volume label, select 'quick format' and click 'start'.
- 6 Your media will quickly be formatted and made ready for use with your camera.



Use the 'format' feature in Windows to format
Your camera's storage media

Choosing a fast USB-C flash disk

USB-C flash disks are designed to offer fast, affordable storage for a wide range of devices and are readily available from a variety of consumer electronics outlets. It's important to note that film making is only one part of the USB-C flash disk market, so choosing the best drive is vital to making sure you have enough speed to record Ultra HD footage.

For the most up to date list of recommended USB-C flash disks please go to www.blackmagicdesign.com/support.

Important Notes About USB-C flash disk Speed

Some models of USB-C flash disk can't save video data at the speed the manufacturer claims. This is due to the disk using hidden data compression to attain higher write speeds. This data compression can only save data at the manufacturer's claimed speed when storing data such as blank data or simple files. Video data includes video noise and pixels which are more random so compression will not help, therefore revealing the true speed of the disk.

Some USB-C flash disks can have as much as 50% less write speed than the manufacturer's claimed speed. So even though the disk specifications claim a USB-C flash disk has speeds fast enough to handle video, in reality the disk isn't fast enough for real time video capture.

Use Blackmagic Disk Speed Test to accurately measure whether your USB-C flash disk will be able to handle high data rate video capture and playback. Blackmagic Disk Speed Test uses data to simulate the storage of video so you get results similar to what you'll see when capturing video to a disk. During Blackmagic testing, we have found newer, larger models of USB-C flash disk and larger capacity USB-C flash disks are generally faster.

Blackmagic Disk Speed Test is available from the Mac app store. Windows and Mac versions are also included in Blackmagic Desktop Video, which you can download from the 'capture and playback' section of the Blackmagic Design support center at www.blackmagicdesign.com/support.

Setup Menu

The 'setup' menu contains your Blackmagic Micro Studio Camera 4K G2's identification settings, date and time settings, menu appearance options and other camera settings not directly linked to recording or monitoring.

Setup

The 'setup' section contain the following settings.

Setup	
Name	Studio 6 Micro Camera
Language	English
Software	8.4
Hardware ID	3198FC00
Drop Frame Timecode	Off
Image Stabilization	On
ATEM Camera ID	15
Color Bars	Off

Name

Displays the name of your camera. You can set a custom name using Blackmagic Camera Setup Utility. Refer to the 'Blackmagic Cameras Setup' section for more information.

Language

Blackmagic Micro Studio Camera 4K G2 supports 13 languages, including English, Chinese, Japanese, Korean, Spanish, German, French, Russian, Italian, Portuguese, Turkish, Ukrainian and Polish.

To select the language:

- 1 Once the setup menu is highlighted, press set.
- 2 Press the 'down' button to select language and press set.
- 3 Use the arrow buttons to select your language and press set. Once selected you will automatically return to the setup menu.

Software

Displays the current software version installed on your Blackmagic Micro Studio 4K G2. Refer to the 'Blackmagic Cameras Setup' section for more information on updating software.

Hardware ID

The 'hardware ID' indicator displays an 8 character identifier for your Blackmagic Micro Studio Camera 4K G2. This is unique to each camera. A longer, 32 character version of this ID is also included in the metadata for Blackmagic RAW. This can be useful for identifying which footage came from a particular camera.

Drop Frame Timecode

Use the 'timecode drop frame' option to use drop frame timecode when using NTSC project frame rates of 29.97 and 59.94. Drop frame timecode skips a small number of frames from the timecode at set intervals. This keeps your project timecode accurate despite each second not containing a whole number of frames at NTSC frame rates.

Image Stabilization

Use this option to enable or disable image stabilization on lenses without a physical switch.

When using gyro stabilization in DaVinci Resolve, ensure this setting is disabled. For more information on how to use gyro stabilization, refer to the 'gyro stabilization' section later in this manual.

ATEM Camera ID

If you're using Micro Studio Camera 4K G2 with an SDI ATEM Switcher and want your camera to receive tally signals from the switcher, you'll need to set the camera number on your camera. This ensures the switcher sends the tally signal to the correct camera. The camera number can be set to a value of 1-99 by using your camera's arrow buttons. The default setting is 1.

When connected to an ATEM switcher via HDMI, you don't need to worry about setting the camera ID as the switcher can detect the input each camera is connected to and assign tally data accordingly.

Color Bars

Outputting color bars rather than a preview image can be useful when connecting your Micro Studio Camera 4K G2 to a switcher or external monitor. The appearance of your camera's color bars on your switcher or monitor confirms the connection, and you can perform basic monitor calibration based on the colors of the bars. To turn on color bars for both the HDMI and SDI outputs, simply set the color bar setting to 'on'.

Date and Time

Date and Time	
Auto Set Date and Time	Off
NTP	time.cloudflare.com
Date	29/10/2023
Time	07:06
Time Zone	GMT +10:00

Auto Set Date and Time

Your Micro Studio Camera 4K G2's date and time are used for time of day timecode if an external timecode source is not connected. Your camera's date and time settings can be set automatically or manually.

To set your camera's time and date automatically toggle the 'auto set date and time' setting to 'on'. Your camera will automatically update the date and time when connected to a network via Ethernet, or the next time you update your camera. The camera's default network time protocol server is time.cloudflare.com You can also manually enter an alternate NTP server using Blackmagic Camera Setup, refer to the 'Using Blackmagic Camera Setup' section later in this manual for more information.

To manually set the date and time, toggle the 'auto set date and time' setting to 'off' and use the 'date', 'time' and 'time zone' menu options to make adjustments. The date format is day, month, year and the time format is 24 hour.

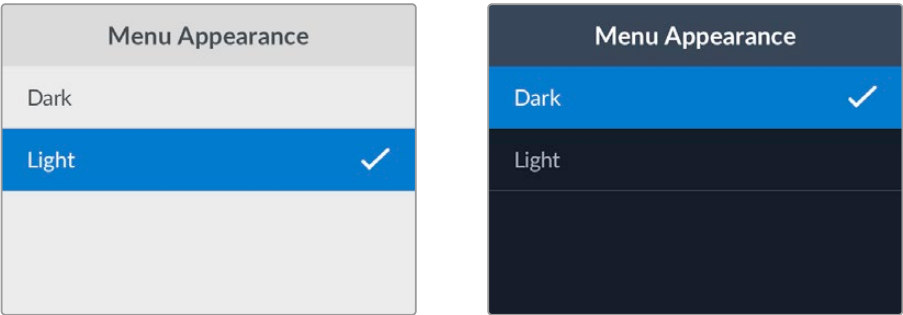
Menu

Use the menu settings to adjust the location and appearance of the menu on the connected HDMI display.

Menu	
Appearance	Light
Opacity	100%
Position	Bottom Left

Appearance

Set your camera's onscreen menu to dark or light mode. Light mode will offer more contrast when shooting in low light conditions.



Opacity

Adjust the levels to reduce the opacity of the menu overlay on the connected display from the default 100% to 20%.

Position

The menu overlay will default to the bottom left hand corner of the screen. To move the menu to a different location, select 'position' and press the 'set' button. Now you can select the top left, top right, bottom left or bottom right corner of the screen.

Shutter

Shutter	
Measurement	Shutter Angle
Flicker Free Based On	50Hz

Measurement

Use this setting to select whether to display shutter information as 'shutter angle' or 'shutter speed'.

It's worth mentioning that when using shutter angle, the shutter conforms to the frame rate.

For example, 180 degrees produces the same motion blur, no matter which frame rate you use. When using shutter speed, however, the shutter is given an absolute value determined independently of the frame rate, so the results differ if you change the frame rate.

Flicker Free Based On

Use this setting to change the mains power frequency your camera uses to calculate flicker free shutter settings.

When shooting under lights, your shutter can affect the visibility of flicker. Your Blackmagic Micro Studio Camera 4K G2 automatically calculates a flicker free shutter value for your current frame rate and suggests up to three shutter values. Shutter values are affected by the frequency of the local mains power supply used to drive those lights. In most PAL countries, this frequency is 50Hz, while NTSC countries typically use 60Hz power. Choose '50Hz' or '60Hz' to set the right frequency for your region.

Characteristics of various light sources may still cause flicker even when using flicker free shutter values. We recommend performing a test shoot when not using continuous lights.

Genlock

Genlock	
Reference Source	Internal
Reference Timing Lines	7
Reference Timing Pixels	10

Reference Source

Your Blackmagic Micro Studio Camera 4K G2 can use its own internal clock as a reference source, or lock to an external program source, such as an output from an ATEM switcher.

Reference Timing

These settings allow you to manually adjust the reference timing on a line or pixel basis.

Zoom Demand

These settings are used to configure the optional Blackmagic Zoom Demand. These settings are only active when you have Blackmagic Zoom Demand attached to your camera.

For information on attaching and using Blackmagic Zoom Demand, refer to the 'Blackmagic Zoom and Focus Demand' section.

Zoom Demand	
Rocker Direction	Normal
Dial	Zoom Speed
Function 1	Record
Function 2	Quick Zoom
Function 3	Auto White Balance
Function 4	Frame Guides

Zoom Rocker Direction

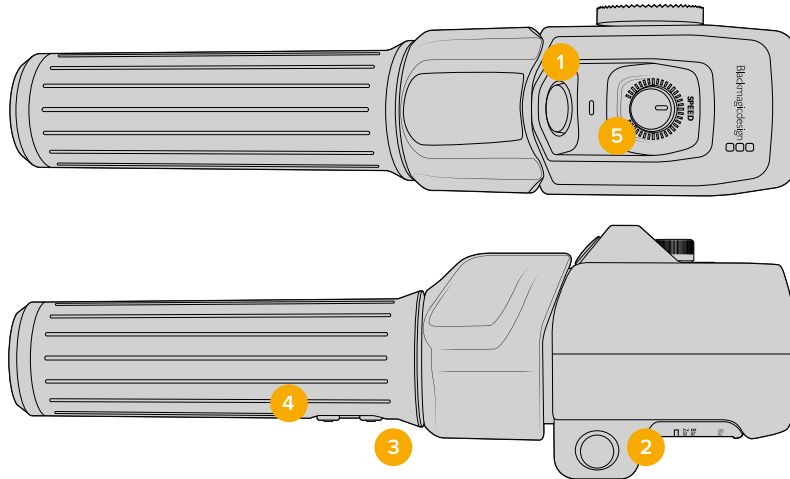
- **Normal**

The default zoom rocker direction. Push the zoom rocker to the right to zoom in and to the left to zoom out.

- **Reverse**

When the zoom rocker direction is set to 'reverse' push the zoom rocker to the left to zoom in and to the right to zoom out.

Blackmagic Zoom Demand has four zoom function buttons and a speed dial that you can map to different functions.



1 Zoom F1 2 Zoom F2 3 Zoom F3 4 Zoom F4 5 Speed Dial

To assign a different function to the speed dial or one of the zoom buttons choose 'dial' or a button number from the Zoom Demand menu and press 'set'. Next, choose a function using your camera's arrow buttons and press 'set'.

Your camera's dial and function button parameter options include:

Speed Dial			
Zoom Speed	Iris Adjustment	Focus Adjustment	

Zoom Buttons 1 - 4			
Record	Quick Zoom	Auto Focus	Frame Guides
Status Text	Color Bars	Call	Auto Iris
Auto White Balance	OIS	Still	Zoom Point A
Zoom Point B	Zoom Point C	Zoom Point D	Focus Point A
Focus Point B	Focus Point C	Focus Point D	Zoom and Focus Point A
Zoom and Focus Point B	Zoom and Focus Point C	Zoom and Focus Point D	

Focus Demand

These settings are used to configure the optional Blackmagic Focus Demand. These settings are only active when you have Blackmagic Focus Demand attached to your camera.

For information on attaching and using Blackmagic Zoom Demand, refer to the 'Blackmagic Zoom and Focus Demand' section.

Focus Demand	
Demand Direction	Normal

Demand Direction

You can change the direction of the focus wheel on focus demand by selection either 'normal' or 'reverse'.

- **Normal**

Turn the focus wheel clockwise to focus on subjects closer to the lens and counterclockwise for subjects further away.

- **Reverse**

Turn the focus wheel counterclockwise to focus on subjects closer to the lens and clockwise for subjects further away.

Tally Light

Tally Light	
Tally Light LED	On
LED Brightness	Low

Tally Light LED

In some shooting environments, for example a dimly lit location or an intimate theater performance, you may want to disable the tally light on your camera. To disable the tally light, simply set ‘tally light LED’ to ‘off’.

LED Brightness

To set the brightness of the tally light LED, select ‘low,’ ‘medium,’ or ‘high’ from the menu and press ‘set’.

Network

These settings allow you to configure options such as choosing between connecting to a network using DHCP or a static IP address. You can connect your camera to a network using a USB-C to Ethernet adapter.

Network	
Protocol	Static IP
IP Address	192.168.24.100
Subnet Mask	255.255.255.0
Gateway	192.168.24.1

Protocol

Blackmagic Micro Studio Camera 4K G2 is shipped set to DHCP, so once connected, your network server will automatically assign an IP address and no other network settings will need to be adjusted. If you need to set a manual address, you can connect via a static IP.

With ‘protocol’ selected press the ‘set’ button to access the menu, select ‘Static IP’ and press ‘set’.

IP Address, Subnet Mask and Gateway

Once Static IP is selected, you can enter your network details manually.

To change the IP address:

- 1 Use the arrow buttons to highlight ‘IP address’ and press the ‘set’ button.
- 2 Using the arrow buttons, adjust the IP address, press ‘update’ to confirm before adjusting the next set of values.

When you have finished entering your IP address, you can repeat these steps to adjust the Subnet Mask and Gateway. Once finished, press the ‘menu’ button to exit and return to the home screen.

Calibration

Calibration	
Pixel Recalibration	>
Motion Sensor Calibration	>

Pixel Recalibration

The CMOS sensor used in your Blackmagic Micro Studio Camera 4K G2 is made up of millions of pixels that respond to light. As a result, they become more visible and become what is known commonly as hot pixels. All camera sensors, regardless of manufacturer, will develop this variation in pixel brightness over time.

To solve this, your camera has a built in recalibration feature that you can run if you see any pixels that are brighter than others.

To perform the pixel recalibration process:

- 1 Attach the lens cap.
- 2 Select 'pixel recalibration' and press 'set'.
- 3 Select 'recalibrate' and press 'set' to confirm your choice.

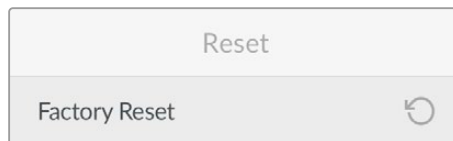
The process takes approximately one minute to complete. When complete, select 'ok'.

Motion Sensor Calibration

To calibrate the horizon meter, place your camera on a surface you know is level, select 'motion sensor calibration' and press 'set', on the next screen confirm your choice by selecting 'calibrate'. It is essential that you keep the camera stable during calibration, this is to ensure that the recorded motion sensor metadata in the Blackmagic RAW files during filming is accurate. The process takes approximately five seconds to complete.

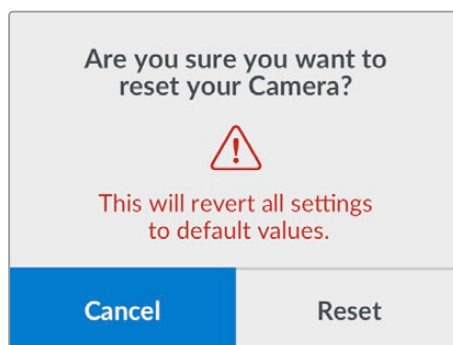
The motion sensor data can be used in DaVinci Resolve to stabilize clips. Refer to the 'gyro stabilization' section for more information.

Reset



Factory Reset

To reset the camera to its default factory settings, select 'factory reset'. On the confirmation page, select 'reset' to confirm this action.

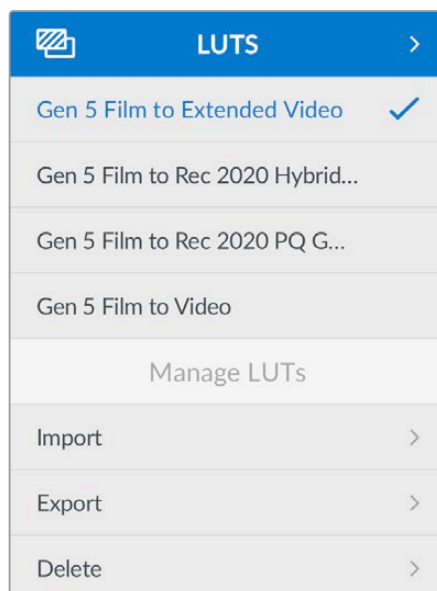


Select 'reset' to restore factory settings

Your camera erases any stored LUTs and presets, and resets all settings. It is a good practice to export your presets to a USB flash drive as a backup before performing a factory reset. After a factory reset, you can restore your presets quickly by importing them from the flash drive. It is important to note that a factory reset also resets the horizon meter, so you should recalibrate the motion sensor after a factory reset to help ensure its accuracy.

3D LUTs

The 'LUTS' menu lets you choose a built-in LUT as well as import and export 3D LUTs to your Blackmagic Micro Studio Camera 4K G2.



Introducing 3D LUTs

3D LUTs can be applied to your camera's outputs and Blackmagic RAW files. LUTs work by telling your camera what color and luminance output to show for a particular color and luminance input. For example, a LUT may tell your camera to display a vibrant, saturated blue when it receives a relatively dull blue input. This can be useful when shooting Blackmagic RAW footage, or using 'film' dynamic range, both of which have an intentionally undersaturated, 'flat' appearance. By applying a LUT, you can get an idea of what your footage will look like after it has been graded.

It is easy to create 3D LUTs using DaVinci Resolve or other color correction software, and LUTs are available online from a variety of sources. Up to thirty 17 point or 33 point 3D LUTs up to 1.5 megabytes each can be stored on the camera. Once loaded, you can choose to display a given LUT on your camera's HDMI output.

Your Blackmagic Micro Studio Camera 4K G2 supports 33 point 3D LUTs in .cube format created in DaVinci Resolve and 17 point 3D LUTs converted to Resolve .cube format via LUT conversion programs. Your camera processes 3D LUTs using high quality tetrahedral interpolation.

Built-in LUTs

A number of built in LUTs are provided that allow you to preview different looks when shooting in 'film' dynamic range or Blackmagic RAW.

Your camera provides LUTs that are specific to Gen 5 color science:

Gen 5 Film to Extended Video

Displays a wider dynamic range than the 'film to video' LUT, and applies a mild contrast change with a smooth roll off in the highlights.

Gen 5 Film to Rec 2020 Hybrid Log Gamma

Displays a gamma curve that is suitable for HDR screens and compatible with standard dynamic range screens.

Gen 5 Film to Rec 2020 PQ Gamma

Displays a gamma curve that is based on what we can perceive with our eyes, for efficient encoding of HDR images.

Gen 5 Film to Video

Similar to the REC 709 color standard for high definition video, and has a high level of contrast and saturation. You may find this setting useful when using Blackmagic Micro Studio Camera 4K G2 alongside other broadcast cameras using the REC 709 color space.

Applying a LUT

To apply a LUT, use the arrow buttons to select the LUT you want to use and press 'set'.

To display the loaded LUT on your camera's HDMI or SDI output, switch on 'display 3D LUT' in the monitor menu. See the 'monitor menu' section for more information. To read more about applying LUTs to Blackmagic RAW files, refer to the 'record settings' section.

Manage LUTs

Use the 'manage LUT' menu to import, export or delete LUTs.

Manage LUTs	
Import	>
Export	>
Delete	>

Importing LUTs

To import a 3D LUT, select 'import' and press 'set'. On the next screen select the USB-C drive where your LUT is stored.

Your camera searches the root directory and '3DLUTs' folder on your selected media, and lists available LUTs. Any LUTs you have saved elsewhere are not visible.

Use your camera's arrow buttons to select a LUT to import and press 'set'. It's worth noting that if you want to import a new LUT but all 17 3D LUT slots are full, you need to delete an existing LUT to make space.

If the LUT you want to import has the same name as a LUT already saved to your camera, you can choose to overwrite the existing LUT or keep both.

NOTE If you have trouble importing a LUT, it may be the wrong size. You can use a LUT editor like Lattice to check its size, or open it in any text editor on your computer. Next to the tag 'LUT_3D_SIZE' is a number indicating the LUT's size. If this value is not 17 or 33, you can use Lattice to resize your 3D LUT to 17 points.

Exporting LUTs

To export a LUT to a USB-C flash disk, select 'export', choose the LUT you want to export and press 'set'. On the next screen confirm the export location for the LUT.

If a LUT with the same name is already present, choose whether to overwrite the LUT or keep both. The camera exports the LUT to a '3DLUTs' folder.

Deleting LUTs

To delete LUTs you are no longer using or make room for more, select 'delete' from the menu. On the next screen select the LUT you want to delete and press 'set'. When prompted to confirm your choice, select 'delete' and press 'set'.

Embedded 3D LUTs

When a 3D LUT is used while shooting Blackmagic RAW on Blackmagic Micro Studio Camera 4K G2, the selected LUT will be embedded into the Blackmagic RAW file that you are recording. The 3D LUT is actually saved with your recorded files in the header of the .braw file, and can easily be applied to footage in post production without needing to handle a separate file.

So when Blackmagic RAW files are delivered to an editor or colorist, they will be able to easily access the LUT that was used while filming, which greatly reduces the possibility that the wrong 3D LUT could be applied to a clip. They can then choose whether to apply the 3D LUT when editing or color grading the footage, and can disable the 3D LUT at any time.

When the 'apply LUT in file' switch is set to 'on' in the record menu, the recorded clip will open in Blackmagic RAW Player and DaVinci Resolve with the chosen 3D LUT already applied to it.

The 3D LUT can then be easily toggled 'on' or 'off' but will always travel with the Blackmagic RAW file as it is written into the clip itself. DaVinci Resolve also has an 'Apply LUT' switch in the RAW settings palette for enabling or disabling the 3D LUT in the Blackmagic RAW file.

The 'Apply LUT' setting in DaVinci Resolve is the same setting as in the camera. This means that when shooting you can direct the colorist to use the LUT by setting it in the camera, but they can switch it off easily in DaVinci Resolve by setting 'Apply LUT' to 'off'.

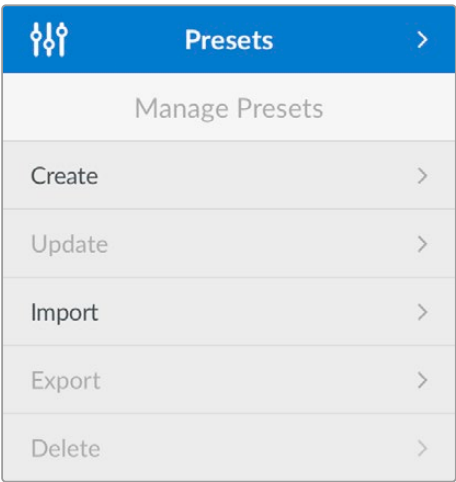
Presets

The 'presets' menu lets you save and recall a complete collection of settings for your Blackmagic Micro Studio Camera 4K G2. This is very useful when one camera is used for multiple projects. For example, you may use your camera for a variety of different shoots with very different settings between types of projects. Your camera's 'presets' function lets you save the setup for a particular project or type of shoot and come back to it quickly and easily when required.

You can also import and export presets. Simply set up one Blackmagic Micro Studio Camera 4K G2 to suit your project, then export that preset for all the other cameras on your production.

Managing Presets

This menu lets you create, import, export and delete presets on your camera.



Creating and Loading Presets

To save a new preset using your camera's current settings, select 'create' from the manage presets menu and press 'set'. The new preset will appear above the 'manage presets' menu, presets are named in the order they are created starting from 'preset 1'.

To load a saved preset, simply select it from the 'manage presets' menu and press the 'set' button. A tick will appear next to the loaded preset.

You can update a preset by selecting 'update' and choosing the preset you want to update with your camera's current settings. Select 'update' to confirm your choice.

Importing Presets

To import a preset from a USB-C flash disk, select 'import' from the 'presets' menu. On the next screen, select the USB-C flash disk that contains the preset you want to import and press the 'set' button.

Your camera searches the root directory and 'presets' folder on your selected media, and lists all the available presets. Any presets you have saved elsewhere are not visible.

Use your camera's arrow buttons to select a preset, then press 'set' to confirm your selection and copy it to the next available slot on the camera.

NOTE If all your camera's preset slots are full, the import menu will not be available. You will need to delete an existing preset to make room.

If the preset you want to import has the same name as a preset already saved to your camera, you can choose to replace the existing preset or keep both.

Exporting Presets

To export a preset to a USB-C flash disk, select 'export' from the presets menu. On the next screen, select the preset that you want to export and press 'set'. Confirm the USB-C drive you want to export the preset to and press 'set', if the preset you're exporting has the same name as a preset already stored on the USB-C drive, you can choose to replace the existing preset or keep both.

Deleting Presets

To delete a preset, select the 'delete' option from the presets menu. On the next screen select the preset you want to delete and press the 'set' button. When prompted to confirm your selection, select 'delete' and press 'set'.

Entering Metadata

Metadata is information saved inside your clip, such as take numbers, camera settings and other identifying details. This is extremely useful when sorting and processing footage in post production. For example, take, shot and scene numbers are essential organizational tools, while lens information can be used to automatically remove distortion or better match VFX assets to plates.

Your Blackmagic Micro Studio Camera 4K G2 automatically saves some metadata to each clip, such as camera settings, timecode, date and time. You can use your camera's slate to add many additional details.

Slate

Press the 'menu' button and use the arrow keys to navigate to the 'slate' menu.

The 'slate' menu is divided into 'clips', 'project' and 'lens data' sections. The 'clip' section contains information that may vary clip by clip, while 'project' contains camera ID information that stays common between clips. The 'lens data' section contains lens type and iris information for the lens fitted to your camera.

TIP Metadata entered into the slate is viewable on your camera's HDMI output when 'display' is set to 'director' in the 'monitor' menu. See the 'monitor menu' section of this manual for more information.

Clip

In standby mode, when your camera is ready to record, clip metadata will be saved to the next recorded clip. You can use the 'good take last clip' button to apply a 'good take' tag to the most recently recorded clip.

Slate >	
Clip	
Slate For	Next Clip
Reel	1
Scene	10
Scene Type	BCU
Take	2
Auto Take	On
Take Type	VFX
Good Take Last Clip	Off
Scene Location	Internal
Scene Time	Day

Slate for

This setting shows the clip which the metadata currently displayed in the 'clip' applies to. In standby mode, this refers to the next clip that will be recorded.

Reel

Displays the current reel.

To adjust the reel number, press 'set' and use your camera's arrow buttons to select a new number. Press 'set' to confirm your choice.

Scene

The 'scene' indicator displays the current scene number. To adjust the scene number, press 'set' and use your camera's arrow buttons to select a new number. Press 'set' to confirm your choice.

Scene numbers range from 1 to 999.

Scene Type

The 'scene type' option lets you add information about the shot type.

There are six available options:

WS	wide shot
MS	medium shot
MCU	medium close up
CU	close up
BCU	big close up
ECU	extreme close up

Take

The 'take' indicator shows the take number for the current shot. To adjust the take number, select 'take' and press 'set', then use the up or down arrows to change the take number. Press 'set' to confirm your selection.

TIP When the 'scene' number changes the 'take' number reverts to '1'.

Auto Take

When 'auto take' is set to 'on' the take number will automatically advance.

Take Type

You can use the 'take type' menu to add a description to the take. The take types available are:

P/U	'Pick up.' This refers to a reshoot of a previous take to add additional material after principal photography has wrapped.
VFX	'Visual effects.' This refers to a take or shot for visual effect use.
SER	'Series.' This refers to a situation in which multiple takes are shot while the camera is kept running.

Good Take Last Clip

To apply a ‘good take’ tag to the last recorded clip, select ‘good take last clip’ and press your camera’s ‘set’ button.

Adding a ‘good take’ tag to a clip makes it easy to identify good takes in DaVinci Resolve.

Scene Location

Use the ‘scene location’ menu to add an ‘interior’ or ‘exterior’ tag to the next clip.

Scene Time

Use the ‘scene time’ menu to add a ‘day’ or ‘night’ tag to the next clip.

Project

‘Project’ metadata always refers to your project as a whole and is independent of clip numbers.

Project	
Camera	A

Camera

Displays a single letter camera index. You can change the camera index to a letter from A-Z or a number from 1-9.

Lens Data

These settings display information about the current lens fitted to your camera. Many electronic lenses automatically supply information such as the lens model, aperture and focal length.

Lens Data	
Lens Type	OLYMPUS M.12-40mm
Iris	f2.9
Reset Lens Data	

Lens Type

If you are using a lens with in built electronics that communicate with your camera, you can see the lens model information here.

Iris

Shows the iris aperture setting at the start of your clip.
This information is displayed in f-stops if supplied automatically.

Reset Lens Data

You can use this option to clear lens data in the ‘lens data’ menu. All lens data will be cleared and repopulated with any lens data automatically provided by the currently fitted lens.

Gyro Stabilization

Your Blackmagic Micro Studio Camera 4K G2 automatically records pan, tilt and roll data captured by an internal motion sensor. This data is also known as gyro data, which DaVinci Resolve can then use to stabilize shots.

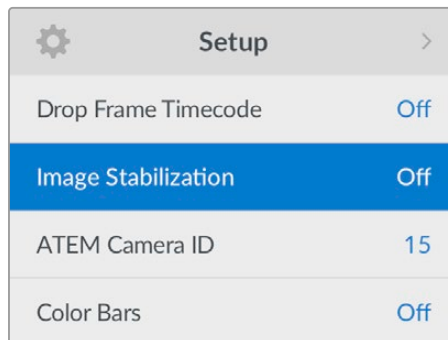
It's important to calibrate your camera's motion sensor prior to recording to ensure that the recorded gyro data is accurate. You can find more information in the 'setup menu' section under 'motion sensor calibration'.

Enabling Gyro Stabilization

To enable gyro stabilization you will need to make sure your lens's optical image stabilization is turned off. If the lens you are using does not have a physical switch to turn optical stabilization off, you can disable lens stabilization in your camera's 'setup' settings.

To disable lens stabilization:

- 1 In your camera's 'setup' menu, navigate to 'image stabilization'.
- 2 Press 'set' to switch image stabilization to 'off'.



- 3 Press 'menu' to return to the home screen.

NOTE For gyro stabilization to work at its best, it requires accurate lens focal length information which is included in the metadata that is automatically recorded when using most micro four thirds lenses.

Applying Gyro Stabilization in DaVinci Resolve

After importing your clips and setting them up on a timeline:

- 1 Go to the 'edit' page's inspector window and scroll down to 'stabilization'.
- 2 Set the stabilization mode to 'camera gyro'.
- 3 Click 'stabilize'.

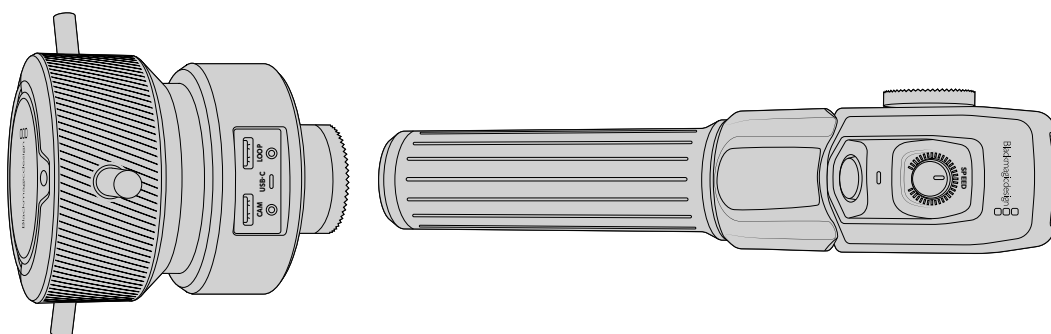
A progress bar will let you know when the stabilization is complete.



In the inspector window select 'camera gyro' to stabilize the clip using gyro data

TIP You can enhance the results by shooting with narrow shutter angles to minimize motion blur. For example, 45 degrees.

Blackmagic Zoom and Focus Demands



Blackmagic Zoom Demand and Blackmagic Focus Demand are optional accessories for controlling focus and zoom when using compatible lenses with Blackmagic Micro Studio Camera 4K G2. You can read more about compatible lenses later in this section.

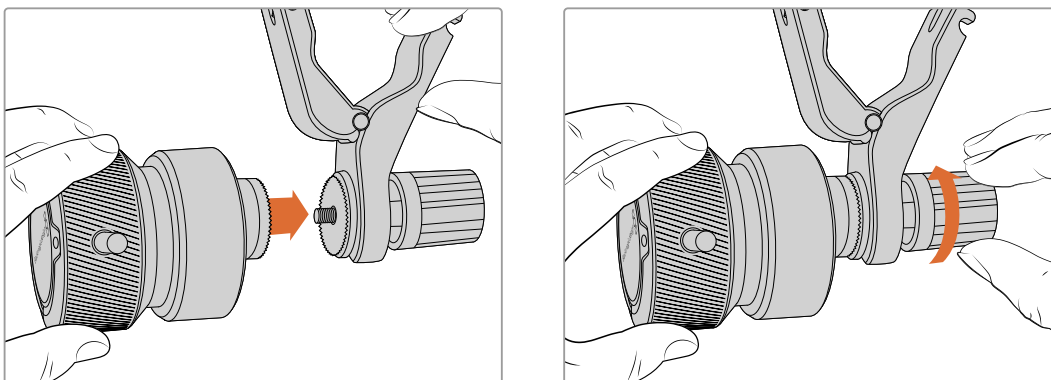
Each unit attaches to a tripod handle on your tripod or camera pedestal. This lets you control focus and zoom while simultaneously panning and tilting the camera using both hands. Additional buttons and controls let you refine the speed and sensitivity of the zoom control and more.

Connecting and Attaching to your Camera

Attaching to Tripod Handles

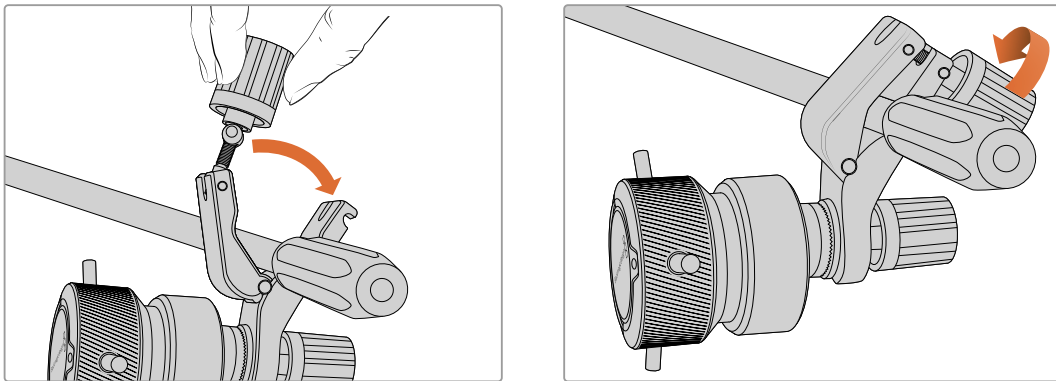
Each unit attaches to a tripod handle via their mounting brackets. Attach each unit to the brackets via their rosette mounts.

To attach the demand units to their brackets, simply connect them together via their rosette mounts and secure them by tightening the fastening knob.



- 1 Place the zoom demand or focus demand against their bracket's rosette mount.
- 2 Tighten their fastening knob so the demand units are firmly attached to their brackets.

Now that the units are attached to the brackets, you can attach the brackets to the tripod arms. One end of each bracket contains a 'T' shaped latch that hinges into a slot and is then tightened.



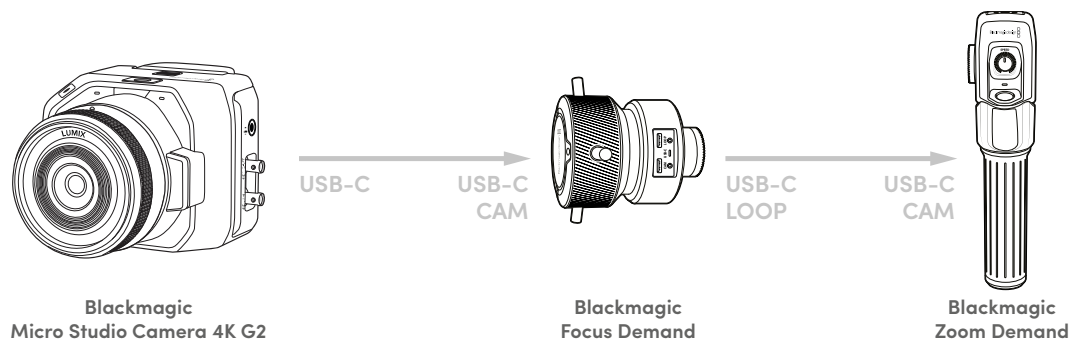
- 1 Loosen the latch by unscrewing the latch knob in a counterclockwise motion. This will release the 'T' shaped latch.
- 2 With the latch open, place the bracket onto the tripod arm and clamp the bracket shut by closing the latch into its fastening slot. Rotate the bracket to your preferred position on the tripod arm.
- 3 Tighten the latch knob to secure the bracket to the tripod arm.

Connecting to Your Camera

Blackmagic Focus and Zoom Demands have two USB-C ports. This lets you use one unit individually, or both units together.

Each unit is supplied with a 1 meter long USB-C cable which is connected directly from either of your camera's USB-C expansion ports to the demand unit's 'cam' port.

If you are using both demand units, daisy chain them together by connecting the first unit to the second unit via USB-C.

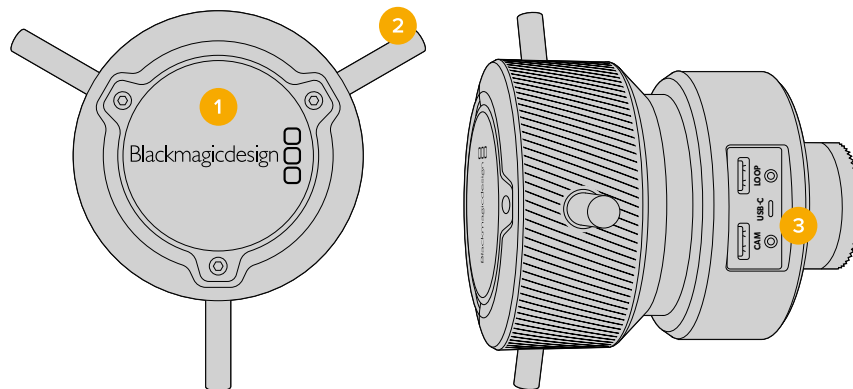


Daisy chaining allows for both units to be controlled using your camera's USB-C port. For example, connect a USB-C cable into your camera's expansion port and connect the other end of the cable into the focus demands 'cam' port. With a second cable, plug the focus demand's 'loop' port into the zoom demand's 'cam' port.

The USB-C cable has locking screws on each end to secure the connectors to each unit, preventing accidental disconnection. You don't have to use the locking screws, but they are helpful for studio setups where the units are always connected to your camera.

Using Blackmagic Focus Demand

This section describes the features and connectors on Blackmagic Focus Demand.



1 Control Knob

Rotate the focus wheel clockwise to focus on subjects closer to the lens, or counterclockwise to focus on subjects further away. You can change the focus direction in the menu by setting it either 'forward' or 'reverse'.

TIP If you are also using a Blackmagic Zoom Demand, press the quick zoom button to magnify the image as you focus using the focus demand.

2 Control Pins

These three pins expand the diameter of the control surface to let you make finer focus adjustments with the tip of a finger.

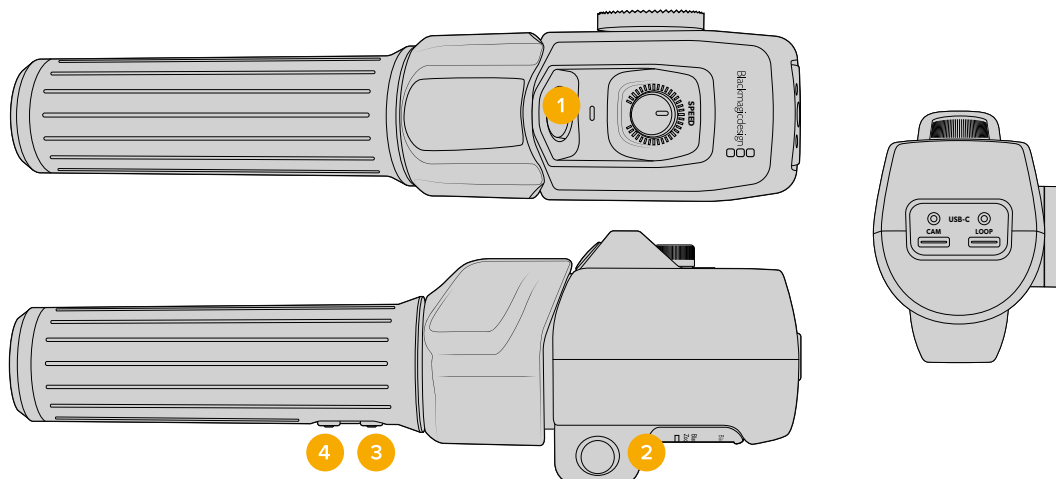
3 USB ports

Allows for connecting the focus demand to the camera and daisy chaining to the zoom demand. The 'cam' port is also used for updating the internal software via the Blackmagic Camera Setup utility.

Using Blackmagic Zoom Demand

The controls on the Zoom Demand are mappable through the Camera settings. To change the button functions, refer to the 'setup menu' section for more information.

The following commands are set as default:



1 Zoom F1

This is the zoom function button 1. By default, it is mapped as a 'record' button for recording to an external drive connected to your Blackmagic Micro Studio Camera 4K G2.

2 Zoom F2

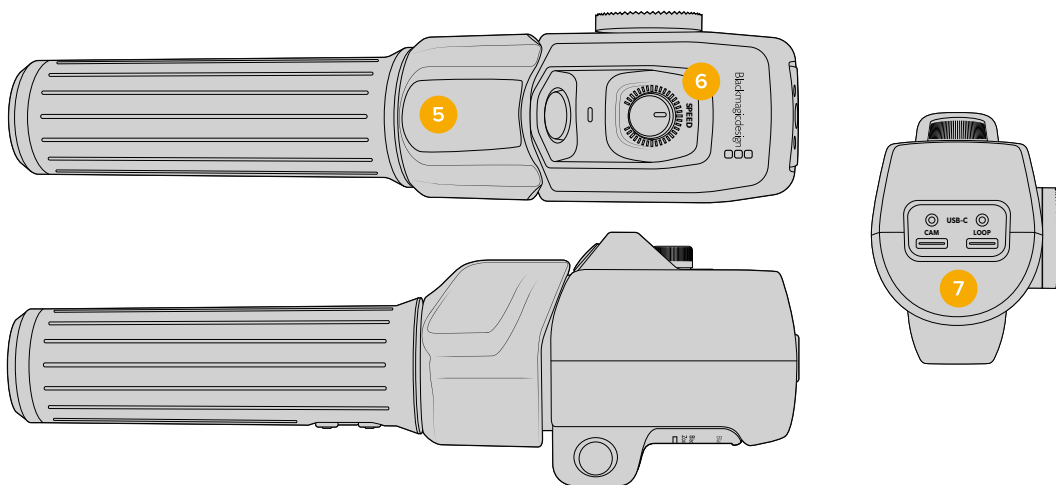
This is the zoom function button 2. On the other side of the controller is an identical button that performs the same function, allowing for left and right handed control. By default, it is set as a quick zoom function which instantaneously punches into the live image.

3 Zoom F3

This is the zoom function button 3. By default, this button is set to 'auto white balance'.

4 Zoom F4

This is the zoom function button 4. By default, this button is set to 'frame guides' and can be used to quickly toggle frame guides on or off.



5 Thumb Rocker

The zoom demand handle provides a thumb rocker control. Push the thumb rocker left to zoom out, and right to zoom in. The direction of the zoom can be reversed using the camera's menu settings.

6 Speed Dial

Finely adjust the speed of the zoom by adjusting the speed dial at the top of the unit. You can map this dial to also control the headphone level, iris adjustment and even focus adjustment!

7 USB-C Ports

Allows for connecting the zoom demand to the camera and daisy chaining to the focus demand. The 'cam' port is also used for updating the internal software via the Blackmagic Camera Setup utility.

Compatible Micro Four Thirds Lenses

While more than 50 micro four thirds lenses will work with Blackmagic Focus Demand, the following lenses will work with both focus and zoom demands on Blackmagic Micro Studio Camera 4K G2.

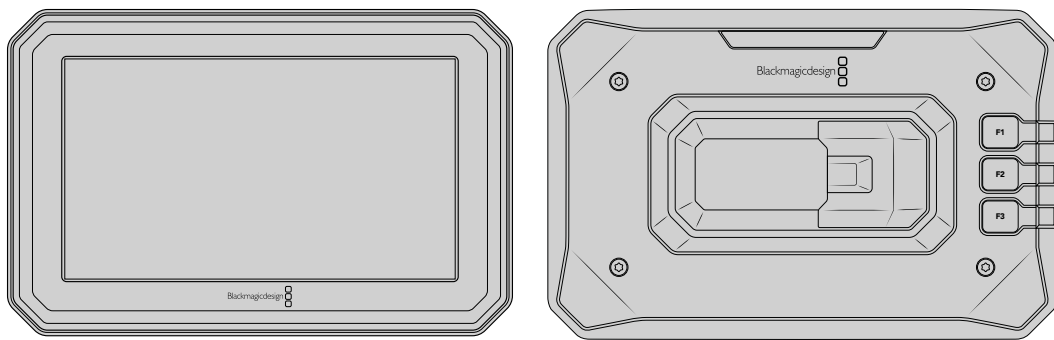
Power Zoom Lenses

- Olympus 12-50mm f/3.5-6.3 ED M.Zuiko EZ Micro 4/3 lens.
- Panasonic Lumix G X Vario PZ 45-175mm f/4.0-5.6 Zoom OIS lens.

Pancake Power Zoom Lenses

- Olympus 14-42mm M.Zuiko f/3.5-5.6 Digital ED EZ lens.
- Panasonic Lumix G X Vario PZ 14-42mm f/3.5-5.6 Power OIS lens.

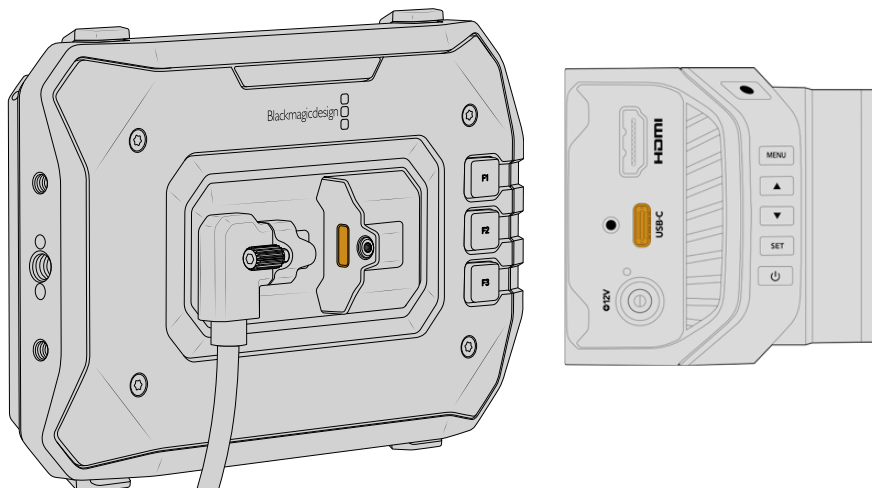
Blackmagic PYXIS Monitor



Blackmagic PYXIS Monitor is an optional 5" HDR touchscreen monitor for your Blackmagic Micro Studio Camera 4K G2. PYXIS Monitor features a 1500 nits screen for use in bright daylight conditions and lets you monitor your camera's image, plus control all your camera's features and change menu settings.

Three programmable function buttons can be mapped to frequently used features and a large tally indicator displays your camera's recording status. Blackmagic PYXIS Monitor is connected and powered via your camera's USB-C port.

Connecting PYXIS Monitor to your Camera



To connect PYXIS Monitor to your Micro Studio Camera 4K G2, connect one end of the supplied USB-C cable to the USB-C port on the back of your PYXIS Monitor and the other end to the USB-C port on your camera's side panel. Your PYXIS Monitor will turn on automatically when your camera is powered.

PYXIS Monitor Touchscreen Controls

Blackmagic PYXIS Monitor features a touch and gesture based interface that will be instantly familiar if you've used other Blackmagic cameras. By touching and swiping on different areas of the LCD touchscreen, you can quickly access the camera's functions while shooting. To open your camera's HUD, simply tap the 'monitor' icon in the top left corner of your PYXIS Monitor's LCD display. You can then access all the same settings that are available via your camera's HUD on the HDMI output.



PYXIS Monitor's LCD touchscreen gives you easy access to your camera's most used settings

Touch to Focus

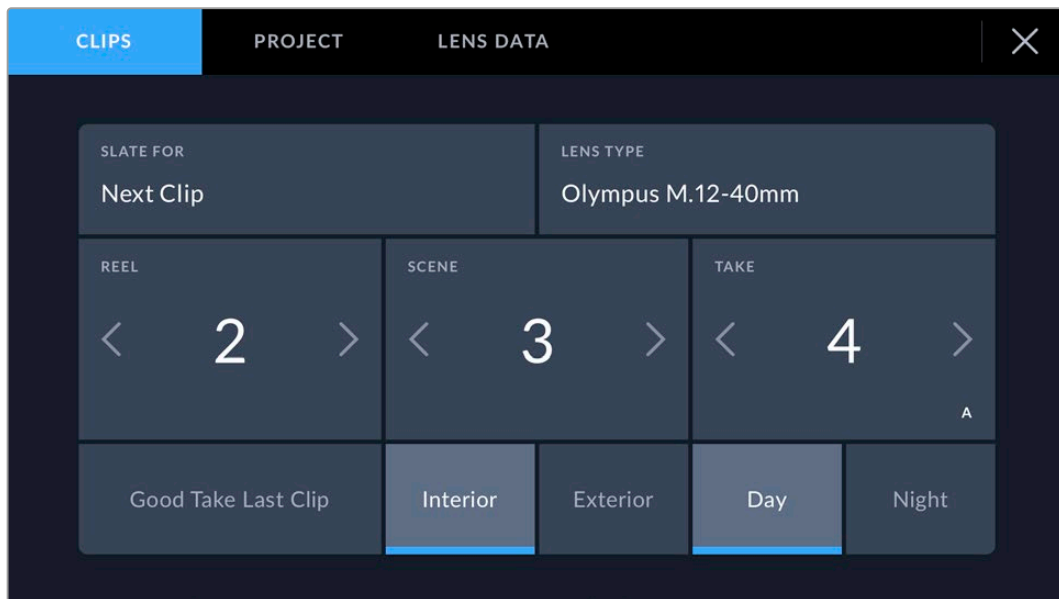
To focus a compatible lens in any region of the image, tap and hold the LCD touchscreen in the area that you want to focus.

Full Screen Mode

Switching to full screen mode can be useful when framing or focusing a shot to temporarily hide your PYXIS Monitor's touchscreen status text and meters. To hide them all at once, swipe up or down on the LCD touchscreen. Frame guides, focus assist and zebra remain visible. To show the status text and meters again, swipe up or down again.

Slate

Swipe left or right on your PYXIS Monitor's touchscreen to open the slate. For more information on the slate, refer to the 'entering metadata section'.



Settings Menu

You can access your camera's settings menu via Blackmagic PYXIS Monitor. To open the settings menu, press the 'menu' button in the top right corner of your PYXIS Monitor's LCD display.

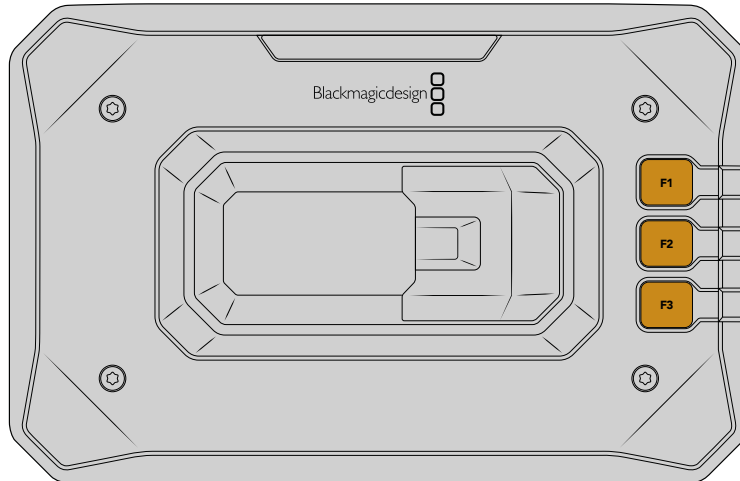


Your camera's settings are divided by function into 'record', 'monitor', 'audio', 'setup', 'presets,' and 'LUTS' tabs. Each tab has multiple pages, which you can cycle through by tapping the arrows at the edge of your camera's touchscreen, or swiping left or right. All the settings in your camera's menu are also available on your PYXIS Monitor, for more information refer to the 'settings' section. However, you'll also notice some additional features that are only

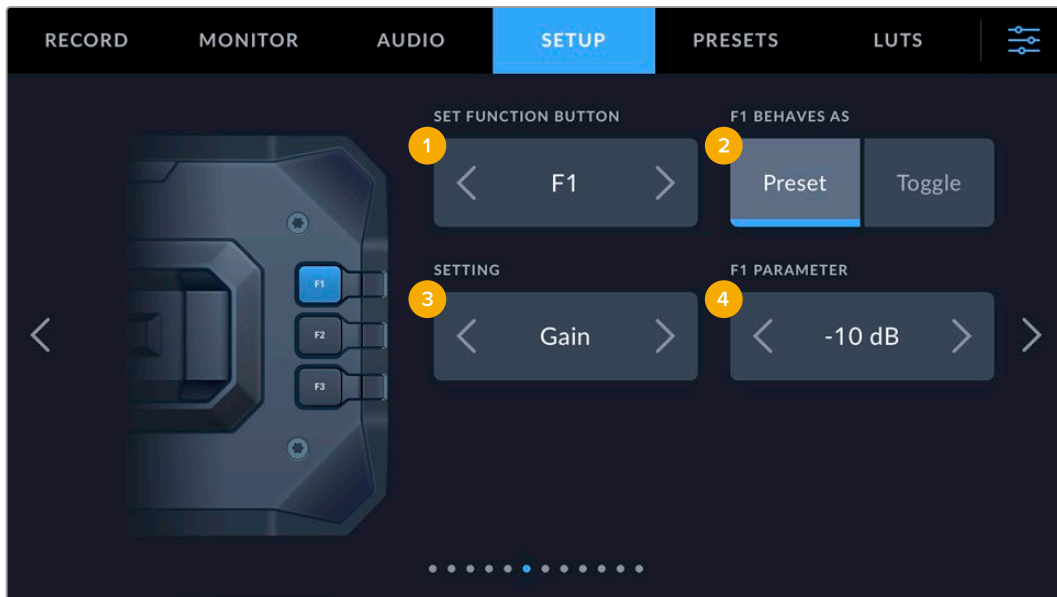
available with your PYXIS Monitor connected, these features are described in the next sections of this manual.

PYXIS Monitor Function Buttons

On the left side of your Blackmagic PYXIS Monitor you'll notice 3 function buttons labelled F1, F2 and F3. These can be mapped to frequently used features and are quickly accessible when using your monitor.



To set these buttons, open the sixth page of your PYXIS Monitor's 'setup' menu. Then select a function button and the behavior, settings and parameters you want for that function.



1 Button 2 Behavior 3 Setting 4 Parameter

Function Button Behaves as Preset or Toggle

Once you have selected the function button you want to map, you can select a behavior.

The available options are:

- **Preset**

When set to this behavior, pressing a function button will recall a combination of a setting and a parameter.

To set a preset, select the setting you want to use from the 'setting' menu, and adjust that setting by tapping the arrow icons on either side of the 'parameter' menu.

For example, to set the F1 button to recall a preset white balance, use the 'set function button' arrows to select 'F1', select the 'preset' behavior, tap the 'WB' setting, and tap the arrows on either side of the 'parameter' menu until you get to WB '5600K' and Tint '-20'.

- **Toggle**

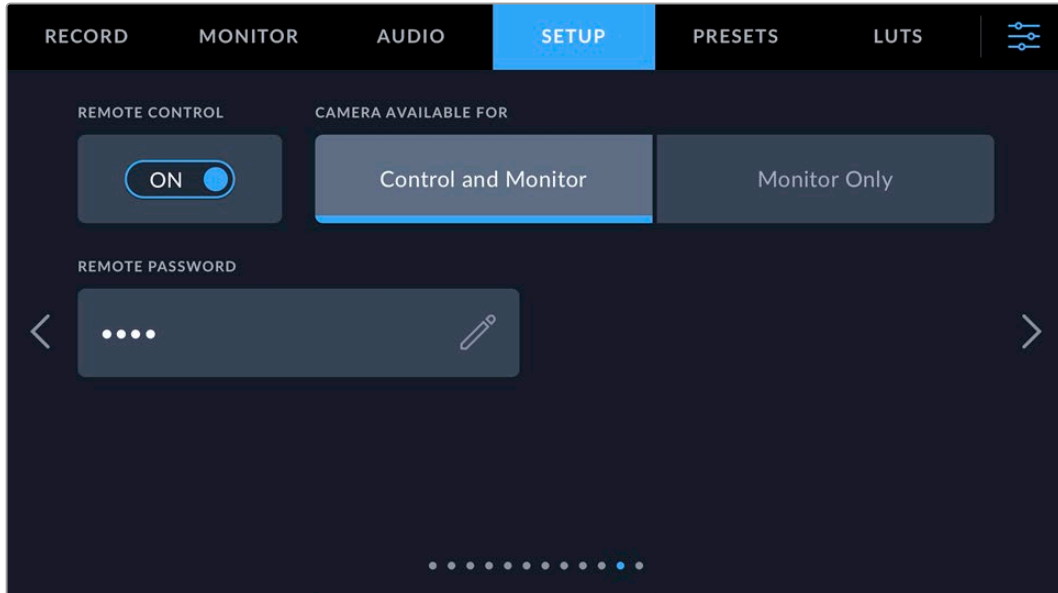
When set to this behavior, pressing a function button will toggle a particular setting on or off. The 'setting' menu is grayed out in this mode. Instead, tap the left or right arrows in the parameter menu to scroll through the available options. These are 'clean feed', 'status text', 'display LUT', 'frame guides', 'focus assist', 'false color', 'zebra', 'grid', 'safe area guide', 'off speed recording', 'focus zoom', 'focus', 'iris', 'record', 'auto white balance', 'color bars', 'playback', 'optical image stabilization', 'stream', 'still', 'call' and 'none'.

Using the 'toggle' behavior also lets you select the output this setting applies to. Simply tap on any combination of available outputs at the bottom right of the display. If the output for an option is not available, such as color bars that always apply to all outputs, the output options are disabled.



Remote Control via Blackmagic Camera App

The eleventh page of your PYXIS Monitor's 'setup' menu contains options to allow remote control of your Blackmagic Micro Studio Camera 4K G2 via a smartphone or iPad using the Blackmagic Camera iOS or Android app.



You can connect your Blackmagic Micro Studio Camera 4K G2 to the Blackmagic Camera app by connecting your camera and smartphone to the same network, or by connecting your smartphone to the USB-C port on your camera.

If you are connecting via a network, you will need to have a valid secure signing certificate installed on your camera. You can easily set up a secure certificate using the Blackmagic Camera Setup software. For more information refer to the 'Blackmagic Camera Setup' section later in this manual.

To allow remote control:

- 1 Tap the pencil icon in the 'remote password' field and enter a password for your Blackmagic Micro Studio Camera 4K G2. Tap 'update'.
- 2 Switch the 'remote control' switch to 'on'.
- 3 Select 'control and monitor' from the 'camera available for' menu. This will let you access your camera's settings and start and stop recording via the Blackmagic Camera app.

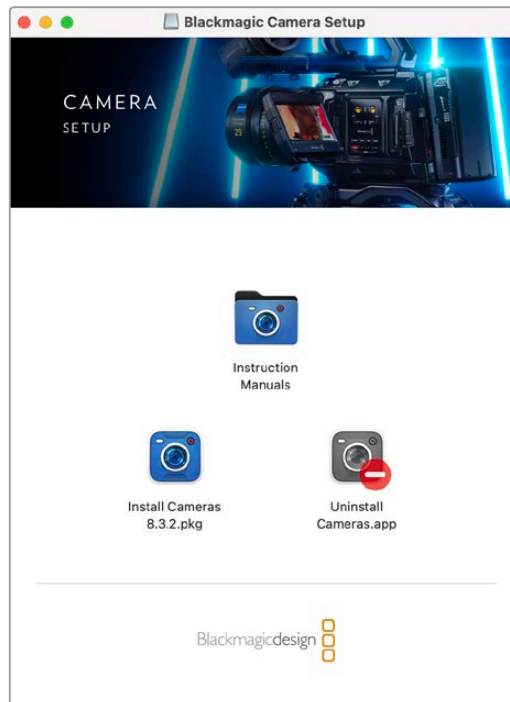
To end a remote connection from Blackmagic Camera app, switch the 'remote control' switch to 'off'.

NOTE While you can use the Blackmagic Camera app to change settings on your Micro Studio Camera 4K G2, it should be noted that a video feed to the Blackmagic Camera app from your Micro Studio Camera 4K G2 is not supported.

Blackmagic Camera Setup

How to Update Your Camera Software on Mac OS

After downloading the latest Blackmagic Camera Update software from the Blackmagic Design support center, unzip the downloaded file and double click on the .dmg disk image file. Launch the 'Install Cameras' installer and follow the onscreen instructions.



How to Update Your Camera Software on Windows

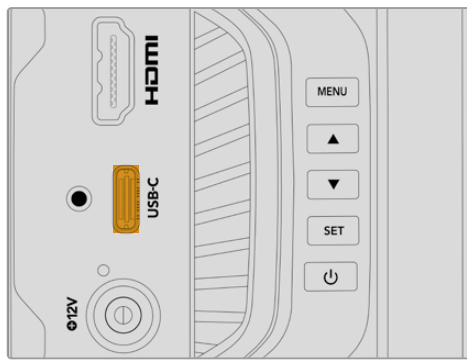
After downloading the 'Blackmagic Camera Setup' software and unzipping the downloaded file, you should see a 'Blackmagic Camera Setup' installer window. Double click on the installer icon and follow the onscreen prompts to complete the installation.

After the installation is complete, click on the Windows 'start' menu, and go to 'all programs'. Click on the Blackmagic Design folder to open the Blackmagic Camera setup software and instruction manuals.

How to Update your Camera's Internal Software

After installing the latest Blackmagic Camera Setup software on your computer, connect a USB cable from the computer to your camera's USB-C port.

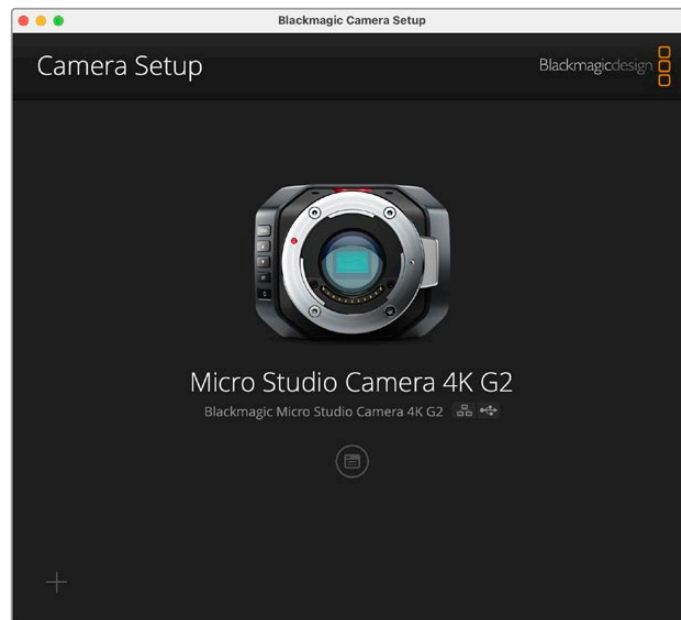
Power your camera, launch 'Blackmagic Camera Setup' and follow the onscreen prompts to update the camera software.



Connect your camera to your computer via the USB-C port

Using Blackmagic Camera Setup

Blackmagic Camera Setup is used to change settings and update the internal software in your camera.



To use Blackmagic Camera Setup:

- 1 Connect your camera to your computer via USB.
- 2 Launch Blackmagic Camera Setup. Your Micro Studio Camera 4K G2 will be named in the setup utility homepage.
- 3 Click on the circular 'setup' icon or the image of your camera to open the setup page.

Blackmagic Micro Studio Camera 4K G2
Micro Studio Camera 4K G2

Setup

Name: Micro Studio Camera 4K G2 Set

Language: English

Software: Version 8.4

Date and Time

☒ Set date and time automatically

Network Time Protocol (NTP): time.cloudflare.com Set

Date and Time: 03 Nov 2023 3:52 pm

Time Zone: UTC+11

Network Settings

Protocol: ☒ DHCP ☐ Static IP

IP Address: 10.61.211.62

Subnet Mask: 255.255.255.0

Gateway: 10.61.211.1

Primary DNS: 10.61.211.1

Secondary DNS: 8.8.8.8

Show in Finder Cancel Save

Setup

If you have more than one Micro Studio Camera 4K G2 camera, you may wish to give each unit a discrete name to make them easy to identify. You can do this by entering a new name into the name field and clicking the ‘set’ button. It’s worth noting that changing the name of the camera will invalidate any digital certificates in use, so it’s worth changing the name before generating a certificate signing request or self signed certificate. More details on digital certificates are available in the ‘secure certificate’ information later in this section of the manual.

Setup

Name: Micro Studio Camera 4K G2 Set

Language: English

Software: Version 8.4

Date and Time

Set your date and time automatically by ticking the ‘set date and time automatically’ checkbox. When this checkbox is enabled, your camera will use the network time protocol server set in the NTP field. The default NTP server is time.cloudflare.com, but you can also manually enter an alternate NTP server and then click on ‘set’.

If you are entering your date and time manually, use the fields to enter your date, time and time zone. Setting the date and time correctly ensures your recorded clips have the same time and date information as your network and also prevents conflicts that can occur with some network storage systems.

Date and Time

☒ Set date and time automatically

Network Time Protocol (NTP): time.cloudflare.com Set

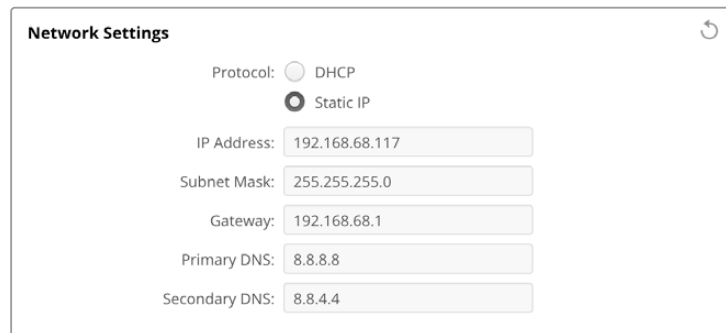
Date and Time: 03 Nov 2023 3:57 pm

Time Zone: UTC+11

Network Settings

Protocol

To control your camera remotely via Ethernet, or when connected to ATEM Television Studio HD8 ISO as a remote source on your network, the camera needs be on the same network as your other equipment using DHCP or by manually adding a fixed IP address.



Network Settings

Protocol: ☐ DHCP
☒ Static IP

IP Address:

Subnet Mask:

Gateway:

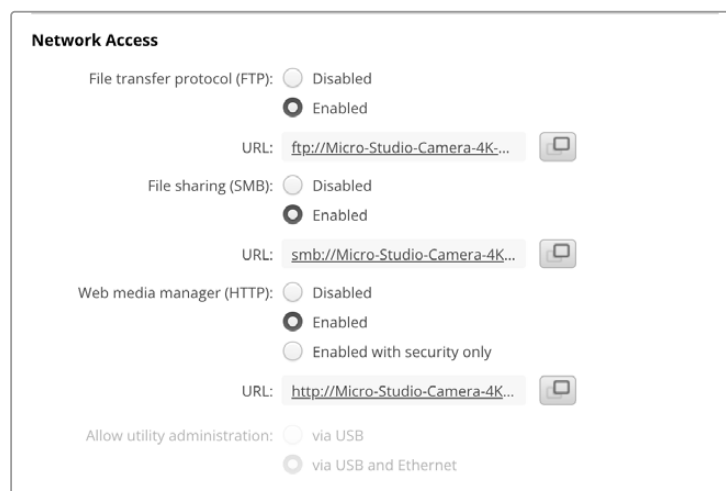
Primary DNS:

Secondary DNS:

DHCP	Your camera is set to DHCP by default. The dynamic host configuration protocol, or DHCP, is a service on network servers that automatically finds your camera and assigns an IP address. The DHCP is a great service that makes it easy to connect equipment via Ethernet and ensure their IP addresses do not conflict with each other. Most computers and network switchers support DHCP.
Static IP	When 'static ip' is selected, you can enter your network details manually. When setting IP addresses manually so all units can communicate, they must share the same subnet mask and gateway settings. If there are other devices on the network that have the same identifying number in their IP address, there will be a conflict and the units won't connect. If you encounter a conflict, simply change the identifying number in the unit's IP address.

Network Access

Your Micro Studio Camera 4K G2 can be accessed via a network for transferring files. Access will be disabled by default, but you can choose to enable individually or via a username and password for added security when using the web manager.



Network Access

File transfer protocol (FTP): ☐ Disabled
☒ Enabled
URL: 

File sharing (SMB): ☐ Disabled
☒ Enabled
URL: 

Web media manager (HTTP): ☐ Disabled
☒ Enabled
☐ Enabled with security only
URL: 

Allow utility administration: ☐ via USB
☒ via USB and Ethernet

File Transfer Protocol

Enable or disable access via FTP using the checkbox. If you are supplying access via an FTP client such as CyberDuck, click the icon to copy the FTP address. For more information, refer to the section 'transferring files over a network'.

File Sharing

At the bottom left corner you will notice a button named 'Show in Finder' on a Mac or 'Show in Explorer' on Windows. This button lets you access your media files using your computer's file browser. All you need to do is enable 'file sharing' and then click on the 'show in Finder' button. You can also copy the URL and paste the file path into your browser.

Your operating system may prompt you to allow access to the drive.

Web Media Manager

Enabling web media manager lets you download clips from USB disks over your network, or even delete unwanted clips if you need to free up disk space. When you click on the link or copy and paste it into your web browser a simple interface will open where you can access the media.

Enable access via HTTP by selecting the 'enabled' checkbox. You can also set up a secure certificate using the 'enabled with security only' option. When using a digital certificate, connections to web media manager are encrypted via HTTPS. More information on digital certificates is available in the 'secure certificate' section.

REST API also uses HTTP and this means enabling access to media via the web media manager also enables camera control via REST API.

Allow Utility Administration

Blackmagic Camera Setup can be accessed when your camera is connected via the network or via USB. To prevent users having access via the network, select 'via USB'.

Secure Login Settings

A screenshot of a web form titled "Secure Login Settings". It contains two input fields: "Username:" and "Password:". The "Password:" field has an eye icon to its right, which is currently closed (a circle with a diagonal line). To the right of the password field is a key icon, indicating a password toggle or a "show password" function.

If you have selected 'enabled with security' for web media manager access you will need to enter a username and password. Type a username and password and click 'save'.

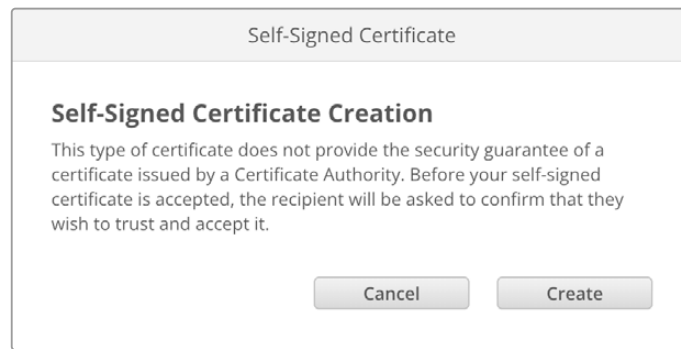
The password field will appear empty once a password is entered. Once a username and password is set, you will need to enter it when accessing the web media manager.

Secure Certificate

To enable web media manager access via HTTPS, you will require a secure certificate. This digital certificate acts as an identification card for your camera so that any incoming connections can confirm they are connecting to the correct unit. Along with confirming the identity of the unit, using a secure certificate ensures data transmitted between your camera and a computer or server will be encrypted. When using the secure login settings the connection will not only be encrypted but require authentication for access.

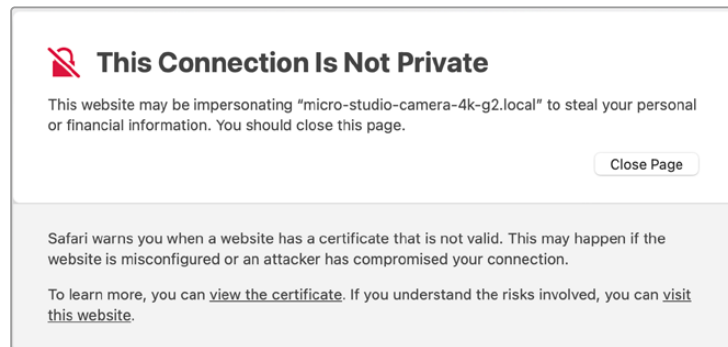
There are two certificate types you can use with your camera. A secure certificate signed by a certificate authority, or a self signed certificate. A self signed certificate may be secure enough for some user workflows, for instance only accessing the camera via a local network.

To generate a self signed certificate click on 'create certificate'. You will be prompted to confirm you understand the risks with using a self signed certificate. Once you click on 'create', the certificate details will autofill the 'domain', 'issuer' and 'valid until' fields in the Camera Setup utility.



Following a factory reset any current certificate will be deleted, but you can also remove it at any time by clicking on the 'remove' button and following the prompts.

When using a self signed certificate to access media files using HTTPS, your web browser will alert you to the risks of accessing the site. Some browsers will allow you to proceed once you confirm you understand the risks, however other web browsers may prevent you from proceeding at all.

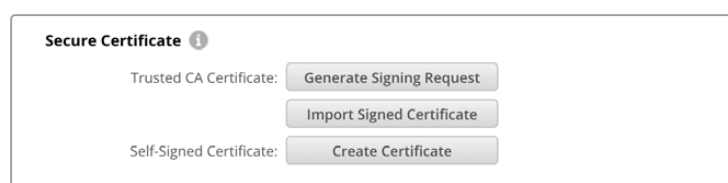


To ensure access is granted to any web browser, you will need to use a signed certificate. To obtain a signed certificate, you first need to generate a certificate signing request, or CSR, using Blackmagic Camera Setup utility. This signing request is then sent to a certificate authority, also known as a CA, or your IT department to be signed. Once completed, a signed certificate with a .cert, .crt or .pem file extension will be returned which you can import into your camera.



To generate the certificate signing request CSR:

- 1 Click on the 'generate signing request' button.



- 2 A window will appear prompting you to enter a common name and subject alternative name for your camera. Adjust any other details as required using the table below.

Information	Description	Example
Common Name	The domain name you will use	studiocamera.melbourne.com
Subject Alternative Name	An alternate domain name	studiocamera.melbourne.net
Country	Country for your organization	AU
State	Province, region, county or state	Victoria
Location	Town, city, village etc. name	South Melbourne
Organization Name	Name of your organization	Blackmagic Design

- 3 Once you have filled in the certificate details, press 'generate'.

When you generate a .csr you will also be creating a public key and private key at the same time. The public key will be included with the signing request while the private key will remain with the unit. Once the CA or IT department have verified the information in the CSR with your organization, they will generate a signed certificate with the above details along with your public key.

Once imported, your camera will use the public and private key to confirm the identity of the camera and to encrypt and decrypt data share via HTTPS.

Importing a signed certificate:

- 1 Click on 'import signed certificate'.
- 2 Navigate to the location of the signed certificate using the file browser and once the file is selected click on 'open'.

The domain, issuer and valid until fields will update with the information from your CA. Generally, a signed certificate will be valid for about a year so the process will need to be repeated as you reach the expiration date.

The screenshot shows a 'Secure Certificate' window with a title bar and a help icon. It contains two main sections. The first section, 'Trusted Certificate:', has a 'Generate Signing Request' button. The second section, 'Self-Signed Certificate:', has an 'Import Signed Certificate' button. Below these is a 'Current certificate details' section. This section features a blue checkmark icon on the left and a table of details on the right. The table lists 'Domain: camera.melbourne.com', 'Issuer: COMODO RSA Organization Valid', and 'Valid until: 2024-02-06 01:15:00'. A 'Remove' button is located at the bottom of the details table.

Secure Certificate ⓘ	
Trusted Certificate:	Generate Signing Request
	Import Signed Certificate
Self-Signed Certificate:	Create Certificate
Current certificate details	
	Domain: camera.melbourne.com
	Issuer: COMODO RSA Organization Valid
	Valid until: 2024-02-06 01:15:00
	Remove

Since a domain name was selected, you will need to speak to your IT department about resolving the DNS entry for your camera. This will point all traffic for the IP address of the studio camera to the selected domain address in the signing request. This will also be the HTTPS address you use to access files via the web media manager, for example <https://camera.melbourne>

It's worth noting that the certificate will be invalidated following a factory reset and a new certificate will need to be generated and signed.

Reset

Select 'factory reset' to restore your camera to factory settings. A factory reset will invalidate the current certificate. If a secure certificate is being used you will need to generate a new certificate signing request to be signed by a certificate authority or IT department.

NOTE Performing a factory reset will also return the utility administration setting to 'via USB'. To enable utility administration via Ethernet after a factory reset, connect your camera directly to a computer using a USB-C cable.

Transferring Files over a Network

When connected to a network via Ethernet, files can be transferred over a network from Blackmagic Micro Studio Camera 4K G2 using following protocols:

HTTP

Hypertext transfer protocol.

HTTPS

Hypertext transfer protocol secure.

FTP

File transfer protocol.

SMB

Server message block.

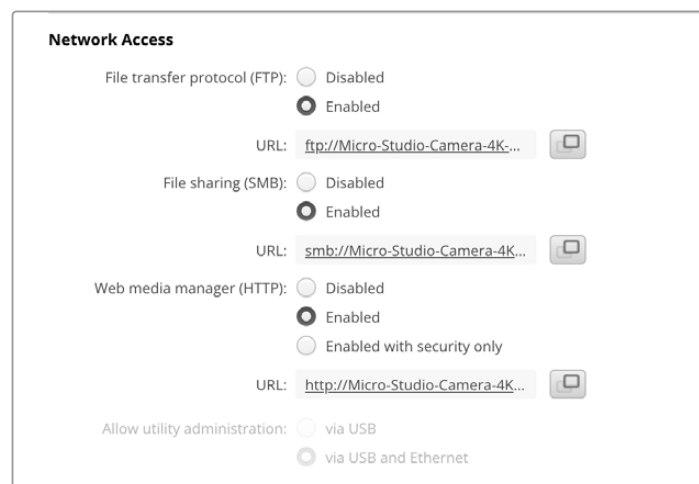
These protocol options let you copy files directly from your camera's USB media to your computer via a network with the fast speeds a local network can provide. For example, you can copy clips and start editing them as soon as you have finished recording.

Access to your camera via any of these protocols can be enabled or disabled via the Camera Setup utility. For example, you could disable FTP access and enable HTTPS access at the same time.

Connecting to your Camera via HTTPS

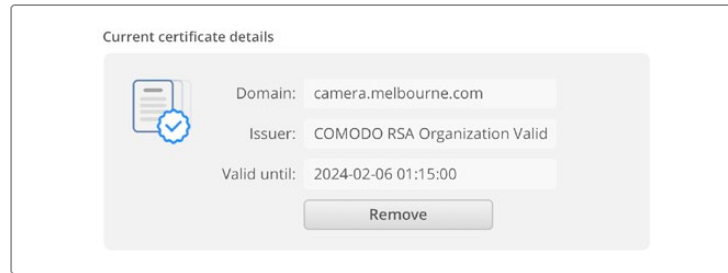
To access your Blackmagic Micro Studio Camera 4K G2 via the web media manager you will need the URL available via the network access settings. Network access settings appear in Camera Setup utility when your computer is connected via USB or Ethernet but are disabled when only Ethernet is connected.

- 1 Using a USB-C cable, connect your computer to the camera via the USB port on the side panel and open Camera Setup. You should see a USB connection icon next to the unit name. Click on the circular icon or anywhere on the product image to open the settings.
- 2 When using a self signed certificate, navigate to the network access settings and click on the copy icon beside the URL. This URL is based on the name of your camera. To modify the URL, modify the name of the unit.



When using a self signed certificate, click on the link

- 3 If you have imported a certificate signed by a CA or IT department, copy and paste the address in the domain field for the current certificate.



Copy the domain address and paste into a browser

- 4 Open your web browser and paste the address into a new window. If you have enabled access with security only you will be prompted to enter the username and password set in Camera Setup.

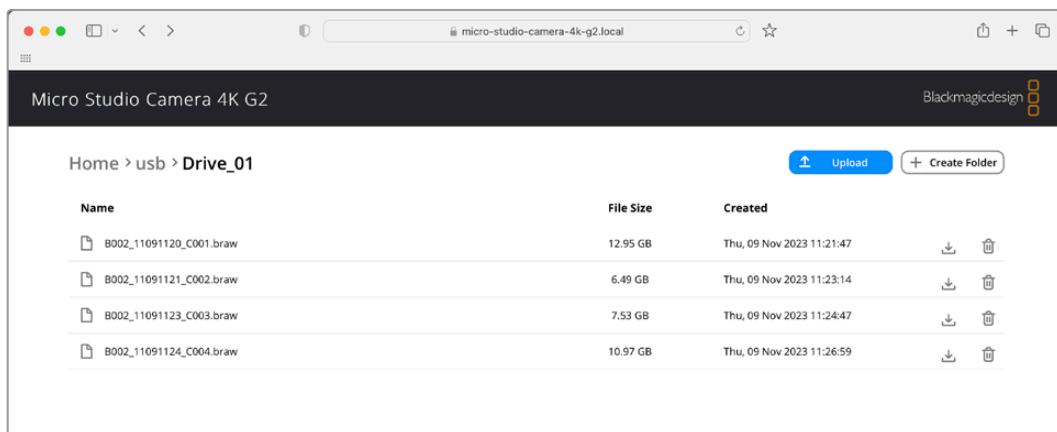
When using a self signed certificate, a browser warning will appear regarding the privacy of the connection. This means a trusted signed certificate has not been imported via the Camera Setup utility

To continue without a valid and trusted certificate, follow your browser prompts to acknowledge the risks and proceed to the website.

Transferring Files Using Web Media Manager

When you first open the web media manager browser view you will see the USB drives listed with the prefix USB/.

Double click the media to reveal the contents.



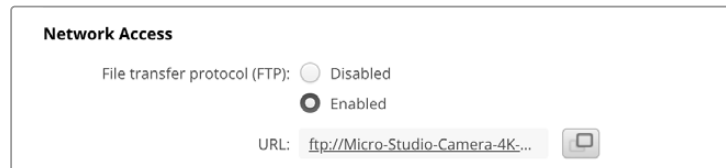
Click the download button to download files or the trash icon to delete them

To download files, use the arrow icon on the far right. Your browser may prompt you to allow downloads from the site. Click on 'allow'. To delete a file, click the trash can icon and a delete file window will appear. Click 'delete' to proceed.

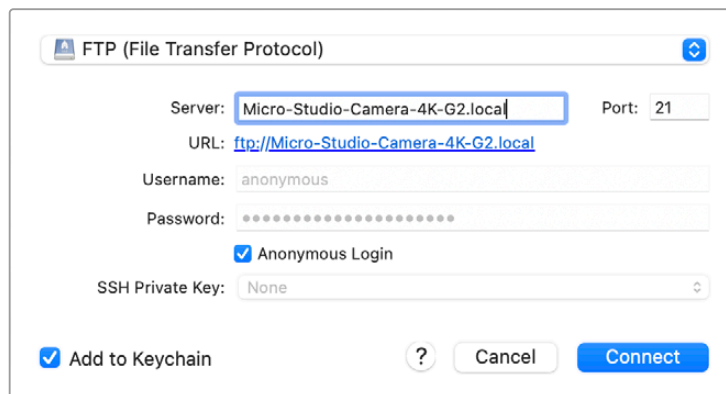
Transferring Files via FTP

With your computer and Micro Studio Camera 4K G2 on the same network, all you need is an ftp client and your camera's IP address or the FTP URL in the Camera Setup utility.

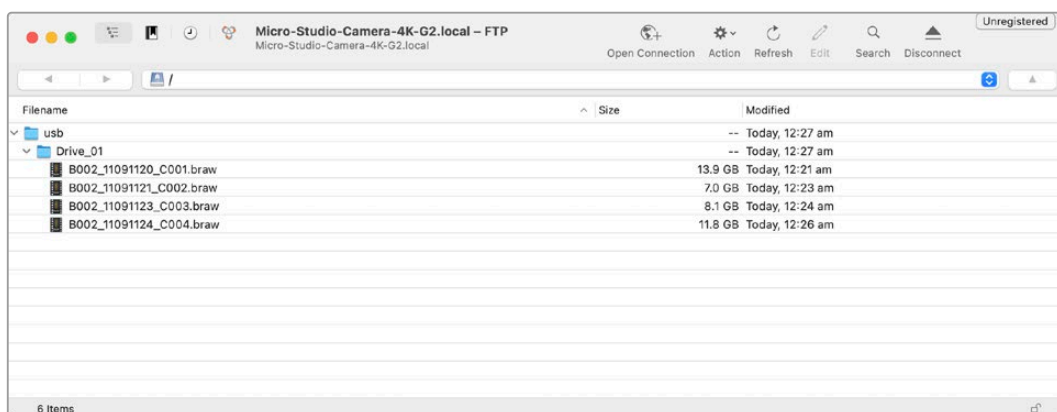
- 1 Download and install an FTP client on the computer you want to connect your camera to. We recommend Cyberduck, FileZilla or Transmit but most FTP applications will work. Cyberduck and FileZilla are free downloads.
- 2 With your camera connected to a network, open Camera Setup and click on URL or press the copy icon to paste it manually. You may need to click the link a second time if the FTP program doesn't open a connection.



- 3 If you are manually opening an FTP connection, paste the URL into the client's server field. Check 'anonymous login' if available.



- 4 Expand the usb folder and any connected USB drives will appear in the list. You can now drag and drop files using the FTP interface.



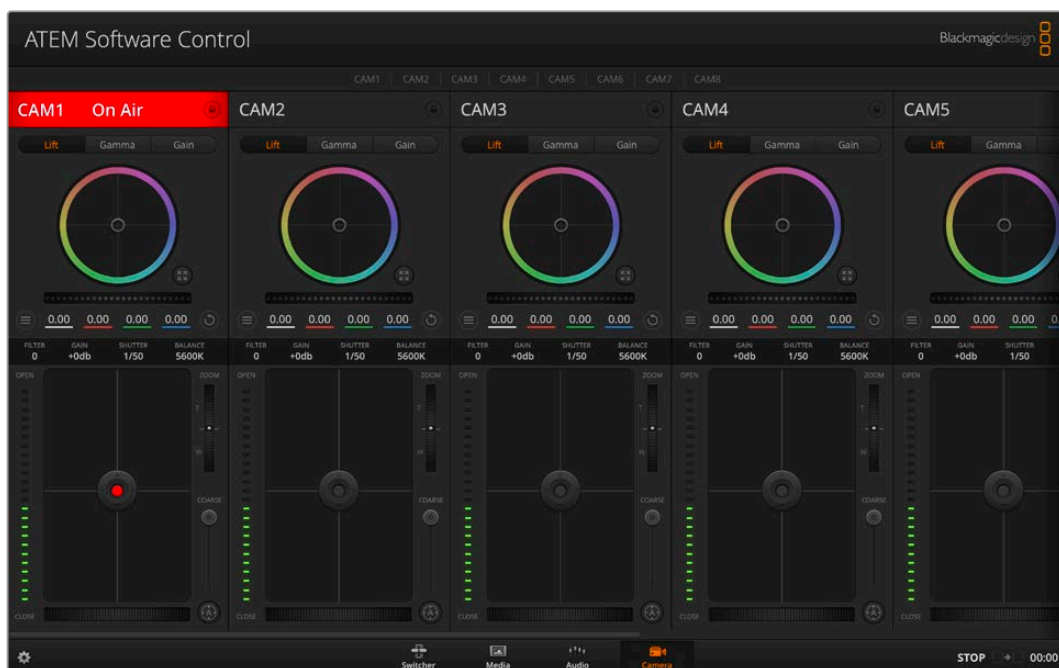
Using ATEM Software Control

Camera Control

Your Blackmagic Micro Studio Camera 4K G2 can be controlled from an ATEM switcher using the Camera Control feature in ATEM Software Control. Clicking on the 'camera' button in ATEM Software Control opens the camera control feature. Settings such as iris, gain, focus 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.

On HDMI ATEM switchers, ATEM Software Control automatically detects which camera is connected to each input, so the tally signals will always trigger the appropriate cameras. However, if you want to change the button mapping so camera inputs appear on different buttons, you can do that in the button mapping settings in ATEM Software Control's preferences.

On SDI ATEM switchers the camera control data, tally and talkback is sent over the program return feed to the camera. On SDI models you will need to set the camera numbers manually if using more than one camera.



ATEM Camera Control

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 features 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.

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



Each camera controller displays the channel status so you know which camera is on air

The camera settings button near the bottom left of the master wheel lets you 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.

Detail

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

Color Wheel

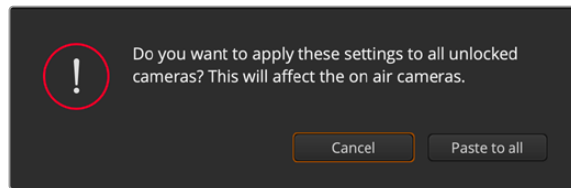
The color wheel is a powerful feature of the DaVinci Resolve color corrector and used to make color adjustments to each YRGB channel's lift, gamma and gain settings. You can select which setting to adjust by clicking on the three selection buttons above the color wheel.

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

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.

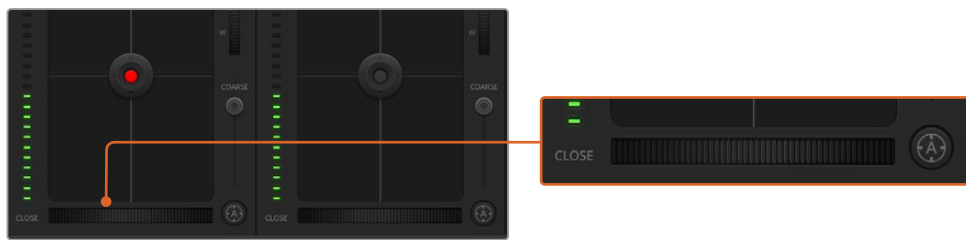
To set your coarse threshold, completely open the iris using the iris control, then drag the coarse setting up or down to set optimum exposure. Now when you adjust the iris, the coarse threshold will prevent it from going above optimum exposure.

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

The filter control lets you change the filter in Blackmagic cameras that have built in ND filters. Press the left or right ND filter buttons to cycle through the options.

Camera Gain

The camera gain setting allows you to turn on additional gain in the camera. On Blackmagic Studio Cameras, this setting relates to ISO. This is important when you are operating in low light conditions and need extra gain, or ISO, 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.

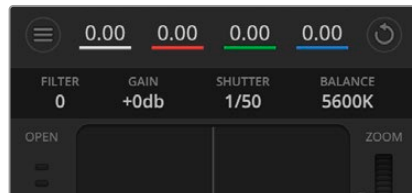
Shutter Speed Control

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. On Blackmagic Studio Cameras, this setting relates to shutter speed.

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

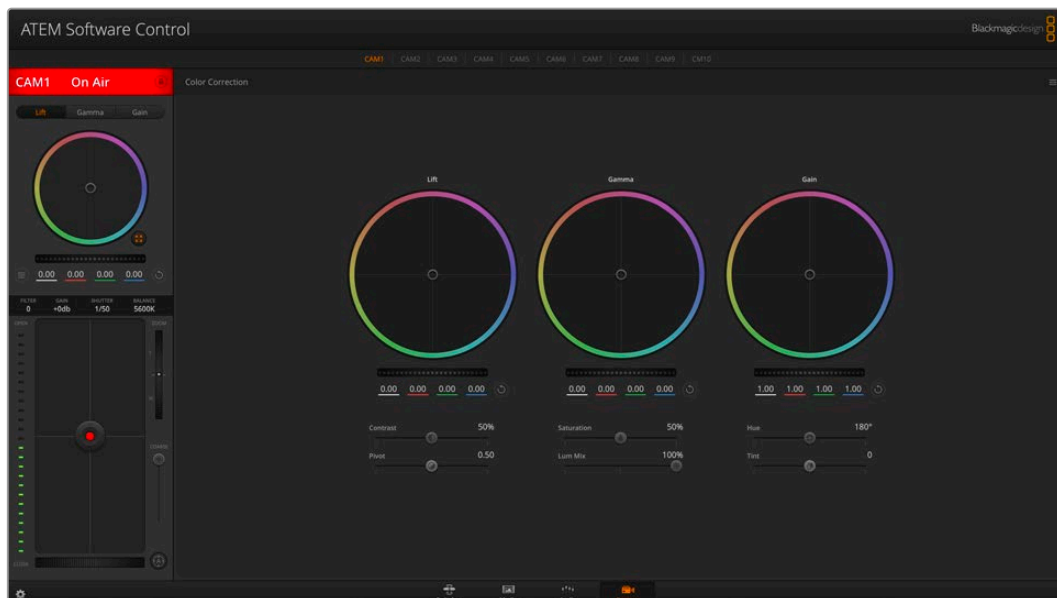
The white balance setting next to the shutter speed control can be adjusted by clicking on the left or right arrows on each side of the color temperature indicator. Different light sources emit warm or cool colors, so you can compensate by adjusting the white balance. This ensures the whites in your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



Hovering your mouse pointer over the 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.



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

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.

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.



Adjust the master wheels by dragging the wheel control left or right

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%. Using the Pivot Control, the pivot points can be moved up and down on the S-curve. When working with log images like the Gen 5 Film curve, after performing white balance and setting exposure, adjusting the contrast and pivot can very quickly get you to a good starting point with your color grade.

Saturation Setting

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

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.

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.

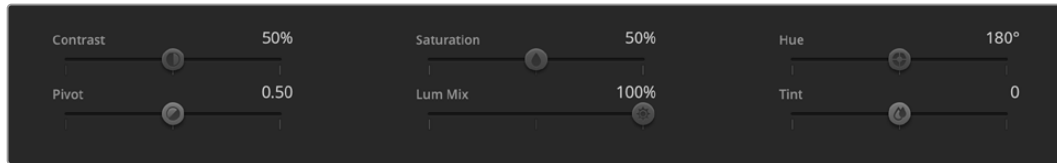
Which is the correct setting to use? That's up to you, as color correction is a pure creative process and there is no right and wrong. The best setting is what you like the most and what you think looks good!

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.

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.

Developer Information

Camera 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 your Blackmagic Studio Camera using Camera Control REST API. This API enables you to perform a wide range of operations, such as starting or stopping recordings, 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 your camera with ease. We look forward to seeing what you come up with!

NOTE It's important to mention that controlling Blackmagic Micro Studio Camera 4K G2 via REST API relies on the web media manager being enabled on each camera. Enable the web media manager in the Blackmagic Camera Setup 'network access' settings for each camera you are controlling.

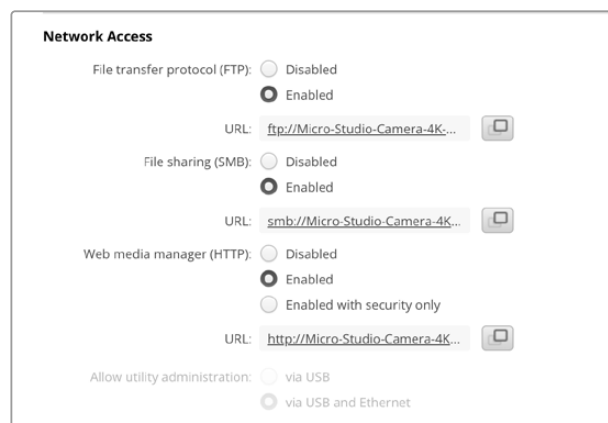
The following Blackmagic cameras are compatible with Camera Control REST API:

- | | |
|--|---------------------------------------|
| ▪ Blackmagic URSA Cine 12K LF | ▪ Blackmagic URSA Cine 17K 65 |
| ▪ Blackmagic Cinema Camera 6K | |
| ▪ Blackmagic URSA Broadcast G2 | |
| ▪ Blackmagic Micro Studio Camera 4K G2 | |
| ▪ Blackmagic Studio Camera 4K Plus | ▪ Blackmagic Studio Camera 4K Plus G2 |
| ▪ Blackmagic Studio Camera 4K Pro | ▪ Blackmagic Studio Camera 4K Pro G2 |
| ▪ Blackmagic Studio Camera 6K Pro | |

Sending API Commands

To send an API command to your camera from a third party application such as Postman, add `/control/api/v1/` to the end of the camera's Web media manager URL or IP address. For example, `https://micro-studio-camera-4k-g2.local/control/api/v1/`

You can find the Web media manager URL and IP address information in Blackmagic Camera Setup.



The Web media manager URL in Blackmagic Camera Setup

Downloading API's from your Camera

You can download REST API YAML documentation from your camera by adding /control/documentation.html to the end of the camera's Web media manager URL or IP address. For example, <https://micro-studio-camera-4k-g2.local/control/documentation.html>

NOTE It's worth noting that changing the camera name in Blackmagic Camera Setup will also change the camera's Web media manager URL.

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

GET /transports/0/timecode

Get device's timecode.

Response

200 - OK

The response is a JSON object.

Name	Type	Description
timecode	number	The time of day timecode in units of binary-coded decimal (BCD).
clip	number	The position of the clip timecode in units of binary-coded decimal (BCD).

GET /transports/0/timecode/source

Get timecode source selected on device

Response

200 - OK

The response is a JSON object.

Name	Type	Description
timecode	string	Possible values are: Timecode, Clip.

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

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?

501 - This functionality is not implemented for the device in use.

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

501 - This functionality is not implemented for the device in use.

PUT /system/codecFormat

Set the codec.

Parameters

Name	Type	Description
codec	string	Currently selected codec
container	string	Multimedia container format

Response

204 - No Content

501 - This functionality is not implemented for the device in use.

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

501 - This functionality is not implemented for the device in use.

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?

501 - This functionality is not implemented for the device in use.

GET /system/supportedFormats

Get supported formats.

Response

200 - OK

The response is a JSON object.

Name	Type	Description
supportedFormats	array	
supportedFormats[i]	object	
supportedFormats[i].codecs	array	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.
supportedFormats[i].codecs[i]	string	
supportedFormats[i].frameRates	array	
supportedFormats[i].frameRates[i]	string	
supportedFormats[i].maxOffSpeedFrameRate	number	
supportedFormats[i].minOffSpeedFrameRate	number	
supportedFormats[i].recordResolution	object	
supportedFormats[i].recordResolution.height	number	Height of the resolution
supportedFormats[i].recordResolution.width	number	Width of the resolution
supportedFormats[i].sensorResolution	object	
supportedFormats[i].sensorResolution.height	number	Height of the resolution
supportedFormats[i].sensorResolution.width	number	Width of the resolution

501 - This functionality is not implemented for the device in use.

GET /system/format

Get current format.

Response

200 - OK

The response is a JSON object.

Name	Type	Description
codec	string	Currently selected codec
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.
maxOffSpeedFrameRate	number	
minOffSpeedFrameRate	number	
offSpeedEnabled	boolean	
offspeedFrameRate	number	
recordResolution	object	
recordResolution.height	number	Height of the resolution
recordResolution.width	number	Width of the resolution
sensorResolution	object	
sensorResolution.height	number	Height of the resolution
sensorResolution.width	number	Width of the resolution

501 - This functionality is not implemented for the device in use.

PUT /system/format

Set the format.

Parameters

Name	Type	Description
codec	string	Currently selected codec
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.
maxOffSpeedFrameRate	number	
minOffSpeedFrameRate	number	
offSpeedEnabled	boolean	
offspeedFrameRate	number	
recordResolution	object	
recordResolution.height	number	Height of the resolution
recordResolution.width	number	Width of the resolution
sensorResolution	object	
sensorResolution.height	number	Height of the resolution
sensorResolution.width	number	Width of the resolution

Response

204 - No Content

501 - This functionality is not implemented for the device in use.

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

Preset Control API

API For controlling the presets on Blackmagic Design products

GET /presets

Get the list of the presets on the camera

Response

200 - OK

The response is a JSON object.

Name	Type	Description
presets	array	List of the presets on the camera
presets[i]	string	

POST /presets

Send a preset file to the camera

Response

200 - OK

The response is a JSON object.

Name	Type	Description
presetAdded	string	Name of the preset uploaded

GET /presets/active

Get the list of the presets on the camera

Response

200 - OK

The response is a JSON object.

Name	Type	Description
preset	string	

PUT /presets/active

Set the active preset on the camera

Parameter

Name	Type	Description
preset	string	

Response

200 - OK

The response is a JSON object.

GET /presets/{presetName}

Download the preset file

Parameter

Name	Type	Description
{presetName}	string	

Response

200 - OK

The response is a binary file.

PUT /presets/{presetName}

Update a preset on the camera if it exists, if not create a preset and save current state with the presetName

Parameter

Name	Type	Description
{presetName}	string	

Response

200 - OK

The response is a JSON object.

DELETE /presets/{presetName}

Delete a preset from a camera if exists

Parameter

Name	Type	Description
{presetName}	string	

Response

200 - OK

The response is a JSON object.

Audio Control API

API For controlling audio on Blackmagic Design Cameras

GET /audio/channel/{channelIndex}/input

Get the audio input (source and type) for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - Currently selected input

The response is a JSON object.

Name	Type	Description
input	string	Possible values are: None, Camera - Left, Camera - Right, Camera - Mono, XLR1 - Mic, XLR1 - Line, XLR2 - Mic, XLR2 - Line, 3.5mm Left - Line, 3.5mm Left - Mic, 3.5mm Right - Line, 3.5mm Right - Mic, 3.5mm Mono - Line, 3.5mm Mono - Mic.

404 - Channel does not exist

PUT /audio/channel/{channelIndex}/input

Set the audio input for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Name	Type	Description
input	string	Possible values are: None, Camera - Left, Camera - Right, Camera - Mono, XLR1 - Mic, XLR1 - Line, XLR2 - Mic, XLR2 - Line, 3.5mm Left - Line, 3.5mm Left - Mic, 3.5mm Right - Line, 3.5mm Right - Mic, 3.5mm Mono - Line, 3.5mm Mono - Mic.

Response

200 - OK

400 - Invalid input

404 - Channel does not exist

GET /audio/channel/{channelIndex}/input/description

Get the description of the current input of the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - Description of the current input of the selected channel

The response is a JSON object.

Name	Type	Description
gainRange	object	
gainRange.Min	number	The minimum gain value in dB
gainRange.Max	number	The maximum gain value in dB
capabilities	object	
capabilities.PhantomPower	boolean	Input supports setting of phantom power
capabilities.LowCutFilter	boolean	Input supports setting of low cut filter
capabilities.Padding	object	
capabilities.Padding.available	boolean	Input supports setting of padding
capabilities.Padding.forced	boolean	Padding is forced to be set for the input
capabilities.Padding.value	number	Value of the padding in dB

404 - Channel does not exist

GET /audio/channel/{channelIndex}/supportedInputs

Get the list of supported inputs and their availability to switch to for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - The list of supported inputs

The response is a JSON object.

Name	Type	Description
supportedInputs	array	
supportedInputs[i]	object	
supportedInputs[i].schema	object	
supportedInputs[i].schema.input	string	Possible values are: None, Camera - Left, Camera - Right, Camera - Mono, XLR1 - Mic, XLR1 - Line, XLR2 - Mic, XLR2 - Line, 3.5mm Left - Line, 3.5mm Left - Mic, 3.5mm Right - Line, 3.5mm Right - Mic, 3.5mm Mono - Line, 3.5mm Mono - Mic.
supportedInputs[i].available	boolean	Is the input available to be switched into from the current input for the selected channel

404 - Channel does not exist

GET /audio/channel/{channelIndex}/level

Get the audio input level for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - Currently set level for the selected channel

The response is a JSON object.

Name	Type	Description
gain	number	
normalised	number	

404 - Channel does not exist

PUT /audio/channel/{channelIndex}/level

Set the audio input level for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Name	Type	Description
gain	number	
normalised	number	

Response

200 - OK

400 - Invalid input

404 - Channel does not exist

GET /audio/channel/{channelIndex}/phantomPower

Get the audio input phantom power for the selected channel if possible

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - Currently set level for the selected channel

The response is a JSON object.

Name	Type	Description
phantomPower	boolean	

404 - Channel does not exist

PUT /audio/channel/{channelIndex}/phantomPower

Set the audio phantom power for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Name	Type	Description
phantomPower	boolean	

Response

200 - OK

400 - Phantom power is not supported for this input

404 - Channel does not exist

GET /audio/channel/{channelIndex}/padding

Get the audio input padding for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - Currently set padding for the selected channel

The response is a JSON object.

Name	Type	Description
padding	boolean	

404 - Channel does not exist

PUT /audio/channel/{channelIndex}/padding

Set the audio input padding for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Name	Type	Description
padding	boolean	

Response

200 - OK

400 - Padding is not supported for this input

404 - Channel does not exist

GET /audio/channel/{channelIndex}/lowCutFilter

Get the audio input low cut filter for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - Currently set low cut filter for the selected channel

The response is a JSON object.

Name	Type	Description
lowCutFilter	boolean	

404 - Channel does not exist

PUT /audio/channel/{channelIndex}/lowCutFilter

Set the audio input low cut filter for the selected channel

Parameter

Name	Type	Description
{channelIndex}	integer	

Name	Type	Description
lowCutFilter	boolean	

Response

200 - OK

400 - Low cut filter is not supported for this input

404 - Channel does not exist

GET /audio/channel/{channelIndex}/available

Get the audio input's current availability for the selected channel. If unavailable, the source will be muted

Parameter

Name	Type	Description
{channelIndex}	integer	

Response

200 - Currently set availability for the selected channel

The response is a JSON object.

Name	Type	Description
available	boolean	

404 - Channel does not exist

Lens Control API

API For controlling the lens on Blackmagic Design products

GET /lens/iris

Get lens' aperture

Response

200 - OK

The response is a JSON object.

Name	Type	Description
continuousApertureAutoExposure	boolean	Is Aperture controlled by auto exposure
apertureStop	number	Aperture stop value
normalised	number	Normalised value
apertureNumber	number	Aperture number

PUT /lens/iris

Set lens' aperture

Parameter

Name	Type	Description
apertureStop	number	Aperture stop value
normalised	number	Normalised value
apertureNumber	number	Aperture number

Response

200 - OK

GET /lens/zoom

Get lens' zoom

Response

200 - OK

The response is a JSON object.

Name	Type	Description
focalLength	integer	Focal length in mm
normalised	number	Normalised value

PUT /lens/zoom

Set lens' zoom

Parameter

Name	Type	Description
focalLength	integer	Focal length in mm
normalised	number	Normalised value

Response

200 - OK

GET /lens/focus

Get lens' focus

Response

200 - OK

The response is a JSON object.

Name	Type	Description
focus	number	Normalised value

PUT /lens/focus

Set lens' focus

Parameter

Name	Type	Description
focus	number	Normalised value

Response

200 - OK

PUT /lens/focus/doAutoFocus

Perform auto focus

Response

200 - OK

Video Control API

API For controlling the video on Blackmagic Design products

GET /video/iso

Get current ISO

Response

200 - OK

The response is a JSON object.

Name	Type	Description
iso	integer	Current ISO value

PUT /video/iso

Set current ISO

Parameter

Name	Type	Description
iso	integer	ISO value to set

Response

200 - OK

GET /video/gain

Get current gain value in decibels

Response

200 - OK

The response is a JSON object.

Name	Type	Description
gain	integer	Current gain value in decibels

PUT /video/gain

Set current gain value

Parameter

Name	Type	Description
gain	integer	Gain value in decibels to set

Response

200 - OK

GET /video/whiteBalance

Get current white balance

Response

200 - OK

The response is a JSON object.

Name	Type	Description
whiteBalance	integer	Current white balance

PUT /video/whiteBalance

Set current white balance

Parameter

Name	Type	Description
whiteBalance	integer	White balance to set

Response

200 - OK

PUT /video/whiteBalance/doAuto

Set current white balance automatically

Response

200 - OK

GET /video/whiteBalanceTint

Get white balance tint

Response

200 - OK

The response is a JSON object.

Name	Type	Description
whiteBalanceTint	integer	Current white balance tint

PUT /video/whiteBalanceTint

Set white balance tint

Parameter

Name	Type	Description
whiteBalanceTint	integer	White balance tint to set

Response

200 - OK

GET /video/ndFilter

Get ND filter stop

Response

200 - OK

The response is a JSON object.

Name	Type	Description
stop	number	Current filter power (fStop)

PUT /video/ndFilter

Set ND filter stop

Parameter

Name	Type	Description
stop	number	Filter power (fStop) to set

Response

200 - OK

GET /video/ndFilter/displayMode

Get ND filter display mode on the camera

Response

200 - OK

The response is a JSON object.

Name	Type	Description
displayMode	string	Possible values are: Stop, Number, Fraction.

PUT /video/ndFilter/displayMode

Set ND filter display mode on the camera

Parameter

Name	Type	Description
displayMode	string	Possible values are: Stop, Number, Fraction.

Response

200 - OK

GET /video/shutter

Get current shutter. Will return either shutter speed or shutter angle depending on shutter measurement in device settings

Response

200 - OK

The response is a JSON object.

Name	Type	Description
continuousShutterAutoExposure	boolean	Is shutter controlled by auto exposure
shutterSpeed	integer	Shutter speed value in fractions of a second (minimum is sensor frame rate)
shutterAngle	integer	Shutter angle

PUT /video/shutter

Set ND filter display mode on the camera

Parameter

Name	Type	Description
shutterSpeed	integer	Shutter speed value in fractions of a second (minimum is sensor frame rate)
shutterAngle	integer	Shutter angle

Response

200 - OK

GET /video/autoExposure

Get current auto exposure mode

Response

200 - OK

The response is a JSON object.

Name	Type	Description
mode	object	Auto exposure mode
mode.mode	string	Possible values are: Off, Continuous, OneShot.
mode.type	string	Possible values are: , Iris, Shutter, Iris,Shutter, Shutter,Iris.

PUT /video/autoExposure

Set auto exposure

Parameter

Name	Type	Description
mode	object	Auto exposure mode
mode.mode	string	Possible values are: Off, Continuous, OneShot.
mode.type	string	Possible values are: , Iris, Shutter, Iris,Shutter, Shutter,Iris.

Response

200 - OK

Color Correction Control API

API For controlling the color correction on Blackmagic Design products based on DaVinci Resolve Color Corrector

GET /colorCorrection/lift

Get color correction lift

Response

200 - OK

The response is a JSON object.

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

PUT /colorCorrection/lift

Set color correction lift

Parameter

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

Response

200 - OK

GET /colorCorrection/gamma

Get color correction gamma

Response

200 - OK

The response is a JSON object.

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

PUT /colorCorrection/gamma

Set color correction gamma

Parameter

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

Response

200 - OK

GET /colorCorrection/gain

Get color correction gain

Response

200 - OK

The response is a JSON object.

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

PUT /colorCorrection/gain

Set color correction gain

Parameter

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

Response

200 - OK

GET /colorCorrection/offset

Get color correction offset

Response

200 - OK

The response is a JSON object.

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

PUT /colorCorrection/offset

Set color correction offset

Parameter

Name	Type	Description
red	number	
green	number	
blue	number	
luma	number	

Response

200 - OK

GET /colorCorrection/contrast

Get color correction contrast

Response

200 - OK

The response is a JSON object.

Name	Type	Description
pivot	number	Default value is: 0.5.
adjust	number	Default value is: 1.

PUT /colorCorrection/contrast

Set color correction contrast

Parameter

Name	Type	Description
pivot	number	Default value is: 0.5.
adjust	number	Default value is: 1.

Response

200 - OK

GET /colorCorrection/color

Get color correction color properties

Response

200 - OK

The response is a JSON object.

Name	Type	Description
hue	number	
saturation	number	Default value is: 1.

PUT /colorCorrection/color

Set color correction color properties

Parameter

Name	Type	Description
hue	number	
saturation	number	Default value is: 1.

Response

200 - OK

GET /colorCorrection/lumaContribution

Get color correction luma contribution

Response

200 - OK

The response is a JSON object.

Name	Type	Description
lumaContribution	number	Default value is: 1.

PUT /colorCorrection/lumaContribution

Set color correction luma contribution

Parameter

Name	Type	Description
lumaContribution	number	Default value is: 1.

Response

200 - OK

Blackmagic SDI Camera Control Protocol

Version 1.6.2

If you are a software developer you can use the Blackmagic SDI 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

This document describes an extensible protocol for sending a unidirectional 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.

Destination device (uint8)	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.
Command length (uint8)	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.
Command id (uint8)	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.
Reserved (uint8)	This byte is reserved for alignment and expansion purposes. It should be set to zero.

Command data (uint8[])	The command data may contain between 0 and 60 bytes of data. The format of the data section is defined by the command itself.
Padding (uint8[])	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

Category (uint8)	The category number specifies one of up to 256 configuration categories available on the device.
Parameter (uint8)	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.
Data type (uint8)	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:

0: void/boolean	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.
1: signed byte	Data elements are signed bytes
2: signed 16 bit integer	Data elements are signed 16 bit values
3: signed 32 bit integer	Data elements are signed 32 bit values
4: signed 64 bit integer	Data elements are signed 64 bit values
5: UTF-8 string	Data elements represent a UTF-8 string with no terminating character.

Data types 6 through 127 are reserved.

128: signed 5.11 fixed point	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.

Operation type (uint8)	The operation type specifies what action to perform on the specified parameter. Currently defined values are:
0: assign value	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.
1: offset/toggle value	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.

Data (void)	The data field is 0 or more bytes as determined by the data type and number of elements.
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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	–	0.0	1.0	0.0 = near, 1.0 = far
	0.1	Instantaneous autofocus	void	–	–	–	trigger instantaneous autofocus
	0.2	Aperture (f-stop)	fixed16	–	-1.0	16.0	Aperture Value (where fnumber = $\sqrt{2^{AV}}$)
	0.3	Aperture (normalised)	fixed16	–	0.0	1.0	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	–	0.0	1.0	Move to specified focal length: 0.0 = wide, 1.0 = tele
	0.9	Set continuous zoom (speed)	fixed16	–	-1.0	+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	–	–	fps as integer (eg 24, 25, 30, 50, 60)
				[1] = M-rate	–	–	0 = regular, 1 = M-rate
				[2] = dimensions	–	–	0 = NTSC, 1 = PAL, 2 = 720, 3 = 1080, 4 = 2kDCI, 5 = 2k16:9, 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	128	1x, 2x, 4x, 8x, 16x, 32x, 64x, 128x gain
	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	2	0 = film, 1 = video, 2 = extended 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	–	Current sensor frame rate	5000	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
	1.15	Display LUT	int8	[0] = selected LUT	–	–	0 = None, 1 = Custom, 2 = film to video, 3 = film to extended video
				[1] = enabled or not	–	–	0 = Not enabled, 1 = Enabled

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
	1.16	ND Filter Stop	fixed16	[0] = stop	0.0	15.0	filter power, as f-stop
				[1] = display mode	–	–	0 = stop 1 = density 2 = transmittance
Audio	2.0	Mic level	fixed16	–	0.0	1.0	0.0 = minimum, 1.0 = maximum
	2.1	Headphone level	fixed16	–	0.1	1.0	0.0 = minimum, 1.0 = maximum
	2.2	Headphone program mix	fixed16	–	0.1	1.0	0.0 = minimum, 1.0 = maximum
	2.3	Speaker level	fixed16	–	0.1	1.0	0.0 = minimum, 1.0 = maximum
	2.4	Input type	int8	–	0	3	0 = internal mic, 1 = line level input, 2 = low mic level input, 3 = high mic level input
	2.5	Input levels	fixed16	[0] ch0	0.0	1.0	0.0 = minimum, 1.0 = maximum
				[1] ch1	0.0	1.0	0.0 = minimum, 1.0 = maximum
	2.6	Phantom power	boolean	–	–	–	true = powered, false = not powered
Output	3.0	Overlay enables	uint16 bit field	[0] = bit field	–	–	bit flags: [0] = display status, [1] = display frame guides [2] = clean feed Some cameras don't allow separate control of frame guides and status overlays.
			uint16 bit field	[1] = target displays bit field	–	–	bit flags: [0] = LCD [1] = HDMI [2] = EVF [3] = Main SDI [4] = Front SDI
	3.1	Frame guides style (Camera 3.x)	int8	–	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	–	0.1	1.0	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, 9 = 4:5, 10 = 1:1
				[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, [3] = display horizon

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Display	4.0	Brightness	fixed16	–	0.0	1.0	0.0 = minimum, 1.0 = maximum
	4.1	Exposure and focus tools	uint16 bit field	[0] = bit field	–	–	bit flags: [0] = Zebra [1] = Focus Assist [2] = False Color
			uint16 bit field	[1] = target displays bit field	–	–	bit flags: [0] = LCD [1] = HDMI [2] = EVF [3] = Main SDI [4] = Front SDI
	4.2	Zebra level	fixed16	–	0.0	1.0	0.0 = minimum, 1.0 = maximum
	4.3	Peaking level	fixed16	–	0.0	1.0	0.0 = minimum, 1.0 = maximum
	4.4	Color bar enable	int8	–	0	30	0 = disable bars, 1-30 = enable bars with timeout (seconds)
	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
	4.6	Program return feed enable	int8	–	0	30	0 = disable, 1-30 = enable with timeout (seconds)
	4.7	Timecode Source	signed byte	[0] = source	–	–	0 = Clip, 1 = Timecode
Tally	5.0	Tally brightness	fixed16	–	0.0	1.0	Sets the tally front and tally rear brightness to the same level. 0.0 = minimum, 1.0 = maximum
	5.1	Front tally brightness	fixed16	–	0.0	1.0	Sets the tally front brightness. 0.0 = minimum, 1.0 = maximum
	5.2	Rear tally brightness	fixed16	–	0.0	1.0	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

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
Confi- guration	7.0	Real Time Clock	int32	[0] time	—	—	BCD - HHMMSSFF (UCT)
				[1] date	—	—	BCD - YYYYMMDD
	7.1	System language	string	[0-1]	—	—	ISO-639-1 two character language code
	7.2	Timezone	int32	—	—	—	Minutes offset from UTC
	7.3	Location	int64	[0] latitude	—	—	BCD - s0DDdddddddddd 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
Color Correction	8.0	Lift Adjust	fixed16	[0] red	-2.0	2.0	default 0.0
				[1] green	-2.0	2.0	default 0.0
				[2] blue	-2.0	2.0	default 0.0
				[3] luma	-2.0	2.0	default 0.0
	8.1	Gamma Adjust	fixed16	[0] red	-4.0	4.0	default 0.0
				[1] green	-4.0	4.0	default 0.0
				[2] blue	-4.0	4.0	default 0.0
				[3] luma	-4.0	4.0	default 0.0
	8.2	Gain Adjust	fixed16	[0] red	0.0	16.0	default 1.0
				[1] green	0.0	16.0	default 1.0
				[2] blue	0.0	16.0	default 1.0
				[3] luma	0.0	16.0	default 1.0
	8.3	Offset Adjust	fixed16	[0] red	-8.0	8.0	default 0.0
				[1] green	-8.0	8.0	default 0.0
				[2] blue	-8.0	8.0	default 0.0
				[3] luma	-8.0	8.0	default 0.0
	8.4	Contrast Adjust	fixed16	[0] pivot	0.0	1.0	default 0.5
				[1] adj	0.0	2.0	default 1.0
	8.5	Luma mix	fixed16	—	0.0	1.0	default 1.0
	8.6	Color Adjust	fixed16	[0] hue	-1.0	1.0	default 0.0
				[1] sat	0.0	2.0	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	–	–	0 = CinemaDNG, 1 = DNxHD, 2 = ProRes, 3 = Blackmagic RAW
				[1] = code variant	–	–	CinemaDNG: 0 = uncompressed, 1 = lossy 3:1, 2 = lossy 4:1
					–	–	ProRes: 0 = HQ, 1 = 422, 2 = LT, 3 = Proxy, 4 = 444, 5 = 444XQ
					–	–	Blackmagic RAW: 0 = Q0, 7 = Q1, 8 = Q3, 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
	10.2	Playback Control	int8 enum	[0] = clip	–	–	0 = Previous, 1 = Next
	10.5	Stream	bool	[0] = enabled	–	–	true = enabled, false = disabled
	10.6	Stream Information	void bool	[0] = enabled	–	–	true = enabled, false = disabled
	10.7	Stream Display 3D LUT	void bool	[0] = enabled	–	–	true = enabled, false = disabled

Group	ID	Parameter	Type	Index	Minimum	Maximum	Interpretation
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 (30/04/10)

This section is for third party developers or anybody 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 consist 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.

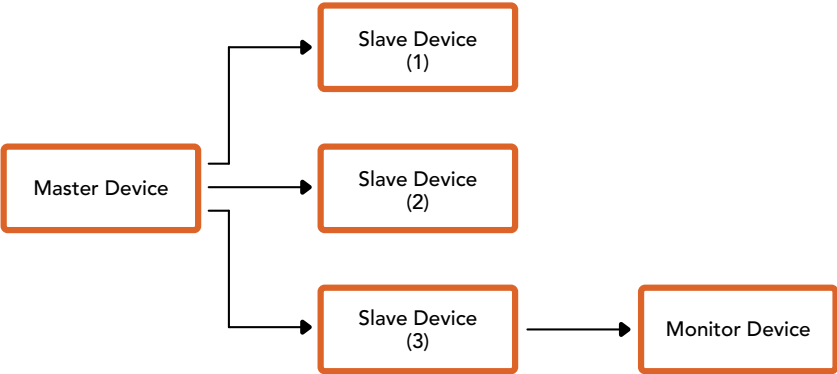
struct tally

```
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	...							

Connecting Tally using the Blackmagic 3G-SDI Shield for Arduino

If you are using an SDI switcher with a tally output connector, you can connect the tally outputs to a Blackmagic 3G-SDI shield for Arduino to send tally signals to your Blackmagic Studio Cameras. This means you can still get tally on your Blackmagic cameras via the SDI program return feed even if you aren't using an ATEM switcher.

For example, the switcher's parallel tally port connects to pins D2 - D9 of the Blackmagic shield and the shield's SDI output is connected to all Blackmagic cameras via a distribution amplifier, such as a Blackmagic Mini Converter SDI Distribution. This way you can send tally to 8 separate Blackmagic cameras.

The Blackmagic camera number must match the switcher's tally outputs, which means you may need to wire a custom connector to make sure the pins correspond to each camera number. The common GND from the switcher's tally connector must be connected to the GND pin of the Blackmagic 3G-SDI Shield.

Below is a configuration example showing how the Blackmagic camera numbers match the tally outputs from the switcher, which are then connected to the pins on the Blackmagic 3G-SDI Shield for Arduino.

Blackmagic Camera Number	Switcher Input Number	Arduino Pin
1	1	D2
2	2	D3
3	3	D4
4	4	D5
5	5	D6
6	6	D7
7	7	D8
8	8	D9

The example sketch in this section shows how the Blackmagic 3G-SDI Shield for Arduino is programmed to send a tally signal to the camera that has been switched to the program output. All SDI switchers that have open collector outputs are configurable for tally using the Blackmagic 3G-SDI Shield for Arduino. Instruction manual from the Blackmagic Design support center at www.blackmagicdesign.com/support.

```

BMD_2_Camera_Tally §

#include <BMDSIDControl.h>

const int          shieldAddress = 0x6E;          // I2C address of shield
BMDSIDTallyControl sdiTallyControl(shieldAddress); // declare sdiTallyControl object

int cameraOneTallyPin = 2; // connect tally connector camera 1 to pin 2
int cameraTwoTallyPin = 3; // connect tally connector camera 2 to pin 3

bool cameraOneTallyChange; // used to check if camera 1 tally status has changed
bool cameraTwoTallyChange; // used to check if camera 2 tally status has changed

void setup()
{
  pinMode(cameraOneTallyPin, INPUT_PULLUP); // define input pins with internal pullup resistors
  pinMode(cameraTwoTallyPin, INPUT_PULLUP);

  cameraOneTallyChange = 0; // initialize tally status
  cameraTwoTallyChange = 0;

  sdiTallyControl.begin(); // initialize sdiTallyControl

  sdiTallyControl.setOverride(true); // allow tally packets to be embeded on SDI stream
}

void loop()
{
  bool cameraOneTally = digitalRead(cameraOneTallyPin); // read camera 1 tally pin
  bool cameraTwoTally = digitalRead(cameraTwoTallyPin); // read camera 2 tally pin

  if (cameraOneTallyChange != cameraOneTally) // only send commands to camera if tally status has changed
  {
    if (cameraOneTally) // turn camera 1 tally ON
    {
      sdiTallyControl.setCameraTally(
        1, // Camera Number
        true, // Program Tally
        false // Preview Tally
      );
    }
    else
    {
      sdiTallyControl.setCameraTally( // turn camera 1 tally OFF
        1, // Camera Number
        false, // Program Tally
        false // Preview Tally
      );
    }
  }

  cameraOneTallyChange = cameraOneTally;

  if (cameraTwoTallyChange != cameraTwoTally) // only send commands to camera if tally status has changed
  {
    if (cameraTwoTally) // turn camera 2 tally ON
    {
      sdiTallyControl.setCameraTally(
        2, // Camera Number
        true, // Program Tally
        false // Preview Tally
      );
    }
    else
    {
      sdiTallyControl.setCameraTally( // turn camera 2 tally OFF
        2, // Camera Number
        false, // Program Tally
        false // Preview Tally
      );
    }
  }

  cameraTwoTallyChange = cameraTwoTally;
}

```

The example sketch above shows how the Blackmagic 3G-SDI Shield for Arduino is programmed to detect a tally signal for input 1 or 2 via the switcher's tally output, and then embed that tally signal into the shield's SDI output. The tally light on the corresponding camera will then illuminate.

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 Blackmagic Micro Studio Camera 4K G2.

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.

Blackmagic Design Forum

The Blackmagic Design forum on our website is a helpful resource you can visit for more information and creative ideas. This can also be a faster way of getting help as there may already be answers you can find from other experienced users and Blackmagic Design staff which will keep you moving forward. You can visit the forum at <https://forum.blackmagicdesign.com>

Contacting Blackmagic Design Support

If you can't find the help you need in our support material or on the forum, 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 Software Version Currently Installed

To check which version of Blackmagic Camera Setup utility software is installed on your computer, open the About Blackmagic Camera Setup utility window.

- On Mac, open Blackmagic Camera Setup utility from the Applications folder. Select About Blackmagic Camera Setup utility from the application menu to reveal the version number.
- On Windows, open Blackmagic Camera Setup utility from your Start menu or Start Screen. Click on the Help menu and select About Blackmagic Camera Setup utility to reveal the version number.

How to Get the Latest Software Updates

After checking the version of Blackmagic Camera Utility software installed on your computer, please visit the Blackmagic Design support center at www.blackmagicdesign.com/support to check for the latest updates. While it is usually a good idea to run the latest updates, it is wise 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.

Class A 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.

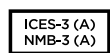
The operation of this equipment is subject to the following two conditions:

- 1 This equipment or device may not cause harmful interference.
- 2 This equipment or device must accept any interference received, including interference that may cause undesired operation.



R-R-BMD-20230627001
R-R-BMD-20241031001
R-R-BMD-20200916001
R-R-BMD-20200916002

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.

Connection to HDMI interfaces must be made with high quality shielded HDMI cables.

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

Blackmagic Micro Studio Camera 4K G2 is suitable for use in tropical locations with an ambient temperature of up to 40°C.

No operator serviceable parts inside product. Refer servicing to your local Blackmagic Design service center.

During sunny conditions, consider shading of the camera to prevent exposure of the camera to extended periods of sunlight.



When using the supplied power adapter, 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 defects or other reproductive harm.

For more information go to www.P65Warnings.ca.gov.

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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