

Matrox MXO2

Installation and User Guide (Mac OS version)

April 22, 2015

matrox[®]
Digital Video Solutions

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1

Introducing Matrox MXO2

This chapter lists the MXO2 system requirements, details the battery requirements and guidelines, and describes the MXO2 documentation.

Welcome to Matrox MXO2

Matrox MXO2 connects to your Mac system to provide broadcast-quality input/output, monitoring, and up/down/cross conversion to streamline your workflow with supported video editing applications. MXO2 provides built-in surround sound monitoring, as well as the flexibility to map any audio track from a video editing application to any audio output. MXO2 also features the Matrox HDMI Calibration Utility, which is a unique tool designed to calibrate your RGB HDMI monitor or television so that it performs like a traditional broadcast video monitor. For Matrox MXO2 products with Matrox MAX technology, the dedicated hardware processor accelerates the creation of H.264 *.mov* files for Blu-ray Disc, the web, and mobile devices.

Matrox MXO2 system requirements

Matrox MXO2 requires a Mac system with the following configuration:



Note For the most up-to-date system requirements, see the Matrox MXO2 Support section of our website at www.matrox.com/video/support.

- Mac OS X Mavericks, Mountain Lion, or Lion. For the supported OS versions for this release, see the “Supported OS and Applications” document provided in the “Downloads” section of the Matrox MXO2 Support website.



Note MXO2 Dock is supported with Mac OS X Mavericks and Mountain Lion only.

- One free PCIe slot to install the Matrox PCIe host adapter (for desktops), or one free ExpressCard/34 slot to install the Matrox PCIe host ExpressCard/34 adapter (for laptops), or one free Thunderbolt port to connect the Matrox MXO2 Thunderbolt adapter or MXO2 Dock.



Note A third-party Thunderbolt cable is required to connect the Matrox MXO2 Thunderbolt adapter or Matrox MXO2 Dock to your computer.

- We recommend an HDMI monitor that supports the following:
 - An HDMI input resolution of 1920×1080 for previewing all HD formats.
 - 1:1 pixel mapping for displaying your MXO2 output at its exact resolution, and for use with the Matrox HDMI Calibration Utility.

Supported programs

For a complete list of the third-party applications supported with this release, see the “Supported OS and Applications” document provided in the “Downloads” section of the Matrox MXO2 Support website.

Check our website for equipment information

For up-to-date information about recommended computer systems, batteries, and other MXO2-compatible devices, check the Matrox MXO2 Support section of our website at www.matrox.com/video/support.

Battery requirements and guidelines for MXO2



Note This section does not apply to Matrox MXO2 Rack and Matrox MXO2 Mini as they cannot be powered by a battery.

As an alternative to using an AC outlet, you can use a battery to power Matrox MXO2 or MXO2 LE. To avoid damage to your MXO2 system and peripheral devices when using a battery, please observe the following requirements and guidelines. For instructions on how to connect a battery, see “[Powering MXO2](#)” on page 12 or “[Powering MXO2 LE](#)” on page 32.

- Use a standard self-protected (fused) battery with a nominal voltage of 12V, 13.2V, or 14.4V. A higher-voltage battery will damage your MXO2 system.
- Disconnect MXO2 from the battery when not in use. Do not leave MXO2 connected to the battery when not in use as this may damage your MXO2 system and/or battery.
- Do not power your MXO2 using your vehicle’s battery via the power socket.



Caution To avoid damage to your MXO2 system and peripheral devices, use a Matrox-recommended battery. For a list of batteries recommended for use with your MXO2, visit the Matrox MXO2 Support section of our website at www.matrox.com/video/support.

About this guide

This guide provides you with information about installing and using your Matrox MXO2 hardware and software, including how to configure your Matrox MXO2 for use with supported programs.

Style conventions

The following style conventions are used in this guide:

- The names of files, folders, and documents appear in *italics*. For example:
 - The data is stored in the *Sample Movie* file.
 - The file is located in the *Clips* folder.
 - Please refer to your *Matrox MXO2 Installation and User Guide*.
- Menus and commands that you need to choose are displayed in the form **Menu > Command**. For example, **File > Save** means click **File** in the menu bar, and then click **Save** in the menu that appears.

How video formats are expressed

With the exception of NTSC and PAL, all SD and HD video formats are expressed in the Matrox MXO2 documentation as follows:

VRp or **i** or **PsF** at **n fps**

Where:

- **VR** is the vertical resolution. For 1440×1080 video, however, both the horizontal and vertical resolutions are specified.
- **p** or **i** or **PsF** represents either progressive, interlaced, or progressive segmented frame video.
- **n fps** is the frame rate in frames per second.

Here are some examples:

- **486p** at **23.98 fps** Represents 720×486 progressive video at 23.98 frames per second.
- **720p** at **59.94 fps** Represents 1280×720 progressive video at 59.94 frames per second.
- **1440x1080i** at **29.97 fps** Represents 1440×1080 interlaced video at 29.97 frames per second. This format is used for HDV 1080i material.
- **1080i** at **29.97 fps** Represents full-size 1920×1080 interlaced video at 29.97 frames per second.

Last-minute information

Any important information that wasn't available for inclusion in this manual by publication time is provided to you in the *Matrox MXO2 Release Notes*.

2

Installing Your Matrox MXO2 Hardware and Software

This chapter describes how to install Matrox MXO2 hardware (PCIe adapters only) and software.

Important installation information

This chapter explains how to install Matrox software and hardware on your Mac system. However, hardware installation is required only if you'll be using MXO2 with the Matrox MXO2 PCIe host adapter or Matrox MXO2 PCIe ExpressCard/34 adapter. If you want to use MXO2 with the Matrox MXO2 Thunderbolt adapter or MXO2 Dock, hardware installation is not required.

Before installing your Matrox hardware

Read the following information carefully before attempting to install the Matrox MXO2 PCIe host adapter on your Mac system.

Start with a functioning system

Before attempting any Matrox MXO2 installation, you should have a Mac computer system with Mac OS X fully installed and functioning smoothly. This will avoid potential problems later on.

Avoid costly damage

Static electricity from your body can damage your Matrox PCIe host adapter or your computer. Although you may not notice it, static electricity is generated every time you move. It's often too small to cause a spark, but it can still cause damage to sensitive electronic components or at least reduce their lifespan.

To avoid damage, please observe the following precautions:

- Do not remove your Matrox PCIe host adapter from its antistatic bag until you're ready to install it. Before removing the card, place the package within easy reach of the area where you intend to perform the installation.
- You should avoid touching the chips and other components on the circuit board. Try to handle the card by its edges.
- Try to work in an area where the relative humidity is at least 50%.
- Do not wear wool or synthetic clothing. These fabrics tend to generate more static electricity than cotton, which is best for this kind of work.
- Turn off the power switches on your computer and its connected components.

Once you've opened your computer, drain static electricity from your body by touching a bare metal surface on your computer chassis before you install or remove any parts of your system. If you have a grounding wrist strap, use it while handling and installing any components in your computer.

Installing your Matrox PCIe adapter

This section details how to install the Matrox MXO2 host adapter and Matrox MXO2 host ExpressCard/34 adapter on your Mac computer.



Note If you want to use MXO2 with the Matrox MXO2 Thunderbolt adapter or MXO2 Dock, hardware installation is not required.

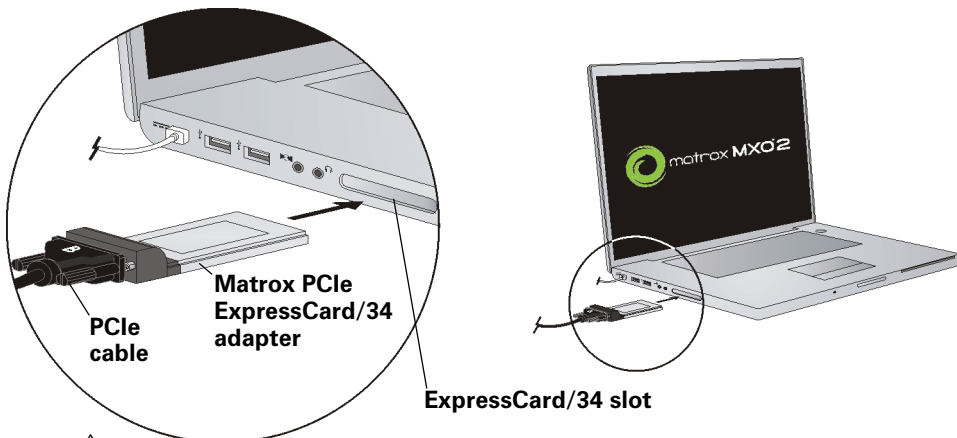
Installing your PCIe host adapter (for desktops)

The Matrox PCIe host adapter is a standard low-profile PCIe x1 card designed to operate in an Intel-based Mac system. For detailed instructions on how to perform the following steps, refer to your Mac desktop computer's documentation.

- 1 Shut down the computer, unplug the power cord and all the cables from the unit, and open the computer's chassis.
- 2 Insert the Matrox PCIe host adapter in an available PCIe slot in the computer, and secure the adapter into place.
- 3 Close the computer chassis, and reconnect the power cord and all the cables to the unit.

Installing your PCIe host ExpressCard/34 adapter (for laptops)

The Matrox PCIe host ExpressCard/34 adapter is designed to operate in your Mac laptop's ExpressCard/34 slot. You can install the Matrox PCIe host ExpressCard/34 adapter when your laptop is on or off. Connect the Matrox PCIe cable to the host ExpressCard/34 adapter, and then insert the host adapter in your laptop's ExpressCard/34 slot until the adapter clicks into place. For details on how to safely remove your Matrox PCIe host ExpressCard/34 adapter from your laptop, see [“Removing your PCIe host ExpressCard/34 adapter”](#) on page 8.




Caution To ensure functionality and avoid damaging the PCIe cable or host connector, the side labeled “B” on the PCIe cable connector must face the top of the Matrox PCIe ExpressCard/34 adapter.

Removing your PCIe host ExpressCard/34 adapter

You can remove the Matrox PCIe host ExpressCard/34 adapter when the laptop is either on or off. However, you must power off the card before removing it.



Important Do not disconnect the PCIe cable from the Matrox PCIe host ExpressCard/34 adapter when your laptop is running. Instead, remove the adapter from your laptop with the Matrox PCIe cable attached.

- 1 Close all video/audio applications that are running on your system.
- 2 From the menu bar, click the ExpressCard icon ()
- 3 Click **Power off Card**.
- 4 Remove the Matrox PCIe host ExpressCard/34 adapter from your laptop's ExpressCard/34 slot.

Installing your Matrox MXO2 software

You can install the MXO2 software on a computer with or without the MXO2 hardware connected. To download and install the latest version of the MXO2 software, visit the MXO2 Support section of our website at www.matrox.com/video/support. You can also contact your MXO2 dealer for the latest software.



Important

- If your MXO2 system also includes a Matrox CompressHD card, you **must** install the Matrox MAX Utilities software, even if your MXO2 hardware does not include Matrox MAX technology. Installing the Matrox MAX Utilities software installs the software for your CompressHD card as well. If the CompressHD software is already installed on your computer, you must uninstall it before installing the Matrox MAX Utilities software.
- If you plan on working with a supported video editing application, such as Adobe Premiere Pro, you **must** install that application before installing the MXO2 software.

Updating your MXO2 firmware

When you install the MXO2 software while your MXO2 hardware is powered and connected to your Mac system, the software installation automatically verifies the firmware on your MXO2 hardware and updates it if required. However, if you install the MXO2 software on your Mac system without a powered MXO2 connected, your MXO2 hardware may have a firmware version that is not supported by the installed MXO2 software. If your MXO2 hardware has an incompatible firmware version when you later connect the MXO2 hardware to your Mac system, the **Matrox Utilities** preferences window options will be unavailable and a message regarding the incompatibility between the

MXO2 software and MXO2 firmware will appear on the **Info** pane (see [“Viewing MXO2 information”](#) on page 72), along with a **Launch firmware updater** button.

To update the MXO2 firmware from the **Matrox Utilities** preferences window, make sure your MXO2 hardware is powered and connected to your computer, and then click **Launch firmware updater** on the **Info** pane to run the Matrox Firmware Updater. You’ll be required to shut down your system, with your MXO2 powered and connected to your computer, to complete the firmware update. If updating the firmware for Matrox MXO2 Mini, you must unplug your MXO2 Mini from the AC outlet, and then re-plug it before restarting your system.



Caution Do not disconnect or power off MXO2, or interrupt the firmware update during the update process. Doing so may damage your MXO2 hardware.

Alternately, you can update your MXO2 firmware by running the Matrox firmware updater from the Finder window as follows:

- 1 With your Mac system shut down, supply power to your MXO2, and connect it to your Mac system.
- 2 Start your computer.
- 3 In the **Finder** menu, choose **File > New Finder Window**.
- 4 In the **Applications** folder, click the Matrox utilities folder, and then double-click the firmware updater file to run the Matrox Firmware Updater. You’ll be required to shut down your system, with your MXO2 powered and connected to your computer, to complete the firmware update. If updating the firmware for Matrox MXO2 Mini, you must unplug your MXO2 Mini from the AC outlet, and then re-plug it before restarting your system.

Disable App Nap for editing applications on Mac OS X Mavericks

To avoid issues with using your editing applications on a Mac OS X Mavericks system, you should turn off the App Nap feature for those applications. To do this, open the application’s folder (such as for Final Cut Pro), right-click the application, choose **Get Info**, and in the displayed pane, select **Prevent App Nap** in the **General** section. When App Nap is disabled, the application will always run at full power.

Removing your Matrox MXO2 software

Perform the following steps to remove the MXO2 software from your Mac system.

- 1 In the **Finder** menu, choose **File > New Finder Window**.
- 2 In the **Applications** folder, click the Matrox utilities folder, and then double-click the software uninstaller file.
- 3 In the uninstaller dialog box, select or clear the **Delete the Matrox software user preferences** option. When selected, all current user settings in the **Matrox Utilities** preferences window will be removed from your computer. Clear this option if you wish to keep your current MXO2 user settings for a future MXO2 software installation.
- 4 Click **Continue**.
- 5 Enter your administrator password, and click **OK** to remove the MXO2 software from your computer.

3

Connecting External Devices to Matrox MXO2

This chapter shows how to supply power and connect external devices to Matrox MXO2.



Note This chapter details how to connect external devices to Matrox MXO2 only. For another MXO2 product, see [Chapter 4, “Connecting External Devices to Matrox MXO2 Rack”](#), [Chapter 5, “Connecting External Devices to Matrox MXO2 LE”](#), or [Chapter 6, “Connecting External Devices to Matrox MXO2 Mini.”](#)

Available MXO2 connections

Matrox MXO2 features a full compliment of professional inputs and outputs, and allows you to connect multiple devices for up to five user-selectable simultaneous video outputs.

MXO2 video connections

- One HD HDMI input and one HD/SD HDMI output, both with up to eight channels of embedded audio support. The HDMI input/output supports YUV and RGB devices.
- One HD/SD SDI input and two HD/SDI outputs with up to 16 channels of embedded audio. Both SDI outputs simultaneously output the same video and embedded audio.
- One HD/SD analog component input/output, one S-Video input/output, and one composite input/output.
- Analog black burst reference input.

MXO2 audio connections

- Two balanced analog XLR inputs (stereo pair).
- Four balanced analog XLR outputs (two stereo pairs).
- One AES/EBU stereo input/output.
- Two unbalanced analog RCA inputs (stereo pair).
- Six unbalanced analog RCA outputs (for surround sound monitoring).

Powering MXO2

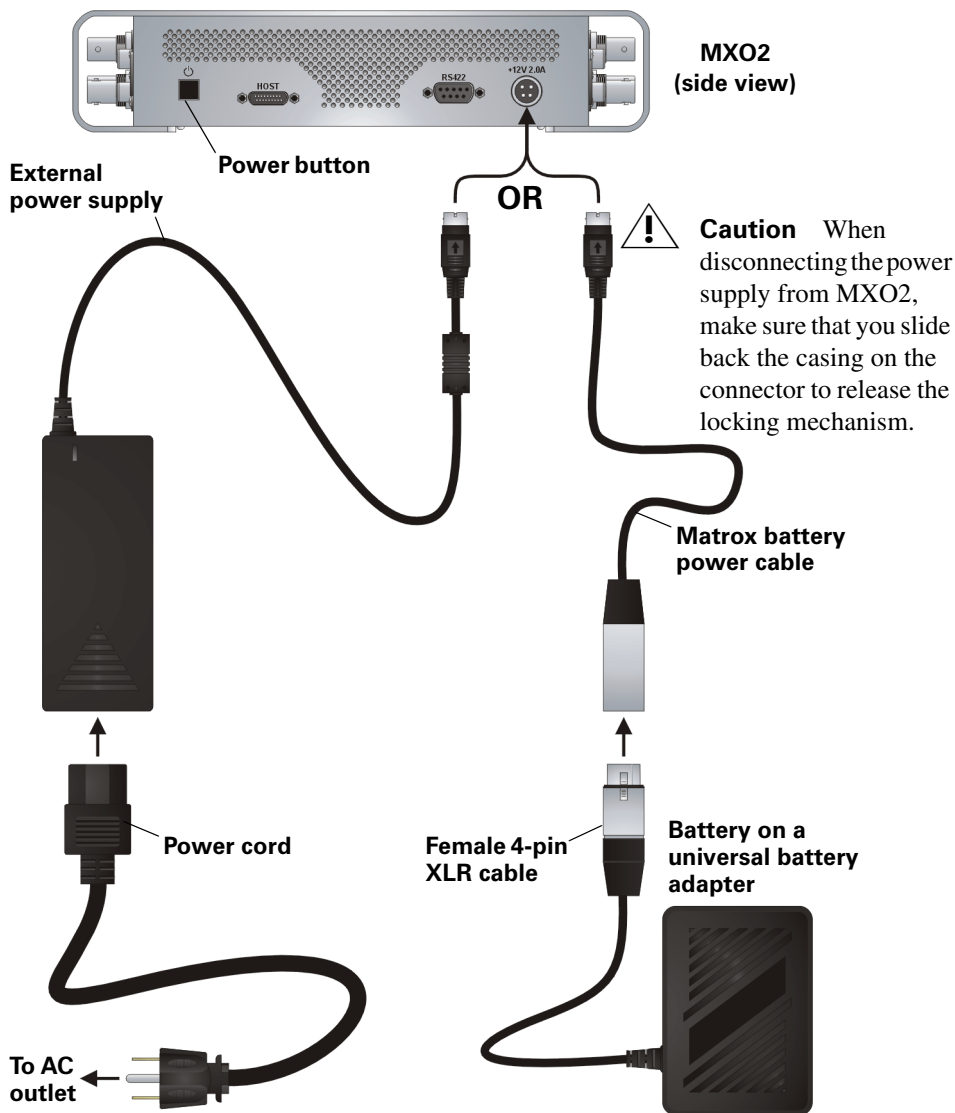
Supply power to MXO2 using an AC outlet via the Matrox external power supply and a power cord, or using a battery via the Matrox battery power cable. Matrox MXO2 connects to the battery via a 4-pin XLR connector. For information on how to connect your battery to portable video equipment, such as Matrox MXO2, contact the battery manufacturer. Before connecting MXO2 to a battery, please read the [“Battery requirements and guidelines for MXO2”](#) on page 3.

MXO2 power functionality

MXO2 features a power button that you can use to manually turn the MXO2 on and off. However, when power is supplied to MXO2 and it is connected to your Mac system, the MXO2 will turn on or off automatically when you start up or

shut down your Mac system. That is, when you shut down your Mac system, your MXO2 turns off. Starting up your Mac system turns your MXO2 on. To manually turn your MXO2 on, press the power button. To turn off your MXO2, press and hold the power button for at least two seconds.

i Important When MXO2 is connected to a Mac system that is running, do not disconnect MXO2 from its power source, or power off MXO2. Shut down your Mac system before removing power from MXO2. If using a battery to power MXO2, ensure that the battery is sufficiently charged.



Powering MXO2

Connecting MXO2 to your Mac system

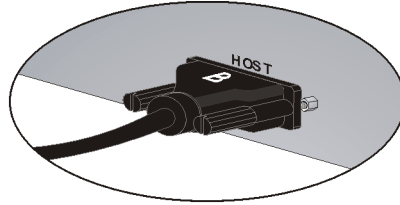
Connect MXO2 to your Mac system using the Matrox PCIe cable and the appropriate Matrox host adapter or MXO2 Dock.

Ensuring proper PCIe cable connection

To ensure functionality and avoid damaging the PCIe cable or host connector when connecting MXO2 to your computer, the PCIe cable must be connected to your MXO2 and host connector as shown below:

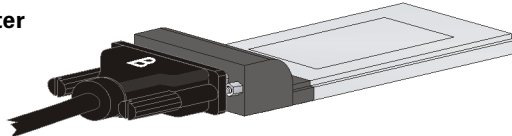
To Matrox MXO2

“B” side of PCIe cable must face the side labeled “HOST” on MXO2.



To Matrox PCIe ExpressCard/34 adapter

“B” side of PCIe cable must face the top of the Matrox PCIe ExpressCard/34 adapter.



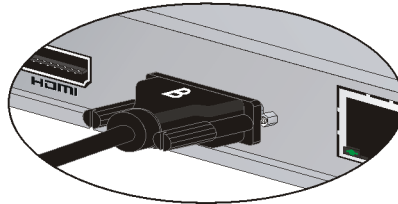
To Matrox MXO2 Thunderbolt adapter

“B” side of PCIe cable must face the side labeled “HOST” on the Matrox MXO2 Thunderbolt adapter.



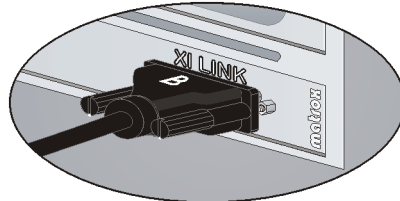
To Matrox MXO2 Dock

“B” side of PCIe cable must face the top of MXO2 Dock.



To Matrox PCIe host adapter

“B” side of PCIe cable must face the side labeled “XI LINK” on the Matrox PCIe host adapter.



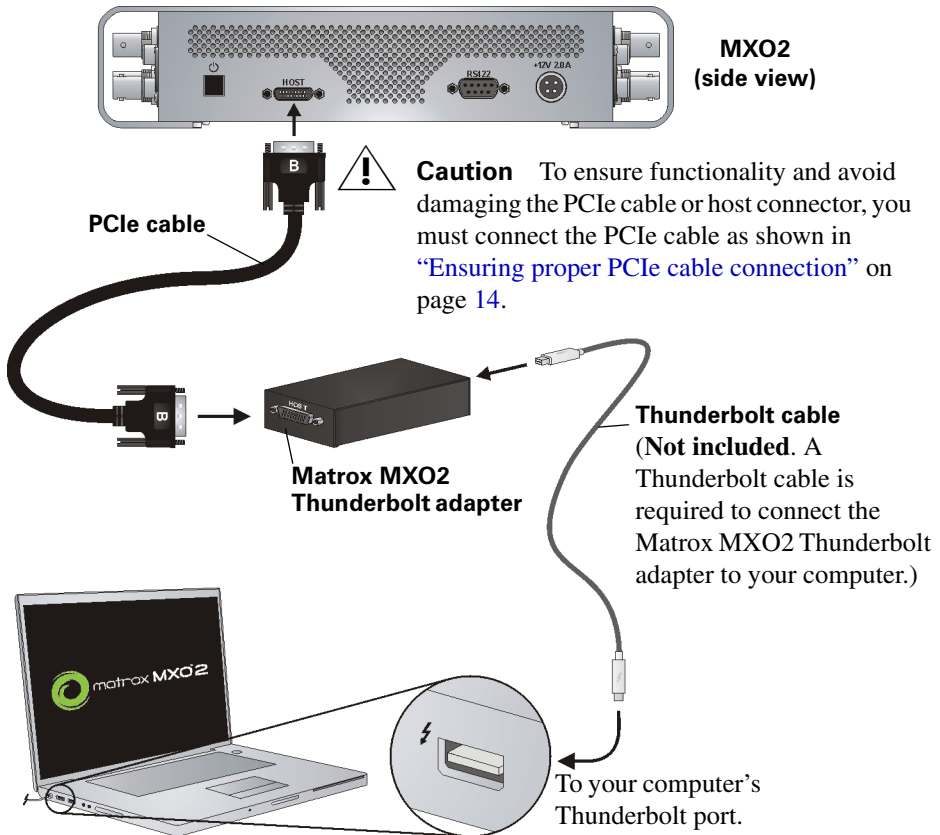
Using Matrox MXO2 Dock

For instructions on how to connect and use Matrox MXO2 Dock, see [Appendix E, “Connecting and Using Matrox MXO2 Dock,”](#) on page 185.

Using the Matrox MXO2 Thunderbolt adapter

Use the Matrox MXO2 Thunderbolt adapter to connect MXO2 to your computer’s Thunderbolt port. When doing this, it may take up to ten seconds for your MXO2 to be detected by your system and its applications.

i Important Make sure that the Matrox PCIe cable is connected to the adapter and MXO2 before connecting the adapter to your computer via the Thunderbolt cable. If you want to disconnect or connect MXO2 when your system is running, you must do it by disconnecting/connecting the Thunderbolt cable. Do not disconnect the Matrox PCIe cable from the adapter, or MXO2, when your Mac system is running.

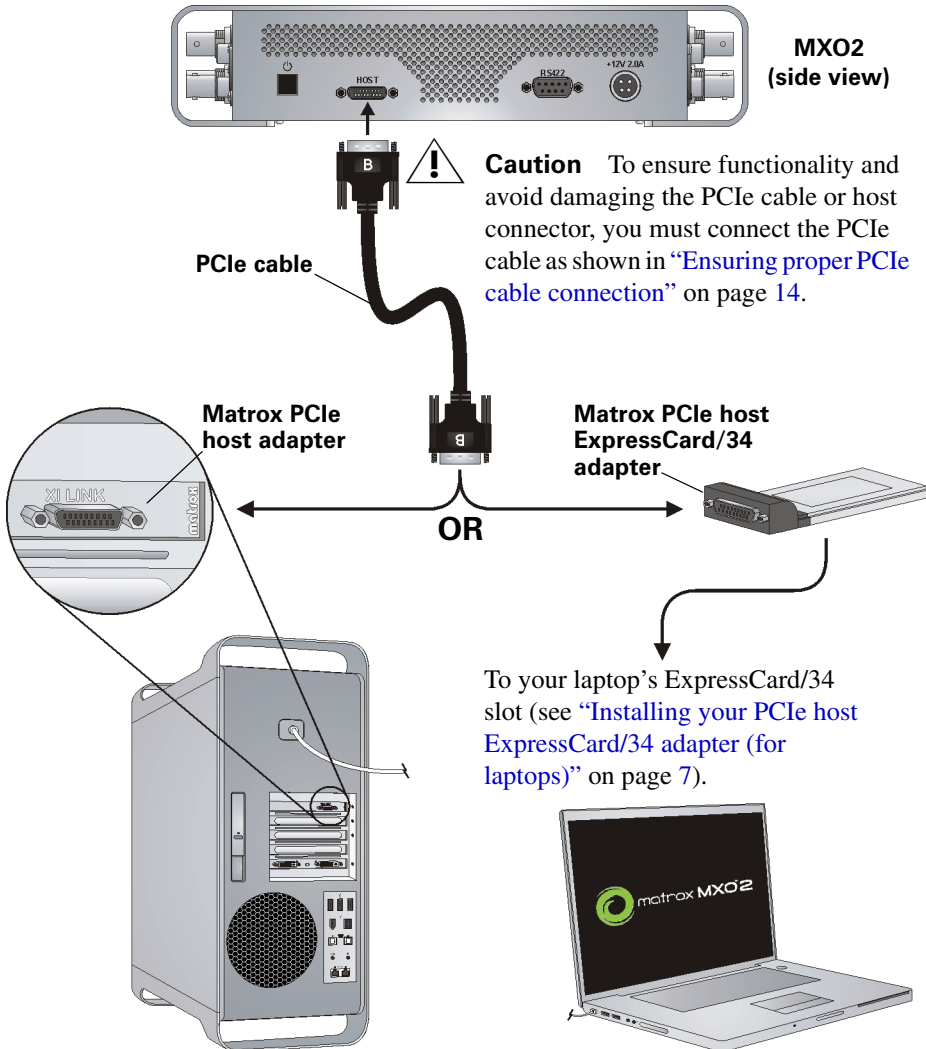


Using the Matrox PCIe host adapters

For MXO2 to be detected on a Mac desktop system, power must be supplied to MXO2 (see [“Powering MXO2”](#) on page 12), and it must be connected to your computer before starting up your system.

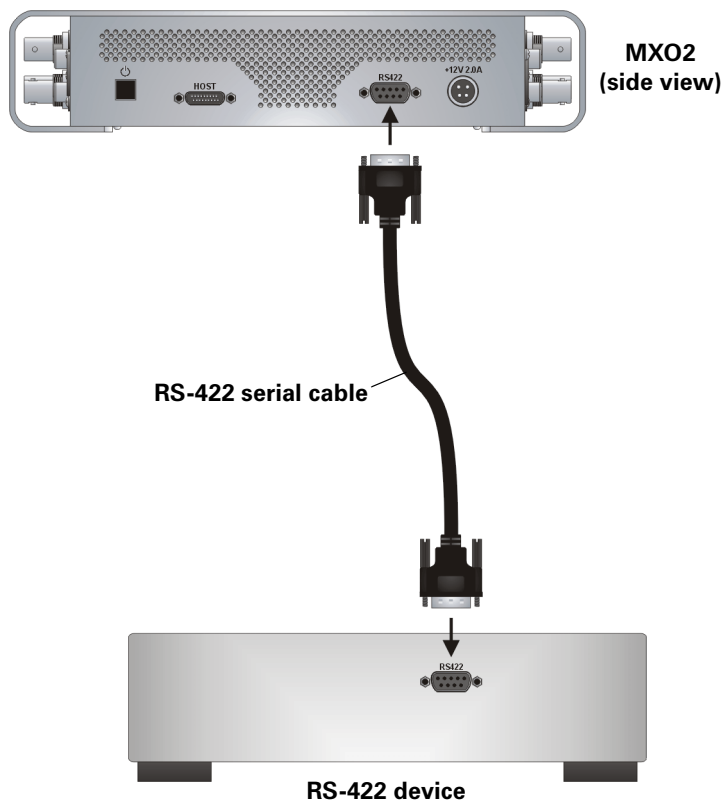


Important Do not disconnect the Matrox PCIe cable from the adapter, or MXO2, when your Mac system is running. To safely remove the Matrox PCIe host ExpressCard/34 adapter, see [“Removing your PCIe host ExpressCard/34 adapter”](#) on page 8.



MXO2 RS-422 serial connection

MXO2's RS-422 serial connector allows a video editing application, such as Adobe Premiere Pro, to control a device that uses the RS-422 SMPTE time code protocol, such as a VTR or digital disk recorder, to ensure frame-accurate capture and export to tape.

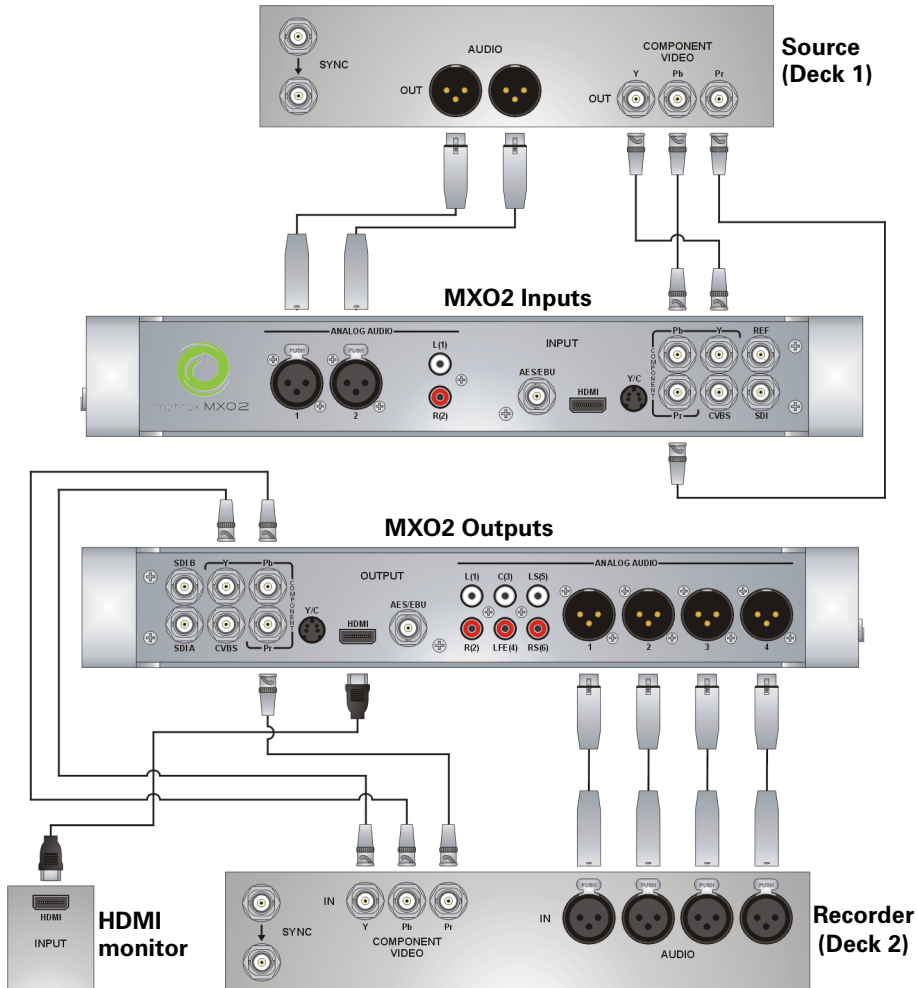


Typical Matrox MXO2 connections

In the following typical connection examples, we've connected a monitor to view the signal that will be recorded, and separate source and record decks. You may, however, use the same deck as both your source and record device by making the input and output connections to a single deck. For details on the Matrox MXO2 connectors, see [Appendix B, "Matrox MXO2 Connectors."](#)

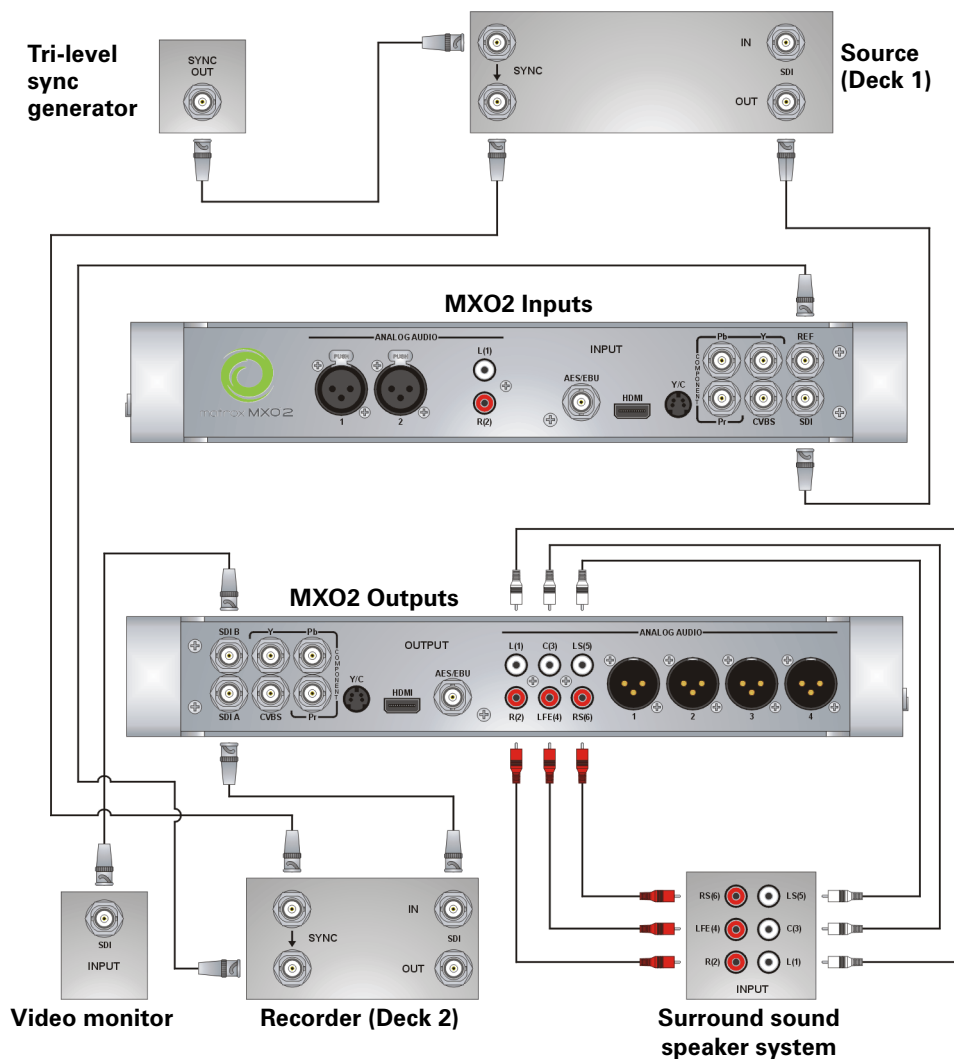
Analog component video connections

In this illustration, we're using analog component connectors for video, XLR connectors for audio, and an HDMI connector for video monitoring. The video is genlocked using MXO2's internal genlock.



Digital video connections

In this illustration, we're using SDI connectors for video and audio, an SDI connector for video monitoring, and we're monitoring the audio on a surround sound speaker system through RCA connectors. The video is genlocked using a tri-level sync generator.



Typical Matrox MXO2 connections

Your notes

4

Connecting External Devices to Matrox MXO2 Rack

This chapter shows how to rack mount, supply power, and connect external devices to Matrox MXO2 Rack.



Note This chapter details how to connect external devices to Matrox MXO2 Rack only. For another MXO2 product, see [Chapter 3, “Connecting External Devices to Matrox MXO2”](#), [Chapter 5, “Connecting External Devices to Matrox MXO2 LE”](#), or [Chapter 6, “Connecting External Devices to Matrox MXO2 Mini.”](#)

Available MXO2 Rack connections

Matrox MXO2 Rack features a full compliment of professional inputs and outputs, and allows you to connect multiple devices for up to five user-selectable simultaneous video outputs.

MXO2 Rack video connections

- One HD HDMI input and one HD/SD HDMI output, both with up to eight channels of embedded audio support. The HDMI input/output supports YUV and RGB devices.
- One HD/SD SDI input and two HD/SDI outputs with up to 16 channels of embedded audio. Both SDI outputs simultaneously output the same video and embedded audio.
- One HD/SD analog component input/output, one S-Video input/output, and one composite input/output.
- One analog black burst reference input and loop-through output.

MXO2 Rack audio connections

- Four balanced analog XLR inputs (two stereo pairs).
- Eight balanced analog XLR outputs (four stereo pairs).
- Two AES/EBU stereo inputs/outputs.

Rack mounting your MXO2 Rack

Use the supplied rackmount brackets to mount your Matrox MXO2 Rack to a standard 19-inch rack. The rackmount brackets can be used to either front or rear mount your MXO2 Rack. You can also mount MXO2 Rack so that it's recessed to allow more space for cables. MXO2 Rack takes up two vertical rack unit spaces.

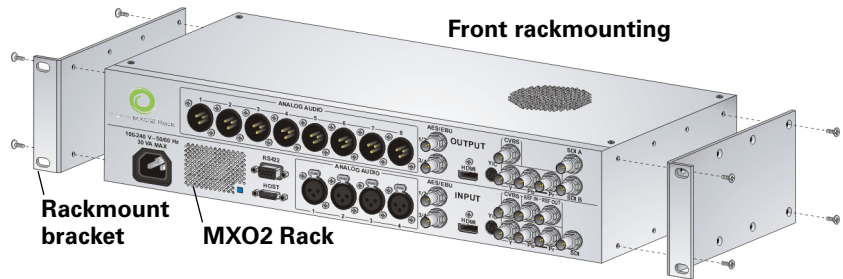
- 1 Unpack the two rackmount brackets and their eight mounting screws.



Caution Use only the screws supplied with your MXO2 Rack to attach the rackmount brackets to your MXO2 Rack. If you use screws that are larger or longer than the ones supplied, you can damage your equipment.

- 2 Depending if you want to front or rear mount your MXO2 Rack, position the rackmount brackets so that the bracket face is either towards the front (connector side) or the back of your MXO2 Rack.

- 3 MXO2 Rack can be recess mounted to allow extra space for connectors and cables. Depending on your mounting needs, align the screw holes on each rackmount bracket with the desired screw holes on either side of the MXO2 Rack.



Caution For stability and safety, whichever mounting method you choose, make sure to fasten each rackmount bracket to MXO2 Rack using all four supplied screws.

- 4 Using a hand screwdriver only (**no power screwdrivers**), carefully tighten each screw until snug. **Do not overtighten!**
- 5 Fasten your MXO2 Rack to the standard 19-inch rack as per your rack's instructions.

Powering MXO2 Rack

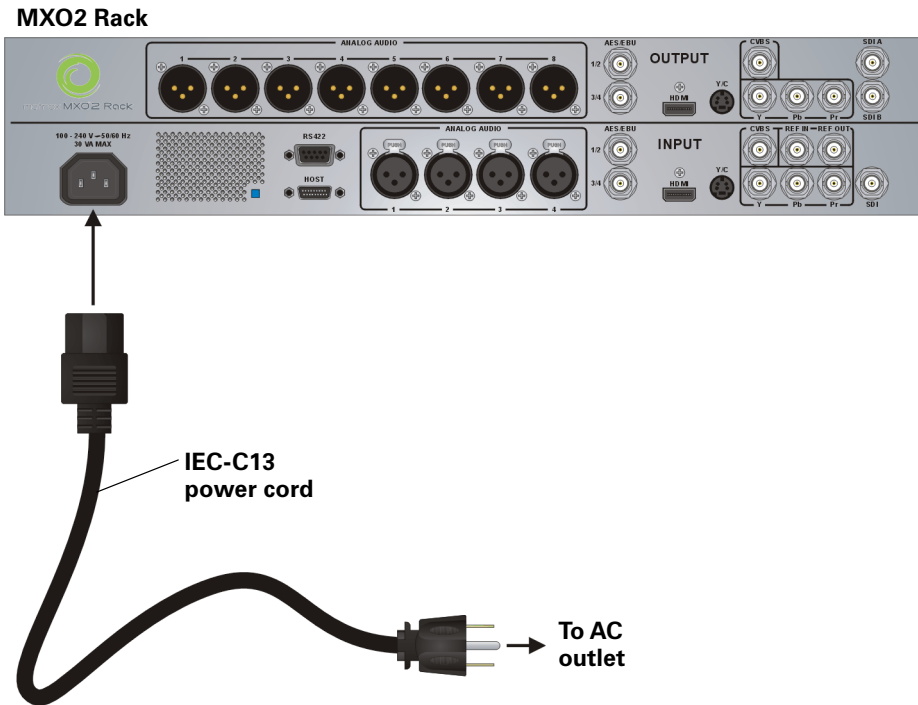
You can power MXO2 Rack using an AC outlet and an IEC-C13 power cord.

MXO2 power functionality

When power is supplied to MXO2 Rack and it is connected to your Mac system, the MXO2 Rack will turn on or off automatically when you start up or shut down your Mac system. That is, when you shut down your Mac system, your MXO2 Rack turns off. Starting up your Mac system turns your MXO2 Rack on.



Important When MXO2 Rack is connected to a Mac system that is running, do not disconnect MXO2 Rack from its power source. Shut down your Mac system before removing power from MXO2 Rack.



Connecting MXO2 Rack to your Mac system

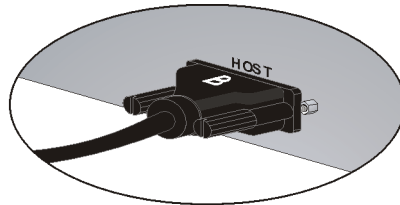
Connect MXO2 Rack to your Mac system using the Matrox PCIe cable and the appropriate Matrox host adapter or MXO2 Dock.

Ensuring proper PCIe cable connection

To ensure functionality and avoid damaging the PCIe cable or host connector when connecting MXO2 Rack to your computer, the PCIe cable must be connected to your MXO2 Rack and host connector as shown below:

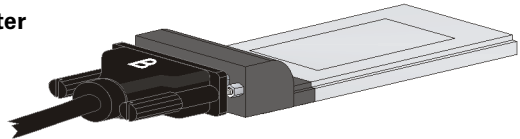
To Matrox MXO2 Rack

“B” side of PCIe cable must face the side labeled “HOST” on MXO2 Rack.



To Matrox PCIe ExpressCard/34 adapter

“B” side of PCIe cable must face the top of the Matrox PCIe ExpressCard/34 adapter.



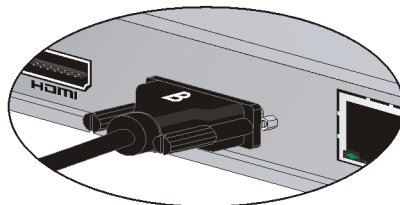
To Matrox MXO2 Thunderbolt adapter

“B” side of PCIe cable must face the side labeled “HOST” on the Matrox MXO2 Thunderbolt adapter.



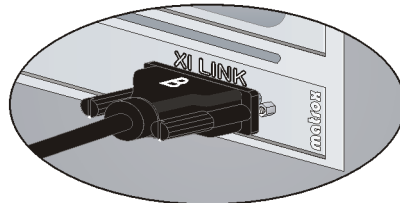
To Matrox MXO2 Dock

“B” side of PCIe cable must face the top of MXO2 Dock.



To Matrox PCIe host adapter

“B” side of PCIe cable must face the side labeled “XI LINK” on the Matrox PCIe host adapter.



Using Matrox MXO2 Dock

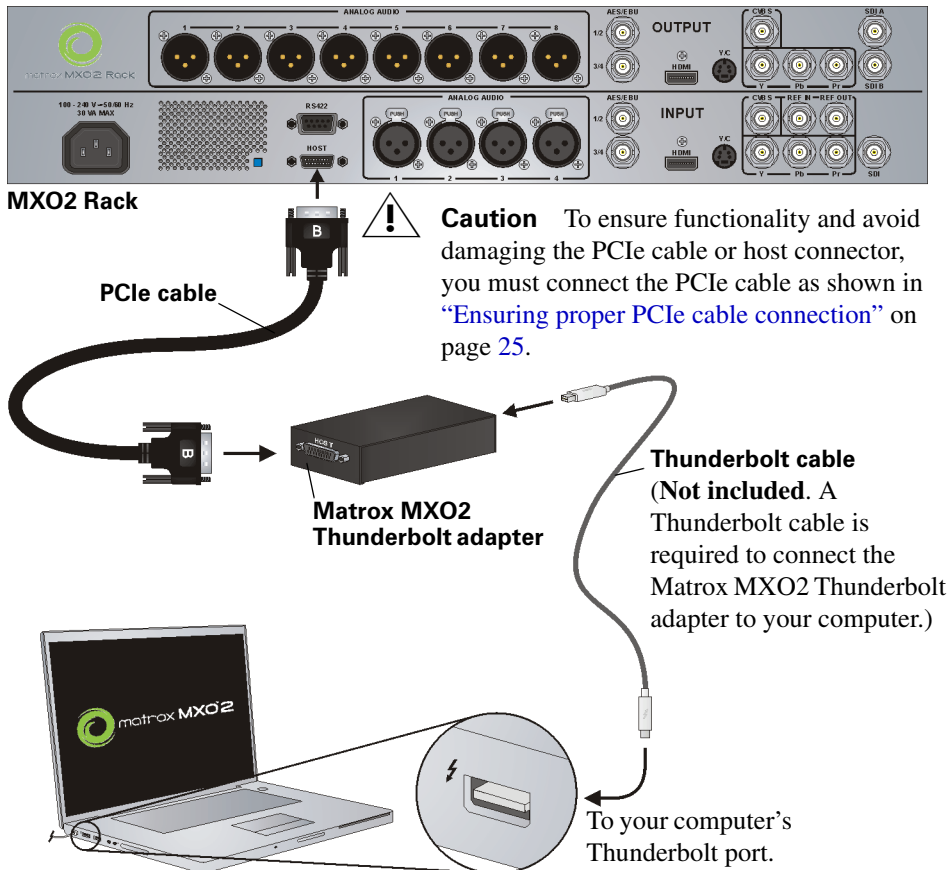
For instructions on how to connect and use Matrox MXO2 Dock, see [Appendix E, “Connecting and Using Matrox MXO2 Dock,”](#) on page 185.

Using the Matrox MXO2 Thunderbolt adapter

Use the Matrox MXO2 Thunderbolt adapter to connect MXO2 Rack to your computer's Thunderbolt port. When doing this, it may take up to ten seconds for your MXO2 Rack to be detected by your system and its applications.



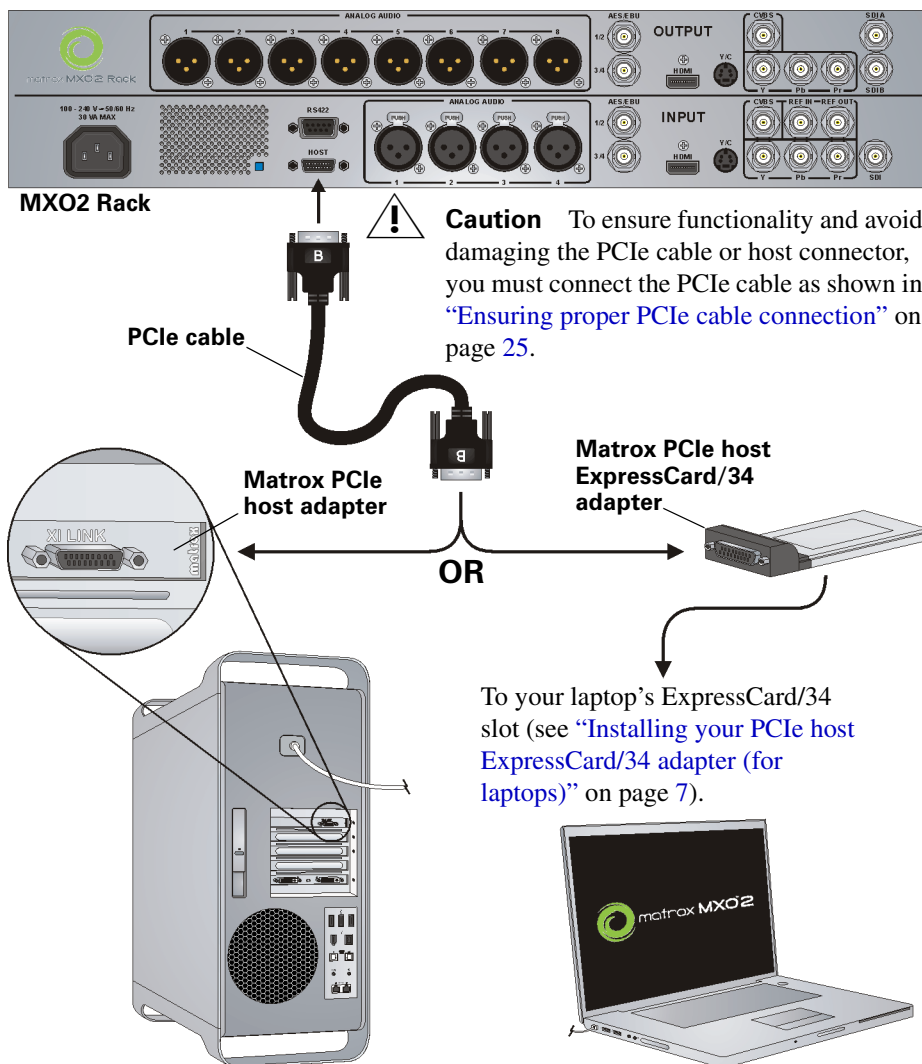
Important Make sure that the Matrox PCIe cable is connected to the adapter and MXO2 Rack before connecting the adapter to your computer via the Thunderbolt cable. If you want to disconnect or connect MXO2 Rack when your system is running, you must do it by disconnecting/connecting the Thunderbolt cable. Do not disconnect the Matrox PCIe cable from the adapter, or MXO2 Rack, when your Mac system is running.



Using the Matrox PCIe host adapters

For MXO2 Rack to be detected on a Mac desktop system, power must be supplied to MXO2 Rack (see [“Powering MXO2 Rack”](#) on page 24), and it must be connected to your computer before starting up your system.

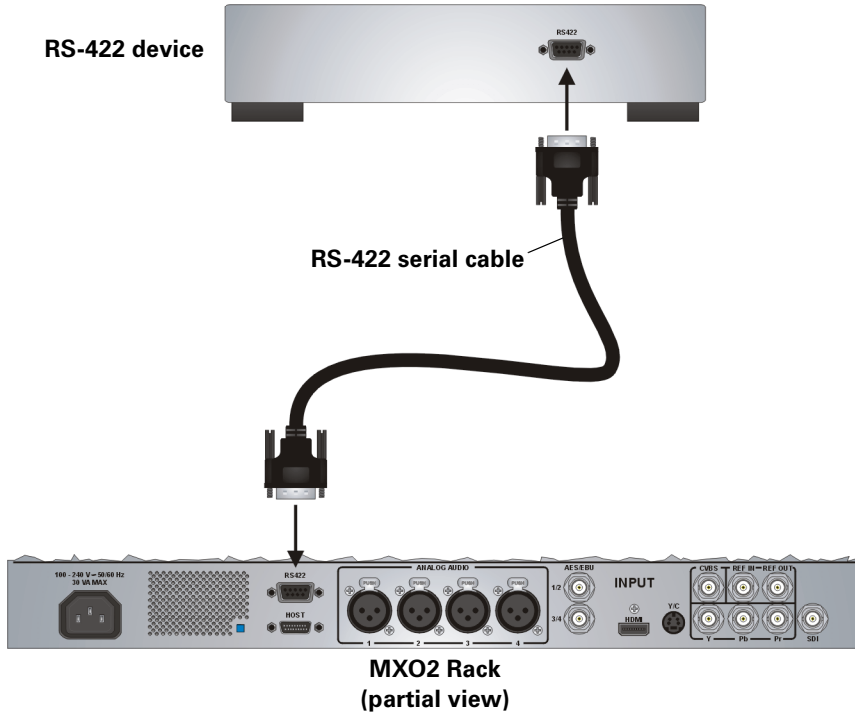
Important Do not disconnect the Matrox PCIe cable from the adapter, or MXO2 Rack, when your Mac system is running. To safely remove the Matrox PCIe host ExpressCard/34 adapter, see [“Removing your PCIe host ExpressCard/34 adapter”](#) on page 8.



Connecting MXO2 Rack to your Mac system

MXO2 Rack RS-422 serial connection

The Matrox MXO2 Rack RS-422 serial connector allows a video editing application, such as Adobe Premiere Pro, to control a device that uses the RS-422 SMPTE time code protocol, such as a VTR or digital disk recorder, to ensure frame-accurate capture and export to tape.

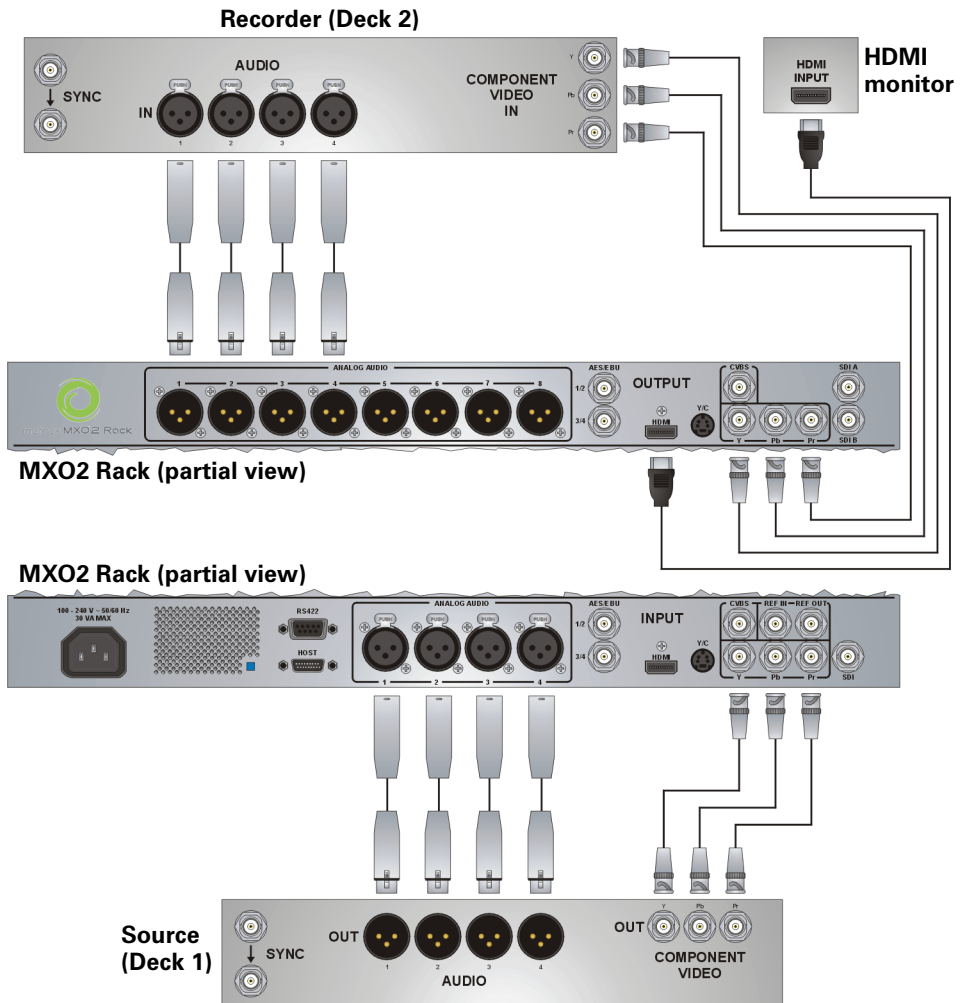


Typical Matrox MXO2 Rack connections

In the following typical connection examples, we've connected a monitor to view the signal that will be recorded, and separate source and record decks. You may, however, use the same deck as both your source and record device by making the input and output connections to a single deck. For details on the Matrox MXO2 Rack connectors, see [Appendix B, "Matrox MXO2 Connectors."](#)

Analog component video connections

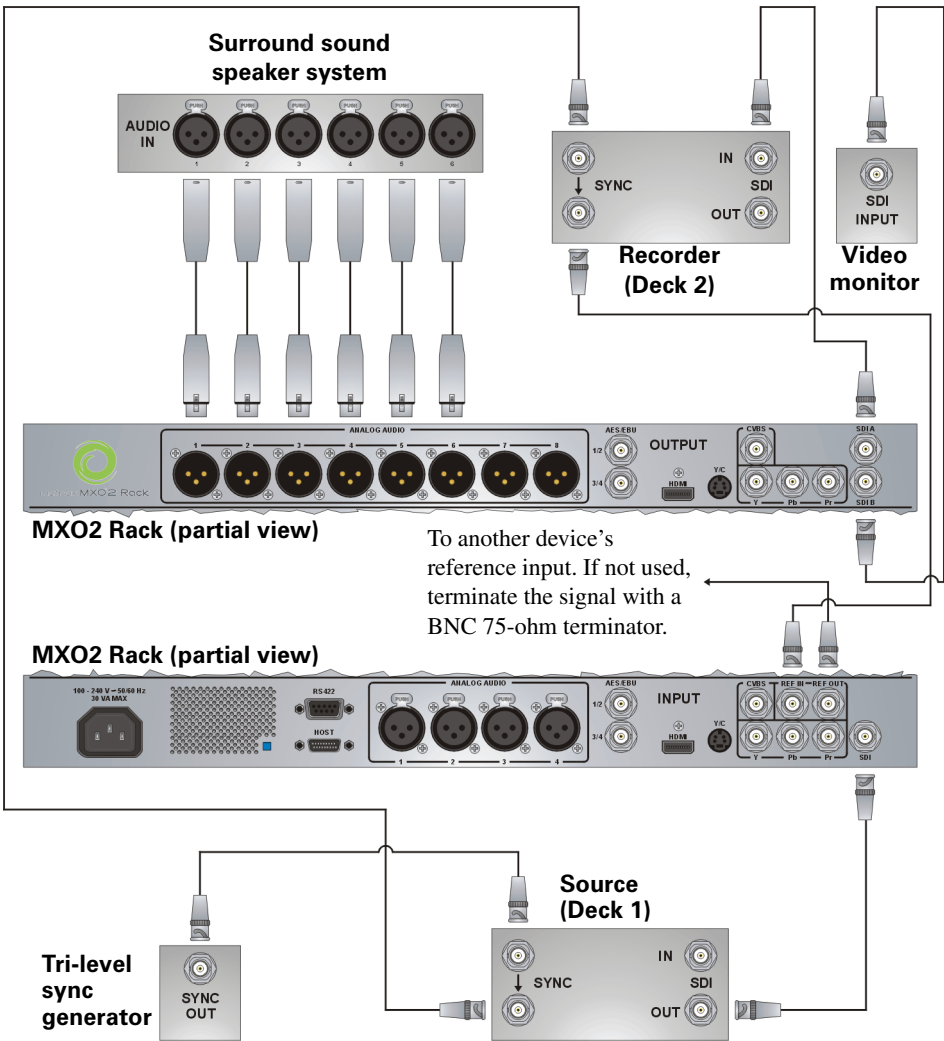
In this illustration, we're using analog component connectors for video, XLR connectors for audio, and an HDMI connector for video monitoring. The video is genlocked using MXO2's internal genlock.



Typical Matrox MXO2 Rack connections

Digital video connections

In this illustration, we're using SDI connectors for video and audio, an SDI connector for video monitoring, and we're monitoring the audio on a surround sound speaker system through XLR connectors. The video is genlocked using a tri-level sync generator.



5

Connecting External Devices to Matrox MXO2 LE

This chapter shows how to supply power and connect external devices to Matrox MXO2 LE.



Note This chapter details how to connect external devices to Matrox MXO2 LE only. For another MXO2 product, see [Chapter 3, “Connecting External Devices to Matrox MXO2”](#), [Chapter 4, “Connecting External Devices to Matrox MXO2 Rack”](#), or [Chapter 6, “Connecting External Devices to Matrox MXO2 Mini.”](#)

Available MXO2 LE connections

Matrox MXO2 LE features a full compliment of professional inputs and output, and allows you to connect multiple devices for up to five user-selectable simultaneous video outputs.

MXO2 LE video connections

- One HD HDMI input and one HD/SD HDMI output, both with up to eight channels of embedded audio support. The HDMI input/output supports YUV and RGB devices.
- One HD/SD SDI input and two HD/SDI outputs with up to 16 channels of embedded audio. Both SDI outputs simultaneously output the same video and embedded audio.
- One HD/SD analog component input/output, one S-Video input/output, and one composite input/output.
- Analog black burst reference input.

MXO2 LE audio connections

- Two balanced analog XLR inputs/outputs (stereo pair).
- Two unbalanced analog RCA inputs/outputs (stereo pair).

Powering MXO2 LE

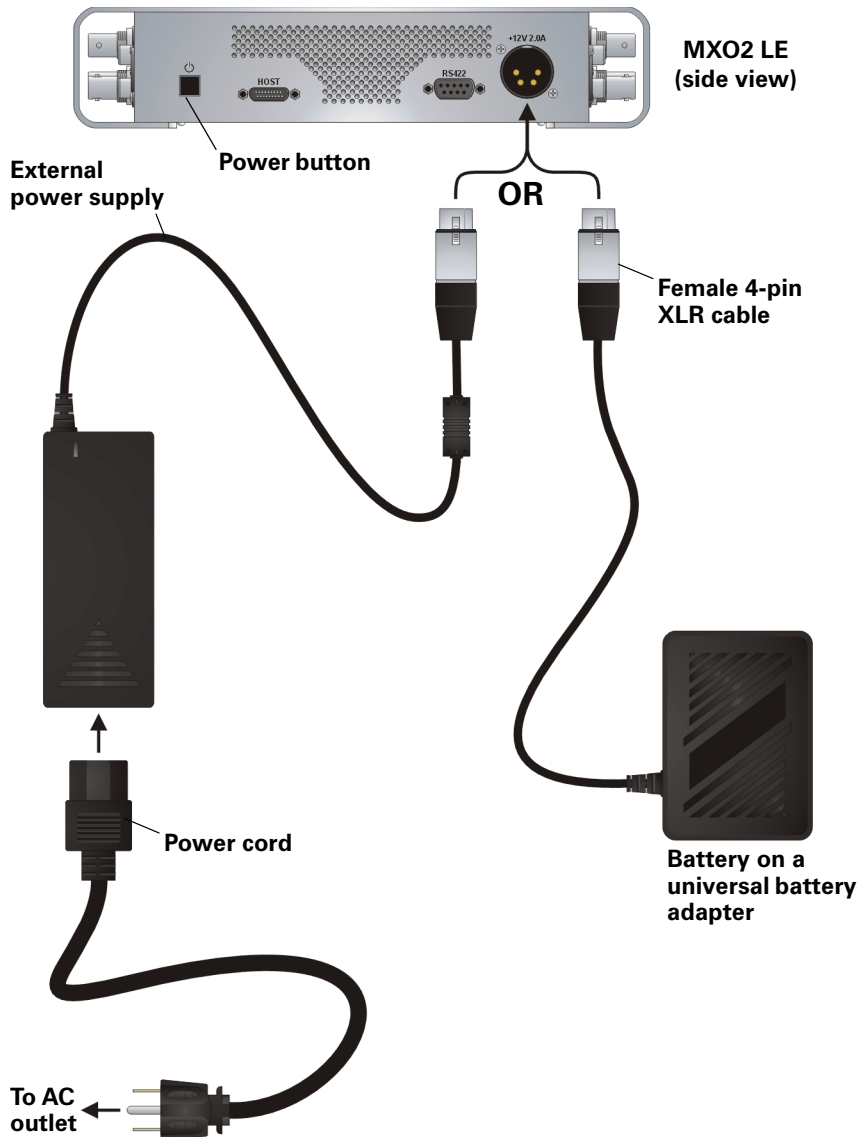
Supply power to MXO2 LE using an AC outlet via the Matrox external power supply and a power cord, or using a battery. Matrox MXO2 LE connects to the battery via a 4-pin XLR connector. For information on how to connect your battery to portable video equipment, such as Matrox MXO2 LE, contact the battery manufacturer. Before connecting MXO2 LE to a battery, please read the [“Battery requirements and guidelines for MXO2”](#) on page 3.

MXO2 LE power functionality

MXO2 LE features a power button that you can use to manually turn the MXO2 LE on and off. However, when power is supplied to MXO2 LE and it is connected to your Mac system, the MXO2 LE will turn on or off automatically when you start up or shut down your Mac system. That is, when you shut down your Mac system, your MXO2 LE turns off. Starting up your Mac system turns your MXO2 LE on. To manually turn your MXO2 LE on, press the power button.

To turn off your MXO2 LE, press and hold the power button for at least two seconds.

i Important When MXO2 LE is connected to a Mac system that is running, do not disconnect MXO2 LE from its power source, or power off MXO2 LE. Shut down your Mac system before removing power from MXO2 LE. If using a battery to power MXO2 LE, ensure that the battery is sufficiently charged.



Connecting MXO2 LE to your Mac system

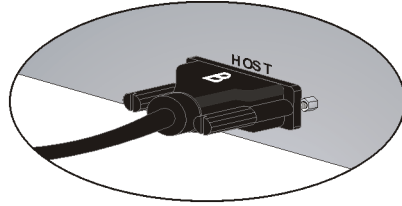
Connect MXO2 LE to your Mac system using the Matrox PCIe cable and the appropriate Matrox host adapter or MXO2 Dock.

Ensuring proper PCIe cable connection

To ensure functionality and avoid damaging the PCIe cable or host connector when connecting MXO2 LE to your computer, the PCIe cable must be connected to your MXO2 LE and host connector as shown below:

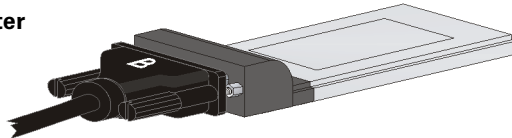
To Matrox MXO2 LE

“B” side of PCIe cable must face the side labeled “HOST” on MXO2 LE.



To Matrox PCIe ExpressCard/34 adapter

“B” side of PCIe cable must face the top of the Matrox PCIe ExpressCard/34 adapter.



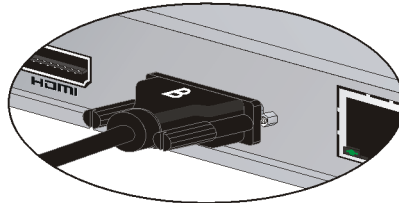
To Matrox MXO2 Thunderbolt adapter

“B” side of PCIe cable must face the side labeled “HOST” on the Matrox MXO2 Thunderbolt adapter.



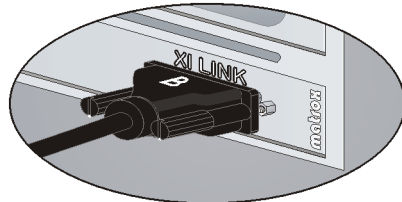
To Matrox MXO2 Dock

“B” side of PCIe cable must face the top of MXO2 Dock.



To Matrox PCIe host adapter

“B” side of PCIe cable must face the side labeled “XI LINK” on the Matrox PCIe host adapter.



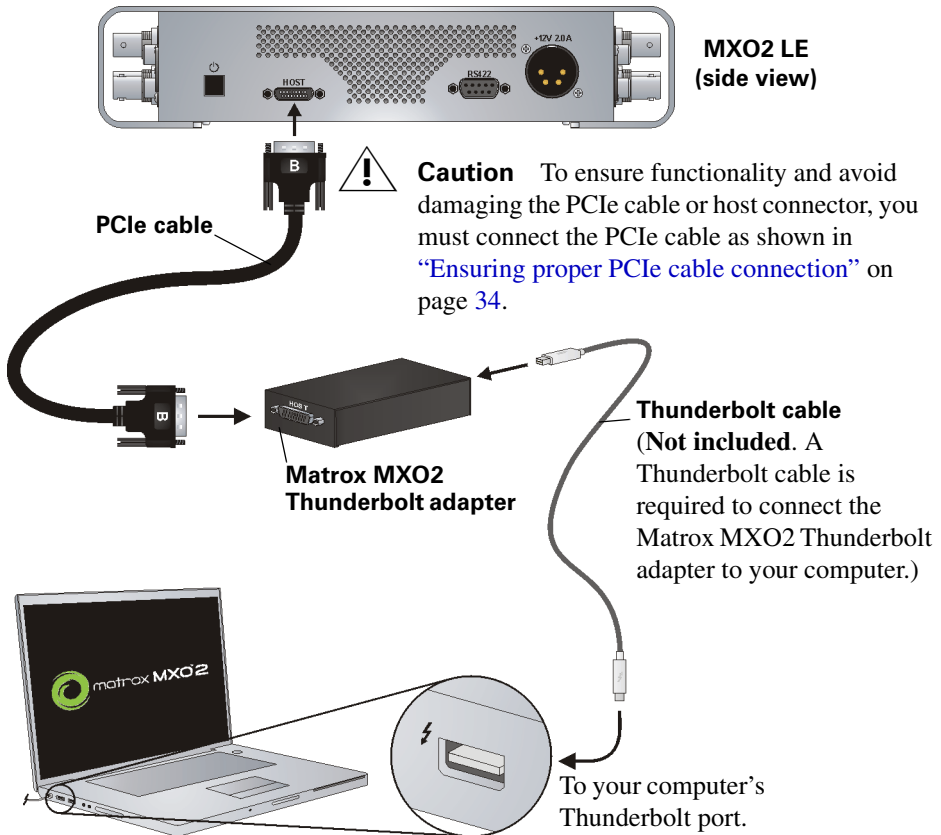
Using Matrox MXO2 Dock

For instructions on how to connect and use Matrox MXO2 Dock, see [Appendix E, “Connecting and Using Matrox MXO2 Dock,”](#) on page 185.

Using the Matrox MXO2 Thunderbolt adapter

Use the Matrox MXO2 Thunderbolt adapter to connect MXO2 LE to your computer's Thunderbolt port. When doing this, it may take up to ten seconds for your MXO2 LE to be detected by your system and its applications.

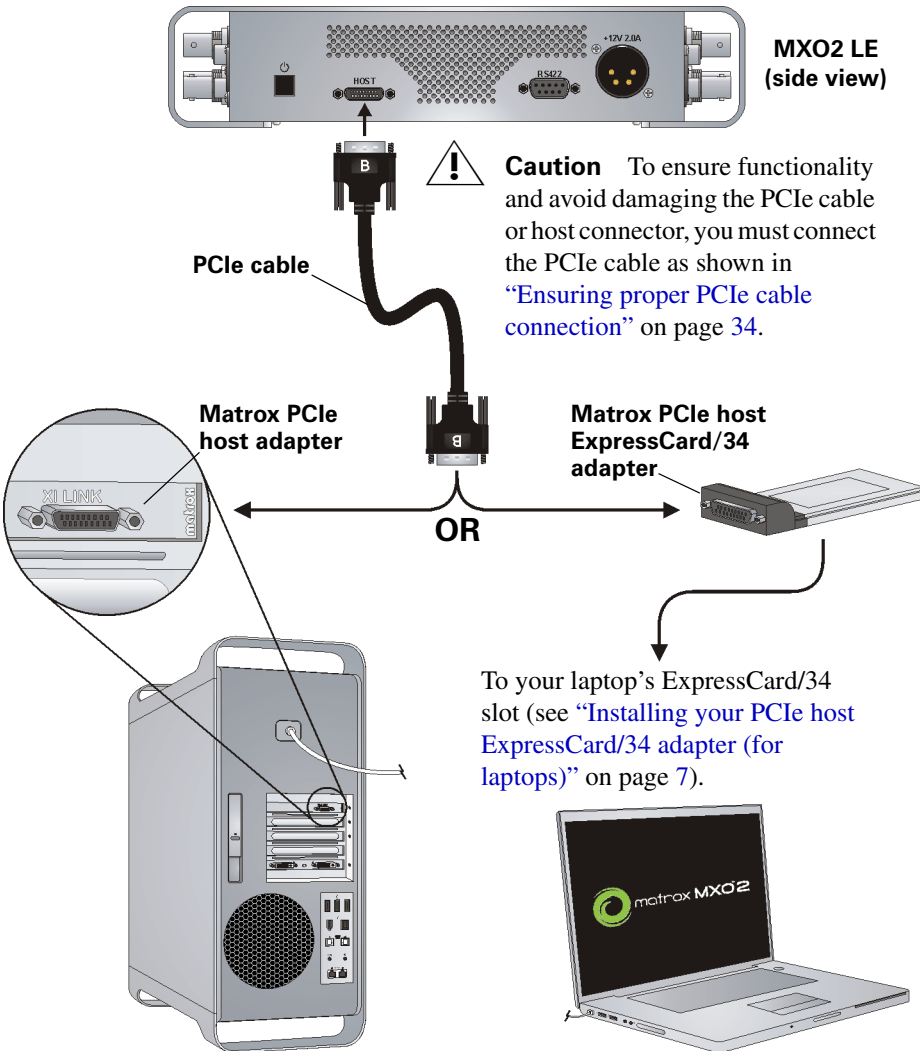
i Important Make sure that the Matrox PCIe cable is connected to the adapter and MXO2 LE before connecting the adapter to your computer via the Thunderbolt cable. If you want to disconnect or connect MXO2 LE when your system is running, you must do it by disconnecting/connecting the Thunderbolt cable. Do not disconnect the Matrox PCIe cable from the adapter, or MXO2 LE, when your Mac system is running.



Using the Matrox PCIe host adapters

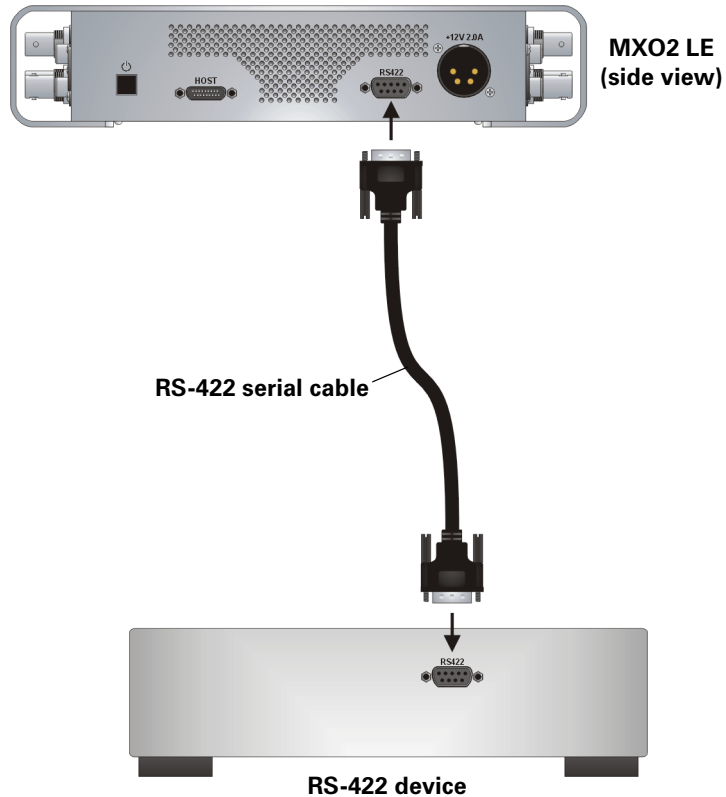
For MXO2 LE to be detected on a Mac desktop system, power must be supplied to MXO2 LE (see [“Powering MXO2 LE”](#) on page 32), and it must be connected to your computer before starting up your system.

Important Do not disconnect the Matrox PCIe cable from the adapter, or MXO2 LE, when your Mac system is running. To safely remove the Matrox PCIe host ExpressCard/34 adapter, see [“Removing your PCIe host ExpressCard/34 adapter”](#) on page 8.



MXO2 LE RS-422 serial connection

MXO2 LE's RS-422 serial connector allows a video editing application, such as Adobe Premiere Pro, to control a device that uses the RS-422 SMPTE time code protocol, such as a VTR or digital disk recorder, to ensure frame-accurate capture and export to tape.

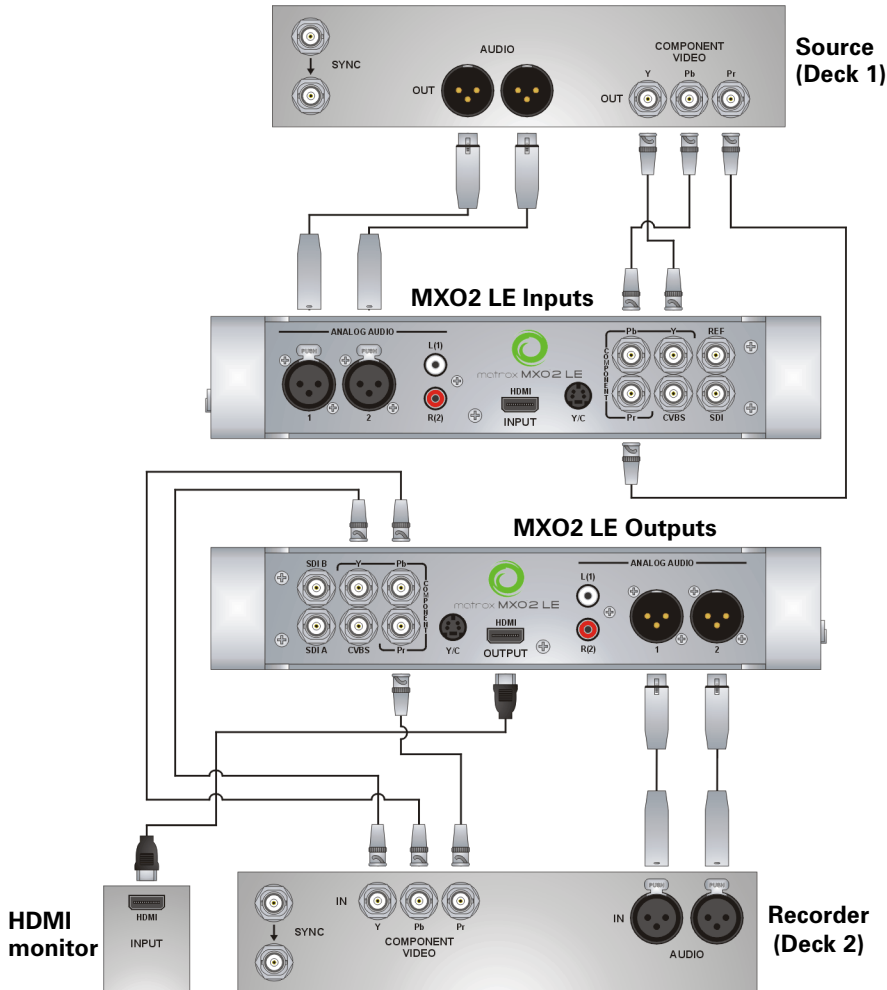


Typical Matrox MXO2 LE connections

In the following typical connection examples, we've connected a monitor to view the signal that will be recorded, and separate source and record decks. You may, however, use the same deck as both your source and record device by making the input and output connections to a single deck. For details on the Matrox MXO2 LE connectors, see [Appendix B, "Matrox MXO2 Connectors."](#)

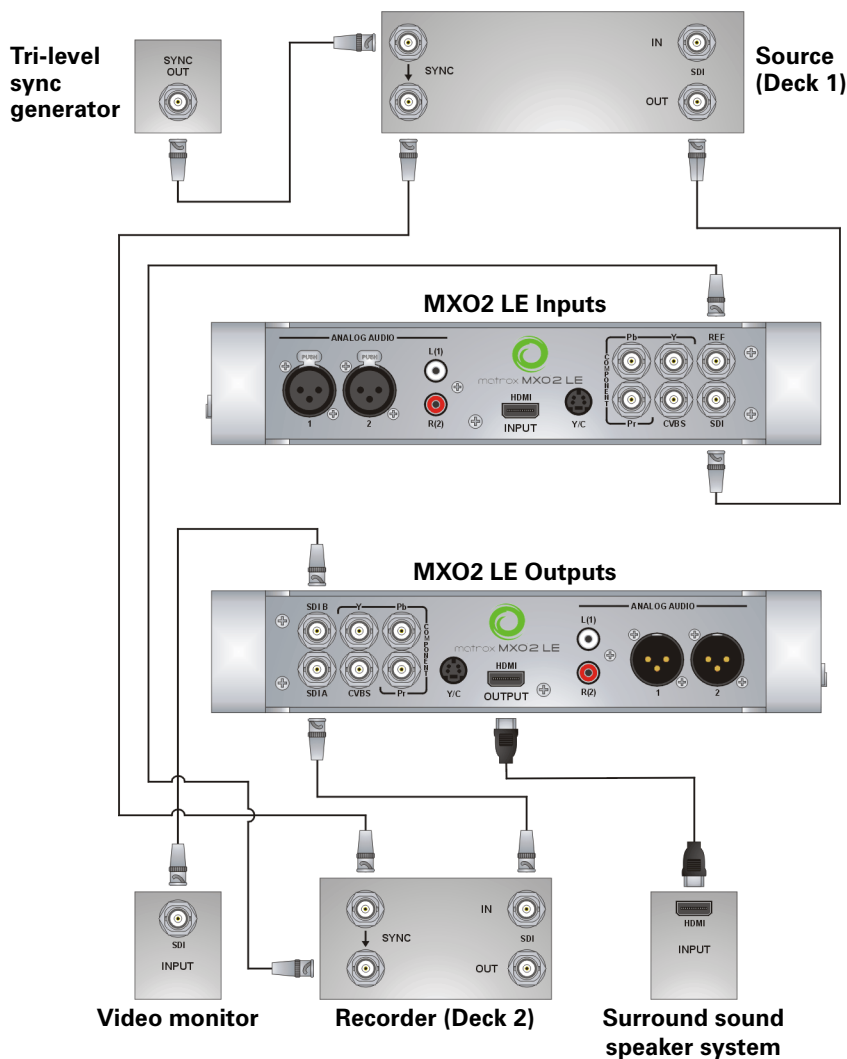
Analog component video connections

In this illustration, we're using analog component connectors for video, XLR connectors for audio, and an HDMI connector for video monitoring. The video is genlocked using MXO2 LE's internal genlock.



Digital video connections

In this illustration, we're using SDI connectors for video and audio, an SDI connector for video monitoring, and we're monitoring the audio on a surround sound speaker system through an HDMI connector. The video is genlocked using a tri-level sync generator.



Typical Matrox MXO2 LE connections

Your notes

6

Connecting External Devices to Matrox MXO2 Mini

This chapter shows how to supply power and connect external devices to Matrox MXO2 Mini.



Note This chapter details how to connect external devices to Matrox MXO2 Mini only. For another MXO2 product, see [Chapter 3, “Connecting External Devices to Matrox MXO2”](#), [Chapter 4, “Connecting External Devices to Matrox MXO2 Rack”](#), or [Chapter 5, “Connecting External Devices to Matrox MXO2 LE.”](#)

Available MXO2 Mini connections

Matrox MXO2 Mini provides inputs and outputs for connecting external devices, including HDMI, analog component, S-Video, and composite video devices.

MXO2 video and audio connections

- One HD HDMI input and one HD/SD HDMI output, both with up to eight channels of embedded audio support. The HDMI input/output supports YUV and RGB devices.
- One HD/SD analog component input/output, or one S-Video input/output and one composite input/output.



Note S-Video input/output is available by using the provided S-Video adapters (see [“Connecting S-Video devices to MXO2 Mini”](#) on page 47).

- Two unbalanced analog RCA audio inputs/outputs (stereo pair).

Powering MXO2 Mini

You can supply power to MXO2 Mini using an AC outlet via the Matrox external power supply cable. To turn MXO2 Mini off, unplug the Matrox external power supply cable from the AC outlet while your computer is shut down.

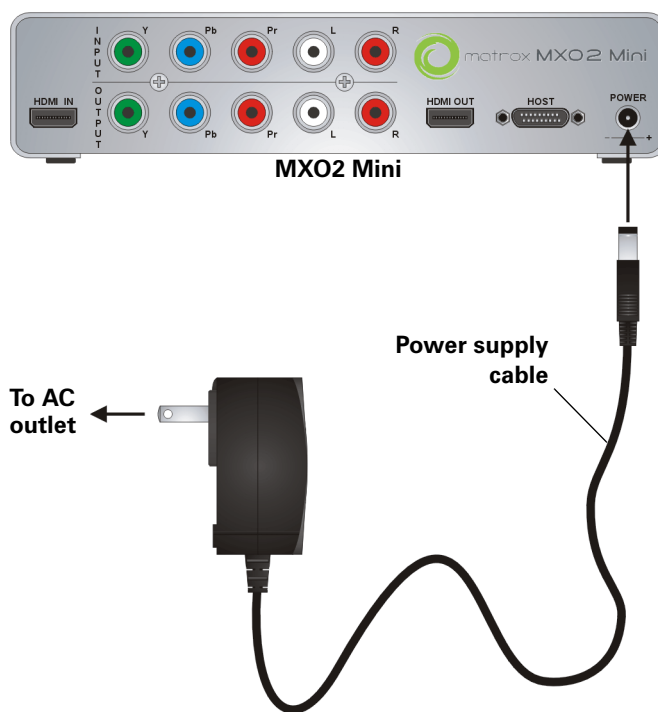
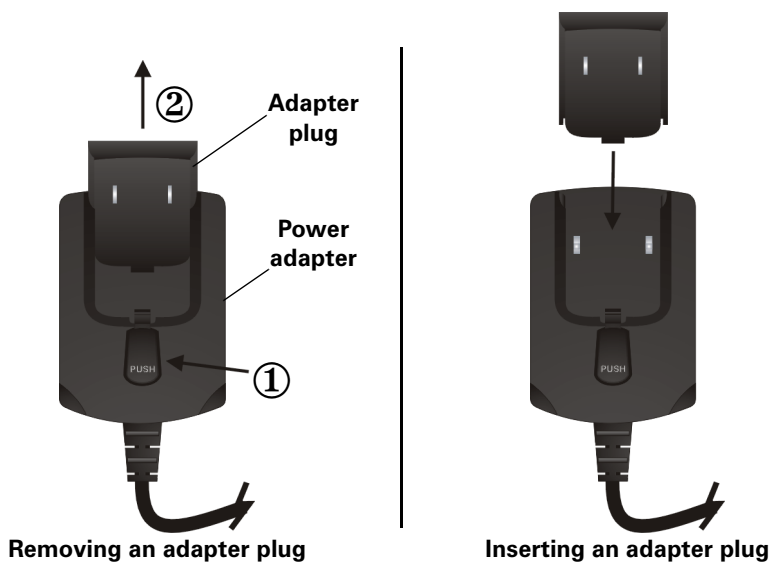


Important When MXO2 Mini is connected to a computer that is running, do not disconnect MXO2 Mini from its power source. Shut down your computer before removing power from MXO2 Mini.

MXO2 Mini power supply and adapter plugs

MXO2 Mini provides an external power supply cable with international adapter plugs for use in different regions:

- To remove an adapter plug from the power adapter, hold down the button labeled **PUSH** on the power adapter, and then slide the adapter plug up until it releases from the power adapter.
- To insert an adapter plug into the power adapter, ensure that the adapter plug is properly aligned with the corresponding slot on the power adapter, and then slide the adapter plug down into the power adapter until it locks into place.



Powering MXO2 Mini

Connecting MXO2 Mini to your computer

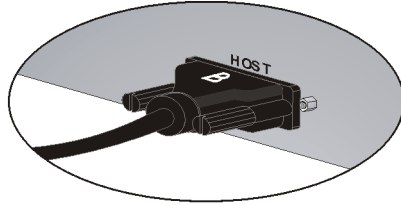
Connect MXO2 Mini to your Mac system using the Matrox PCIe cable and the appropriate Matrox host adapter or MXO2 Dock.

Ensuring proper PCIe cable connection

To ensure functionality and avoid damaging the PCIe cable or host connector when connecting MXO2 Mini to your computer, the PCIe cable must be connected to your MXO2 Mini and host connector as shown below:

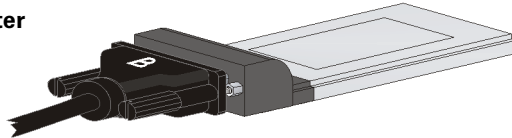
To Matrox MXO2 Mini

“B” side of PCIe cable must face the side labeled “HOST” on MXO2 Mini.



To Matrox PCIe ExpressCard/34 adapter

“B” side of PCIe cable must face the top of the Matrox PCIe ExpressCard/34 adapter.



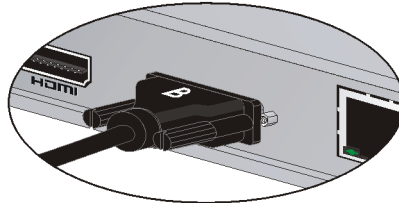
To Matrox MXO2 Thunderbolt adapter

“B” side of PCIe cable must face the side labeled “HOST” on the Matrox MXO2 Thunderbolt adapter.



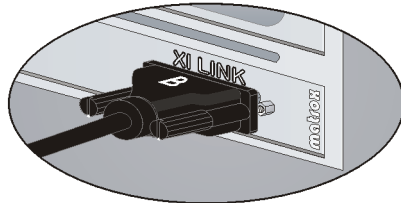
To Matrox MXO2 Dock

“B” side of PCIe cable must face the top of MXO2 Dock.



To Matrox PCIe host adapter

“B” side of PCIe cable must face the side labeled “XI LINK” on the Matrox PCIe host adapter.



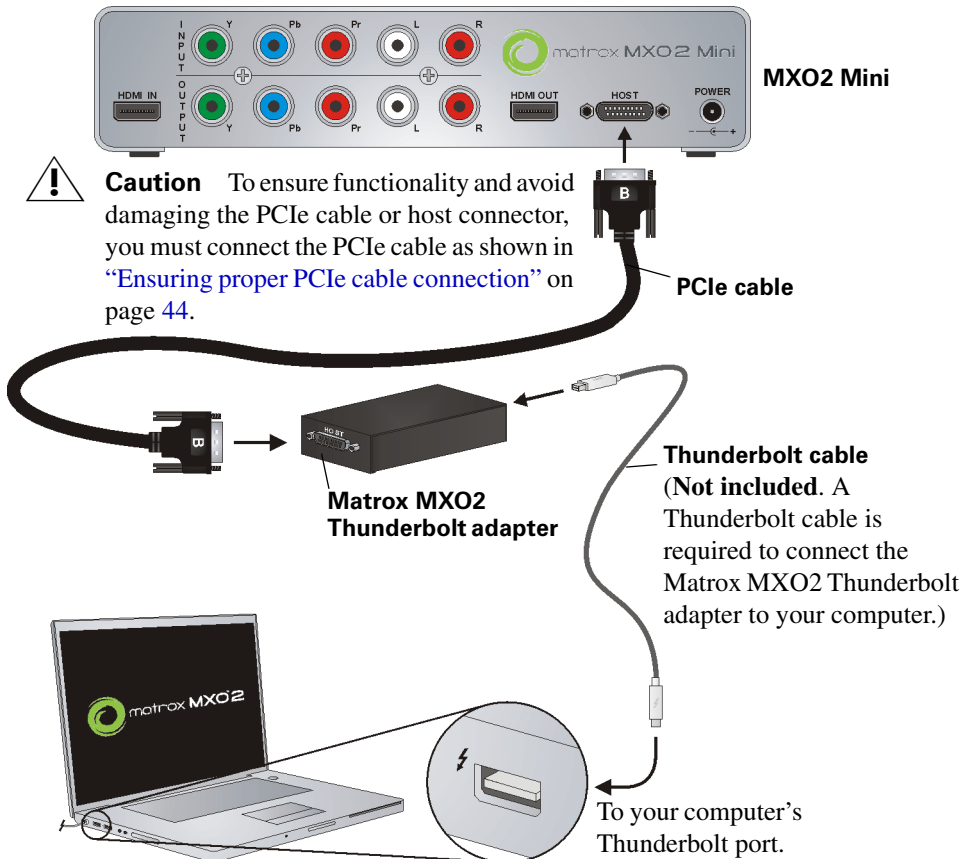
Using Matrox MXO2 Dock

For instructions on how to connect and use Matrox MXO2 Dock, see [Appendix E, “Connecting and Using Matrox MXO2 Dock,”](#) on page 185.

Using the Matrox MXO2 Thunderbolt adapter

Use the Matrox MXO2 Thunderbolt adapter to connect MXO2 Mini to your computer's Thunderbolt port. When doing this, it may take up to ten seconds for your MXO2 Mini to be detected by your system and its applications.

Important Make sure that the Matrox PCIe cable is connected to the adapter and MXO2 Mini before connecting the adapter to your computer via the Thunderbolt cable. If you want to disconnect or connect MXO2 Mini when your system is running, you must do it by disconnecting/connecting the Thunderbolt cable. Do not disconnect the Matrox PCIe cable from the adapter, or MXO2 Mini, when your Mac system is running.

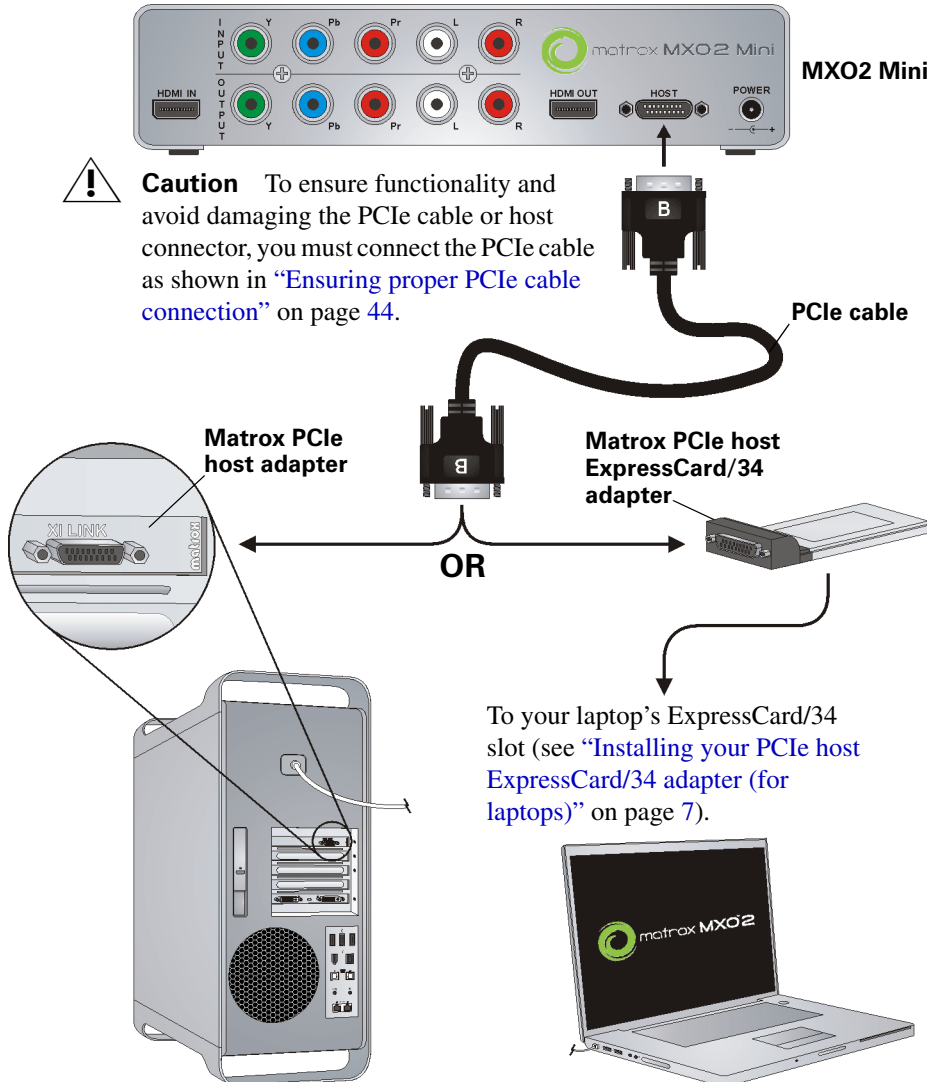


Connecting MXO2 Mini to your computer

Using the Matrox PCIe host adapters

For MXO2 Mini to be detected on a Mac desktop system, power must be supplied to MXO2 Mini (see [“Powering MXO2 Mini”](#) on page 42), and it must be connected to your computer before starting up your system.

Important Do not disconnect the Matrox PCIe cable from the adapter, or MXO2 Mini, when your Mac system is running. To safely remove the Matrox PCIe host ExpressCard/34 adapter, see [“Removing your PCIe host ExpressCard/34 adapter”](#) on page 8.

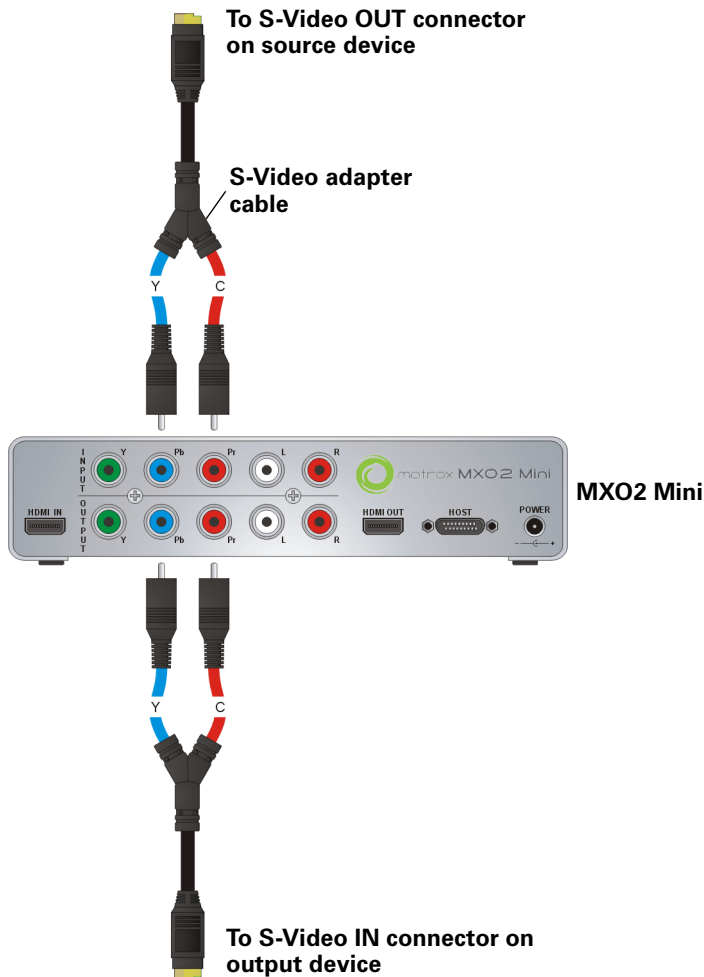


Connecting S-Video devices to MXO2 Mini

To support S-Video connections on MXO2 Mini, your MXO2 Mini kit includes two S-Video adapter cables (one for S-Video input and one for S-Video output).



Note When you connect an S-Video device to MXO2 Mini, you won't be able to connect an analog component device at the same time.

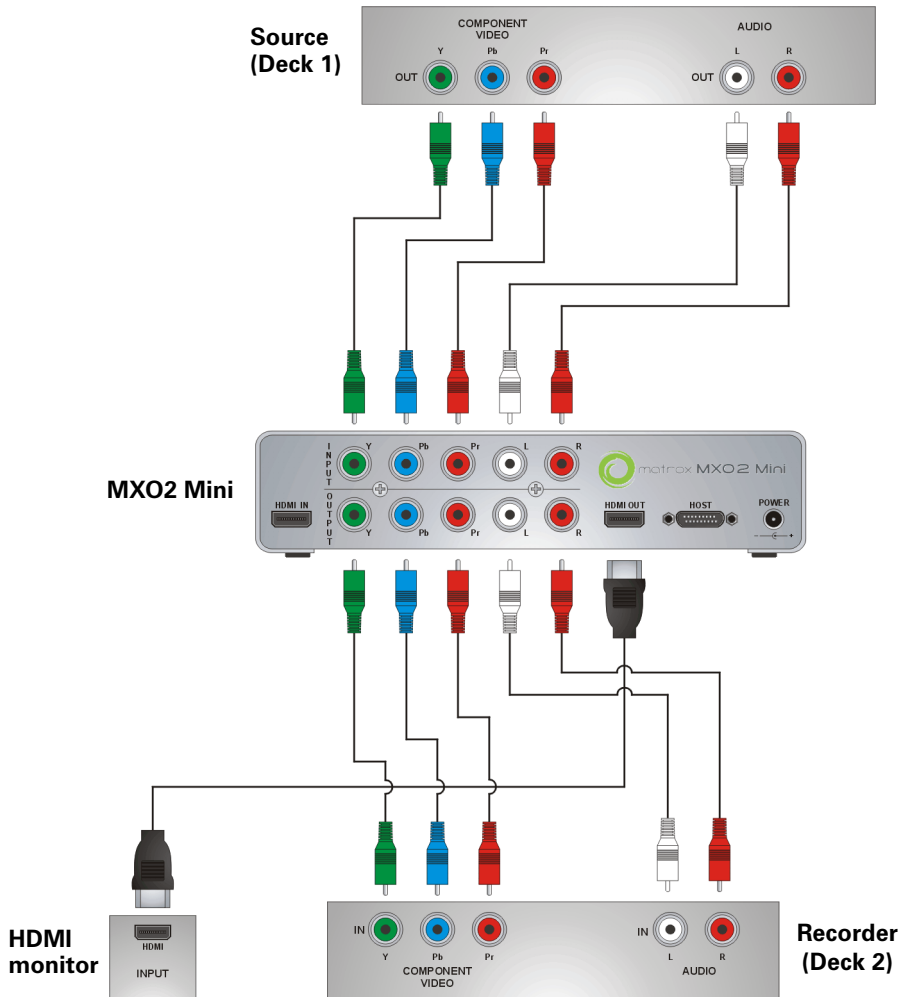


Typical Matrox MXO2 Mini connections

In the following typical connection examples, we've connected a monitor to view the signal that will be recorded, and separate source and record decks. You may, however, use the same deck as both your source and record device by making the input and output connections to a single deck. For details on the Matrox MXO2 Mini connectors, see [Appendix B, "Matrox MXO2 Connectors."](#)

Analog component video connections

In this illustration, we're using component connectors for video, RCA connectors for audio, and an HDMI connector for video monitoring. The video is genlocked to the input source using MXO2 Mini's built-in genlock.

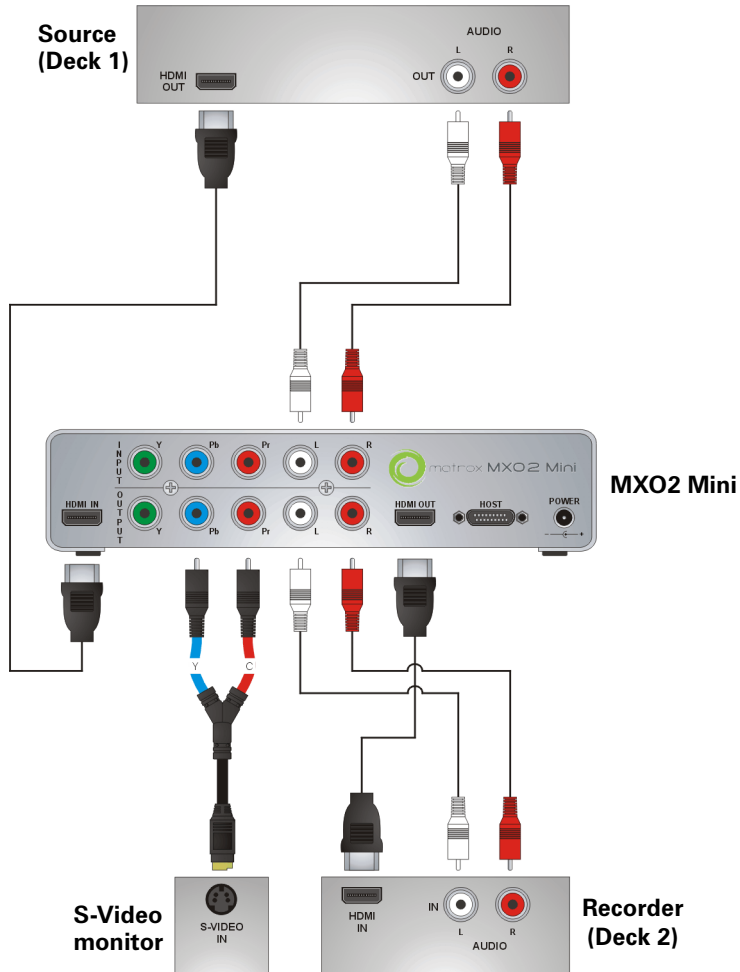


HDMI video connections

In this illustration, we're using HDMI for video, RCA connectors for audio, and S-Video for video monitoring. The video is genlocked to the input source using MXO2 Mini's built-in genlock.



Note When using HDMI connections, the embedded uncompressed HDMI audio is also available.



Typical Matrox MXO2 Mini connections

Your notes

7

Configuring Your MXO2 System

This chapter explains how to configure your MXO2 settings.

Introduction

This chapter describes the settings in the Matrox Utilities preferences window for all MXO2 products. The **Matrox Utilities** preferences window allows you to specify various settings for working with MXO2. You can also save and load custom presets, and view information about your MXO2, such as the serial number and software version.

Depending on your MXO2 hardware, some of the options described in this chapter may not be available, and your Matrox Utilities preferences window may not appear exactly as shown.

Remarks

- Before defining your settings, make sure that you’ve installed your MXO2 hardware, powered your MXO2, and connected your MXO2 to your Mac system.
- If you have an MXO2 product with Matrox MAX technology, the MXO2 inputs and outputs will not be available when creating H.264 files using the Matrox MAX H.264 codec. This limitation, however, does not apply if your system includes a Matrox CompressHD card. In this case, the Matrox MAX H.264 codec on your CompressHD card will always be used for the encoding, and your Matrox inputs and outputs will be available when creating H.264 files. For details on using the Matrox MAX H.264 codec, see [Chapter 10, “Using the Matrox MAX H.264 Codec.”](#)

Custom presets

You can save and load custom presets of your Matrox MXO2 preference settings.

Saving custom presets

Saving a custom MXO2 preference settings preset creates a *.plist* file that you can load at any time. All settings, except the **FCP X** setting, are saved in your custom preset.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Specify your MXO2 settings.
- 3 Click **Save Preset**, specify a filename and location, and then click **Save**.



Important Do not save your preset, or overwrite any Matrox files, in *Users/~/.Library/Preferences*.

Loading custom presets

You can load a custom MXO2 preference settings preset at any time. Your MXO2 settings are automatically updated when you load a preset.



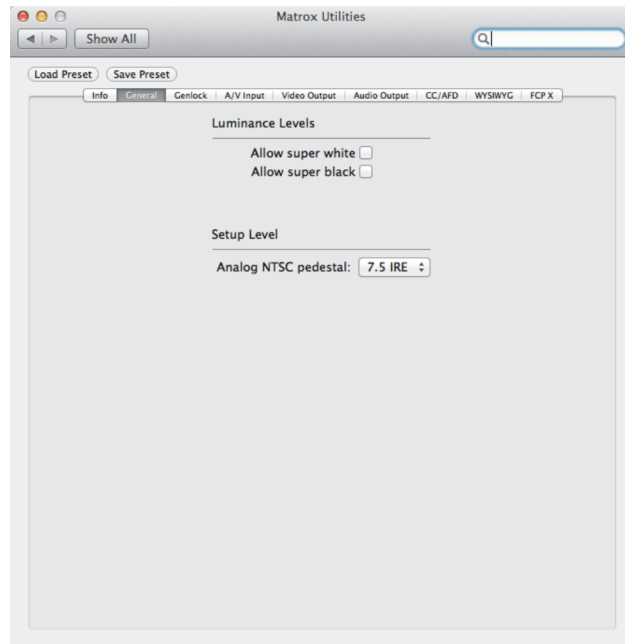
Note Since the **FCP X** setting is not saved in a custom preset, this setting is not updated in your **Matrox Utilities** preferences window when loading a preset.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **Load Preset**, select the custom preset file (*.plist*) that you want to load, and then click **Open**.

Specifying your general settings

You can specify general settings for working with Matrox MXO2. These settings are applied to the MXO2 video inputs and outputs.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **General**.



- 3 Under **Luminance Levels**, select **Allow super white** to allow the highest luminance level of your video to exceed the standard maximum white level. Select **Allow super black** to allow the lowest luminance level of your video to fall below the standard black level.



Note Super white and super black should not be allowed when producing your final video production for broadcast.

4 Under **Setup Level**, select the pedestal setting that you want for your NTSC analog video from the **Analog NTSC pedestal** menu:

- **7.5 IRE** Applies the standard NTSC pedestal of 7.5 IRE.
- **0 IRE** Applies a pedestal of 0 IRE. You should select this option when working with a commercial DV device that uses the Japanese analog NTSC pedestal of 0 IRE. For example, if the video appears too bright when you play back DV clips on your NTSC monitor, you can change the pedestal to 0 IRE to output your DV clips at the correct brightness.



Note If your device has a different NTSC pedestal for input and output, you can switch the pedestal setting as needed before capturing or recording to tape.

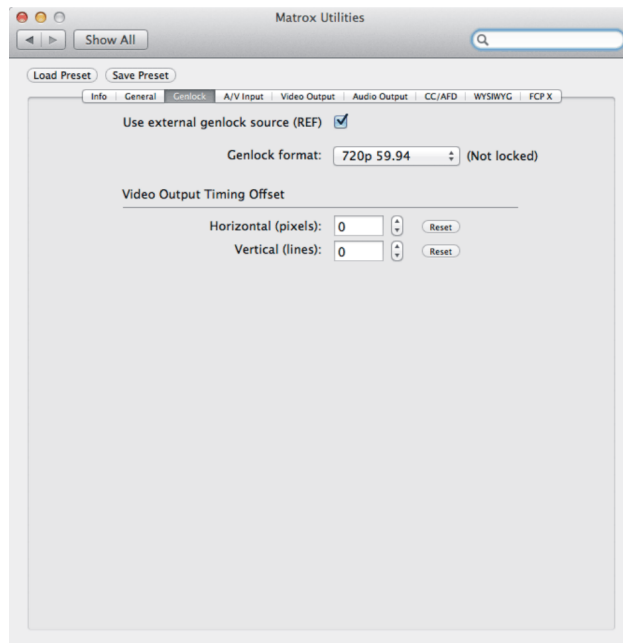
Specifying your genlock settings



Note This section does not apply to Matrox MXO2 Mini.

You can select the source to which you want to genlock all devices connected to your MXO2 system, as well as adjust the timing offset for all MXO2 video outputs.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **Genlock**.



- 3 Select **Use external genlock source (REF)** if you connected an external analog genlock source to MXO2's **REF/REF IN** connector, such as a bi-level analog black burst for SD or a tri-level sync for HD. If you don't have an external genlock source connected to MXO2, clear this option to genlock to MXO2's internal reference signal during playback, and genlock to your capture source during capture (see [“Specifying your A/V input settings”](#) on page 55).

Remarks

- When capturing RGB material from a DVI source using MXO2's HDMI input, you must use an external genlock source.
- When capturing video with digital closed captioning (see [“Matrox 4VANC capture and playback”](#) on page 66), you must genlock to your capture source and not an external genlock source. Clear this option to genlock to your capture source.

To indicate whether or not MXO2 is presently locked to your external genlock source, the status will be displayed next to the **Genlock format** menu as **Locked** or **Not locked**.

- 4 From the **Genlock format** menu, select the video format of your external genlock source.



Important To ensure good output results, make sure that your genlock source's video format is compatible with the MXO2 video output format.

- 5 Use the horizontal and vertical settings under **Video Output Timing Offset** to adjust the timing of the video output relative to your external genlock source. This lets you compensate for cable delays within your system.

Specifying your A/V input settings

You can select the MXO2 video and audio inputs to be used as your capture source. Only one video and audio input source can be used at a time. You can also capture your video to a different format than your source video by enabling scaling on the input.



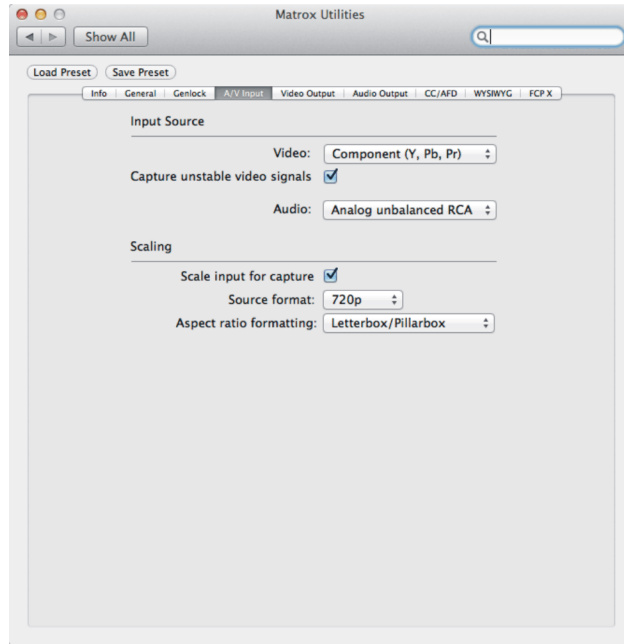
Note When capturing, MXO2 outputs your source video at the capture format. The Matrox video output settings are ignored during capture.

For descriptions of the MXO2 inputs, see [“Inputs”](#) on page 158. For a list of the input and capture formats that are supported on MXO2, and to view the MXO2 input scaling options, see [Appendix C, “Matrox MXO2 Supported Input and Capture Formats.”](#)



Note The HDMI video input does not support SD video for capture. When capturing RGB material from a DVI source using MXO2's HDMI input, you must use an external genlock source (see [“Specifying your genlock settings”](#) on page 54).

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **A/V Input**.



- 3 Under **Input Source**, select the **Video** and **Audio** inputs that you want to capture.

Remarks

- The **SDI embedded audio** option can be used with the **SDI** video input option only.
 - When capturing from an HDMI source, only uncompressed embedded audio is supported.
- 4 To capture an unstable or low-quality video signal, such as from a low-quality composite or S-Video VCR, select **Capture unstable video signals** to ensure that the capture application does not stop the capture due to a poor video signal/signal loss. The captured video, however, may include dropped or black frames. If this option is disabled, a low-quality video signal or signal loss may cause the capture application to stop the capture.
 - 5 If the format to which you want to capture does not match the format of your source video, select **Scale input for capture**. MXO2 will either upscale, downscale, or cross-convert to the desired capture format. For example, select **Scale input for capture** if your source video is 720p at 59.94 fps and

you want to capture to 1080i at 29.97 fps. For a list of the input and capture formats that are supported on MXO2, and to view the MXO2 input scaling options, see [Appendix C, “Matrox MXO2 Supported Input and Capture Formats.”](#)



Note If **Scale input for capture** is not selected, your capture format must match your source video’s format.

- 6 If you selected **Scale input for capture** in step 5, select the format of your source video (MXO2 input) from the **Source format** list:



Note Depending on the input type selected in step 3, some options may not be available.

- **SD 4:3** Select this option for standard 4:3 NTSC or PAL video. When upscaling to HD, the video is captured in pillarbox format.
 - **SD 16:9** Select this option for widescreen 16:9 NTSC or PAL video. When upscaling to HD, the video is captured in anamorphic format.
 - **720p** Select this option for 720p video.
 - **1080i** Select this option for 1080i video.
 - **1080PsF** Select this option for 1080PsF video.
 - **1080p** Select this option for 1080p video.
- 7 If you selected **Scale input for capture** in step 5, select the **Aspect ratio formatting** option to be used when your source video’s aspect ratio does not match the capture aspect ratio:
 - **Letterbox/Pillarbox** When capturing 16:9 video from a 4:3 source, your video is captured in pillarbox mode (black bars to the left and right of the picture). When capturing 4:3 video from a 16:9 source, your video is captured in letterbox mode (black bars at the top and bottom of the picture). When capturing SD 16:9 from an SD 4:3 source, this option is not supported and will result in anamorphic video.
 - **Center cut/Center zoom** When capturing 16:9 video from a 4:3 source, your video is captured in center zoom mode (picture is zoomed with even cropping of the top and bottom edges of the picture). When capturing 4:3 video from a 16:9 source, your video is captured in center cut mode (even cropping of the left and right edges of the picture).
 - **Anamorphic** Captures the source video so that the entire picture fills the capture aspect ratio, without cropping. The source video’s aspect ratio is not maintained.

Specifying your video output settings

MXO2 features simultaneous video outputs that allow you to send your video to a variety of devices at the same time. MXO2 provides two separate video output channels to choose from: main channel and SD channel. The video output settings allow you to set the main channel's video format, assign a video channel to an MXO2 output, and define the channel's behavior. You can also select other settings such as the scrub and pause method, and calibrate your HDMI monitor for video.



Note When capturing, MXO2 outputs your source video at the capture format. The Matrox video output settings are ignored during capture.

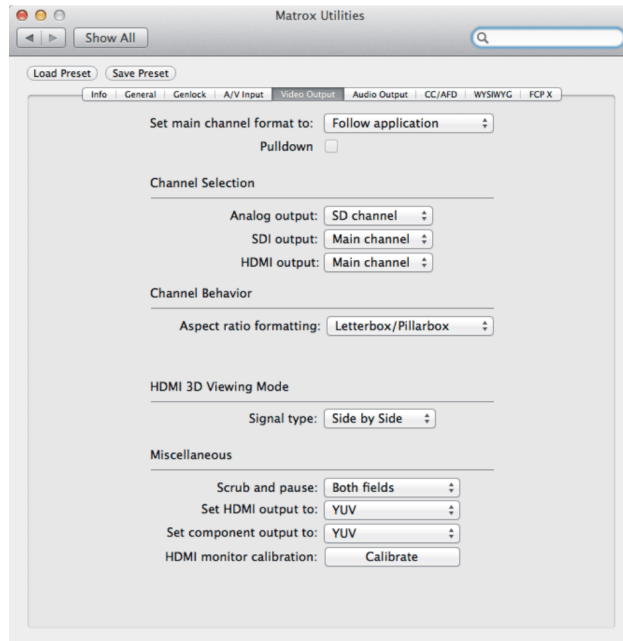
For a list of the supported video output formats for the MXO2 main and SD channels, and the supported video formats for the MXO2 outputs, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

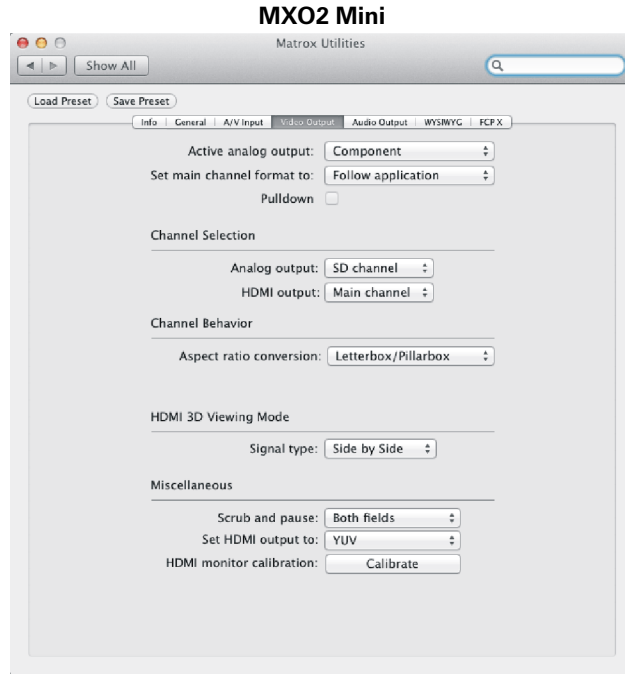


Note When working with Apple Final Cut Pro X, changes made to certain video output settings won't take effect until you play back the clip in Final Cut Pro X.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **Video Output**.

MXO2, MXO2 Rack, and MXO2 LE





- 3 For MXO2 Mini only, from the **Active analog output** menu, select the type of connection that you want to use for MXO2 Mini’s Y, Pb, and Pr output connectors (see “[Outputs](#)” on page 165).



Note When you connect an analog component device to MXO2 Mini, you won’t be able to connect an S-Video or composite device at the same time. If you’re outputting HD analog component video, the composite and S-Video outputs will be invalid.

- 4 From the **Set main channel format to** menu, you can select the video output format that you want for the MXO2 main channel. For a list of the supported video output formats for the MXO2 main and SD channels, see “[Supported main and SD video output formats](#)” on page 180.
- **Follow application** Sets the main channel’s video output to match your project’s video format, or to a compatible format for your project. For example, if your project’s video format is NTSC, the MXO2 main channel will be set to NTSC as well. If your project’s video format is 720p at 23.98 fps, the MXO2 main channel will be set to the compatible 720p at 59.94 fps output format.
 - **486p/576p** Sets the main channel’s video output to either 486p or 576p, depending on your project’s video frame rate. For example, a 720p

at 23.98 fps project will be output as 486p, and a 720p at 25 fps project will be output as 576p.

- **720p** Sets the main channel's video output to 720p at a frame rate compatible with your project's video frame rate.
 - **1080i/PsF** Sets the main channel's video output to a 1080i or 1080PsF format, depending on your project's video format. For 23.98 fps video, selecting this option outputs 1080PsF at 23.98 fps video by default. However, you can use the **Pulldown** feature (see step 5) to convert 1080PsF at 23.98 fps video to 1080i at 29.97 fps video at the output.
 - **1080p** Sets the main channel's video output to 1080p at a frame rate compatible with your project's video frame rate.
- 5** If **1080i/PsF** was selected in step 4, select **Pulldown** to output 23.98 fps video as 1080i at 29.97 fps video instead of 1080PsF at 23.98 fps. Matrox uses standard pulldown to convert 1080PsF at 23.98 fps video to 1080i at 29.97 fps video. For a description of standard pulldown, see [Appendix A, "Understanding Pulldown."](#)
- 6** Under **Channel Selection**, select the video channel (main or SD) that you want for your MXO2 analog (composite, S-Video, and component), SDI (not available on MXO2 Mini), and HDMI outputs:
- **Main channel** Outputs your project's video as defined for the main channel (see step 4).
 - **SD channel** Outputs your project's video as NTSC or PAL, depending on your project's video output frame rate.
- 7** Under **Channel Behavior**, select the **Aspect ratio formatting** option to be used for your video output when the source video's aspect ratio does not match the main channel/SD channel output's aspect ratio:
- **Letterbox/Pillarbox** When outputting 16:9 video from a 4:3 source, the video is output in pillarbox mode (black bars to the left and right of the picture). When outputting 4:3 video from a 16:9 source, the video is output in letterbox mode (black bars at the top and bottom of the picture). When outputting SD 16:9 from an SD 4:3 source, this option is not supported and will result in anamorphic video.
 - **Center cut/Center zoom** When outputting 16:9 video from a 4:3 source, the video is output in center zoom mode (picture is zoomed with even cropping of the top and bottom edges of the picture). When outputting 4:3 video from a 16:9 source, the video is output in center cut mode (even cropping of the left and right edges of the picture).
 - **Anamorphic** Outputs the source video so that the entire picture fills the capture aspect ratio, without cropping. The source video's aspect ratio is not maintained. When outputting 4:3 video from a 16:9 source, select the

16:9 display setting on your NTSC/PAL monitor to display the video with the correct proportions.

- 8 Under **HDMI 3D Viewing Mode**, select the **3D Signal type** that will be sent to your 3D monitor via MXO2's HDMI output. This option signals your 3D monitor to automatically switch to the selected 3D viewing mode. You must select the signal type that matches the 3D video that you want to output, or disable this option (this feature may not be supported on some 3D monitors).
 - **Disabled** Select this if you're not outputting 3D video, or to disable this option. You can still monitor 3D video, but you must select the correct viewing mode on your 3D monitor manually.
 - **Side by Side** Select this for horizontally-compressed side-by-side 3D video (also referred to as side-by-side horizontal).
 - **Over/Under** Select this for over/under 3D video (also referred to as top bottom).



Note If your Avid Media Composer or Avid Symphony project's **Stereoscopic** setting is anything other than **Side by side**, **Over/Under**, or **Full**, make sure that you set the **HDMI 3D Viewing Mode** to **Disabled**. For example, if your project's **Stereoscopic** setting is **Off** or **Leading Eye**, you must disable the **HDMI 3D Viewing Mode** option in order to properly view the HDMI output.

- 9 Under **Miscellaneous**, select **First field**, **Second field**, or **Both fields** from the **Scrub and pause** menu to indicate whether you want to display both fields or only one field when pausing video playback or scrubbing the timeline in your project. For example, you may want to scrub the first or second field to eliminate the flickering that can be seen in your picture when you pause while scrubbing interlaced video.
- 10 From the **Set HDMI output to** menu, select the type of video signal that you want to be sent from the HDMI output:
 - **YUV** Outputs YUV HDMI video. Select this only if you connected the HDMI output to a device that accepts a YUV signal.
 - **RGB - calibrated** Outputs adjusted RGB HDMI video using the currently loaded Matrox HDMI calibration settings for your HDMI monitor or television. For details on calibrating your HDMI monitor and loading HDMI calibration settings using the Matrox HDMI Calibration Utility, see [Chapter 8, "Calibrating Your HDMI Monitor for Video."](#)
 - **RGB - native** Outputs native RGB HDMI video that does not apply any calibration compensation. This is useful when you want to output RGB HDMI video to a device other than an HDMI monitor or television, such as an HDMI recorder to perform an export to tape.

- 11 From the **Set component output to** menu, select **YUV** or **RGB** to set the type of video that is sent from MXO2's component (Y, Pb, Pr) output. For example, select **RGB** if your MXO2's component output is connected to a device that accepts an RGB signal.



Note Component outputs are not available on MXO2 Mini.

- 12 Click the **Calibrate** button to calibrate your HDMI monitor or load HDMI calibration settings using the Matrox HDMI Calibration Utility (see [Chapter 8, “Calibrating Your HDMI Monitor for Video”](#)).



Note In order to run the Matrox HDMI Calibration Utility, the HDMI output type must be set to **RGB - calibrated** (see step 10).

Specifying your audio output settings

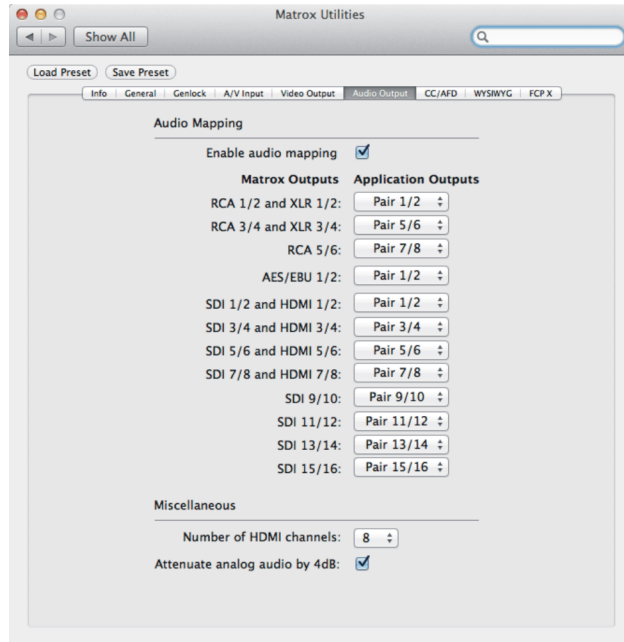
MXO2's simultaneous audio outputs allow you to send your audio to a variety of devices at the same time. You can also map any audio track in your video application to any MXO2 audio output. For descriptions of the MXO2 outputs, see “Outputs” on page 165.



Important Audio mapping must be disabled for surround sound HDMI audio output.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.

2 Click **Audio Output**.



Note The available MXO2 audio outputs depend on your MXO2 hardware.

- 3 Under **Audio Mapping**, select or clear the **Enable audio mapping** option. If this option is cleared, your application's audio track outputs will be routed to the corresponding MXO2 audio outputs by default. For example, when you output audio tracks as Pair 1/2 from your application, the audio will be routed to the corresponding 1/2 MXO2 audio outputs.
- 4 If you selected the **Enable audio mapping** option, for each of the MXO2 outputs, select the desired audio pair from your application.



Note If you enable playback of Matrox 4VANC AFD or Matrox 4VANC closed captioning, audio track 15 or 16 will be muted and won't be available for audio playback (see [“Matrox 4VANC capture and playback”](#) on page 66).

- 5 Under **Miscellaneous**, select the **Number of HDMI channels** that you want to output from MXO2's HDMI output. This option is especially useful for HDMI monitors that don't accept more than two audio channels. If you choose to output two audio channels, MXO2 will output the audio pair mapped to **HDMI 1/2**.
- 6 Select **Attenuate analog audio by 4dB** to decrease the level of the audio that is output from the MXO2 analog outputs by 4dB.



Note The **Attenuate analog audio by 4dB** option is not available on MXO2 Mini.

Closed captioning and AFD



Note Closed captioning and AFD are supported on Matrox MXO2, MXO2 Rack, and MXO2 LE only.

The Matrox 4VANC tool lets you capture and play back digital closed caption and AFD (active format description) data along with your video using a supported video application.

Matrox MXO2 also supports Adobe Premiere Pro's closed captioning feature for playback and export to tape. If you're working with Adobe Premiere Pro, you can choose to use Premiere Pro's closed captioning feature instead of the Matrox 4VANC tool to play back closed captioning using MXO2.

This section details how to specify the settings in MXO2 when using the Matrox 4VANC tool or Premiere Pro's closed captioning feature.

Adobe closed caption playback

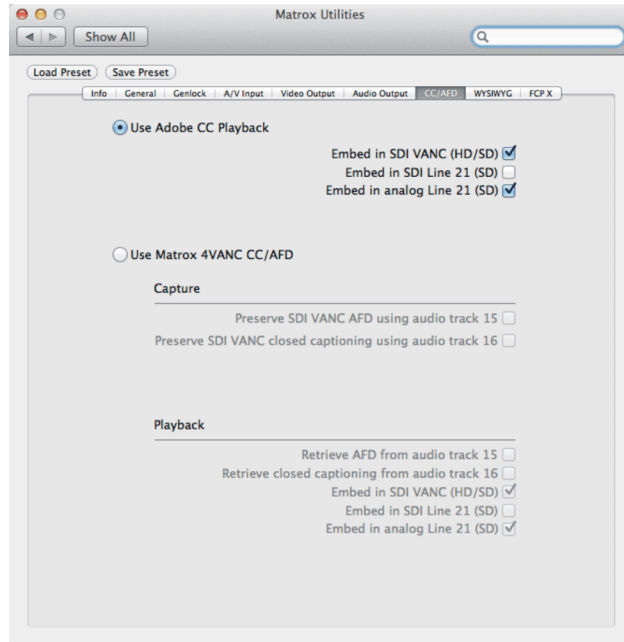
Matrox MXO2 supports Premiere Pro's closed captioning feature for playback and export to tape. When using Premiere Pro, you can choose to use the closed captioning feature in Premiere Pro instead of the Matrox 4VANC tool to play back closed captioning using MXO2.

The closed captions on your sequence can be embedded in your video's VANC on output for display on an SDI or analog video monitor that supports closed captioning, or you can choose to overlay the closed captions on all the MXO2 video outputs for display on video monitors that do not support closed captioning.

For detailed instructions on how to use Adobe Premiere Pro's closed captioning feature with MXO2, see [“Closed captioning and AFD”](#) on page 91.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.

2 Click **CC/AFD**.



3 Select **Use Adobe CC Playback**.

4 Specify where you want the closed caption data to be embedded in the video signal during playback. Since MXO2 features simultaneous outputs, you can select more than one of the following options.

- **Embed in SDI VANC (HD/SD)** Use this option if you want to play back HD or SD video from MXO2's SDI output, and embed the closed captioning data in your video's VANC.
- **Embed in SDI Line 21 (SD)** Use this option if you want to play back SD video from MXO2's SDI output, and embed the closed captioning data on Line 21 of the VBI (vertical blanking interval) portion of your video signal.
- **Embed in analog Line 21 (SD)** Use this option if you want to play back SD video from any of MXO2's analog outputs (component, S-Video, and composite), and embed the closed captioning data on Line 21 of the VBI (vertical blanking interval) portion of your video signal.



Note To preview HD video with closed captioning on an SD monitor, you must set the output that is connected to your monitor to SD (see [“Specifying your video output settings”](#) on page 58), and select either **Embed in SDI Line 21 (SD)** or **Embed in analog Line 21 (SD)**.

- 5 Specify the appropriate settings in your video application.

Matrox 4VANC capture and playback

The Matrox 4VANC tool lets you capture and play back AFD (active format description) and digital closed caption data, along with your video, using audio tracks 15 and 16, respectively. This section describes Matrox 4VANC, as it applies to AFD and closed captioning, and details how to enable these features on MXO2.

AFD capture and playback

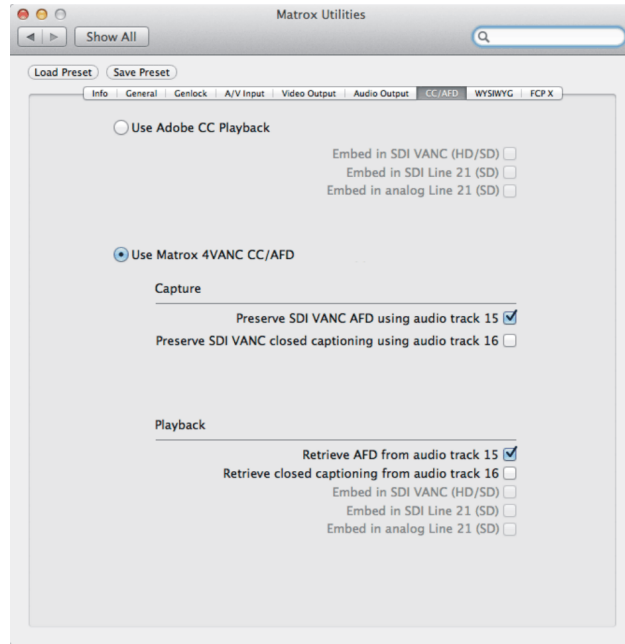
If you have an SDI video source that contains AFD (active format description) data in the VANC (vertical ancillary data space), Matrox 4VANC lets you preserve the data during capture, maintain the data during playback and export to disk, and restore the data during output. When using a supported video application, Matrox 4VANC captures the AFD data as an audio track using MXO2's SDI input, along with the video. The Matrox 4VANC audio track that contains the AFD data can then be used in a supported video application to play back the AFD data through MXO2's SDI output.

Matrox 4VANC preserves the SDI VANC AFD data during capture by encoding the data into the audio stream using audio track 15. The resulting file is an uncompressed 24-bit 48 kHz audio file that contains the AFD data. When using MXO2's SDI input for capture, you can choose to use audio track 15 to preserve the AFD data that is in your source video's VANC. Because audio track 15 is used for capturing AFD data, that channel will not be available for capturing audio.

When using MXO2's SDI output for playback, you can choose to retrieve and output the Matrox 4VANC AFD data from your video application. The AFD data is retrieved from audio track 15 and output using MXO2's SDI output. The AFD data is restored to your HD/SD video's VANC on output. When Matrox 4VANC is being used, track 15 is muted during playback, therefore it will not be available for playing back audio.

The following steps describe how to enable Matrox 4VANC AFD for capture and playback on MXO2:

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **CC/AFD**.



- 3 Select **Use Matrox 4VANC CC/AFD**.
- 4 Under **Capture**, select **Preserve SDI VANC AFD using audio track 15** to capture the AFD data from your source video's VANC using SDI audio track 15.



Note To capture AFD data, you must select **SDI** as your video input source (see [“Specifying your A/V input settings”](#) on page 55). You must also genlock to your capture source and not an external genlock source (see [“Specifying your genlock settings”](#) on page 54).

- 5 Under **Playback**, select **Retrieve AFD from audio track 15** to retrieve the Matrox 4VANC AFD data from audio track 15 in your video application, and play back the video with the AFD data restored to the VANC using MXO2's SDI output.
- 6 Specify the appropriate settings in your video application. For information on how to set your video application settings to capture, play back, and export Matrox 4VANC AFD, see [Chapter 9, “Using Matrox MXO2 with Supported Programs.”](#)

Closed caption capture and playback

If you have an SDI video source that contains digital closed caption data in the VANC (vertical ancillary data space), Matrox 4VANC lets you capture the closed caption data as an audio track using MXO2's SDI input, along with the video. The Matrox 4VANC audio track that contains the closed caption data can then be used in a supported video application to play back closed captioning through MXO2's SDI or analog output.

Matrox 4VANC preserves the SDI VANC closed caption data during capture by encoding the data into the audio stream using audio track 16. The resulting file is an uncompressed 24-bit 48 kHz audio file that contains the closed caption data. You can also create a Matrox 4VANC closed caption audio file using supported captioning software, such as CPC MacCaption. You can add a Matrox 4VANC closed caption audio file to any project timeline in your video application, or transport and store the audio file on any video/audio device as an audio track.

When using MXO2's SDI input for capture, you can choose to use audio track 16 to preserve the closed caption data that is in your source video's VANC. Because audio track 16 is used for capturing closed captioning, that channel will not be available for capturing audio.

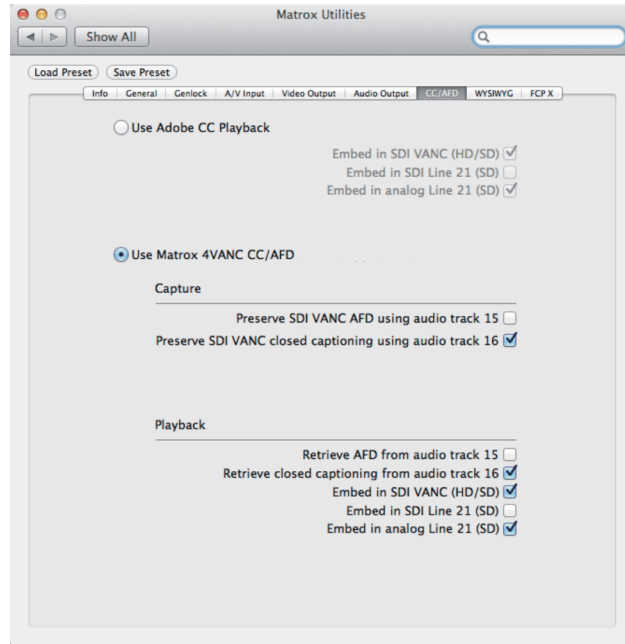


Note Closed caption data that is present in line 21 of a video's VBI (vertical blanking interval) is not transferred to an audio track because it is captured by MXO2 as part of the video signal.

When using MXO2's SDI or analog output for playback, you can choose to retrieve and output the Matrox 4VANC closed caption data from your video application. The closed caption data is retrieved from audio track 16 and output using MXO2's SDI or analog output. When Matrox 4VANC is being used, track 16 is muted during playback, therefore it will not be available for playing back audio. For playback, MXO2 lets you choose whether to embed the closed caption data in your HD/SD video's VANC, or in Line 21 of the VBI portion of SD video.

The following steps describe how to enable Matrox 4VANC closed captioning for capture and playback on MXO2:

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **CC/AFD**.



- 3 Select **Use Matrox 4VANC CC/AFD**.
- 4 Under **Capture**, select **Preserve SDI VANC closed Captioning using audio track 16** to capture the digital closed caption data from your source video's VANC using SDI audio track 16.



Note To capture digital closed captioning, you must select **SDI** as your video input source (see “[Specifying your A/V input settings](#)” on page 55). You must also genlock to your capture source and not an external genlock source (see “[Specifying your genlock settings](#)” on page 54).

- 5 Under **Playback**, select **Retrieve closed captioning from audio track 16** to retrieve the Matrox 4VANC closed caption data from track 16 in your video application, and play back the video with closed captioning using MXO2's SDI or analog output.
- 6 If you selected **Retrieve closed captioning from audio track 16** in step 5, specify where you want the closed captioning data to be embedded in the video signal during playback. Since MXO2 features simultaneous outputs, you can select more than one of the following options.

- **Embed in SDI VANC (HD/SD)** Use this option if you want to play back HD or SD video from MXO2's SDI output, and embed the closed captioning data in your video's VANC.
- **Embed in SDI Line 21 (SD)** Use this option if you want to play back SD video from MXO2's SDI output, and embed the closed captioning data on Line 21 of the VBI (vertical blanking interval) portion of your video signal.
- **Embed in analog Line 21 (SD)** Use this option if you want to play back SD video from any of MXO2's analog outputs (component, S-Video, and composite), and embed the closed captioning data on Line 21 of the VBI (vertical blanking interval) portion of your video signal.



Note To preview HD video with closed captioning on an SD monitor, you must set the output that is connected to your monitor to SD (see [“Specifying your video output settings”](#) on page 58), and select either **Embed in SDI Line 21 (SD)** or **Embed in analog Line 21 (SD)**.

- 7 Specify the appropriate settings in your video application. For information on how to set your video application settings to capture, play back, and export Matrox 4VANC closed captioning, see [Chapter 9, “Using Matrox MXO2 with Supported Programs.”](#)

Specifying your Matrox WYSIWYG settings

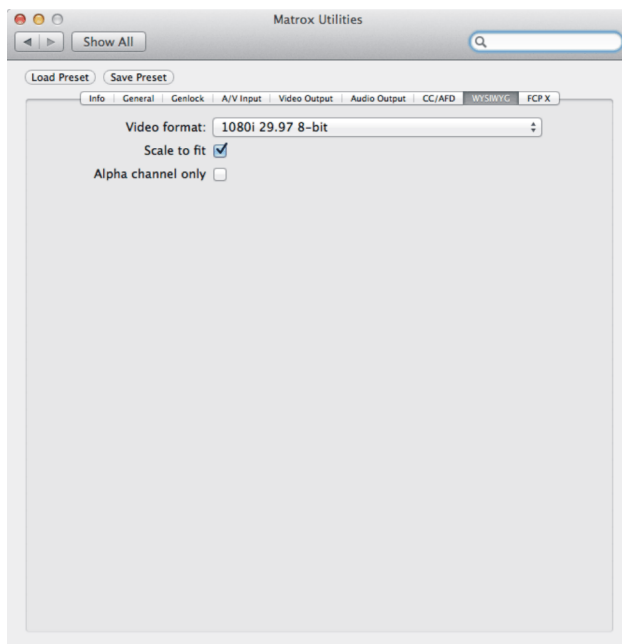
The Matrox WYSIWYG settings configure the MXO2 video output when working with Adobe After Effects (v12.x or earlier) and Photoshop only (see [Chapter 9, “Using Matrox MXO2 with Supported Programs”](#)).



Note If you're using Adobe After Effects v13.x, you don't need to specify WYSIWYG settings. Instead, you use the MXO2 playback device to output your After Effects project using the MXO2 outputs as explained in [“Using Adobe After Effects v13.x”](#) on page 110.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.

2 Click **WYSIWYG**.



- 3 From the **Video format** menu, select the format that matches your composition/image, or the format that is closest in resolution and aspect ratio. The video format at which your composition/image is output from MXO2 is set in the **Video Output** pane (see step 6).



Note To view a 1:1 representation of your composition/image on an HDMI monitor that does not support 1:1 pixel mapping, select your monitor's native resolution as the video format, and disable **Scale to fit**.

- 4 If the selected video format does not match your composition/image, select **Scale to fit** to upscale/downscale your project to fit the selected video format. Clear this option to display your composition/image at its exact resolution (1:1) within the selected video format.
- 5 Select **Alpha channel only** to output only the alpha channel from your composition/image.
- 6 Specify the **Video Output** settings in the Matrox preferences window as described in “[Specifying your video output settings](#)” on page 58.



Note To output your composition/image at the video format selected in step 3, select **Follow Application** from the **Set main channel format to** list, and make sure that the MXO2 output that you will use for monitoring is set to output the **Main channel** under **Channel Selection**.

- 7 To output your project using MXO2, specify the settings in Adobe After Effects/Photoshop as explained in [Chapter 9, “Using Matrox MXO2 with Supported Programs.”](#)

Specifying the Apple Final Cut Pro X setting

The **FCP X** pane in the **Matrox Utilities** preferences window is used when working with Apple Final Cut Pro X only. For details on setting the **FCP X** setting when using Matrox MXO2 with Final Cut Pro X, see [“Working with Apple Final Cut Pro X”](#) on page 123.



Note The **FCP X** setting in the **Matrox Utilities** preferences window is not saved when saving a custom preset (see [“Saving custom presets”](#) on page 52).

Viewing MXO2 information

To view your MXO2’s serial number, firmware version, and software version:

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **Info**.



Note If a message appears indicating an unsupported firmware version on your MXO2 hardware, you must update the MXO2 firmware as explained in [“Updating your MXO2 firmware”](#) on page 8.

MXO2 core audio support

You can use MXO2 as the input and output audio device for your Mac OS, and any audio application on your system. The Matrox MXO2 input and output audio device options allow you to set MXO2 as the input and output audio device in your Mac OS **Sound** settings for your entire system, for use with such applications as Apple iTunes. You can also set MXO2 as the input and output audio device within specific audio applications on your system.

Capture

If you want to perform a capture in an application that has MXO2 as the audio device, you must close any other application that has MXO2 selected as the audio device before capturing.

Playback

When playing back in an application that uses MXO2 as the output audio device, you must close any other application that uses MXO2 as the output audio device.

Your notes

8

Calibrating Your HDMI Monitor for Video

This chapter explains how to use the Matrox HDMI Calibration Utility to calibrate your RGB HDMI monitor for video.

Overview

The Matrox HDMI Calibration Utility is a unique tool designed to calibrate your RGB HDMI monitor or television so that it performs like a traditional broadcast video monitor. This utility provides a wizard that walks you through the calibration process using specially designed patterns to effectively identify and compensate for the processing errors that may be present in your HDMI monitor. The Matrox HDMI Calibration Utility calibrates your monitor's black and white levels, white point, gamma response, and hue and chroma.

This utility is optimized for calibrating HDMI LCD/LED monitors or televisions that support 1:1 pixel mapping, which allows you to view the output on your HDMI monitor at its exact resolution without any scaling. Although instructions are provided for calibrating plasma HDMI monitors, and HDMI monitors that scale the output, a blue-only filter will be required for the color calibration (hue and chroma). Some HDMI monitors feature a built-in blue-only mode that you can use for color calibration. If your HDMI monitor does not have a built-in blue-only mode, you can use a proper third-party blue-only filter (for example, a blue gel filter, or blue-only calibration glasses) that completely blocks out all colors except for blue. Because some blue-only filters do not block out colors effectively, the Matrox HDMI Calibration Utility includes a blue-only filter test that you can use to determine if your blue-only filter is adequate for color calibration.



Note This utility is best viewed at a display resolution of 1280×800 or higher.

Calibrating your HDMI monitor

The Matrox HDMI Calibration Utility provides on-screen instructions to calibrate your HDMI monitor. At the end of the calibration process, you must save your calibration settings to a file. Once saved, the calibration settings are automatically loaded as your system's current calibration settings. If you're calibrating more than one HDMI monitor, you can calibrate and save settings for each monitor and load the corresponding settings at any time (see [“Loading Matrox HDMI calibration settings”](#) on page 77). You can later choose to enable or disable the loaded calibration settings (see [“Enabling and disabling the Matrox HDMI calibration settings”](#) on page 78).



Note An administrator username and password is required to calibrate your HDMI monitor.

- 1 Ensure that your HDMI monitor is connected to MXO2's HDMI output, turn the HDMI monitor on, and allow it to warm up for about 20 or 30 minutes.
- 2 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 3 Click **Video Output**.

- 4 Under **Miscellaneous**, from the **Set HDMI output to** list, select **RGB - calibrated**.
- 5 Click **Calibrate**, and follow the on-screen instructions to calibrate your HDMI monitor.



Note When the Matrox HDMI Calibration Utility is running, you will not have access to the MXO2 options in the Matrox preferences window, and the MXO2 inputs and outputs will not be available to any other application.

- 6 At the end of the calibration process, save your calibration settings to a file anywhere on your system. You'll be required to enter an administrator username and password to save the settings. Once saved, your settings are automatically loaded as your system's current calibration settings. You can later choose to enable or disable the loaded calibration settings (see [“Enabling and disabling the Matrox HDMI calibration settings”](#) on page 78).



Note The calibration settings file is saved as a *.plist* file. If you cancel the HDMI calibration, or close the utility at any time before saving the calibration settings, the current calibration settings will be lost.

Loading Matrox HDMI calibration settings

After calibrating your HDMI monitor and saving your calibration settings to a file (see [“Calibrating your HDMI monitor”](#) on page 76), the calibration settings are automatically loaded as the current HDMI calibration settings for your system. You can, however, load another HDMI calibration settings file at any time, but only one calibration settings file can be loaded for your system at any given time. Once loaded, you can enable or disable the calibration settings (see [“Enabling and disabling the Matrox HDMI calibration settings”](#) on page 78). If your system has multiple users, the loaded calibration settings apply to all users.



Note An administrator username and password is required to load HDMI calibration settings.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **Video Output**.
- 3 Under **Miscellaneous**, from the **Set HDMI output to** list, select **RGB - calibrated**.
- 4 Click **Calibrate**, enter an administrator username and password, and then click **Load Settings** from the **Welcome** page.
- 5 Select the desired *.plist* calibration file, and then click **Open**.

Enabling and disabling the Matrox HDMI calibration settings

The HDMI calibration settings that are loaded for your system (see [“Loading Matrox HDMI calibration settings”](#) on page 77) can be enabled or disabled. When enabled, the video that is output from the MXO2 HDMI output will have the color settings that are saved in the currently loaded calibration file. This is used when you want to monitor video on your RGB HDMI monitor. Disable the calibration settings if you want the HDMI video to be output from MXO2 with its native color settings, such as when performing an edit-to-tape.

- 1 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 2 Click **Video Output**.
- 3 Under **Miscellaneous**, from the **Set HDMI output to** list, select **RGB - calibrated** to enable the loaded HDMI calibration settings. Depending on your HDMI output device, select **RGB - native** or **YUV** to disable the loaded calibration settings. For more information on setting the MXO2 HDMI output type, see [“Specifying your video output settings”](#) on page 58.

9

Using Matrox MXO2 with Supported Programs

This chapter explains how to define various settings for using MXO2 with supported programs.

Introduction

This chapter provides information on how to configure the following applications for use with MXO2:

- Adobe Premiere Pro ([page 80](#))
- Adobe Encore ([page 108](#))
- Adobe Prelude ([page 109](#))
- Adobe After Effects ([page 110](#))
- Adobe Photoshop ([page 111](#))
- Adobe SpeedGrade ([page 112](#))
- Avid Media Composer and Symphony ([page 114](#))
- Apple Final Cut Pro X ([page 123](#))



Important Matrox MXO2 features scaling options that you can use to scale your video for capture and output. To ensure desired results, always scale your video using the MXO2 scaling options (see [Chapter 7, “Configuring Your MXO2 System”](#)) instead of the scaling options found in your video editing application.

Working with Adobe Premiere Pro

You can use Adobe Premiere Pro to play back, capture, export, and output video and audio using Matrox MXO2. For a list of the supported video output formats for the MXO2 main and SD channels, and the supported video formats for the MXO2 outputs, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#) For a list of the input and capture formats that are supported on MXO2, and to view the MXO2 input scaling options, see [Appendix C, “Matrox MXO2 Supported Input and Capture Formats.”](#)



Note To ensure that changes made in the **Matrox Utilities** preferences window are applied to Premiere Pro when switching between Premiere Pro and the **Matrox Utilities** preferences window, select **Disable video output when in the background** in Premiere Pro’s **Playback** settings (**Premiere Pro > Preferences > Playback**).

This section provides information on how to:

- Create a new Adobe Premiere Pro project. ([page 81](#))
- Define your playback settings. ([page 82](#))
- Define your capture settings. ([page 84](#))
- Add a voice-over to your sequence. ([page 86](#))
- Work with closed captioning and AFD. ([pages 91–94](#))
- Set up Matrox device control. ([page 99](#))
- Export your sequence to tape. ([page 101](#))

- Use the Matrox MPEG-2 I-frame codec. (page 105)

Support for Adobe Premiere Pro CC and CS6

The following instructions are for using Adobe Premiere Pro CC and Adobe Premiere Pro CS6. When an operation is different between the CC and CS6 versions, the version is displayed after the operation as (CC) or (CS6). Screen shots of the Adobe Premiere Pro dialog boxes are for the CC version only. Dialog boxes in the CS6 version may be slightly different.

Creating a new Adobe Premiere Pro project

Creating a new Adobe Premiere Pro project involves specifying the location of your scratch disks and selecting a sequence preset.

- 1 Start Adobe Premiere Pro and click the **New Project** icon. The **New Project** dialog appears. You can leave all the settings on the **General** pane at the default settings. For details on changing these settings, see your Adobe Premiere Pro documentation.
- 2 On the **Scratch Disks** pane, use the **Browse** button to select an appropriate A/V drive for each scratch disk type. When specifying the location of your scratch disks, make sure you follow the recommendations in your Adobe Premiere Pro documentation. For example, store your video and audio files on a separate hard drive dedicated to your media assets.



Tip Specifying the same scratch disk settings for all your projects will help shorten the amount of time it takes to open new or existing projects.

- 3 From the **Location** list, select where you want to save your project.
- 4 Specify a **Name** for your project.
- 5 Click **OK** to save your settings.
- 6 Choose **File > New > Sequence** (CC only). The **New Sequence** dialog opens on the **Sequence Presets** pane.
- 7 Under **Available Presets**, select the preset that matches the type of sequence that you want to create. Matrox MXO2 supports all the available presets, including custom presets that you create.



Note When you select any of the MPEG-2 I-frame presets, the Matrox MPEG-2 I-frame codec will be set for rendering your video previews.

- 8 Specify a **Sequence Name**.
- 9 If you plan on playing back or exporting Matrox 4VANC AFD or Matrox 4VANC closed caption data:
 - a In the **Tracks** pane, select **Multichannel** from the **Master** list.
 - b From the **Number of channels** list, select **16**, and then set the **Track Type** for each track in your sequence to **Mono**.

- c In the **Settings** pane, under **Audio**, select **48000 Hz** from the **Sample Rate** list.

10 Click **OK** to apply the settings.

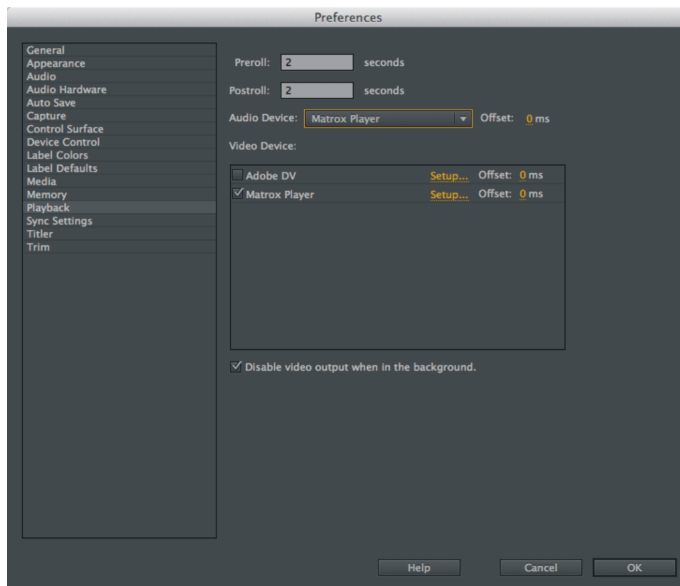


Note To avoid playback issues when using **Matrox Player** as the playback device, make sure that a Matrox audio device is not selected in the **Audio Hardware** preferences (and **Audio Output Mapping** preferences in Premiere Pro CS6).

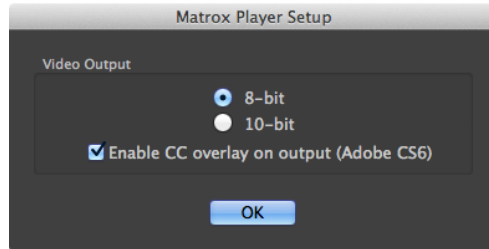
Defining your playback settings

This section details how to define your settings in order to use your Matrox MXO2 hardware to output video and audio that is played back in Adobe Premiere Pro. For a list of the supported video output formats for the MXO2 main and SD channels, and the supported video formats for the MXO2 outputs, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

- 1 In Premiere Pro, choose **Premiere Pro > Preferences > Audio Hardware**, and make sure that a Matrox audio device is not selected for **Adobe Desktop Audio** (CC) or **Default Device** (CS6). This includes a Matrox aggregate audio device that you created for your Mac OS X Mavericks or Mountain Lion system for the purposes of adding a voice-over (see [“Adding a voice-over to your sequence”](#) on page 86).
- 2 Choose **Premiere Pro > Preferences > Playback**.



- 3 In the **Preferences** dialog, select **Matrox Player** from the **Audio Device** list.
- 4 Under **Video Device**, select **Matrox Player**, and then click **Setup** beside Matrox Player.



- 5 In the **Matrox Player Setup** dialog, select the bit depth for your video output (**8-bit** or **10-bit**).
- 6 If you're using Premiere Pro CS6 and your sequence includes closed captioning that was not created using the Matrox 4VANC tool (see [“Closed captioning and AFD”](#) on page 91), you can select **Enable CC overlay on output (Adobe CS6)** if you want to overlay the closed captions on all the MXO2 video outputs for display on video monitors that do not support closed captioning as explained in [“Overlay closed captions \(CS6\)”](#) on page 98.



Note If you're using Premiere Pro CC, you can use the closed captioning overlay feature in Premiere Pro as explained in [“Overlay closed captions \(CC\)”](#) on page 98.

- 7 Click **OK** to close the **Matrox Player Setup** dialog.
- 8 Click **OK** to save your settings in the **Preferences** dialog.
- 9 If you selected an MPEG-2 I-frame sequence preset, or a custom sequence preset that uses the Matrox MPEG-2 I-frame codec to render your video preview, choose **Sequence > Sequence Settings**, and then in the **Settings** pane, click **Configure** beside **Preview File Format** to configure the codec. See [“Using the Matrox MPEG-2 I-frame codec”](#) on page 105 for information on specifying your Matrox MPEG-2 I-frame codec settings.
- 10 Set the appropriate video and audio output settings in the **Matrox Utilities** preferences window (see [Chapter 7, “Configuring Your MXO2 System”](#)).



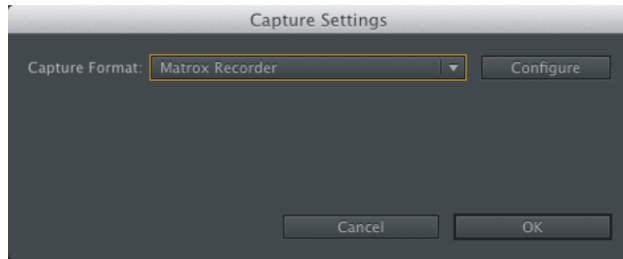
Note To ensure that changes made in the **Matrox Utilities** preferences window are applied to Premiere Pro when switching between Premiere Pro and the **Matrox Utilities** preferences window, select **Disable video output when in the background** in Premiere Pro's **Playback** settings (**Premiere Pro > Preferences > Playback**).

- 11 In Premiere Pro, play back your sequence.

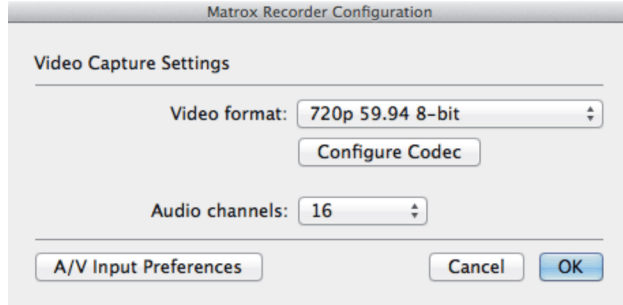
Defining your capture settings

To capture video and audio in Premiere Pro using your Matrox MXO2 hardware, you must define your capture settings as detailed in this section. For a list of the input and capture formats that are supported on MXO2, and to view the MXO2 input scaling options, see [Appendix C, “Matrox MXO2 Supported Input and Capture Formats.”](#)

- 1 In Premiere Pro, choose **File > Capture**.
- 2 In the **Capture** panel, in the **Settings** pane, under **Capture Settings**, click **Edit**.



- 3 In the **Capture Settings** pane, select **Matrox Recorder** from the **Capture Format** list, and then click **Configure**.



- 4 In the **Matrox Recorder Configuration** dialog, select the **Video format** to which you want to capture your source video.
- 5 Click **Configure Codec** to select and configure the capture codec. If you want to use the Matrox MPEG-2 I-frame codec, see [“Using the Matrox MPEG-2 I-frame codec”](#) on page 105 for details on configuring the codec.
- 6 Select the number of **Audio channels** to capture. If capturing Matrox 4VANC AFD or closed caption data (see [“Closed captioning and AFD”](#) on page 91), you must capture 16 audio channels.

- 7 Click **A/V Input Preferences** to set the appropriate video and audio input settings in the **Matrox Utilities** preferences window (see [“Specifying your A/V input settings”](#) on page 55).



Note To ensure that changes made in the **Matrox Utilities** preferences window are applied to Premiere Pro when switching between Premiere Pro and the **Matrox Utilities** preferences window, select **Disable video output when in the background** in Premiere Pro’s **Playback** settings (**Premiere Pro > Preferences > Playback**).

- 8 Click **OK** to save your settings in the **Matrox Recorder Configuration** dialog.
- 9 If you want to use Matrox device control for frame-accurate capture from a device, see [“Setting up Matrox device control”](#) on page 99.



Note When using Matrox device control, the capture does not stop at the end of the tape when using the **Tape** option in the **Capture** panel. To avoid capturing beyond the end of the tape, use the **In/Out** capture option instead and set an In and Out point for your capture.

- 10 Capture as you would normally.

Adding a voice-over to your sequence

Matrox MXO2 supports voice-over in Adobe Premiere Pro, which allows you to record audio tracks as .wav files to add commentary to video clips, such as newsreels and documentaries.



Note Matrox voice-over supports recording to standard, mono, and adaptive audio tracks only.

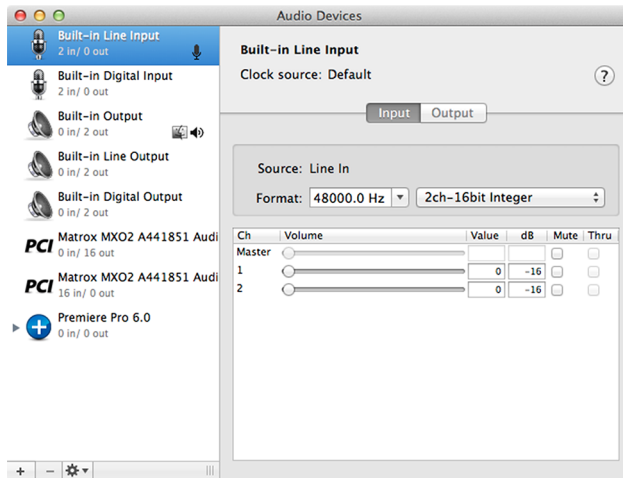
Connection and setup

- 1 Connect the microphone to the audio input on a source device, such as a preamplifier, and then connect the audio output from the source device to the corresponding audio input on your MXO2 hardware.



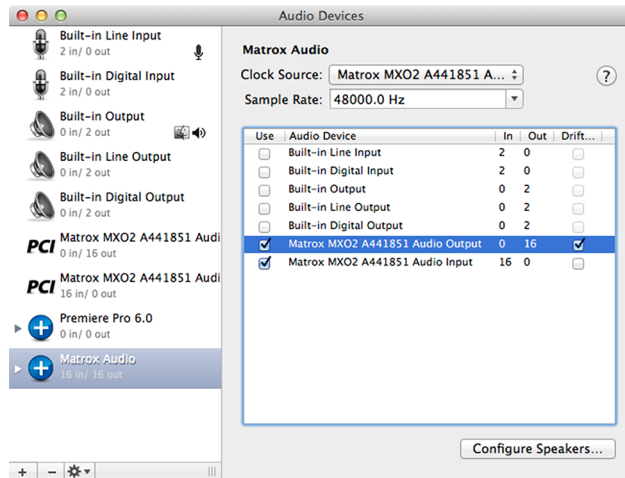
Note The Matrox hardware audio inputs are line level. Therefore, make sure your audio equipment output matches.

- 2 If you're using a Mac OS X Lion system, proceed to step 3. For Mac OS X Mavericks or Mountain Lion users, a Matrox aggregate audio device is required for your system. If you previously created a Matrox aggregate audio device on your system for the purposes of voice-over, proceed to step 3. To create a Matrox aggregate audio device, perform the following steps:
 - a In the Mac OS X **Finder** window, choose **Applications > Utilities**, and then double-click **Audio MIDI Setup**.



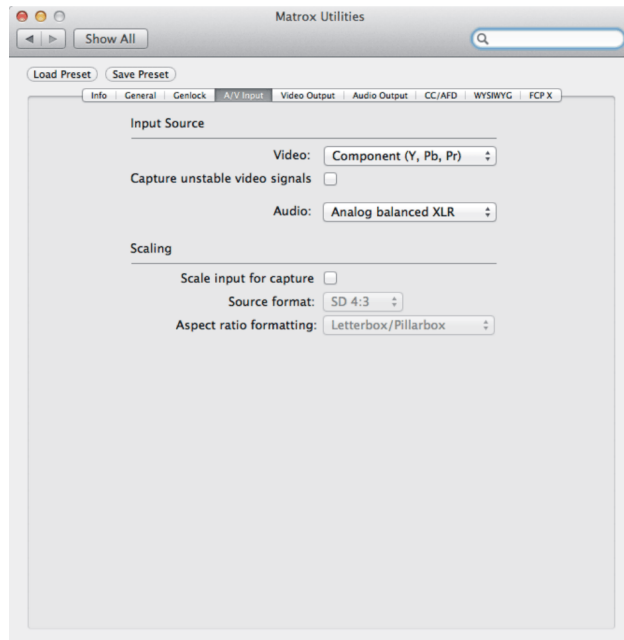
- b In the **Audio Devices** window, click at the bottom left of the dialog, and then **Create Aggregate Device**.
- c Double-click the newly created aggregate device that appears in the left pane, and type a descriptive name for the device, such as **Matrox Audio**.

- d Highlight the **Matrox Audio** aggregate device, and then select to use the Matrox audio input and output.

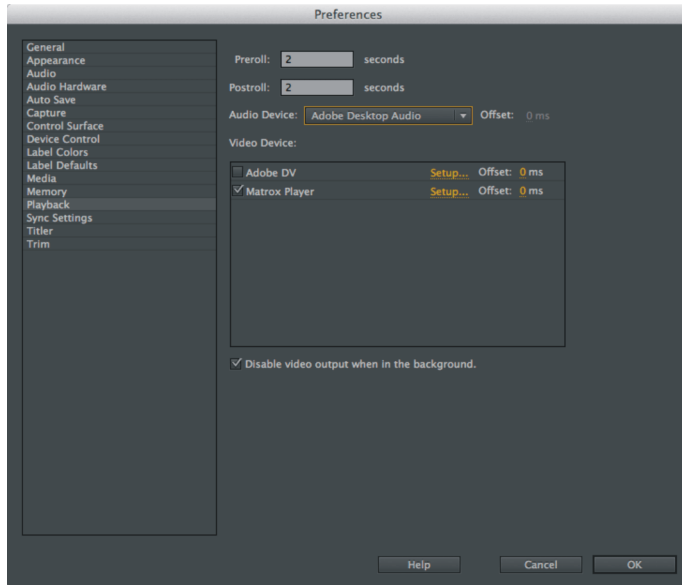


- e Quit **Audio MIDI Setup**.

- 3 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- 4 Click **A/V Input**.

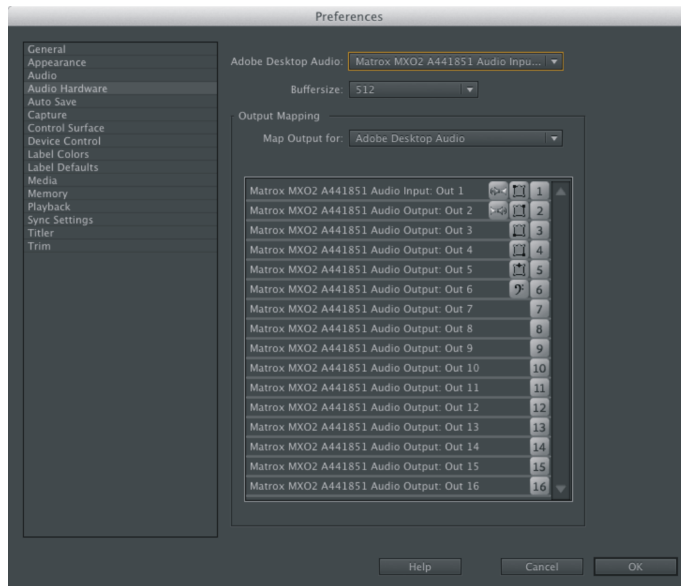


- 5 Under **Input Source**, select the **Audio** input on your Matrox hardware to which your audio source device is connected, and then select **Component** from the **Video** list.
- 6 Close the **Matrox Utilities** preferences window.
- 7 In Premiere Pro, choose **Premiere Pro > Preferences > Playback**, and then select **Adobe Desktop Audio** as the **Audio Device**.

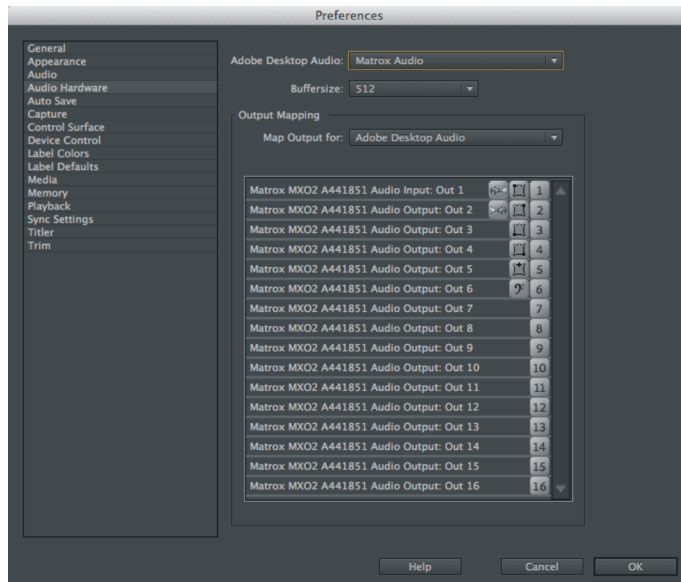


- 8 Click **OK** to apply the change.
- 9 Choose **Premiere Pro > Preferences > Audio Hardware**, and then select the option based on your operating system:
 - **Mac OS X Lion** Select the Matrox input/output option from the **Adobe Desktop Audio** list (CC) or the **Default Device** list (CS6). For example,

Matrox MXO2 (serial number) Input/Matrox MXO2 (serial number) Output. Do not select the Matrox option for output only.



- **Mac OS X Mavericks or Mountain Lion** Select the Matrox aggregate audio device created in step 2 from the **Adobe Desktop Audio** list (CC) or the **Default Device** list (CS6).




10 Click **OK** to apply the change.

Recording your voice-over

You use Adobe Premiere Pro's Audio Track Mixer (CC) or Audio Mixer (CS6) to record your voice-over. For further information on using this mixer, see your Adobe Premiere Pro documentation.

- 1 In Premiere Pro, choose **Window > Audio Track Mixer (CC)** or **Audio Mixer (CS6)**, and then select the sequence in which you want to record your voice-over, such as **Sequence 01**.



- 2 Position the current-time indicator in the **Timeline** panel where you want the voice-over to begin. You can also set In and Out points to specify the section of the timeline to which you want to add your voice-over.
- 3 In the mixer's panel, click the **Enable track for recording** button () for the tracks on which you want to record audio. You can record your voice-over on multiple tracks at the same time.



Note If a track that you'll be recording your voice-over on already contains audio at the current-time indicator, the audio will be overwritten by your voice-over.

- 4 For each track selected in step 3, select the Matrox audio input channel that you want to record from the Track Input Channel list at the top of the panel.
- 5 Select **Meter Input(s) Only** in the mixer's menu to display the MXO2 audio input levels in the meters.



Tip You can click the **Solo Track** button () for a track on which you'll be recording audio to mute the audio playback of other audio tracks in your sequence.

- 6 Test the audio input levels by speaking into the microphone, and watch the levels in the meters. If needed, adjust the audio level on your source device so that the input levels are sufficiently high but not clipping.
- 7 Click the **Record** button () to prepare the sequence for recording.
- 8 Click the **Play** button (), or the **Play In to Out** button () if you set In and Out points, to start recording your voice-over.



Note During recording, there's a slight delay in the audio preview of your voice-over. To mute the preview, click the **Mute Track** button () or you can choose to lower the track volume by dragging the **Volume** slider.

- 9 Click the **Stop** button () to stop recording. Your voice-over will be added to the selected audio tracks as .wav files.
- 10 To ensure proper A/V synchronization during playback when not recording a voice-over, make sure that a Matrox audio option is not selected for the **Adobe Desktop Audio** option (CC) or **Default Device** option (CS6) in the **Audio Hardware** preferences (**Premiere Pro > Preferences > Audio Hardware**), and then select **Matrox Player** as the **Audio Device** and **Video Device** in the **Playback** settings (**Premiere Pro > Preferences > Playback**).

Closed captioning and AFD

Matrox MXO2 provides two ways of working with closed caption and AFD data in Adobe Premiere Pro:

- **Matrox 4VANC tool** (pages 92 and 94) The Matrox 4VANC tool lets you capture and play back digital closed caption and AFD (active format description) data along with your video. The Matrox 4VANC closed caption and AFD data can be embedded in your video's VANC on output for display on an SDI or analog video monitor that supports closed captioning.
- **Premiere Pro's closed captioning** (page 97) Matrox MXO2 supports Adobe Premiere Pro's closed captioning feature for playback. The closed captions on your sequence can be embedded in your video's VANC on

output for display on an SDI or analog video monitor that supports closed captioning, or you can choose to overlay the closed captions on all the MXO2 video outputs for display on video monitors that do not support closed captioning.

Working with Matrox 4VANC AFD

MXO2 lets you capture the AFD (active format description) data stored in your video's VANC, along with your video, and restore the AFD data during playback, using the Matrox 4VANC tool. This section details how to capture and play back Matrox 4VANC AFD using Adobe Premiere Pro. You can also use Premiere Pro to export a sequence with Matrox 4VANC AFD to a file for playback using Premiere Pro. For more information about any of the features mentioned in this section, see your Premiere Pro documentation.



Note Matrox MXO2 Mini does not support AFD data.

Capturing Matrox 4VANC AFD

When using MXO2's SDI input for capture, Matrox 4VANC lets you preserve the AFD (active format description) data from your video's VANC (vertical ancillary data space) by capturing the data as an audio track.

If Matrox 4VANC capture is enabled in the **Matrox Utilities** preferences window, Matrox MXO2 uses audio track 15 to preserve the AFD data during capture in Premiere Pro. The resulting file is an uncompressed 24-bit 48 kHz audio file that contains the AFD data. The Matrox 4VANC audio track that contains the AFD data can then be played back in Premiere Pro. During playback the AFD data is restored to your HD/SD video's VANC through MXO2's SDI or analog output (see [“Playing back Matrox 4VANC AFD”](#) on page 92). Because audio track 15 is used for capturing AFD data, that channel will not be available for capturing audio. To capture Matrox 4VANC AFD:

- a Enable capture of Matrox 4VANC AFD in the **Matrox Utilities** preferences window (see [“AFD capture and playback”](#) on page 66).
- b Specify your capture settings in Premiere Pro as detailed in [“Defining your capture settings”](#) on page 84.
- c Capture as you would normally.

Playing back Matrox 4VANC AFD

During playback, MXO2 retrieves the AFD data from the Matrox 4VANC audio track that is assigned to audio output 15 in Premiere Pro, and restores the AFD data to your HD/SD video's VANC through MXO2's SDI or analog output. Set your playback settings as follows:

- a In Premiere Pro, choose **File > New > Sequence**. In the **New Sequence** dialog:
 - In the **Tracks** pane, select **Multichannel** from the **Master** list.

- From the **Number of channels** list, select **16**, and then set the **Track Type** for each track in your sequence to **Mono**.
 - In the **Settings** pane, under **Audio**, select **48000 Hz** from the **Sample Rate** list.
- b** Set the remaining settings in the **New Sequence** dialog, and then click **OK**.
- c** With your project files on the timeline, in the **Audio Track Mixer**, assign the audio track that contains the Matrox 4VANC closed caption data on your timeline to audio output **15 + 16**, and then use the **Pan/balance control** to set the balance completely to the left (channel 15). If there is another audio track assigned to **15 + 16**, you must set the balance for that audio track completely to the right (channel 16). Audio track 16 can be used for Matrox 4VANC closed caption data (see [“Working with Matrox 4VANC closed captioning”](#) on page 94).



Note To preserve the integrity of the AFD data for playback, do not manipulate the audio track that contains the AFD data in any way. For example, do not adjust the audio gain or add audio effects to the track.

- d** Specify your playback settings as detailed in [“Defining your playback settings”](#) on page 82.
- e** Enable playback of Matrox 4VANC AFD in the **Matrox Utilities** preferences window (see [“AFD capture and playback”](#) on page 66).
- f** Play back your sequence.

Exporting Matrox 4VANC AFD to a file

This section details how to maintain the Matrox 4VANC AFD data when exporting your sequence to a file. The exported file can then be used in Premiere Pro for playback (see [“Playing back Matrox 4VANC AFD”](#) on page 92).

- a** In Premiere Pro, choose **File > New > Sequence**. In the **New Sequence** dialog:
- In the **Tracks** pane, select **Multichannel** from the **Master** list.
 - From the **Number of channels** list, select **16**, and then set the **Track Type** for each track in your sequence to **Mono**.
 - In the **Settings** pane, under **Audio**, select **48000 Hz** from the **Sample Rate** list.
- b** Set the remaining settings in the **New Sequence** dialog, and then click **OK**.
- c** With your project files on the timeline, in the **Audio Track Mixer**, assign the audio track that contains the Matrox 4VANC AFD data to an audio output pair (for example, **3 + 4**), and then use the **Pan/balance control** to set the balance of the Matrox 4VANC track completely to the left or

right. If the selected audio output pair is assigned to another audio track, set the balance for the other audio track to the other side. For example, if the Matrox 4VANC AFD audio track balance is set to the left, set the balance for the other audio track that is assigned to the same audio outputs to the right.

d Choose **File > Export > Media**.

e In the **Audio** pane, select a lossless or uncompressed **Audio Codec**. Compressed audio codecs are not supported for use with Matrox 4VANC.

f Under **Basic Audio Settings**, select **48000 Hz** from the **Sample Rate** list.

g From the **Channels** list, select the number of audio channels to export.



Note **Mono**, **5.1**, and **Stereo** are not supported when exporting Matrox 4VANC AFD data.

h From the **Sample Size** list, select **24 bit**.

i Export your sequence to file. If you have an MXO2 product with MAX technology, see [Chapter 10, “Using the Matrox MAX H.264 Codec”](#) for information on exporting your sequence using the Matrox MAX H.264 codec.

Working with Matrox 4VANC closed captioning

MXO2 lets you capture and play back video with digital closed captioning using the Matrox 4VANC tool. This section details how to capture and play back Matrox 4VANC closed captioning using Adobe Premiere Pro. You can also use Premiere Pro to export a sequence with Matrox 4VANC closed captioning to a file for playback using Premiere Pro. For more information about any of the features mentioned in this section, see your Premiere Pro documentation.



Note Matrox MXO2 Mini does not support closed captioning.

Capturing Matrox 4VANC closed captioning

When using MXO2's SDI input for capture, Matrox 4VANC lets you preserve the closed caption data from your video's VANC (vertical ancillary data space) by capturing the data as an audio track.

If Matrox 4VANC capture is enabled in the **Matrox Utilities** preferences window, Matrox MXO2 uses audio track 16 to preserve the closed caption data during capture in Premiere Pro. The resulting file is an uncompressed 24-bit 48 kHz audio file that contains the closed caption data. The Matrox 4VANC audio track that contains the closed caption data can then be used in Premiere Pro to play back closed captioning through MXO2's SDI or analog output (see [“Playing back Matrox 4VANC closed captioning”](#) on page 95). Because audio track 16 is used for capturing closed captioning, that channel will not be available for capturing audio. To capture Matrox 4VANC closed captioning:

- a Enable capture of Matrox 4VANC closed captioning in the **Matrox Utilities** preferences window (see “[Closed caption capture and playback](#)” on page 68).
- b Specify your capture settings in Premiere Pro as detailed in “[Defining your capture settings](#)” on page 84.
- c Capture as you would normally.

Playing back Matrox 4VANC closed captioning

During playback, MXO2 retrieves the closed caption data from the Matrox 4VANC audio track that is assigned to audio output 16, and outputs it using MXO2’s SDI or analog output. To play back Matrox 4VANC closed captioning:

- a In Premiere Pro, choose **File > New > Sequence**. In the **New Sequence** dialog:
 - In the **Tracks** pane, select **Multichannel** from the **Master** list.
 - From the **Number of channels** list, select **16**, and then set the **Track Type** for each track in your sequence to **Mono**.
 - In the **Settings** pane, under **Audio**, select **48000 Hz** from the **Sample Rate** list.
- b Set the remaining settings in the **New Sequence** dialog, and then click **OK**.
- c With your project files on the timeline, in the **Audio Track Mixer**, assign the audio track that contains the Matrox 4VANC closed caption data on your timeline to audio output **15 + 16**, and then use the **Pan/balance control** to set the balance completely to the right (channel 16). If there is another audio track assigned to **15 + 16**, you must set the balance for that audio track completely to the left (channel 15). Audio track 15 can be used for Matrox 4VANC AFD data (see “[Working with Matrox 4VANC AFD](#)” on page 92).




Note To preserve the integrity of the closed caption data for playback, do not manipulate the audio track that contains the closed caption data in any way. For example, do not adjust the audio gain or add audio effects to the track.

- d Specify your playback settings as detailed in “[Defining your playback settings](#)” on page 82.
- e Enable playback of Matrox 4VANC closed captioning in the **Matrox Utilities** preferences window (see “[Closed caption capture and playback](#)” on page 68).
- f Play back your sequence.

Exporting Matrox 4VANC closed captioning to a file

This section details how to maintain the Matrox 4VANC closed caption data when exporting your sequence to a file. The exported file can then be used in Premiere Pro for playback (see “[Playing back Matrox 4VANC closed captioning](#)” on page 95).

- a In Premiere Pro, choose **File > New > Sequence**. In the **New Sequence** dialog:
 - In the **Tracks** pane, select **Multichannel** from the **Master** list.
 - From the **Number of channels** list, select **16**, and then set the **Track Type** for each track in your sequence to **Mono**.
 - In the **Settings** pane, under **Audio**, select **48000 Hz** from the **Sample Rate** list.
 - b Set the remaining settings in the **New Sequence** dialog, and then click **OK**.
 - c With your project files on the timeline, in the **Audio Track Mixer**, assign the audio track that contains the Matrox 4VANC closed caption data to an audio output pair (for example, **3 + 4**), and then use the **Pan/balance control** to set the balance of the Matrox 4VANC track completely to the left or right. If the selected audio output pair is assigned to another audio track, set the balance for the other audio track to the other side. For example, if the Matrox 4VANC closed caption audio track balance is set to the left, set the balance for the other audio track that is assigned to the same audio outputs to the right.
 - d Choose **File > Export > Media**.
 - e In the **Audio** pane, select a lossless or uncompressed **Audio Codec**. Compressed audio codecs are not supported for use with Matrox 4VANC.
 - f Under **Basic Audio Settings**, select **48000 Hz** from the **Sample Rate** list.
 - g From the **Channels** list, select the number of audio channels to export.
-  **Note** **Mono**, **5.1**, and **Stereo** are not supported when exporting Matrox 4VANC closed caption data.
- h From the **Sample Size** list, select **24 bit**.
 - i Export your sequence to file. If you have an MXO2 product with MAX technology, see [Chapter 10, “Using the Matrox MAX H.264 Codec”](#) for information on exporting your sequence using the Matrox MAX H.264 codec.

Working with Premiere Pro's closed captioning

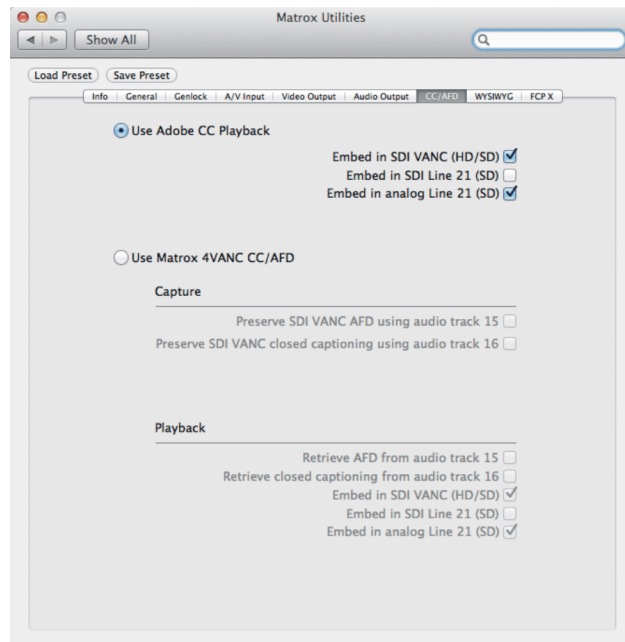
Matrox MXO2 supports Premiere Pro's closed captioning feature for playback and export to tape. The closed captions on your sequence can be embedded in your video's VANC on output for display on an SDI or analog video monitor that supports closed captioning, or you can choose to overlay the closed captions on all the MXO2 video outputs for display on video monitors that do not support closed captioning.

For details on how to import a closed caption file to your sequence, see your Adobe Premiere Pro documentation. To determine your video monitor's capabilities for displaying closed captioning, check your video monitor's documentation.

Embed closed captions in VANC

This section details how to embed the closed captions that are on your sequence in your video's VANC for play back and export to tape using MXO2.

- a From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.
- b Click **CC/AFD**.



- c Select **Use Adobe CC Playback**.

- d Specify where you want the closed caption data to be embedded in the video signal during playback. Since MXO2 features simultaneous outputs, you can select more than one of the following options.
 - **Embed in SDI VANC (HD/SD)** Use this option if you want to play back HD or SD video from MXO2's SDI output, and embed the closed captioning data in your video's VANC.
 - **Embed in SDI Line 21 (SD)** Use this option if you want to play back SD video from MXO2's SDI output, and embed the closed captioning data on Line 21 of the VBI (vertical blanking interval) portion of your video signal.
 - **Embed in analog Line 21 (SD)** Use this option if you want to play back SD video from any of MXO2's analog outputs (component, S-Video, and composite), and embed the closed captioning data on Line 21 of the VBI (vertical blanking interval) portion of your video signal.



Note To preview HD video with closed captioning on an SD monitor, you must set the output that is connected to your monitor to SD (see [“Specifying your video output settings”](#) on page 58), and select either **Embed in SDI Line 21 (SD)** or **Embed in analog Line 21 (SD)**.

e In Premiere Pro, specify your playback settings as detailed in [“Defining your playback settings”](#) on page 82.

f Play back your sequence or export your sequence to tape.

Overlay closed captions (CC)

This section details how to overlay the closed captions that are on your sequence on all the MXO2 video outputs for playback using Premiere Pro CC.



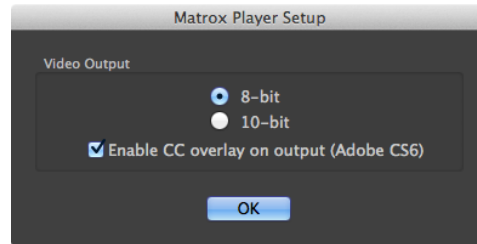
Note The closed captioning overlay is supported for playback only. The overlay will not be exported to tape.

- a In Premiere Pro, specify your playback settings as detailed in [“Defining your playback settings”](#) on page 82.
- b From the Program monitor pop-up menu, choose **Closed Captioning Display > Enable**.
- c From the Program monitor pop-up menu, choose **Overlay Settings > Settings**, and in the **Overlay Settings** dialog, select **Enable overlays for Transmit**.
- d Play back your sequence.

Overlay closed captions (CS6)

This section detailed how to overlay the closed captions that are on your sequence on all the MXO2 video outputs for playback using Adobe Premiere Pro CS6.

- a In Premiere Pro, specify your playback settings as detailed in “[Defining your playback settings](#)” on page 82. When specifying your playback settings, make sure to select the **Enable CC overlay on output (Adobe CS6)** option in the **Matrox Player Setup** dialog.



- b From the Program monitor pop-up menu, choose **Closed Captioning Display > Enable**.
- c Play back your sequence.

Setting up Matrox device control

Matrox device control lets you control any device that supports the RS-422 SMPTE time code protocol when capturing or exporting material to tape in Adobe Premiere Pro. To use device control, you must connect your source device or recorder as follows:

- **MXO2, MXO2 Rack, and MXO2 LE** Connect the RS-422 connector on your MXO2 hardware to the serial device control port on your source device or recorder using an RS-422 serial cable (see “[MXO2 RS-422 serial connection](#)” on page 17, “[MXO2 Rack RS-422 serial connection](#)” on page 28, or “[MXO2 LE RS-422 serial connection](#)” on page 37).



Note When using an analog RS-422 device on MXO2, MXO2 Rack, or MXO2 LE, you must genlock to an external broadcast-quality analog sync source. If you’re using an SDI RS-422 device and you don’t have an external broadcast-quality analog sync source, you can genlock to your SDI video source for capture. For export to tape, you can set your genlock source to the MXO2 internal reference and configure the setting on your deck to genlock to the SDI video input. For details on how to set your genlock source, see “[Specifying your genlock settings](#)” on page 54.

- **MXO2 Mini** MXO2 Mini does not feature an RS-422 serial connector. You can, however, use a suitable serial adapter to connect the serial device port on your source device or recorder to your computer. For a list of supported device control adapters, see the Matrox MXO2 Support section of our website at www.matrox.com/video/support.

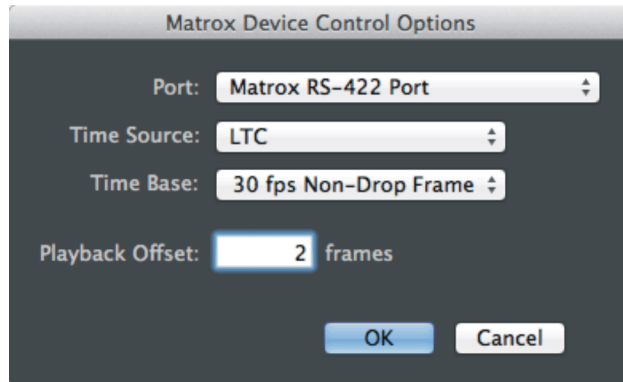
➡ **To configure your Matrox device control settings:**

- 1 In Premiere Pro, choose **Premiere Pro > Preferences > Device Control**.



Note When exporting to tape, Matrox uses a preroll of five seconds. This value is hardcoded and cannot be changed. The **Preroll** and **Timecode Offset** options available in Premiere Pro are ignored when using Matrox device control for export to tape (see [“Exporting your sequence to tape”](#) on page 101).

- 2 From the **Devices** list, select **Matrox Device Control**.
- 3 Click **Options** to display the **Matrox Device Control Options** panel.



- 4 From the **Port** list, select **Matrox RS-422 Port**. If the list contains more than one **Matrox RS-422 Port** option, which occurs when your system has more than one serial device control connection, select the option corresponding to the desired connection.



Note For MXO2 Mini users, if you're using a third-party serial adapter to connect the serial device port on your source device or recorder to your computer, the adapter must be connected to your computer before starting your system for it to appear in the **Port** list.

- 5 From the **Time Source** list, select the time source to be used for controlling your device:
 - **LTC** Longitudinal Time Code recorded on a track adjacent to the video. This type of time code can be read at all tape speeds, except still.
 - **VITC** Vertical Interval Time Code that is recorded onto the vertical blanking interval of the video. This type of time code can be read whenever an image is displayed, but not usually during high-speed operation.
 - **LTC+VITC** Select this if you want your device to decide which type of time code to use in different operational modes (recommended only if you're sure that the two types of time code match on your tape).

- **Control Track** Select this if you want to use only your tape's control track as the time source. Because using the control track is not as reliable as LTC or VITC for device control, you should select this option only if you're having problems using the time code on your tape.
- 6 From the **Time Base** list, select the time base that matches your tape, such as **30 fps Drop Frame** if you're using NTSC video with drop frame time code, or **25 fps** if you're using PAL video.
- 7 If required, in the **Playback Offset** box, specify the number of frames to offset the playback of your sequence for export to tape. For example, if playback starts too late and the first three frames are black on the tape, enter an offset of -3. Alternately, if playback starts too early and the first three frames of your sequence are missing, enter an offset of 3.
- 8 Click **OK** to save your Matrox device control settings.
- 9 Click **OK** to save your settings in the **Preferences** dialog.

For details on specifying your capture settings in Premiere Pro, see [“Defining your capture settings”](#) on page 84. For details on capturing with device control, see your Adobe Premiere Pro documentation. For information about exporting your sequence to tape, see [“Exporting your sequence to tape”](#) on page 101.

Exporting your sequence to tape

To export your Adobe Premiere Pro sequence to tape without using device control, simply play back your sequence and record the output from any of the available outputs on your MXO2 system. If your recorder supports RS-422 device control, you can export your sequence to tape using Matrox device control as explained in [“Exporting to tape using Matrox device control \(CC\)”](#) on page 101 or [“Exporting to tape using Matrox device control \(CS6\)”](#) on page 102.

Exporting to tape using Matrox device control (CC)



Note The following procedure applies to Adobe Premiere Pro CC only. If you're using Adobe Premiere Pro CS6, see [“Exporting to tape using Matrox device control \(CS6\)”](#) on page 102.

You can record your sequence onto tape using Matrox device control in Adobe Premiere Pro CC as follows:

- 1 Open your project, and set your playback settings as described in [“Defining your playback settings”](#) on page 82.
- 2 Make sure that you've properly connected your RS-422 recorder and configured Matrox device control as explained in [“Setting up Matrox device control”](#) on page 99.
- 3 Activate the sequence that you want to export to tape, and position the work area bar over the section of the sequence that you want to export.

- 4 If you haven't already done so, render all sections that are identified with a red or yellow render bar.



Note Adobe Premiere Pro will automatically render sections that have a red render bar when you start an export to tape, but to avoid having dropped frames you must render both the red and yellow sections before performing an export to tape.

- 5 Load a striped recordable tape into your recorder, and set your recorder to Remote or VTR mode.

- 6 Choose **File > Export > Tape (Serial Device)** to open the **Edit To Tape** panel.



Note When exporting to tape, Matrox uses a preroll of five seconds. This value is hardcoded and cannot be changed.

- 7 To preview the export to tape in the **Edit to Tape** panel:
 - a Connect your recorder's output to the input on MXO2, and set the MXO2 input settings as specified in ["Specifying your A/V input settings"](#) on page 55.
 - b In the **Edit To Tape** panel, click **Recorder Settings**, select **Matrox Recorder** from the **Capture Format** list, and then click **OK** to close the **Capture Settings** pane.
- 8 Use the settings and controls in Premiere Pro's **Edit To Tape** panel to export your sequence to tape. For information on how to use the **Edit To Tape** panel, refer to your Adobe Premiere Pro documentation.



Note When exporting to tape, MXO2 supports the first four audio channels only.

Exporting to tape using Matrox device control (CS6)



Note The following procedure applies to Adobe Premiere Pro CS6 only. If you're using Adobe Premiere Pro CC, see ["Exporting to tape using Matrox device control \(CC\)"](#) on page 101.

With Matrox device control, you can you can perform either an insert or assemble edit to record your sequence onto tape in Adobe Premiere Pro CS6 as follows:

- 1 Open your project, and set your playback settings as described in ["Defining your playback settings"](#) on page 82.
- 2 Activate the sequence that you want to export to tape, and position the work area bar over the section of the sequence that you want to export.
- 3 If you haven't already done so, render all sections that are identified with a red or yellow render bar.



Note Adobe Premiere Pro will automatically render sections that have a red render bar when you start an export to tape, but to avoid having dropped frames you must render both the red and yellow sections before performing a Matrox export to tape.


- 4 Make sure that you've properly connected your RS-422 recorder and configured Matrox device control as explained in [“Setting up Matrox device control”](#) on page 99.



Note When exporting to tape, Matrox uses a preroll of five seconds. This value is hardcoded and cannot be changed. The **Preroll** and **Timecode Offset** options available in Premiere Pro are ignored when using Matrox device control for exporting to tape.





- 5 Load a striped recordable tape into your recorder, and set your recorder to Remote or VTR mode.
- 6 Make sure that the sequence is activated, and then choose **File > Export > Tape** to open the **Matrox Export to Tape** panel.




- 7 Under **Export to Tape Mode**, select the **Edit mode** for your export to tape. Check your device's documentation to determine its recording capabilities for assemble and insert editing:
 - **Assemble** Records all tracks (video and audio) sequentially onto the tape. The control track and previously recorded material on the tape will be replaced with the material recorded from your sequence.
 - **Insert** Records selected tracks (video and/or audio), without affecting the control track. This lets you perform a video or audio dub. For example, you can choose to record only video, only selected audio tracks, or video and selected audio tracks from your sequence.
- 8 If **Insert** was selected as the **Edit mode**, select whether to export the **Video track**, and select the **Audio tracks** to export.
- 9 Select **Abort export on dropped frames** if you'd like the export to tape to automatically stop when dropped frames are encountered. You'll get a warning if the export to tape is aborted due to a dropped frame.
- 10 Under **Transport Control**, use the controls to play back your tape. The current time code of your tape appears in the box above the transport controls. When entering a time code manually, you must use the HH:MM:SS:FF format. You can also use the **J**, **K**, and **L** shortcut keys to control the shuttle. Press **J** to shuttle left, **L** to shuttle right, and **K** to stop. Pressing **J** or **L** multiple times increases the shuttling speed. Click the cue button () to position the tape at the currently displayed time code.



Note The transport controls are greyed out when there is no tape in the recorder or when an invalid connection is detected.

- 11 Specify where you want the recording to start and stop on your tape as follows:
 - Click the **In** button () to set the In point to the current time code, or enter the required time code in the **In** box. Click the cue button () to position the tape at the currently displayed **In** time code.
 - Click the **Out** button () to set the Out point to the current time code, or enter the required time code in the **Out** box. Click the cue button () to position the tape at the currently displayed **Out** time code. The Out time code is not inclusive. That is, your recording will stop a frame before the set Out point time code. For example, if your In point is 00:00:00:01 and your Out point is 00:00:00:03, the duration of your recording is 00:00:00:02 and you will record over frames 01 and 02 on your tape.
Alternately, you can select **Duration** and enter the duration you want for the recording. The Out point will then be calculated for you. By default, the duration is set to the duration of the work area. Click the reset button

() at any time to set the duration back to the duration of the work area.



Note When **Out** is selected, the duration is calculated based on your selected In and Out points. When **Duration** is selected, the Out point is calculated based on your specified In point and duration.

12 Click **Export** to start the export to tape.



Note The **Export** button is not available when the tape/recorder is in Record Inhibit mode, when there is no tape in the recorder, or when an invalid connection is detected.

Using the Matrox MPEG-2 I-frame codec

The Matrox MPEG-2 I-frame codec is a full-raster HD codec that gets installed automatically when you install your MXO2 software. It is included primarily for users who do not have a full-raster HD codec installed on their system.

To capture SD/HD video using the Matrox MPEG-2 I-frame codec, the MXO2 software must be installed on your system, and the MXO2 hardware must be connected.

If the captured video will be played back on another system, the Matrox MPEG-2 I-frame codec must be installed on that system as well. You can download the Matrox MPEG-2 I-frame codec for playback on other Mac systems from the Download section of our Support website at www.matrox.com/video/support.



To configure the Matrox MPEG-2 I-frame codec:

The default settings for the Matrox MPEG-2 I-frame codec provide good results for most applications. We recommend that you change these settings only when needed for special purposes.



Note If you're using the Matrox MPEG-2 I-frame codec for playback, some of the options described in this section may not apply.

- 1 Under **Motion**, select the frame rate for your captured video in **Frames per second**, and enter a target data rate in the **Limit data rate to** box.



Note The data rate must be between 10 Mb/s (975 KB/s) and 300 Mb/s (36621 KB/s) for SD material, and 50 Mb/s (6100 KB/s) and 300 Mb/s for HD material.

- 2 To apply advanced compression settings, set the options under **Compressor**. The default settings for the advanced options provide good results for most applications. We recommend that you change these settings only when needed for special purposes.

— Select your desired **Scan pattern**:

- **Regular** Sets the regular zig zag scanning pattern of the AC coefficient of the DCT block as defined in the ISO/IEC 13818-2 (figure 7-2) specification document.
- **Alternate** Sets the alternate zig zag scanning pattern of the AC coefficient of the DCT block as defined in the ISO/IEC 13818-2 (figure 7-3) specification document. Use this setting when capturing video at a high data rate.

— Select your desired **Rounding type**:

- **MPEG-2** Rounds the AC coefficient up to the nearest whole number when calculating the quantization coefficient.

- **Matrox custom** Truncates the AC coefficients to the lowest whole number when calculating the quantization coefficient. In some cases, this setting may yield less artifacts in graphics.
 - From the **DC precision** list, select the bit-depth precision of the DC intra block. The higher the DC precision value that's used to render your video, the more likely that the DC content will be increased at the expense of the AC content in the encoded stream. This may result in lowering the overall quality of the compressed stream at a specified data rate.
 - Select the **Force frame-based DCT** setting to render macroblocks as frames rather than as fields. In some cases, graphics will yield less artifacts if this option is selected.
- 3 Click **OK** to save your settings.

Working with Adobe Encore

The MXO2 playback device for Encore lets you monitor video and audio from your Encore project using the MXO2 outputs. For a list of the supported video output formats for the MXO2 main and SD channels, and the supported video formats for the MXO2 outputs, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

Perform the following steps to output video and audio from the MXO2 outputs during playback in Encore:

- 1 Start Adobe Encore and either open an existing project, or start a new composition. If necessary, import your clip.
- 2 Choose **Encore > Preferences > Audio/Video Out.**
- 3 In the **Preferences** dialog, select **Matrox Player** from the **Audio Device** list.
- 4 Under **Video Device**, select **Matrox Player**, and then click **Setup** beside Matrox Player.
- 5 In the **Matrox Player Setup** dialog, set whether to output **8-bit** or **10-bit** video, and then click **OK**.



Note The **Enable CC overlay on output (Adobe CS6)** option in the **Matrox Player Setup** dialog is not used.

- 6 Set the appropriate video and audio output settings in the **Matrox Utilities** preferences window (see [Chapter 7, “Configuring Your MXO2 System”](#)).



Important When using **Matrox Player** as the playback device in Encore, make sure that a Matrox audio option is not selected as the **Audio Output Device** from **Encore > Preferences > Audio/Video Out**.

Working with Adobe Prelude

The MXO2 playback device for Prelude lets you monitor video and audio from your Prelude project using the MXO2 outputs. For a list of the supported video output formats for the MXO2 main and SD channels, and the supported video formats for the MXO2 outputs, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

Perform the following steps to output video and audio from the MXO2 outputs during playback in Encore:

- 1 Start Adobe Prelude and either open an existing project, or start a new composition. If necessary, import your clip.
- 2 Choose **Prelude > Preferences > Playback.**
- 3 In the **Preferences** dialog, select **Matrox Player** from the **Audio Device** list.
- 4 Under **Video Device**, select **Matrox Player**, and then click **Setup** beside Matrox Player.
- 5 In the **Matrox Player Setup** dialog, set whether to output **8-bit** or **10-bit** video, and then click **OK**.



Note The **Enable CC overlay on output (Adobe CS6)** option in the **Matrox Player Setup** dialog is not used.

- 6 Set the appropriate video and audio output settings in the **Matrox Utilities** preferences window (see [Chapter 7, “Configuring Your MXO2 System”](#)).

Working with Adobe After Effects

You can output video and audio from the MXO2 outputs during playback in Adobe After Effects. The procedure to do this depends on which version of After Effects you're using as explained in the following sections.

Using Adobe After Effects v13.x

When working with After Effects v13.x, you can output video and audio from the MXO2 outputs during playback as follows:

- 1 Start Adobe After Effects and either open an existing project, or start a new composition. If necessary, import your clip.
- 2 Choose **After Effects > Preferences > Video Preview**.
- 3 In the **Preferences** dialog box, select **Matrox Player** under **Video Device**, and then click **Setup** beside Matrox Player.
- 4 In the **Matrox Player Setup** dialog box, set whether to output **8-bit** or **10-bit** video, and then click **OK**.



Note The **Enable CC overlay on output (Adobe CS6)** option in the **Matrox Player Setup** dialog is not used.

- 5 Set the appropriate video output settings in the **Matrox Utilities** preferences window as described in [“Specifying your video output settings”](#) on page 58.
- 6 Play back your clip. When playing back your clip in After Effects, the video portion of your clip is sent to the MXO2 outputs automatically. However, if you want to monitor audio from the MXO2 outputs as well, you must select MXO2 as the audio hardware device and then play back your clip in RAM Preview mode. To do so, choose **After Effects > Preferences > Audio Hardware**, select **Matrox MXO2 Audio Output** from the **Default Device** list, and launch RAM Preview (**Composition > Preview > RAM Preview**).

Using Adobe After Effects v12.x or earlier

The Matrox WYSIWYG plug-in for Adobe After Effects (v12.x and earlier) lets you monitor video and audio from your After Effects project using the MXO2 outputs. Matrox also provides WYSIWYG options that you can set to customize your output preview.

Perform the following steps to output video and audio from the MXO2 outputs during playback in After Effects:

- 1 Start Adobe After Effects and either open an existing project, or start a new composition. If necessary, import your clip.
- 2 Set the MXO2 WYSIWYG settings in the **Matrox Utilities** preferences window (see [“Specifying your Matrox WYSIWYG settings”](#) on page 70).

- 3 Play back your clip. When playing back your clip in After Effects, the video portion of your clip is sent to MXO2the Mojito outputs automatically. However, if you want to monitor audio from MXO2the Mojito outputs as well, you must select MXO2 as the audio hardware device and then play back your clip in RAM Preview mode. To do so, choose **After Effects > Preferences > Audio Hardware**, select **Matrox MXO2 Audio Output** from the **Default Device** list, and launch RAM Preview (**Composition > Preview > RAM Preview**).

Working with Adobe Photoshop

The Matrox WYSIWYG plug-in for Photoshop lets you export your Photoshop image to MXO2the Mojito outputs for monitoring. Matrox also provides WYSIWYG options that you can set to customize your output preview.

Perform the following steps to export your Photoshop image to MXO2the Mojito outputs:

- 1 Start Adobe Photoshop and either open an existing image file, or start a new project.
- 2 Set MXO2the Mojito WYSIWYG settings in the **Matrox Utilities** preferences window (see [“Specifying your Matrox WYSIWYG settings”](#) on page 70).
- 3 Export your image to MXO2the Mojito outputs by choosing **File > Export > Matrox WYSIWYG Preview**. If you make a change to your image, or to the Matrox WYSIWYG options, you must export the image again to refresh the output.




Tip You can create a Photoshop Action shortcut for **File > Export > Matrox WYSIWYG Preview**. For information on creating Actions, see your Adobe Photoshop documentation.

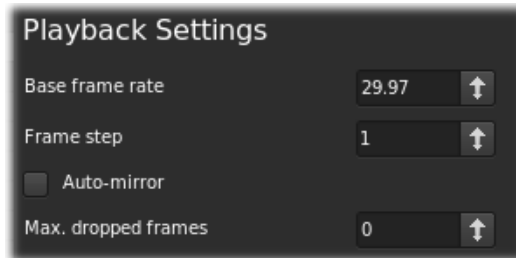
Working with Adobe SpeedGrade

You can output video played back in Adobe SpeedGrade on the Matrox MXO2 video outputs to preview your clips on your video monitor. You can also choose to output audio played back in Adobe SpeedGrade on your Matrox MXO2 hardware.

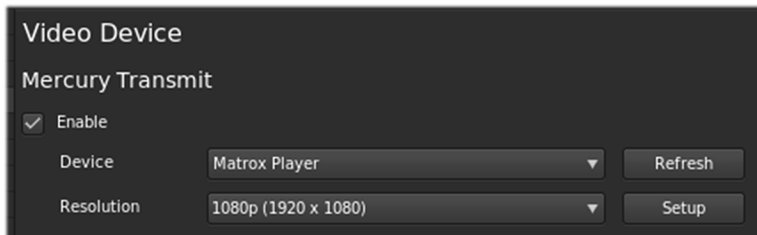
For detailed information about using Adobe SpeedGrade, see your Adobe SpeedGrade documentation.

⇒ To specify your playback settings for use with Matrox MXO2:

- 1 In Adobe SpeedGrade, click **Preferences** () at the top left of the window.
- 2 In the **Preferences** dialog, click **Playback** and set the **Base frame rate** for the playback, such as **29.97**.



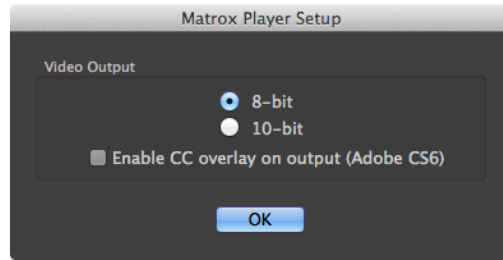
- 3 Click **Display** and select **Enable** under **Mercury Transmit**.



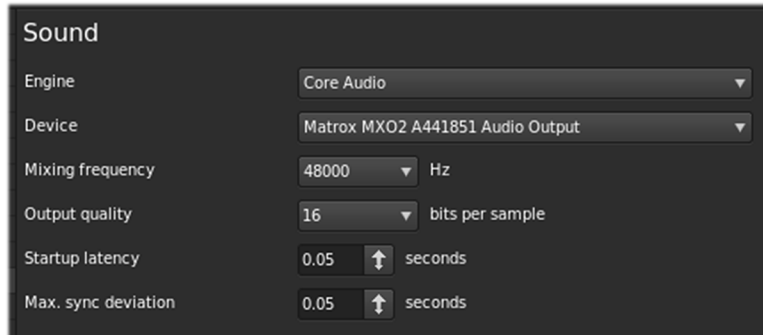
- 4 From the **Device** list, select **Matrox Player**.
- 5 From the **Resolution** list, select the resolution for playback, such as **1080p (1920 x 1080)**.
- 6 Click **Setup** and select the bit depth for your video output (8-bit or 10-bit).



Note The **Enable CC overlay on output (Adobe CS6)** option is not used.



- 7 Click **OK** to return to the **Preferences** dialog.
- 8 If you also want to output audio from your Matrox MXO2 hardware, click **Sound**, select **Core Audio** from the **Engine** list, and then select the Matrox MXO2 audio output option from the **Device** list.



Important For your sound device setting to take effect, you must quit and restart Adobe SpeedGrade.

- 9 Set the appropriate video and audio output settings in the **Matrox Utilities** preferences window (see [Chapter 7, “Configuring Your MXO2 System”](#)).
- 10 Play back your sequence in Adobe SpeedGrade.

Working with Avid Media Composer and Symphony

You can use Avid Media Composer and Avid Symphony with MXO2 to capture and play back video and audio. For a list of the supported input and capture video formats, see [Appendix C, “Matrox MXO2 Supported Input and Capture Formats.”](#) For a list of the supported video output formats, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

This section includes information on how to:

- Create a new Matrox MXO2 project. ([page 114](#))
- Define your playback settings. ([page 114](#))
- Define your capture settings. ([page 115](#))
- Add a voice-over to your sequence. ([page 117](#))
- Specify settings for capturing, playing back, and exporting Matrox 4VANC AFD and closed caption data. ([pages 115–120](#))
- Specify your audio output settings. ([page 121](#))
- Define settings for exporting your sequence to tape. ([page 122](#))

Creating a new Matrox MXO2 project

You can create a new Avid Media Composer/Symphony project for working with Matrox MXO2 as explained in your Avid documentation, with the following exceptions:

- Avid supports only standard raster dimensions for projects created on Matrox MXO2 hardware. This means that when you create an HD project for MXO2, the raster dimension will be set to 1280×720 for a 720p project, or 1920×1080 for a 1080i/p project. You can, however, still import, export, and play back thin raster material in your HD project.
- Matrox MXO2 supports YCbCr video only. If you set your project’s color space to RGB, Avid Media Composer/Symphony will convert your material to YCbCr for output on Matrox MXO2. To capture video using your Matrox MXO2 hardware, your project’s color space must be set to YCbCr.

Defining your playback settings

This section details how to specify various settings for playing back video and audio in Avid Media Composer and Symphony using the Matrox MXO2 outputs. For a list of the supported video output formats, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

- 1 Specify the MXO2 **General** settings, and if applicable to your Matrox hardware, specify the **Genlock** settings (see [Chapter 7, “Configuring Your MXO2 System](#)).
- 2 In Avid Media Composer/Symphony, open the project that you want to play back.
- 3 When using an MXO2, MXO2 LE, or MXO2 Rack SDI output for playback, you can choose to play back Matrox 4VANC AFD (active format description) or closed caption data that is stored as an audio track, and restore the data to your video's VANC (vertical ancillary data space) on output. For more information on Matrox 4VANC, see [“Matrox 4VANC capture and playback”](#) on page 66.



Note Matrox 4VANC is not available on Matrox MXO2 Mini.

To play back the Matrox 4VANC AFD and/or closed caption data, in Avid Media Composer/Symphony, click **Settings** in the **Project** window, and then double-click **Audio Project**. In the **Audio Project Settings** dialog box, in the **Output** pane, click the Mix Mode Selection button to select **Direct** or **Direct, surround tracks in SMPTE order**, depending on your version of Avid Media Composer/Symphony. Then assign the audio track that contains the Matrox 4VANC AFD data to output as audio channel 15, and/or assign the audio track that contains the Matrox 4VANC closed caption data to output as audio channel 16. For information on how to maintain Matrox 4VANC AFD and closed caption data when exporting your project to a file, see [“Specifying settings for exporting Matrox 4VANC AFD and closed captioning to a file”](#) on page 120.



Note To preserve the integrity of the AFD and closed caption data for playback, do not manipulate the audio tracks that contain the AFD and closed caption data in any way. For example, do not adjust the audio gain or balance, or add audio effects to the tracks.

- 4 In Avid Media Composer/Symphony, click **Settings** in the **Project** window, double-click **Video Output** to open the **Matrox Utilities** preferences window, and then select **More...** to specify your Matrox video output settings (as described in [“Specifying your video output settings”](#) on page 58). If you're playing back Matrox 4VANC AFD and/or closed caption data, you must enable Matrox 4VANC playback in the **Matrox Utilities** preferences window as described in [“Matrox 4VANC capture and playback”](#) on page 66.
- 5 In Avid Media Composer/Symphony, play back your project.

Defining your capture settings

This section details how to specify various settings for capturing video and audio in Avid Media Composer/Symphony using the Matrox MXO2 inputs.

When using MXO2 with Avid Media Composer/Symphony, your source material is captured to your project's video format. You can also preview the captured video using the Matrox MXO2 outputs. When previewing the captured video, the output video format will match your project's video format. For a list of the supported input and capture video formats, see [Appendix C, "Matrox MXO2 Supported Input and Capture Formats."](#)



Note The **SD channel** video output setting is not supported on MXO2 during capture. To preview the captured video, **Main channel** must be selected for the MXO2 outputs in the **Video Output** pane of the **Matrox Utilities** preferences window (see ["Specifying your video output settings"](#) on page 58).

If you want to capture material using RS-422 device control, you can connect the RS-422 connector on Matrox MXO2, MXO2 Rack, or MXO2 LE to the RS-422 serial device control port on your source device (see ["MXO2 RS-422 serial connection"](#) on page 17, ["MXO2 Rack RS-422 serial connection"](#) on page 28, or ["MXO2 LE RS-422 serial connection"](#) on page 37). On Matrox MXO2 Mini, you must use a suitable adapter to connect the serial device control port on your source device or recorder to your computer. For a list of supported device control adapters, see the Matrox MXO2 Support section of our website at www.matrox.com/video/support.

Remarks

- To capture video on Matrox MXO2, your project's color space must be set to YCbCr.
- Matrox MXO2 supports the **Audio** tool so that you can monitor and adjust your audio input levels for capture.
- Capture on Matrox MXO2 is not supported for a 24p NTSC, 24pPAL, or 720p/29.97 project.




To specify your capture settings:

- 1 Specify the MXO2 **General** settings, and if applicable to your Matrox hardware, specify the **Genlock** settings (see [Chapter 7, "Configuring Your MXO2 System"](#)).
- 2 Open Avid Media Composer/Symphony and create a new project (see ["Creating a new Matrox MXO2 project"](#) on page 114). Your source material will be captured to your project's video format.
- 3 In the **Capture** tool, make sure that **Matrox** is selected as the **Video** and **Audio** input sources.
- 4 When using an MXO2, MXO2 LE, or MXO2 Rack SDI input for capture, you can choose to capture the AFD (active format description) or closed caption data that is stored in your source video's VANC (vertical ancillary data space) by using the Matrox 4VANC tool. For more information on Matrox 4VANC, see ["Matrox 4VANC capture and playback"](#) on page 66.

To capture AFD and/or closed caption data, in Avid's **Capture** tool, enable all 16 audio channels, set audio channels 15 and 16 to **Mono**, and select **1:1 MXF** from the **Res** list.



Note Matrox 4VANC is not available on Matrox MXO2 Mini.

- 5 Click the **Hardware Setup** () button to open the **Matrox Utilities** preferences window, and specify your Matrox capture settings as described in “[Specifying your A/V input settings](#)” on page 55. If you’re capturing Matrox 4VANC AFD and/or closed caption data, you must enable Matrox 4VANC capture in the **Matrox Utilities** preferences window as described in “[Matrox 4VANC capture and playback](#)” on page 66.
- 6 Capture as you would normally.

Adding a voice-over to your sequence

Matrox MXO2 supports the **Audio Punch-In** tool, which allows you to record audio directly into the **Timeline** to add voice-over narration, such as to add commentary to newsreels and documentaries.



Note The **Audio Punch-In** tool supports recording to mono tracks only.

Connection and setup

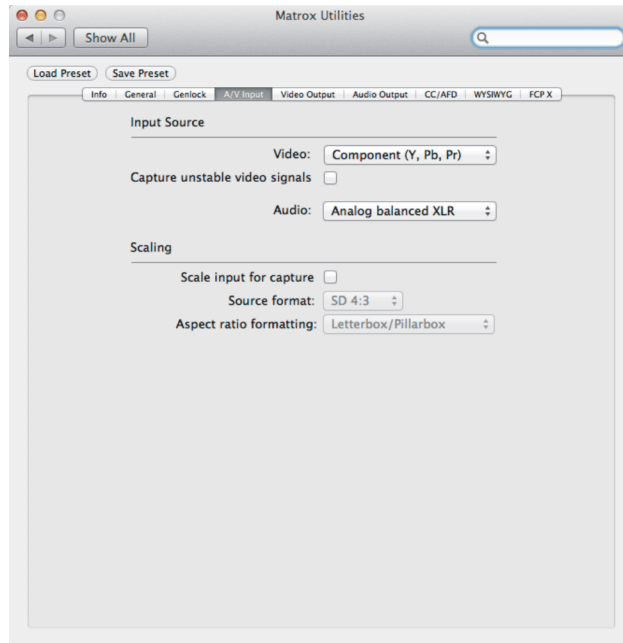
- 1 Connect the input device (microphone) to the audio input on a source device, such as a preamplifier, and then connect the audio output from the source device to the corresponding audio input on your MXO2 hardware.



Note The Matrox hardware audio inputs are line level. Therefore, make sure your audio equipment output matches.

- 2 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.

3 Click **A/V Input**.



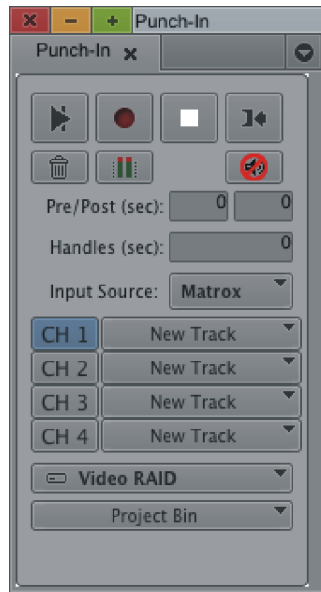
4 Under **Input Source**, select the **Audio** input on your Matrox hardware to which your audio source device is connected, and then select **Component** from the **Video** list.

5 Close the **Matrox Utilities** preferences window.

Recording your voice-over

You use the **Audio Punch-In** tool to record your voice-over. The following steps provide guidelines for recording a voice-over. For details on using the **Audio Punch-In** tool, see your Avid documentation.


- 1 With a sequence loaded in the Avid Media Composer/Symphony timeline, choose **Tools > Audio Punch-In**.



- 2 Select **Matrox** from the **Input Source** list.



Tip If **Matrox MXO2 (serial number) Audio Input** appears in the **Input Source** list instead of **Matrox**, the Matrox hardware is deactivated in Avid. Click the Toggle Hardware button in Avid to activate the Matrox hardware, and then select **Matrox**.



- 3 Select the Matrox audio input channels that you want to record, and then select the corresponding tracks on which you want to record. If you select an existing track, you can replace all or part of the audio on the track with your voice-over.
- 4 Click the **Audio Tool** button (), and use the controls and meters in the **Audio** tool to test the audio input levels while speaking into the microphone. If needed, adjust the audio level on your source device so that the input levels are sufficiently high but not clipping.



Note To see the meters in the **Audio** tool, make sure that the In/Out toggle buttons are set to **I** (for Input):



For details on using the **Audio** tool, see your Avid documentation.

- 5 Move the position indicator on the timeline to where you want the voice-over to begin. You can also set In and Out points to specify the section of the timeline to which you want to add your voice-over, and specify preroll and postroll values if desired.
- 6 When you're ready to start the voice-over, click the **Record** button ().
- 7 Click the **Stop** button () to stop the recording. Your voice-over will be added as an audio clip on the **Timeline**.



Note During recording, your voice-over will not be output to your Matrox MXO2 hardware, and audio punch-in monitoring is not supported.

Specifying settings for exporting Matrox 4VANC AFD and closed captioning to a file

When working in an Avid Media Composer or Symphony project that has Matrox 4VANC AFD and/or closed caption data stored as an audio track, the following steps detail how to specify your settings in Avid Media Composer/Symphony to maintain the Matrox 4VANC AFD and closed caption data when exporting your project to a file. For information on how to capture and play back Matrox 4VANC data in Avid Media Composer/Symphony, see [“Defining your capture settings”](#) on page 115 and [“Defining your playback settings”](#) on page 114.

- 1 In Avid Media Composer/Symphony, make sure that the audio track that contains the Matrox 4VANC AFD data is set to output as audio channel 15, and/or the audio track that contains the Matrox 4VANC closed caption data is set to output as audio channel 16.
- 2 Choose **File > Export**.
- 3 In the **Export As** dialog, select **Send to QT Movie** from the **Export setting** list, and then click **Options**.
- 4 In the **Export Settings** dialog, select the **Use Marks** and **Use Enabled Tracks** options, select **Video and Audio**, and then select **Direct Out** in the **Audio Format** pane.

Specifying settings for importing a Matrox 4VANC file

When working in Avid Media Composer or Symphony, you can import a video file that contains Matrox 4VANC AFD and/or closed caption data to your project. You can also import a Matrox 4VANC closed caption audio file that was created using a supported captioning software, such as CPC MacCaption. This section details how to import your Matrox 4VANC file in Avid Media Composer/Symphony.

For information on how to capture and play back Matrox 4VANC data in Avid Media Composer/Symphony, see [“Defining your capture settings”](#) on page 115 and [“Defining your playback settings”](#) on page 114. For information on how to specify your settings in Avid Media Composer/Symphony to maintain the Matrox 4VANC AFD and closed caption data when exporting your project, see [“Specifying settings for exporting Matrox 4VANC AFD and closed captioning to a file”](#) on page 120.”

- 1 In Avid Media Composer/Symphony, choose **File > Import**.
- 2 In the **Select files to Import** dialog, select **1:1 MXF** from the **Resolution** list, except when importing a Matrox 4VANC closed caption audio file that was created using a supported captioning software, such as CPC MacCaption. In this case, select a DV MXF option from the list.
- 3 Click **Options**.
- 4 In the **Audio** pane, make sure that all options are cleared, and then click **OK**.
- 5 In the **Select files to Import** dialog, select the file to import and then click **Open**.

Specifying your audio output settings

The simultaneous audio outputs on your Matrox MXO2 hardware allow you to send your audio to a variety of devices at the same time. Avid Media Composer/Symphony and Matrox provide various settings to configure your audio output on MXO2.

- 1 In Avid Media Composer/Symphony, click **Settings** in the **Project** window, and then double-click **Audio Project**.
- 2 In the **Audio Project Settings** dialog, click the **Output** tab, and then specify your desired audio output settings as explained in your Avid documentation. If playing back a project with Matrox 4VANC AFD and/or closed caption data, see [“Defining your playback settings”](#) on page 114 for information on how to specify your audio settings in Avid for use with Matrox 4VANC. If exporting a project with Matrox 4VANC AFD or closed captioning to a file, see [“Specifying settings for exporting Matrox 4VANC AFD and closed captioning to a file”](#) on page 120.

Remarks

- For surround sound HDMI audio output, Matrox MXO2 supports the 5.1 and 7.1 SMPTE settings only (and the Direct SMPTE setting, if available).
- Matrox MXO2 supports the **Audio** tool so that you can monitor the global output level of your sequence. If needed, you can use the **Output Gain** (master attenuator) slider to adjust the overall output volume for all tracks.

- To preserve the integrity of Matrox 4VANC AFD or closed caption data for playback (see “[Defining your playback settings](#)” on page 114), do not manipulate the audio tracks that contain the AFD and closed caption data in any way. For example, do not adjust the audio gain or balance, or add audio effects to the tracks.
- 3 MXO2 lets you map any audio track in Avid Media Composer/Symphony to any MXO2 audio output. For information on how to enable and configure audio mapping in MXO2, see “[Specifying your audio output settings](#)” on page 62.



Note For surround sound HDMI audio output, the **Enable audio mapping** option in the **Audio Output** pane of the **Matrox Utilities** preferences window must be disabled.

Exporting your sequence to tape

You can record your sequence onto tape using device control or manually as explained in your Avid documentation. Before exporting to tape, set your desired playback settings as explained in “[Defining your playback settings](#)” on page 114. For a list of the supported video output formats, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

To export to tape without device control, simply play back your sequence and record the output from any of the available outputs on your MXO2 system.

If your recorder supports RS-422 device control, you can connect the RS-422 connector on Matrox MXO2, MXO2 Rack, or MXO2 LE to the RS-422 serial control port on your recorder (see “[MXO2 RS-422 serial connection](#)” on page 17, “[MXO2 Rack RS-422 serial connection](#)” on page 28, or “[MXO2 LE RS-422 serial connection](#)” on page 37). On Matrox MXO2 Mini, you must use a suitable adapter to connect the serial device control port on your source device or recorder to your computer. For a list of supported device control adapters, see the Matrox MXO2 Support section of our website at www.matrox.com/video/support.



Note When using an analog RS-422 device on MXO2, MXO2 Rack, or MXO2 LE, you must genlock to an external broadcast-quality analog sync source. If you’re using an SDI RS-422 device and you don’t have an external broadcast-quality analog sync source, you can set your genlock source to the MXO2 internal reference and configure the setting on your deck to genlock to the SDI video input. For details on how to set your genlock source, see “[Specifying your genlock settings](#)” on page 54.

To record the output from your MXO2 system using device control with the **Digital Cut** tool, make sure that the **Output Mode** is set to **Real-Time**. Also, when configuring your deck in the **Channel** window, make sure that **Direct** is selected from the **Channel Type** list, and **Matrox RS-422** is selected from the **Port** list.

- i Important** If you want to downconvert a 720p/23.976, 1080p/23.976, or 1080p24 sequence to SD to record a digital cut, you must change your project's format (project type) to SD. For example, to downconvert a 720p/23.976 or 1080p/23.976 sequence to NTSC to record a digital cut, you must change the project type to 23.976p NTSC. You can then select the output format that you want in the **Digital Cut** tool.

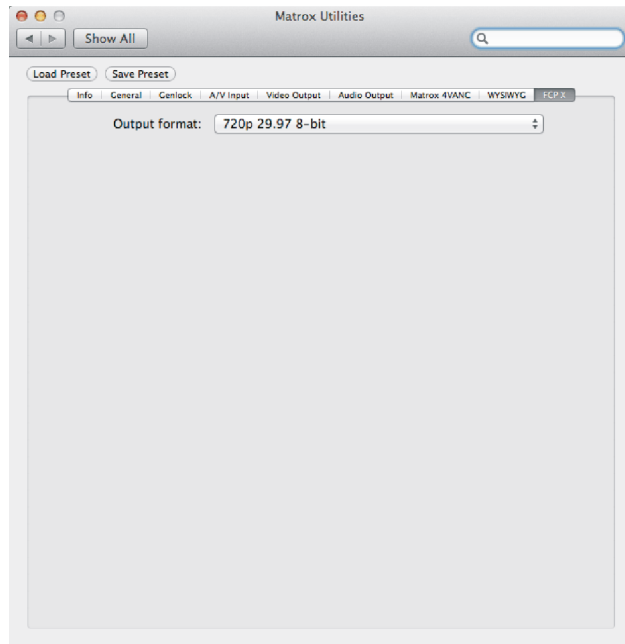
Working with Apple Final Cut Pro X

You can use Apple Final Cut Pro X to play back and output video and audio using Matrox MXO2.

Playback using Matrox MXO2

This section details how to play back and output video and audio in Apple Final Cut Pro X using Matrox MXO2. For a list of the supported video output formats, see [Appendix D, “Matrox MXO2 Supported Output Formats.”](#)

- 1 Ensure that Apple Final Cut Pro X is not running.
- 2 From the **Apple** menu, click **System Preferences**, and then click the **Matrox Utilities** icon.



- 3 In the **Matrox Utilities** preferences window, in the **FCP X** pane, select the **Output format** that matches the format of the project or clip that you want to play back in Final Cut Pro X.

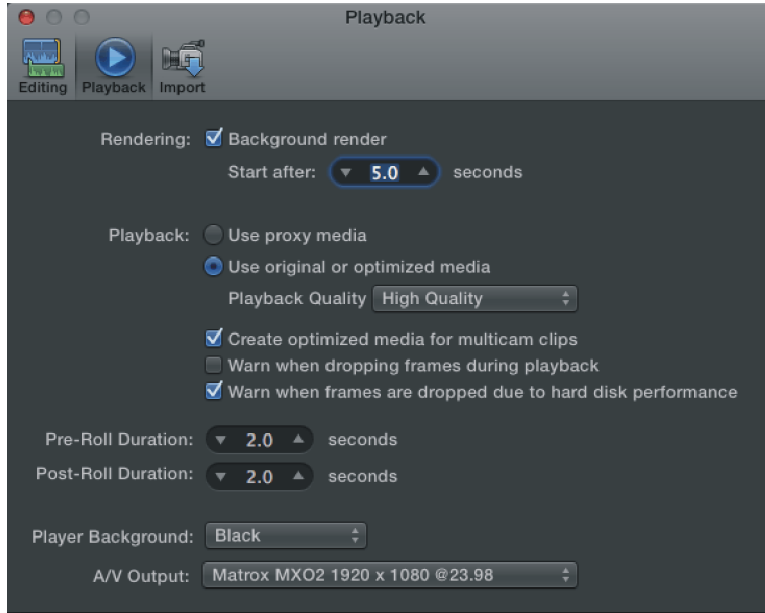


Note If the **Output format** list is unavailable and “**(In use)**” appears, MXO2the Mojito hardware is currently being used by an application on your system. To change the output format, you must first disable **A/V Output** in Final Cut Pro X (**Window > A/V Output**), or close any application that is using Matrox MXO2.

- 4 In **System Preferences > Sound**, set Matrox MXO2 as the **Output** audio device for your Mac OS system. Close the **Sound** preferences window.

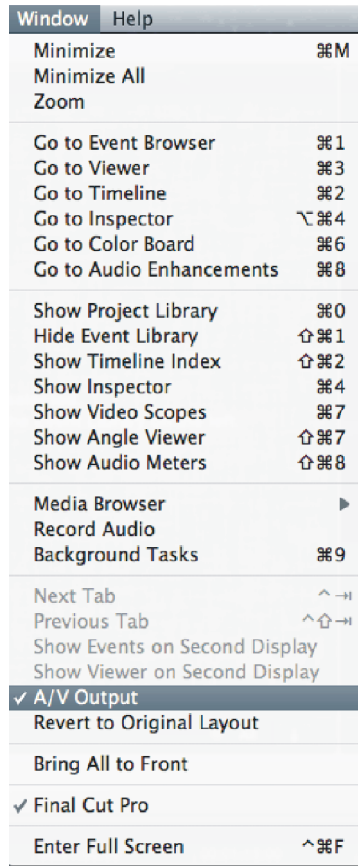


- 5 Open Final Cut Pro X, choose **Final Cut Pro > Preferences**, and ensure that the Matrox video format that you selected in step 3 appears as the **A/V Output** option in the **Playback** pane.



- 6 In the **Playback** pane, set **Playback Quality** to **High Quality**. However, if you experience dropped frames in your video output, select **Better Performance**.

7 From the **Window** menu, enable **A/V Output**.



8 Play back your video in Final Cut Pro X.

10

Using the Matrox MAX H.264 Codec

This chapter explains how to use the Matrox MAX H.264 codec that is available on Matrox MXO2 products with MAX technology for exporting material for Blu-ray Disc, the web and mobile devices.

Overview

If you have an MXO2 product with Matrox MAX technology, you can quickly and easily create H.264 files for Blu-ray Disc (Apple Compressor only), the web and mobile devices, such as Apple TV, iPod, and iPhone, using the Matrox MAX H.264 codec.

Remarks

- The MXO2 inputs and outputs will not be available when creating H.264 files using the Matrox MAX H.264 codec. This limitation, however, does not apply if your system includes a Matrox CompressHD card. In this case, the Matrox MAX H.264 codec on your Matrox CompressHD card will always be used, and your MXO2 inputs and outputs will be available when creating H.264 files.
- Non-Matrox compression options that are available in supported applications are not optimized for using MXO2 to accelerate H.264 encoding. As a result, the use of non-Matrox options in a supported application may result in increased encoding times.

This chapter provides information on how to encode using the Matrox MAX H.264 codec from the following applications:

- Apple Compressor ([page 128](#))
- Apple Final Cut Pro X ([page 137](#))
- Adobe Premiere Pro ([page 138](#))
- Adobe Media Encoder ([page 138](#))
- Telestream Episode ([page 142](#))
- Avid Media Composer ([page 145](#))
- Avid Symphony ([page 145](#))
- Apple QuickTime Pro ([page 149](#))

Using Apple Compressor

The Matrox MAX H.264 component for Apple Compressor includes predefined Matrox MAX H.264 settings that you can assign to immediately apply appropriate compression settings for delivering H.264 files for Blu-ray, the web, and mobile devices. For most deliverables, you can use one of the predefined Matrox MAX H.264 settings in Compressor (see “[Assigning a Matrox MAX H.264 setting](#)” on [page 129](#)). However, if you require a custom setting, see “[Creating a custom Matrox MAX H.264 setting](#)” on [page 130](#). For detailed information on settings and other Compressor-related subjects, see your Apple Compressor documentation.

The Matrox MAX H.264 Blu-ray settings encode video only. Audio is not encoded by the Matrox MAX H.264 codec when creating H.264 elementary streams for Blu-ray. To include audio when exporting to Blu-ray format, you must assign a separate audio setting to your source media file. However, audio is encoded by the Matrox MAX H.264 codec when creating QuickTime files for the web and mobile devices. The Matrox MAX H.264 elementary stream files that you create for Blu-ray Disc using Compressor can be imported directly to Adobe Encore and Roxio Toast without having to transcode the files.

Matrox MAX technology also supports the closed caption data from SCC files for web deliverables (.mov) when encoding at 1:1, or when downscaling. When an SCC (CEA-608) closed caption file is associated with your source media file in Compressor, Matrox MAX technology embeds the closed caption data in the encoded video file (.mov).

Assigning a Matrox MAX H.264 setting

This section describes how to assign a Matrox MAX H.264 setting to your source file in Apple Compressor. The Matrox MAX H.264 settings include the predefined settings installed with your MXO2 software, and any custom settings that you create (see [“Creating a custom Matrox MAX H.264 setting”](#) on page 130).



Note When selecting a predefined Matrox MAX H.264 setting, any modifications made to your source video’s frame size in your application must be taken into consideration. For example, if your source video was cropped in your application, your source video’s frame size is the cropped frame size and not the original frame size.

The predefined Matrox MAX H.264 settings that are installed with your MXO2 software are located in Compressor’s **Settings** window, under **Custom > Matrox MAX H.264 Settings**. The predefined Matrox MAX H.264 settings are separated into three folders: Blu-ray, Fast Encode, and High-Quality:

- **Blu-ray** Use these settings for all Blu-ray deliverables. The encoded file’s extension will be .264.



Note For compatibility with most Blu-ray players and Adobe Encore, the predefined Matrox MAX H.264 settings for Blu-ray use a simple GOP structure.

- **Fast Encode** Use these settings for fast encoding of QuickTime files. These settings leverage your system’s resources with the MXO2 hardware, resulting in even faster encoding times. The encoded file’s extension will be .mov.



Note If your source video must be scaled for encoding and its aspect ratio does not match the compression aspect ratio, with Compressor v3.5 or later,

you can select **Preserve source aspect ratio** from the **Padding** list in Compressor's Geometry pane to maintain your source video's aspect ratio.

- **High-Quality** Use these settings for high-quality encoding of QuickTime files. With these settings, the encoding is performed entirely by the MXO2 hardware, which frees your system's resources for other tasks. The encoded file's extension will be *.mov*.

⇒ To assign a Matrox MAX H.264 setting:

- 1 In Apple Compressor, add the source media file that you want to export as an H.264 file to the **Batch** window in Compressor.
- 2 Drag the desired **Matrox MAX H.264** setting from the **Settings** window to your source media file (job) in the **Batch** window.



Note Matrox MAX technology supports closed caption data from SCC files for web deliverables (*.mov*) when encoding at 1:1, or when downscaling. When an SCC (CEA-608) closed caption file is associated with your source media file in Compressor, Matrox MAX technology embeds the closed caption data in the encoded video file (*.mov*).

- 3 If you're exporting to Blu-ray format and you want to export audio as well, you must add a separate audio setting to your **Batch** window. Matrox provides predefined audio settings for each of the Matrox settings, however, you can choose to use another audio setting.
- 4 Choose a destination for your job's targets and submit your batch as you would normally.

Creating a custom Matrox MAX H.264 setting

You can create a custom Matrox MAX H.264 setting in Apple Compressor for delivering H.264 files for either Blu-ray (*.264*) or QuickTime (*.mov*). Once you create a new Matrox MAX H.264 setting, you can assign it to your source file in Apple Compressor using the steps described in [“Assigning a Matrox MAX H.264 setting”](#) on page 129.



Important To avoid losing your custom Matrox MAX H.264 settings in Compressor when updating your MXO2 software, you must uninstall the MXO2 software that is installed on your system, restart your computer, and then install the new MXO2 software version **before** opening Compressor. If you open Compressor before installing the new MXO2 software, that is, with no MXO2 software installed on your computer, your custom Matrox MAX H.264 settings will be deleted by Compressor.

- 1 In Apple Compressor, click the **Create a new setting** button in the **Settings** window, and then click either **Matrox MAX H.264 (.264)** for Blu-ray or **Matrox MAX H.264 (.mov)** for QuickTime.



Note You can also select and duplicate an existing Matrox MAX H.264 setting that you want to use as a starting point for creating the new setting.

- 2 In the **Inspector** window, type a **Name** and **Description**.
- 3 On the **Encoder** pane of the **Inspector** window, make sure that **File Format** is set to **Matrox MAX H.264 (.264)** for Blu-ray or **Matrox MAX H.264 (.mov)** for QuickTime, and **Extension** is set to **264** for Blu-ray or **mov** for QuickTime, and then click **Options**.

(.264 options)

The screenshot shows the Apple Compressor Inspector window for the .264 format. The window is divided into two main sections: Encoding Resolution and Video Compression.

Encoding Resolution:

- H.264 Level: 4.1
- Frame size: Custom, 1280 X 720
- Pixel aspect ratio: Square, 1.0000
- Color space: High definition
- Frame rate: 29.97 fps

GOP Structure:

- GOP type: Simple GOP
- GOP size: 16 frames
- Distance between P frames: 8

Hardware Preprocessing:

- ☒ Hardware scaling
- ☐ De-interlace video
- ☒ Retain aspect ratio when scaling
- Noise filter: None to Maximum (slider at 15)

Video Compression:

- Algorithm: CABAC (Profile: Main)
- Compression type: Variable data rate
- Target data rate: 10 Mb/s (Value must be between 0.1 Mb/s and 50.0 Mb/s)
- Minimum data rate: 0% to 100% (slider at 2.5 Mb/s)
- Maximum data rate: 0% to 800% (slider at 10.0 Mb/s)
- Source video complexity: Simple to Complex (slider at 15)
- Sample rate: Low
- Data rate adjustment: Gradual to Quick (slider at 50)

Buttons: MAX, Cancel, Save

(.mov options)

The screenshot shows the Apple Compressor Inspector window for the .mov format. The window is divided into two main sections: Encoding Resolution and Video Compression.

Encoding Resolution:

- H.264 Level: 4.1
- Frame size: Custom, 1280 X 720
- Pixel aspect ratio: Square, 1.0000
- Color space: High definition
- Frame rate: 29.97 fps

GOP Structure:

- GOP size: 64 frames
- Distance between P frames: 4

Hardware Preprocessing:

- ☒ Hardware scaling
- ☐ De-interlace video
- ☒ Retain aspect ratio when scaling
- Noise filter: None to Maximum (slider at 13)
- ☒ Scene detection

Video Compression:

- Algorithm: CABAC (Profile: Main)
- Compression type: Variable data rate
- Target data rate: 20 Mb/s (Value must be between 100.0 Kb/s and 20000.0 Kb/s)
- Minimum data rate: 0% to 100% (slider at 5.0 Mb/s)
- Maximum data rate: 0% to 800% (slider at 20.0 Mb/s)
- Source video complexity: Simple to Complex (slider at 13)
- Sample rate: Low
- Data rate adjustment: Gradual to Quick (slider at 43)

Audio:

- ☒ Enable audio (Settings)
- MPEG 4 AAC LC Encoder (aac)
- 44100 samples per seconds
- Stereo (L R)
- 128.0 Kbps

Buttons: MAX, Cancel, Save

- 4 Under **Encoding Resolution**, select the resolution settings for your encoded video:



Note Matrox MAX technology supports closed caption data from SCC files for web deliverables (.mov) when encoding at 1:1, or when downscaling. When an SCC (CEA-608) closed caption file is associated with your source media file in Compressor, Matrox MAX technology embeds the closed caption data to the encoded video file (.mov).

- **H.264 Level** Select the H.264 level that you want for your encoded video.

H.264 level	Maximum Frame size	Maximum Frame rate (fps)	Maximum Data rate (Mb/s)
2.0	352×288	29.97	2
3.0	720×576	29.97	10
3.1	1280×720	29.97	14
4.0	1920×1080	29.97	20
4.1	1920×1080	29.97	50
4.2	1920×1080	59.94	50

Remarks

- Use H.264 level 4.0 if you want to create Matrox MAX H.264 files intended for mass replication of Blu-ray Discs. You can use either level 4.0 or 4.1 if you want to author and burn individual copies that are compatible with Blu-ray Disc players.
- Use H.264 level 3.1 to create HD video for use with Apple iPad.
- **Frame size** Specify the frame size that you want for your encoded video. You can select a frame size from the list, or select **Custom** and enter a frame size (horizontal×vertical). If entering a custom frame size, the minimum frame size is 64×64, and the maximum frame size depends on the selected H.264 level. The horizontal and vertical values must be even numbers.



Note The available frame sizes in the list depend on the selected H.264 level. If the compression frame size differs from your source video's frame size, MXO2's onboard scaler will either upscale or downscale your source video.

- **Pixel aspect ratio** If you entered a custom compression frame size, specify a pixel aspect ratio for your encoded video. You can select a pixel aspect ratio from the list, or enter a custom value:
 - **Custom** Enter a custom pixel aspect ratio using a decimal value.

- **Square** Use this for video that will be displayed on a computer, or when exporting to 1280×720 or 1920×1080.
 - **NTSC (4:3)** Sets the pixel aspect ratio to 4:3 using 720×480 pixels.
 - **NTSC (16:9)** Sets the pixel aspect ratio to 16:9 using 720×480 pixels.
 - **PAL (4:3)** Sets the pixel aspect ratio to 4:3 using 720×576 pixels.
 - **PAL (16:9)** Sets the pixel aspect ratio to 16:9 using 720×576 pixels.
 - **DVCPRO HD 720p** Sets the pixel aspect ratio to 16:9 using 960×720 pixels.
 - **DVCPRO HD 1080i 59.94** Sets the pixel aspect ratio to 16:9 using 1280×1080 pixels.
 - **DVCPRO HD 1080i 50 / HDV** Sets the pixel aspect ratio to 16:9 using 1440×1080 pixels.
- **Color space** If you entered a custom compression frame size, specify a color space for your encoded video.
 - **Frame rate** Select the frame rate that you want for your encoded video.
 - **Web streaming (Fast Start)** (*.mov* files only) Select this option if you want your encoded *.mov* QuickTime file to play as it is being downloaded from a standard web server. This option encodes your video as a QuickTime “Fast Start” file. When the file is being downloaded, it will begin to play back from a QuickTime application once enough data has been downloaded to the system for uninterrupted playback. This option ensures high-quality playback regardless of internet connection speed. However, viewers with slower connection speeds may wait longer before the file begins to play.
- 5 Under **GOP Structure**, specify the GOP structure settings that you want the Matrox MAX H.264 codec to use to encode your video:
- **GOP type** (*.264* files only) Select the type of GOP structure for your encoded video:
 - **Simple GOP** Offers a fixed structure in how frames are referenced, and may be more easily decoded than advanced GOPs.
 - **Advanced GOP (short/long)** An advanced GOP has more structural flexibility than a simple GOP, is capable of using more reference frames, and therefore may provide better overall compression. For a “short” advanced GOP, the distance between P frames is always 4, and for a “long” advanced GOP, the distance between P frames is always 8.



Important An H.264 elementary stream file for Blu-ray that was created using an advanced GOP structure may not be compatible with some Blu-ray players, and may cause stability issues in Adobe Encore when burning a

Blu-ray Disc. For compatibility with most Blu-ray players and Adobe Encore, we recommend using a simple GOP structure when encoding to Blu-ray.

- **GOP size** Select the GOP size in frames (must be a multiple of the distance between P frames). The GOP size can be either 2048, or an integer value between 3 and 254.



Note When creating an H.264 elementary stream file for Blu-ray, the GOP size must be less than one second of video. For example, if the frame rate that you want for your encoded video is 29.97 fps, the GOP size must be 29 frames or less.

- **Distance between P frames** Select the number of frames between P frames that you want for your GOP structure. This setting can be changed for a simple GOP structure only.

6 Under Hardware Preprocessing, specify the hardware-related processing settings for your encoded video:

- **Hardware scaling** If your source video must be scaled for encoding, select this option if you want the scaling to be done by the MXO2 hardware. This produces the best-quality results and frees your system's resources for other tasks. Clear this option to leverage your system's resources with the MXO2 hardware for even faster encoding times. If enabled, specify the following scaling options:
 - **De-interlace video** Select this option if your source video is interlaced and you want to de-interlace your video before encoding. This option can be used to display your encoded video on a monitor that displays lines progressively, such as an LCD or computer monitor. For all other instances, make sure this option is not selected.
 - **Retain aspect ratio when scaling** If your source video must be scaled for encoding, and its aspect ratio does not match your selected compression aspect ratio, select this option to maintain your source video's aspect ratio. If this option is selected, MXO2 will encode your source video as pillarbox video when encoding to a larger aspect ratio, or letterbox video when encoding to a smaller aspect ratio. If this option is not selected, MXO2 will encode your source video as anamorphic video.



Important When your source video must be scaled for encoding and **Hardware scaling** is disabled, if you're working with Compressor v3.5 or later you can select **Preserve source aspect ratio** from the **Padding** list in Compressor's Geometry pane to maintain your source video's aspect ratio.


- **Noise Filter** Sets the level of noise filtering that you want to apply to your video before encoding. Increasing the noise filter level reduces the amount of high frequencies in your source video by softening the

high-detail portions of your video. Since high frequencies require more bits to encode, increasing the noise filter level leaves more bits available for the encoding of other frames, which can improve the overall quality of your encoded video. However, if you lose too much detail in your encoded video you may need to decrease the noise filter level.

- **Scene detection** (*.mov* files only) Enabling this option allows the Matrox MAX H.264 codec to detect scene changes while encoding, and encode these transitions as I-frames. This results in multi-pass quality in a single pass. This option can be useful for creating higher quality video at a given data rate. It's especially useful when encoding video with many scene changes and targeting a low data rate.
- 7 Under **Video Compression**, specify the compression settings for your encoded video:
- **Algorithm** Select the entropy coding method to be used during compression:
 - **CABAC** Uses the CABAC coding method, and defines the video stream as H.264 Main profile.
 - **CAVLC** Uses the CAVLC coding method, and defines the video stream as H.264 Baseline profile when **Distance between P frames** is set to 1. Otherwise, the video stream is defined as H.264 Main profile. This method is not supported when encoding to a frame size that has a width greater than 720.
 - **Compression type** Select from the following compression types:
 - **Variable data rate** Video is compressed at varying data rates based on the complexity of the video and your specified minimum and maximum data rates. The Matrox MAX H.264 codec analyzes and encodes each frame to deliver the highest possible quality at your target data rate.
 - **Constant data rate** Video is compressed at your specified target data rate, which is useful when you need to limit or predict the size of your video file. However, if your video is very complex (such as scenes with many colors, sharp edges, or transitions), you'll need to specify a high target data rate to avoid having frames of blocky video in your file.
 - **Constant quality** Delivers your desired quality on each frame with no regard to data rate.

Remarks

- When using **Constant quality**, the entropy encoding algorithm must be set to CABAC.
 - **Variable data rate** and **Constant quality** compression types are not recommended for delivering H.264 files for Blu-ray.
- 8 Specify the settings associated with your selected compression type:

- **Target data rate** (Variable/Constant data rate only) Enter the target data rate, in **Mb/s** or **Kb/s**, for your encoded video. The higher the target data rate you specify, the better the video quality will be.
- **Minimum/Maximum data rate** (Variable data rate only) If locked () to the **Target data rate**, the minimum and maximum data rates are set automatically and cannot be changed. Unlock the minimum and maximum data rates to set custom rates for your encoded video.



Note If you'll be using Adobe Encore or Apple Compressor 3.5 to burn the encoded H.264 file for Blu-ray, the maximum H.264 level and data rate accepted by these applications for Blu-ray authoring is H.264 level 4.1 at 35 Mb/s (Encore) and H.264 level 4.1 at 30 Mb/s (Compressor).

- **Source video complexity** (Variable data rate only) Specifies the complexity level of your source video. A complex video can be defined as containing scenes with many colors, sharp edges, or transitions. The Matrox MAX H.264 codec uses this setting to determine how much compression is required in order to deliver high-quality video at your specified target data rate. The default setting (15) is suitable for most moderately complex videos. For simpler or more complex videos, you may need to adjust this setting to obtain the highest-quality encoding possible while respecting your target data rate. If the size of your encoded video is good but the quality can be improved, lower the complexity level setting. Your video will then be encoded with less compression. If the quality of your encoded video is good but the size is larger than expected, raise the complexity level setting. Your video will then be encoded with more compression. In any case, you may need to try different settings to get your desired results.
- **Sample rate** (Variable/Constant data rate only) Determines how frequently the Matrox MAX H.264 codec verifies the current data rate while encoding and compares it to your specified target data rate. If a discrepancy exists between the current and target data rates, the current data rate is adjusted as specified by the **Data rate adjustment** option.
- **Data rate adjustment** (Variable/Constant data rate only) When the current encoding data rate does not match your specified target data rate, this setting determines how quickly the current data rate is adjusted to reach the target data rate. A gradual adjustment produces smoother transitions than a quick adjustment.
- **Encoding quality** (Constant quality only) Specifies the quality level for your encoded video. Every frame in your video will be encoded at the specified quality level with no regard to data rate.

- 9 For *.mov* files, select **Enable audio** under **Audio** to encode audio along with your video, and then click **Settings** to set your QuickTime movie audio settings.



Note To export a clip for use with Apple iPod or iPhone devices, you must choose AAC (advanced audio coding) as your export audio file format. To do this, in the **Sound Settings** window, select **AAC** from the **Format** list, and then click **Save**.

10 Click **Save**.

Using Apple Final Cut Pro X

When working in Final Cut Pro X, you can send your clip to Apple Compressor and then use the Matrox MAX H.264 Compressor settings to export H.264 files for Blu-ray, the web, and other mobile devices. For detailed information on Final Cut Pro X- or Compressor-related subjects, see your application's documentation.



Note The Share feature in Final Cut Pro X for encoding using the Matrox MAX H.264 codec in Compressor is not supported.

The Matrox MAX H.264 Blu-ray settings encode video only. Audio is not encoded by the Matrox MAX H.264 codec when creating H.264 elementary streams for Blu-ray. To include audio when exporting to Blu-ray format, you must assign a separate audio setting to your source media file. However, audio is encoded by the Matrox MAX H.264 codec when creating QuickTime files for the web and mobile devices.



Note When selecting a predefined Matrox MAX H.264 setting, any modifications made to your source video's frame size in your application must be taken into consideration. For example, if your source video was cropped in your application, your source video's frame size is the cropped frame size and not the original frame size.

The predefined Matrox MAX H.264 Compressor settings are separated into three folders: Blu-ray, Fast Encode, and High-Quality:

- **Blu-ray** Use these settings for all Blu-ray deliverables. The encoded file's extension will be *.264*.



Note For compatibility with most Blu-ray players and Adobe Encore, the predefined Matrox MAX H.264 settings for Blu-ray use a simple GOP structure.

- **Fast Encode** Use these settings for fast encoding of QuickTime files. These settings leverage your system's resources with the MXO2 hardware, resulting in even faster encoding times. The encoded file's extension will be *.mov*.



Note If your source video must be scaled for encoding and its aspect ratio does not match the compression aspect ratio, with Compressor v3.5 or later,

you can select **Preserve source aspect ratio** from the **Padding** list in Compressor's Geometry pane to maintain your source video's aspect ratio.

- **High-Quality** Use these settings for high-quality encoding of QuickTime files. With these settings, the encoding is performed entirely by the MXO2 hardware, which frees your system's resources for other tasks. The encoded file's extension will be *.mov*.

➡ **To send a Final Cut Pro X clip to Apple Compressor for export using the Matrox MAX H.264 settings:**

- 1 In Final Cut Pro X, select the clip or sequence that you want to export.
- 2 If your system does not include a Matrox CompressHD card, from the **Window** menu, disable **A/V Output**.
- 3 Choose **File > Send to Compressor**.
- 4 Drag the desired **Matrox MAX H.264** setting from the **Settings** window to your source media file (job) in the **Batch** window.



Note Matrox MAX technology supports closed caption data from SCC files for web deliverables (*.mov*) when encoding at 1:1, or when downscaling. When an SCC (CEA-608) closed caption file is associated with your source media file in Compressor, Matrox MAX technology embeds the closed caption data in the encoded video file (*.mov*).

- 5 If you're exporting to Blu-ray format and you want to export audio as well, you must add a separate audio setting to your **Batch** window. Matrox provides predefined audio settings for each of the Matrox settings, however, you can choose to use another audio setting.
- 6 Choose a destination for your job's targets and submit your batch as you would normally.

Using Adobe Premiere Pro or Media Encoder

This section details how to specify the Matrox MAX H.264 compression settings in Adobe Premiere Pro and Media Encoder for delivering QuickTime files for the web, and for use with Apple TV, iPad, iPod, iPhone, and other QuickTime-based devices. The encoded file's extension will be *.mov*.

The Matrox MAX H.264 component for Premiere Pro and Media Encoder includes predefined Matrox MAX H.264 presets that you can use to immediately apply appropriate compression settings for delivering H.264 files. For most deliverables, you can use one of the predefined Matrox MAX H.264 presets (see [“Assigning a Matrox MAX H.264 preset”](#) on page 139). However, if you require a custom setting, see [“Creating a custom Matrox MAX H.264 preset”](#) on page 139.

Assigning a Matrox MAX H.264 preset

This section describes how to assign a Matrox MAX H.264 preset to your source file in Premiere Pro and Media Encoder for delivering QuickTime files for the web, and for use with Apple TV, iPad, iPod, iPhone, and other QuickTime-based devices. The Matrox MAX H.264 presets include the predefined presets installed with your MXO2 software, and any custom presets that you create (see [“Creating a custom Matrox MAX H.264 preset”](#) on page 139).



Note When selecting a predefined Matrox MAX H.264 preset, any modifications made to your source video’s frame size in your application must be taken into consideration. For example, if your source video was cropped in your application, your source video’s frame size is the cropped frame size and not the original frame size.

- 1 Start Adobe Premiere Pro and open a project, or start Adobe Media Encoder and add the source clip or sequence to the queue.



Note When encoding using the Matrox MAX H.264 codec in Adobe Media Encoder, the Matrox MAX H.264 codec does not support batch encoding the same item (job) in the queue to more than one Matrox MAX H.264 setting. To export your file/sequence to more than one Matrox MAX H.264 setting, you must add a separate item to the queue for each Matrox MAX H.264 setting.

- 2 If you’re working with Premiere Pro, choose **File > Export > Media**. If you’re working with Media Encoder, in the **Queue** panel, right-click the clip or sequence that you want to export, and then click **Export Settings**.
- 3 In the **Export Settings** dialog, under **Export Settings**, select **QuickTime** from the **Format** list, and then select the desired **Matrox MAX** preset from the **Preset** list.
- 4 Export the file as you would normally.

Creating a custom Matrox MAX H.264 preset


You can create a custom Matrox MAX H.264 preset in Adobe Premiere Pro and Media Encoder for delivering QuickTime files for the web, and for use with Apple TV, iPad, iPod, iPhone, and other QuickTime-based devices. Once you create a new Matrox MAX H.264 preset, you can assign it to your source file in Premiere Pro and Media Encoder using the steps described in [“Assigning a Matrox MAX H.264 preset”](#) on page 139.

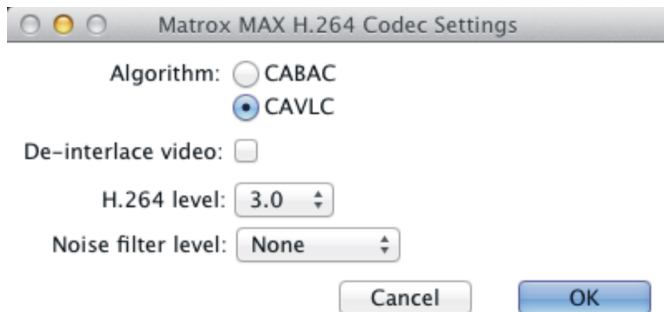
- 1 Start Adobe Premiere Pro and open a project, or start Adobe Media Encoder and add the source clip or sequence to the queue.



Note When encoding using the Matrox MAX H.264 codec in Adobe Media Encoder, the Matrox MAX H.264 codec does not support batch encoding the same item (job) in the queue to more than one Matrox MAX H.264 setting.

To export your file/sequence to more than one Matrox MAX H.264 setting, you must add a separate item to the queue for each Matrox MAX H.264 setting.

- 2 If you're working with Premiere Pro, choose **File > Export > Media**. If you're working with Media Encoder, in the **Queue** panel, right-click the clip or sequence that you want to export, and then click **Export Settings**.
- 3 In the **Export Settings** dialog, under **Export Settings**, select **QuickTime** from the **Format** list.
-  **Tip** You can use an existing **Matrox MAX** preset as a starting point for your new preset by selecting the desired preset from the **Preset** list before specifying your export settings.
- 4 In the **Video** pane, under **Video Codec**, select **Matrox MAX H.264** from the **Video Codec** list, and then click **Codec Settings**.
- 5 In the **Matrox MAX H.264 Codec Settings** dialog, set the following options:




- Select the entropy coding **Algorithm** to be used during compression:
 - **CABAC** Uses the CABAC coding method, and defines the video stream as H.264 Main profile.
 - **CAVLC** Uses the CAVLC coding method, and defines the video stream as H.264 Main profile when **Frame Reordering** (under **Advanced Settings**) is selected. Otherwise, the video stream is defined as H.264 Baseline profile. This method is not supported when encoding to a frame size that has a width greater than 720. In this case, CABAC will always be used for encoding.
- **De-interlace video** Select this option if your source video is interlaced and you want to de-interlace your video before encoding. This option can be used to display your encoded video on a monitor that displays lines progressively, such as an LCD or computer monitor. For all other instances, make sure this option is not selected.

- Select the **H.264 level** that you want to be used to encode your video.

H.264 level	Maximum Frame size	Maximum Frame rate (fps)	Maximum Data rate (Mb/s)
2.0	352×288	29.97	2
3.0	720×576	29.97	10
3.1	1280×720	29.97	14
4.0	1920×1080	29.97	20
4.1	1920×1080	29.97	50
4.2	1920×1080	59.94	50

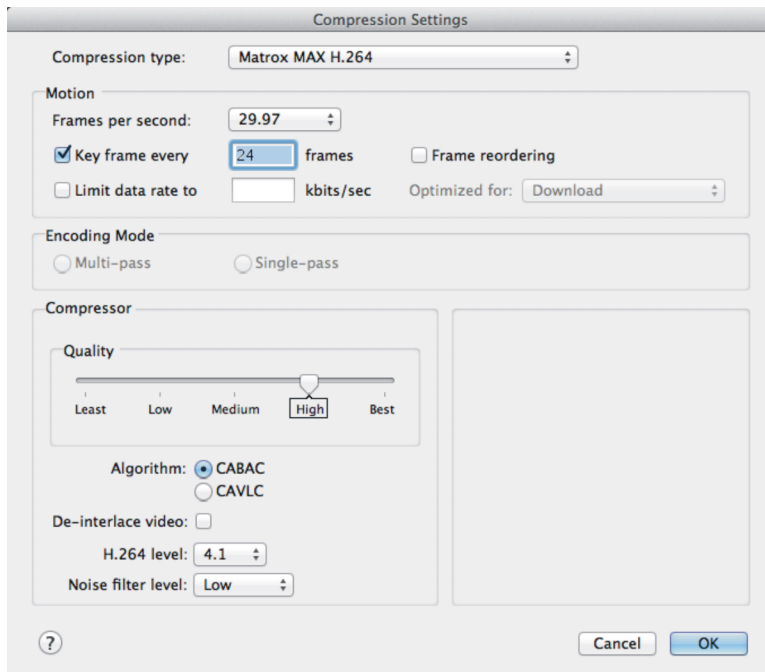
- Select the **Noise filter level** that will be applied to your video before encoding. Increasing the noise filter level reduces the amount of high frequencies in your source video by softening the high-detail portions of your video. Since high frequencies require more bits to encode, increasing the noise filter level leaves more bits available for the encoding of other frames, which can improve the overall quality of your encoded video. However, if you lose too much detail in your encoded video you may need to decrease the noise filter level.

- 6 Click **OK** to save and close the **Matrox MAX H.264 Codec Settings** dialog.
 - 7 In the **Export Settings** dialog, in the **Video** pane, under **Bitrate Settings**, enable the **Limit data rate to** option and enter a value if you're using the CAVLC entropy coding algorithm (see step 5). If using CABAC, you can enable or disable this option.
 - 8 For optimal results when encoding using the Matrox MAX H.264 codec, in the **Video** pane, under **Basic Video Settings**, select **Progressive** from the **Field Order** list.
 - 9 Specify any other export settings as desired. For detailed information on Media Encoder settings, see your Media Encoder documentation.
-  **Note** To export a clip for use with Apple iPad, iPod or iPhone devices, you must select **AAC** as the **Audio Codec**.
- 10 In the **Export Settings** dialog, under **Export Settings**, click the **Save Preset** button next to the **Preset** list.
 - 11 Type a descriptive name for your preset, and then click **OK**.
 - 12 Export the file as you would normally.

Using Telestream Episode



This section details how to specify Matrox MAX H.264 compression settings in Telestream Episode for delivering QuickTime files for the web, and for use with Apple TV, iPad, iPod, iPhone, and other QuickTime-based devices. The encoded file's extension will be *.mov*.

- 1 Start Telestream Episode, drag the source file that you want to encode, and an encoder preset, to the **Workflow Panel**.
- 2 Click the encoder preset in the **Workflow Panel**, and then in the **Inspector Panel**, type a descriptive name in the **Task Name** text box.
- 3 In the **Inspector Panel**, under **Format**, select **MOV** for the **Container**, and **QuickTime** for the **Video Codec**. The **Compression Settings** window appears. If not, highlight **Video Codec**, and then click **Options**.



- 4 In the **Compression Settings** dialog, select **Matrox MAX H.264** from the **Compression type** menu.
- 5 Under **Motion**, select your desired settings as explained in your Telestream Episode documentation.

Remarks

- If using the CAVLC entropy coding algorithm (see step 7), you must enable **Limit data rate to** and type a value. If using CABAC, you can enable or disable this option.
 - The **Limit data rate to** option applies to the video portion of your encoded file only. When factoring in the encoded audio, the overall data rate for your encoded file may exceed the specified data rate limit. To minimize the impact of the audio on the overall data rate, select **AAC** or **AAC QuickTime** as the **Audio Codec** in the **Inspector Panel**.
- 6 Under **Compressor**, set the **Quality** level for your encoded video. Your desired quality is delivered on each frame at the lowest data rate possible, depending on the complexity of the video.
 - 7 Select the entropy coding **Algorithm** to be used during compression:
 - **CABAC** Uses the CABAC coding method, and defines the video stream as H.264 Main profile.
 - **CAVLC** Uses the CAVLC coding method, and defines the video stream as H.264 Main profile when **Frame Reordering** is selected. Otherwise, the video stream is defined as H.264 Baseline profile.
-  **Note** CAVLC is not supported when encoding to a frame size that has a width greater than 720. In this case, CABAC will always be used for encoding.
- 8 If your source video is interlaced and you want to de-interlace your video before encoding, select **De-interlace video**. This option can be used to display your encoded video on a monitor that displays lines progressively, such as an LCD or computer monitor. For all other instances, make sure this option is not selected.
-  **Important** If your interlaced video is being scaled, either because you applied an effect in your project or specified a different frame size for export (see step 12), don't use this option. Instead, use the **Deinterlace** option under **Video Filters** in the **Inspector Panel** to de-interlace your video.
- 9 Select the **H.264 level** that you want to be used to encode your video.

H.264 level	Maximum Frame size	Maximum Frame rate (fps)	Maximum Data rate (Mb/s)
2.0	352×288	29.97	2
3.0	720×576	29.97	10
3.1	1280×720	29.97	14
4.0	1920×1080	29.97	20
4.1	1920×1080	29.97	50

H.264 level	Maximum Frame size	Maximum Frame rate (fps)	Maximum Data rate (Mb/s)
4.2	1920×1080	59.94	50



Note Use H.264 level 3.1 to create HD video for use with Apple iPad.

- 10 Select the **Noise filter level** that will be applied to your video before encoding. Increasing the noise filter level reduces the amount of high frequencies in your source video by softening the high-detail portions of your video. Since high frequencies require more bits to encode, increasing the noise filter level leaves more bits available for the encoding of other frames, which can improve the overall quality of your encoded video. However, if you lose too much detail in your encoded video you may need to decrease the noise filter level.

- 11 Click **OK**.

- 12 If you want to scale your source video for export, specify the new frame size in the **Resize** option under **Video Filters** in the **Inspector Panel**.



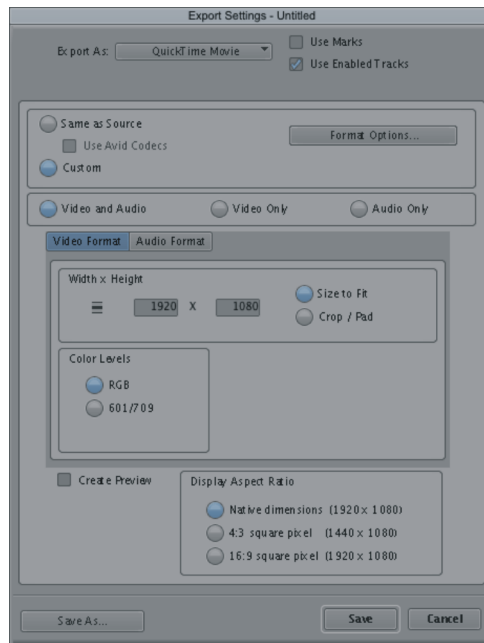
Note The minimum frame size is 64×64, and the maximum frame size depends on the H.264 level selected in step 9. The horizontal and vertical values must be even numbers.

- 13 Set your desired audio settings. To export a clip for use with Apple iPad, iPod or iPhone devices, you must select **AAC** or **AAC QuickTime** as the **Audio Codec** in the **Inspector Panel**.
- 14 Drag a deployment location to the **Workflow Panel**, and encode the file as you would normally.

Using Avid Media Composer or Symphony

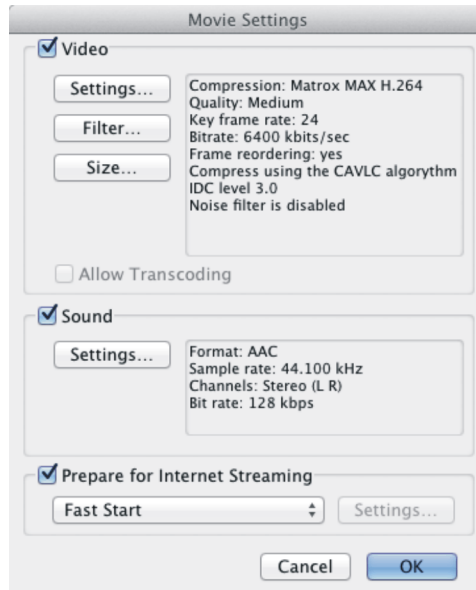
This section details how to specify the Matrox MAX H.264 compression settings in Avid Media Composer and Avid Symphony for delivering QuickTime files for the web and mobile devices. The encoded file's extension will be *.mov*.

- 1 Open Avid Media Composer/Symphony, and open the project that you want to export.
- 2 Choose **File > Export**.
- 3 In the **Export As** dialog, select **Untitled** from the **Export setting** list, and then click **Options**.
- 4 In the **Export Settings** dialog, select **QuickTime Movie** from the **Export As** list.

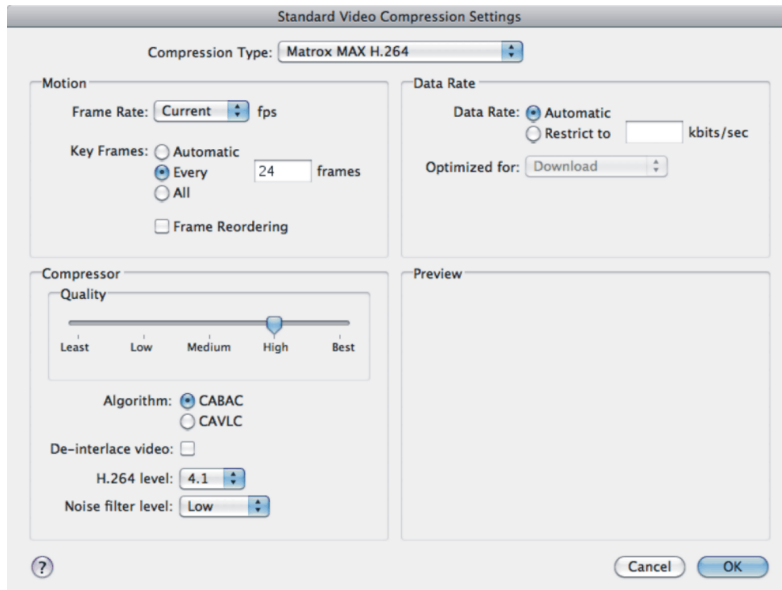


- 5 Select **Custom**, and then click **Format Options**.

6 In the **Movie Settings** dialog, under **Video**, click **Settings**.





7 From the **Compression Type** menu, select **Matrox MAX H.264**.



8 Under **Motion** and **Data Rate**, select your desired settings as explained in your Avid documentation.

Remarks

- If using the CABAC entropy coding algorithm (see step 10), you can use either the **Automatic** or **Restrict to** data rate option. If using CAVLC, you must use the **Restrict to** data rate option.
 - The **Restrict to** data rate option applies to the video portion of your encoded file only. When factoring in the encoded audio, the overall data rate for your encoded file may exceed the specified data rate limit. To minimize the impact of the audio on the overall data rate, select AAC as the audio format for your encoded file (see step 15).
- 9 Under **Compressor**, if **Automatic** was selected as the **Data Rate**, set the **Quality** level for your encoded video. Your video is compressed at the specified quality setting with no regard to data rate. Your desired quality is delivered on each frame at the lowest data rate possible, depending on the complexity of the video.
- 10 Select the entropy coding **Algorithm** to be used during compression:
- **CABAC** Uses the CABAC coding method, and defines the video stream as H.264 Main profile.
 - **CAVLC** Uses the CAVLC coding method, and defines the video stream as H.264 Main profile when **Frame Reordering** is selected. Otherwise, the video stream is defined as H.264 Baseline profile.
-  **Note** CAVLC is not supported when encoding to a frame size that has a width greater than 720. In this case, CABAC will always be used for encoding.
- 11 If your source video is interlaced and you want to de-interlace your video before encoding, select **De-interlace video**. This option can be used to display your encoded video on a monitor that displays lines progressively, such as an LCD or computer monitor. For all other instances, make sure this option is not selected.
-  **Important** If your interlaced video is being scaled, either because you applied an effect in your project or specified a different compression frame size, don't use this option. Instead, use the **Deinterlace Source Video** option in the **Export Size Setup** window to de-interlace your video. You'll be able to do this when specifying the frame size for your encoded video in step 16.
- 12 Select the **H.264 level** that you want to be used to encode your video.

H.264 level	Maximum Frame size	Maximum Frame rate (fps)	Maximum Data rate (Mb/s)
2.0	352×288	29.97	2
3.0	720×576	29.97	10

H.264 level	Maximum Frame size	Maximum Frame rate (fps)	Maximum Data rate (Mb/s)
3.1	1280×720	29.97	14
4.0	1920×1080	29.97	20
4.1	1920×1080	29.97	50
4.2	1920×1080	59.94	50



Note Use H.264 level 3.1 to create HD video for use with Apple iPad.

- 13 Select the **Noise filter level** that will be applied to your video before encoding. Increasing the noise filter level reduces the amount of high frequencies in your source video by softening the high-detail portions of your video. Since high frequencies require more bits to encode, increasing the noise filter level leaves more bits available for the encoding of other frames, which can improve the overall quality of your encoded video. However, if you lose too much detail in your encoded video you may need to decrease the noise filter level.
- 14 Click **OK**.
- 15 In the **Movie Settings** dialog, under **Sound**, click **Settings** to specify your audio settings, and then click **OK**.

Remarks

- When limiting the data rate of your encoded file to a specified bit rate (see step 8), please note that the encoded audio may cause the overall data rate to exceed the data rate limit. To minimize the impact of the encoded audio on the overall data rate, select AAC as the audio format for your encoded file. To do this, in the **Sound Settings** window, select **AAC** from the **Format** list.
 - To export a clip for use with Apple iPod or iPhone devices, you must choose AAC (advanced audio coding) as your export audio file format. To do this, in the **Sound Settings** window, select **AAC** from the **Format** list.
- 16 In the **Movie Settings** dialog, click **Size** and select the frame size that you want for your encoded video from the **Dimensions** menu.



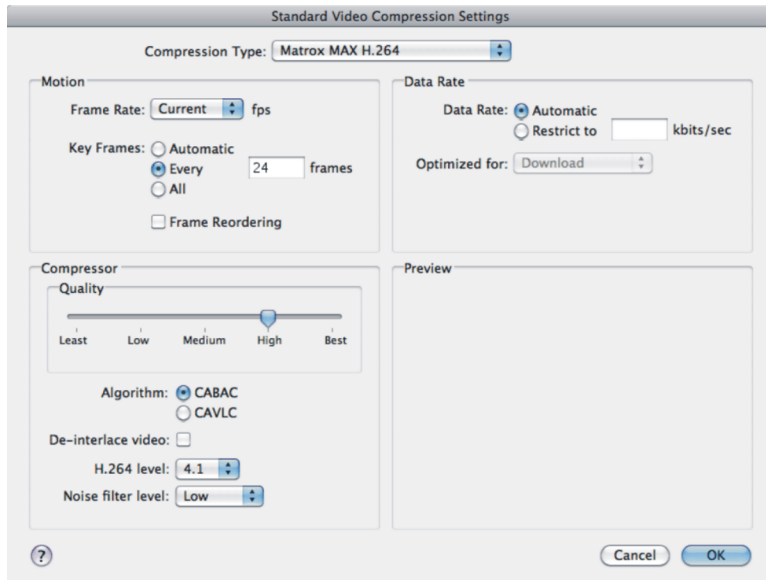
Note The minimum frame size is 64×64, and the maximum frame size depends on the H.264 level selected in step 12. The horizontal and vertical values must be even numbers.

- 17 Once all settings are specified, click **OK** in the **Movie Settings** window.
- 18 Click **Save** in the **Export Settings** dialog, and then click **Save** in the **Export As** window to encode your video.

Using Apple QuickTime Pro, and other QuickTime-based applications

This section details how to specify Matrox MAX H.264 compression settings in QuickTime Pro v7.6.x for delivering QuickTime files for the web, and for use with Apple TV, iPad, iPod, iPhone, and other QuickTime-based devices. The encoded file's extension will be *.mov*. The settings described in this section are the same when exporting to QuickTime from other QuickTime-based video applications. For details on how to export to QuickTime from another QuickTime-based application, see your application's documentation.



- 1 Start QuickTime Pro, and open the video file that you want to export.
- 2 Choose **File > Export**.
- 3 In the **Save exported file as** window, click **Options**.
- 4 In the **Movie Settings** dialog, under **Video**, click **Settings**.



- 5 From the **Compression Type** menu, select **Matrox MAX H.264**.
- 6 Under **Motion** and **Data Rate**, select your desired settings as explained in your application's documentation.

Remarks

- If using the CABAC entropy coding algorithm (see step 8), you can use either the **Automatic** or **Restrict to** data rate option. If using CAVLC, you must use the **Restrict to** data rate option.

- The **Restrict to** data rate option applies to the video portion of your encoded file only. When factoring in the encoded audio, the overall data rate for your encoded file may exceed the specified data rate limit. To minimize the impact of the audio on the overall data rate, select AAC as the audio format for your encoded file (see step 13).
- 7 Under **Compressor**, set the **Quality** level for your encoded video. Your desired quality is delivered on each frame at the lowest data rate possible, depending on the complexity of the video.
 - 8 Select the entropy coding **Algorithm** to be used during compression:
 - **CABAC** Uses the CABAC coding method, and defines the video stream as H.264 Main profile.
 - **CAVLC** Uses the CAVLC coding method, and defines the video stream as H.264 Main profile when **Frame Reordering** is selected. Otherwise, the video stream is defined as H.264 Baseline profile.
-  **Note** CAVLC is not supported when encoding to a frame size that has a width greater than 720. In this case, CABAC will always be used for encoding.
- 9 If your source video is interlaced and you want to de-interlace your video before encoding, select **De-interlace video**. This option can be used to display your encoded video on a monitor that displays lines progressively, such as an LCD or computer monitor. For all other instances, make sure this option is not selected.
-  **Important** If your interlaced video is being scaled, either because you applied an effect in your project or specified a different compression frame size, don't use this option. Instead, use the **Deinterlace Source Video** option in the **Export Size Setup** window to de-interlace your video. You'll be able to do this when specifying the frame size for your encoded video in step 14.
- 10 Select the **H.264 level** that you want to be used to encode your video.

H.264 level	Maximum Frame size	Maximum Frame rate (fps)	Maximum Data rate (Mb/s)
2.0	352×288	29.97	2
3.0	720×576	29.97	10
3.1	1280×720	29.97	14
4.0	1920×1080	29.97	20
4.1	1920×1080	29.97	50
4.2	1920×1080	59.94	50



Note Use H.264 level 3.1 to create HD video for use with Apple iPad.

- 11 Select the **Noise filter level** that will be applied to your video before encoding. Increasing the noise filter level reduces the amount of high frequencies in your source video by softening the high-detail portions of your video. Since high frequencies require more bits to encode, increasing the noise filter level leaves more bits available for the encoding of other frames, which can improve the overall quality of your encoded video. However, if you lose too much detail in your encoded video you may need to decrease the noise filter level.
- 12 Click **OK**.
- 13 In the **Movie Settings** dialog, under **Sound**, click **Settings** to specify your audio settings, and then click **OK**.

Remarks

- When limiting the data rate of your encoded file to a specified bit rate (see step 6), please note that the encoded audio may cause the overall data rate to exceed the data rate limit. To minimize the impact of the encoded audio on the overall data rate, select AAC as the audio format for your encoded file. To do this, in the **Sound Settings** window, select **AAC** from the **Format** list.
 - To export a clip for use with Apple iPad, iPod or iPhone devices, you must choose AAC (advanced audio coding) as your export audio file format. To do this, in the **Sound Settings** window, select **AAC** from the **Format** list.
- 14 In the **Movie Settings** dialog, click **Size** and select the frame size that you want for your encoded video from the **Dimensions** menu.



Note The minimum frame size is 64×64, and the maximum frame size depends on the H.264 level selected in step 10. The horizontal and vertical values must be even numbers.

- 15 Once all settings are specified, click **OK**, and then **Save** in the **Save exported file as** window to encode your video.

Your notes



Understanding Pulldown

This appendix describes MXO2 pulldown.

Overview

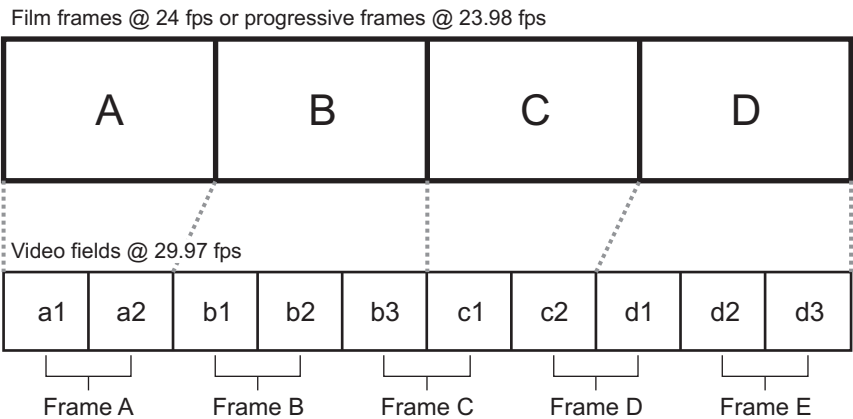
Depending on your project’s video output format, you may choose to apply a pulldown to convert 23.98 fps video to 29.97 fps or 59.94 fps video for output on MXO2 (see [Appendix D, “Matrox MXO2 Supported Output Formats”](#)). If you choose to enable **Pulldown** in the **Video Output** pane of the Matrox preferences window (see [Chapter 7, “Configuring Your MXO2 System”](#)), Matrox uses the standard pulldown method to convert 23.98 fps to 29.97 fps or 59.94 fps video.

Standard pulldown

Standard pulldown is often used as part of the telecine process to transfer 24 fps film footage to 29.97 fps interlaced video. This pulldown method is also used to convert any 23.98 fps progressive video to 29.97 fps interlaced video, such as for converting 486p @ 23.98 fps video to NTSC.

In order to convert 24 fps film or 23.98 fps progressive video to 29.97 fps interlaced video, additional video frames, and more specifically video fields, must be created and added to the video sequence. For example, to convert a sequence of four film or progressive frames, five frames of video are needed for a total of 10 video fields. Therefore, one additional video frame or two video fields must be created. To accomplish this, the first and third frames of a four-frame film or progressive video sequence are each converted to two video fields. The second and fourth frames of the sequence are converted to three video fields to make up a total of five interlaced video frames.

The following diagram demonstrates the process:



Standard pulldown is accomplished by representing the first frame of film or progressive video (frame **A**) as two fields of video (fields **a1** and **a2**), the second frame (frame **B**) as three fields of video (fields **b1**, **b2**, and **b3**), the third frame

(frame **C**) as two fields (fields **c1** and **c2**), and the fourth frame (frame **D**) as three fields (fields **d1**, **d2**, and **d3**). This sequence repeats six times each second.

Your notes

B

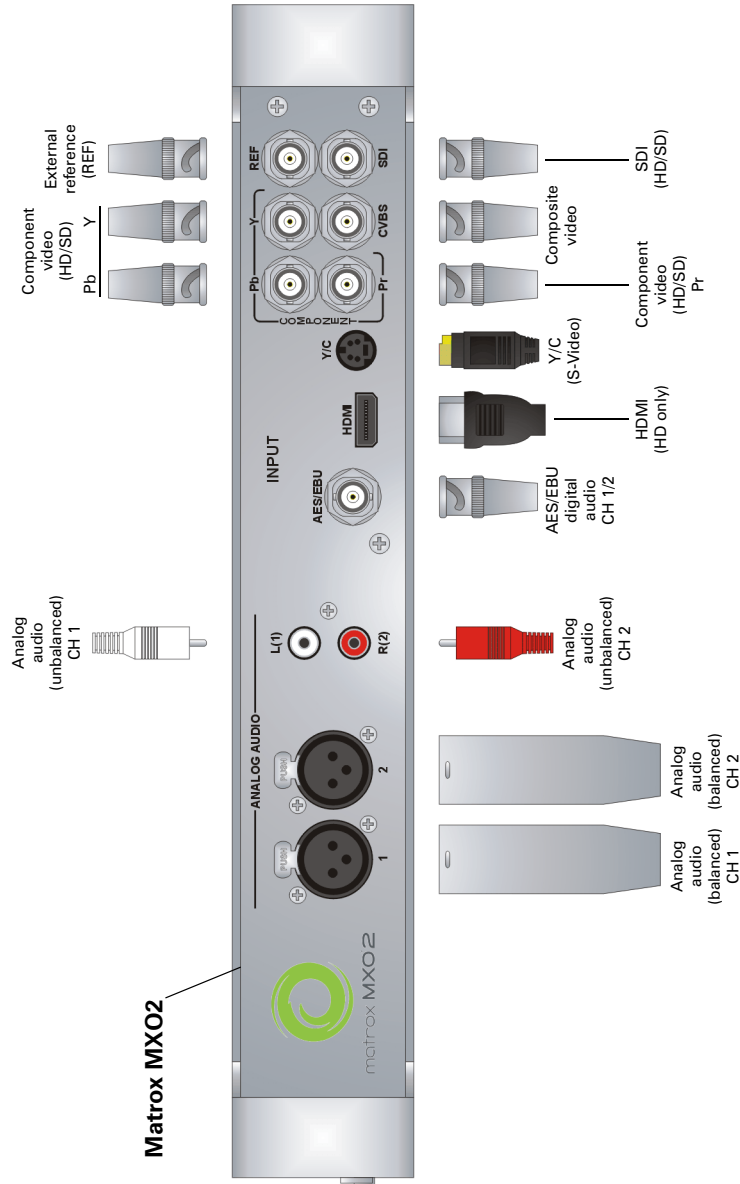
Matrox MXO2 Connectors

This appendix describes the inputs and outputs for MXO2, MXO2 Rack, MXO2 LE, and MXO2 Mini.

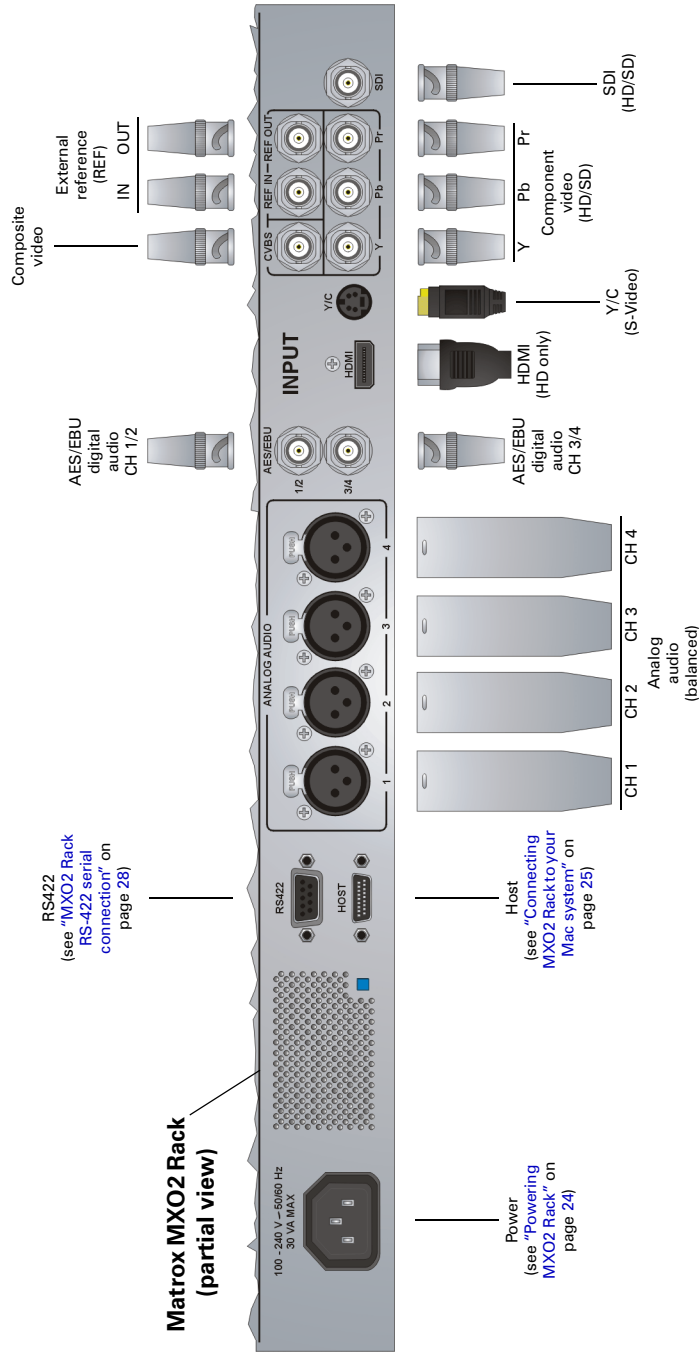
Inputs

The following sections detail the MXO2, MXO2 Rack, MXO2 LE, and MXO2 Mini inputs.

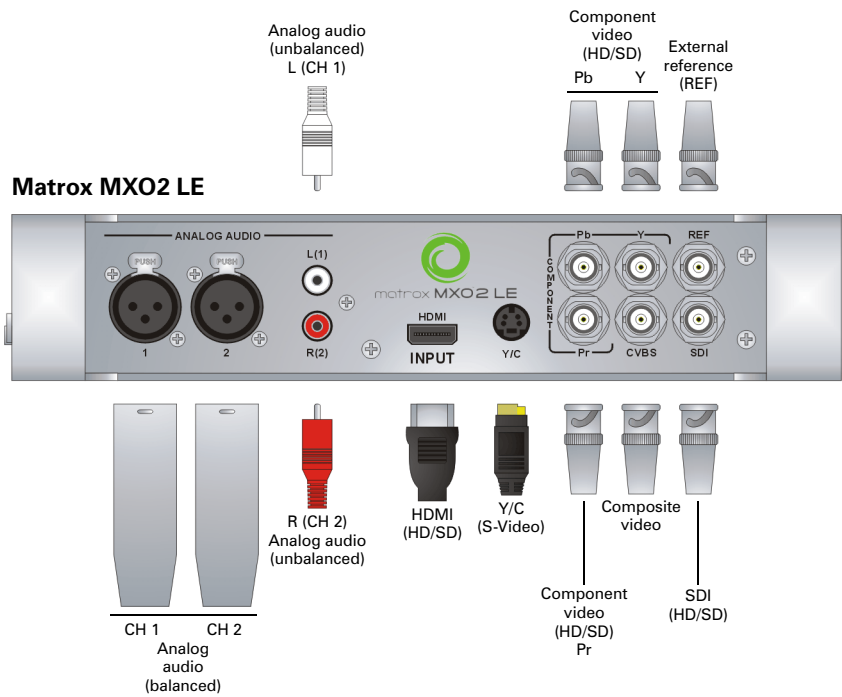
MXO2 inputs



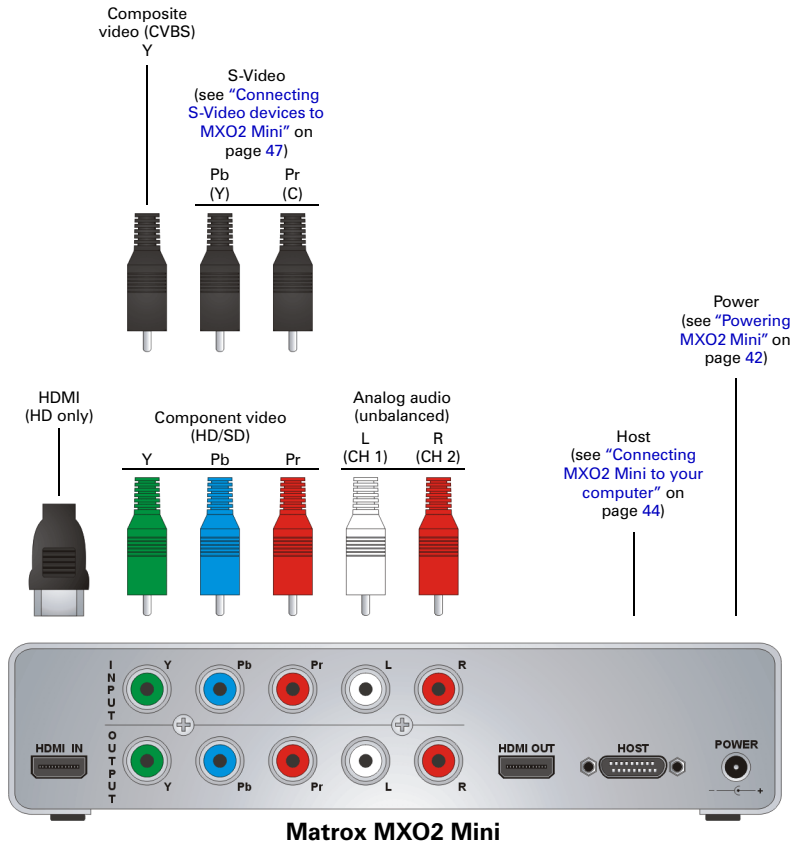
MXO2 Rack inputs



MXO2 LE inputs



MXO2 Mini inputs



Input connector descriptions

This section describes the Matrox MXO2, MXO2 Rack, and MXO2 LE inputs. For MXO2 Mini inputs, see [“Input connector descriptions \(MXO2 Mini\)”](#) on page 164.

You can select the video and audio inputs to be used as your capture source in the MXO2 preferences window (see [“Specifying your A/V input settings”](#) on page 55). For a list of the supported input and capture formats, see [Appendix C, “Matrox MXO2 Supported Input and Capture Formats.”](#)



Note Depending on your MXO2 hardware, some of the following connectors may not be available or may be available in a limited capacity only. Some connectors on your MXO2 hardware may not appear exactly as shown below.



(MXO2 and MXO2 LE)



(MXO2 Rack)

External reference (REF) Allows you to genlock all devices connected to your MXO2 system to an external genlock source (bi-level analog black burst for SD, or analog tri-level sync for HD). MXO2 Rack features an additional REF OUT connector with loop through that allows you to daisy chain the genlock reference input to another device’s reference input.



Important If you connected an external genlock source to MXO2 Rack’s REF IN connector, and you’re not using the REF OUT connector, you must terminate the reference signal by connecting a BNC 75-ohm terminator to REF OUT.

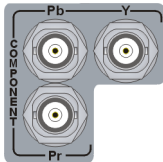
To compensate for cable delays, timing-offset controls that align your video output relative to your external genlock source are available (see [“Specifying your genlock settings”](#) on page 54).



HDMI Provides an input for HD HDMI video (either YUV or RGB), and up to eight channels of uncompressed embedded audio, from a digital HDMI device. HDCP sources and SD video are not supported on this input. Connect a standard HDMI video/audio cable from a camera, VTR, or other video input source.



SDI Provides an input for use with a digital SDI device. This input supports HD-SDI and SD-SDI video, and up to 16 channels of embedded audio. You can also use this input to capture closed captioning and AFD data (see [“Matrox 4VANC capture and playback”](#) on page 66). Connect an SDI video/audio cable from a camera, VTR, or other video input source.



Component video (Y, Pb, Pr) Provide inputs for use with an analog component device, and support HD and SD video. Connect component Y, Pb, Pr video cables from a camera, VTR, or other video input source.



Y/C (S-Video) Provides an input for use with an analog S-Video device (SD only). Connect an S-Video cable from a camera, VTR, or other video input source.



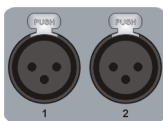
Composite video (CVBS) Allows you to input SD video from an analog NTSC or PAL device. Connect a composite video cable from a camera, VTR, or other video input source.



AES/EBU digital audio Allows you to input stereo digital audio. Connect a coaxial BNC audio cable from a camera, VTR, audio mixer, or other audio input source.



Note Not available on MXO2 LE.



Analog audio (balanced) Allows you to input balanced stereo analog audio. Connect XLR cables from a camera, VTR, audio mixer, or other audio input source.



Analog audio (unbalanced) Allows you to input unbalanced stereo analog audio. Connect RCA cables from a camera, VTR, audio mixer, or other audio input source.

Input connector descriptions (MXO2 Mini)

This section describes the Matrox MXO2 Mini inputs. For other MXO2 products, see [“Input connector descriptions”](#) on page 162.

You can select the video and audio inputs to be used as your capture source in the MXO2 Mini preferences window (see [“Specifying your video output settings”](#) on page 58). For a list of the supported input and capture formats, see [Appendix C, “Matrox MXO2 Supported Input and Capture Formats.”](#)



Note Analog A/V cables connected to Matrox MXO2 Mini must be limited to less than three meters to comply with EEC and EMC directives.



HDMI Provides an input for HD HDMI video (either YUV or RGB), and up to eight channels of uncompressed embedded audio, from a digital HDMI device. HDCP sources and SD video are not supported on this input. Connect a standard HDMI video/audio cable from a camera, VTR, or other video input source.



Component video (Y, Pb, Pr) Provide inputs for use with an analog component device, and support HD and SD video. Connect component Y, Pb, Pr video cables from a camera, VTR, or other video input source.



Note When you connect an analog component device to MXO2 Mini, you won't be able to connect an S-Video or composite device at the same time.



S-Video Input connectors **Pb** and **Pr** allow you to connect the MXO2 S-Video adapter cable for use with an analog S-Video device (SD only). Connect an S-Video cable, via the MXO2 S-Video adapter cable, from a camera, VTR, or other video input source. For an illustration on how to connect S-Video devices to MXO2 Mini, see [“Connecting S-Video devices to MXO2 Mini”](#) on page 47.



Composite video (Y) Allows you to input SD video from an analog NTSC or PAL device. Connect a composite video cable from a camera, VTR, or other video input source.

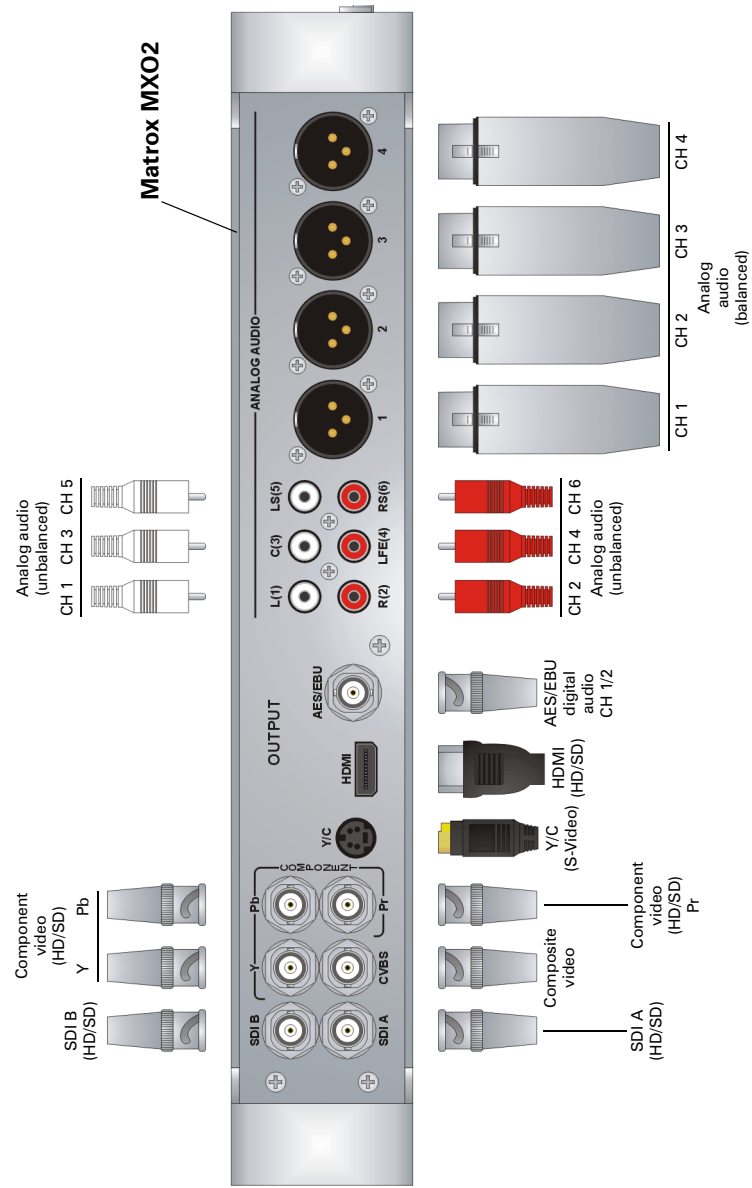


Analog audio (unbalanced) Allows you to input unbalanced stereo analog audio. Connect RCA cables from a camera, VTR, audio mixer, or other audio input source.

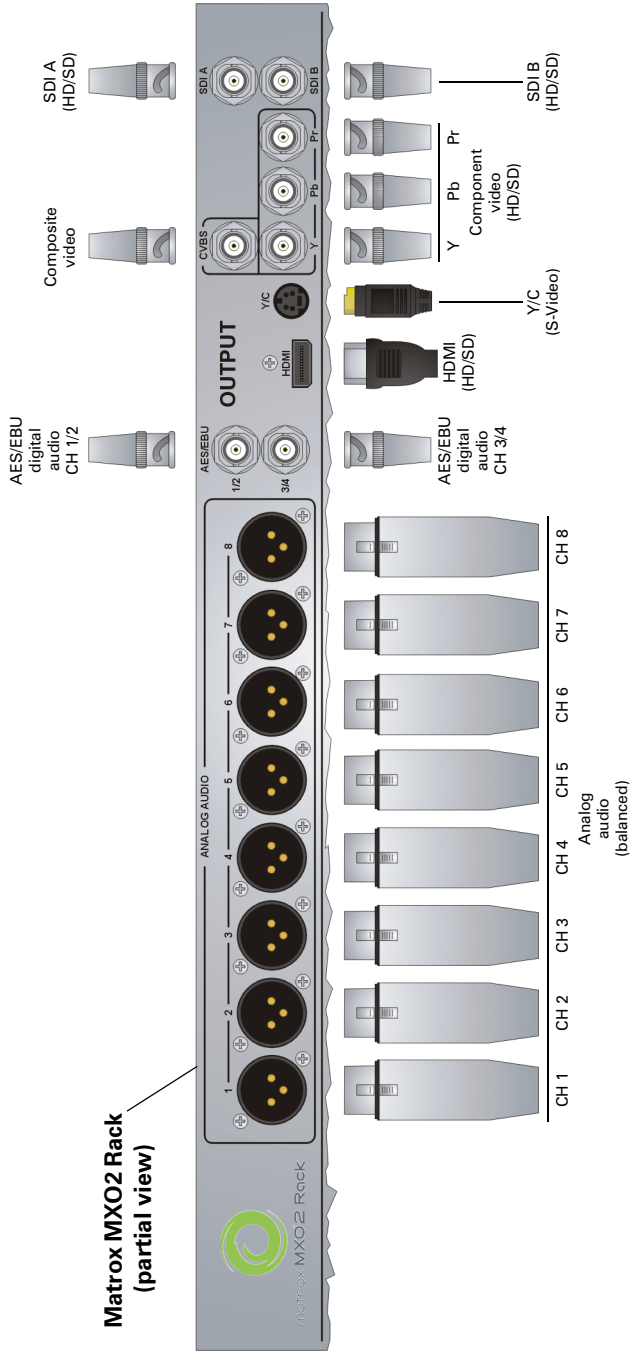
Outputs

The following sections detail the MXO2, MXO2 Rack, MXO2 LE, and MXO2 Mini outputs.

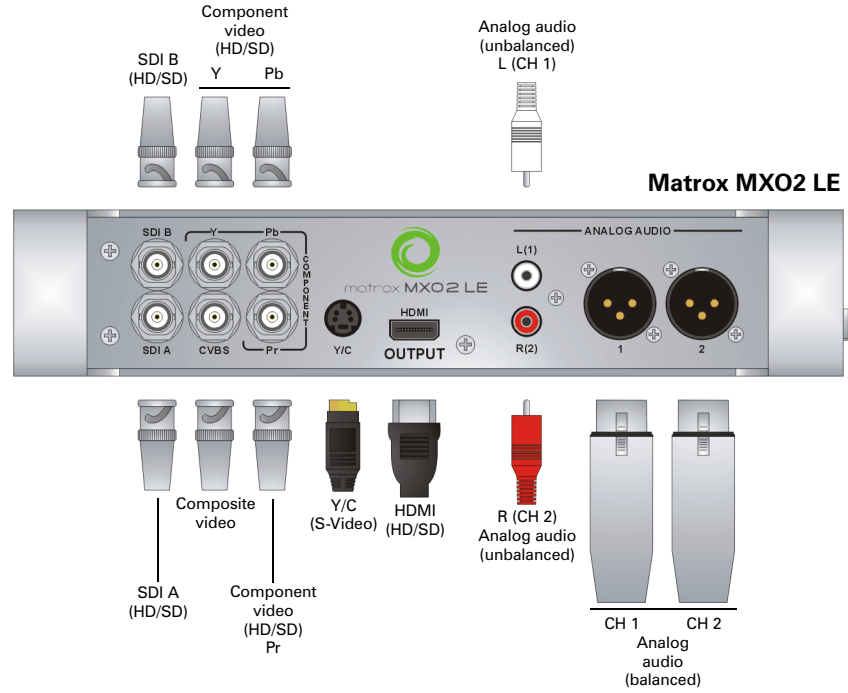
MXO2 outputs



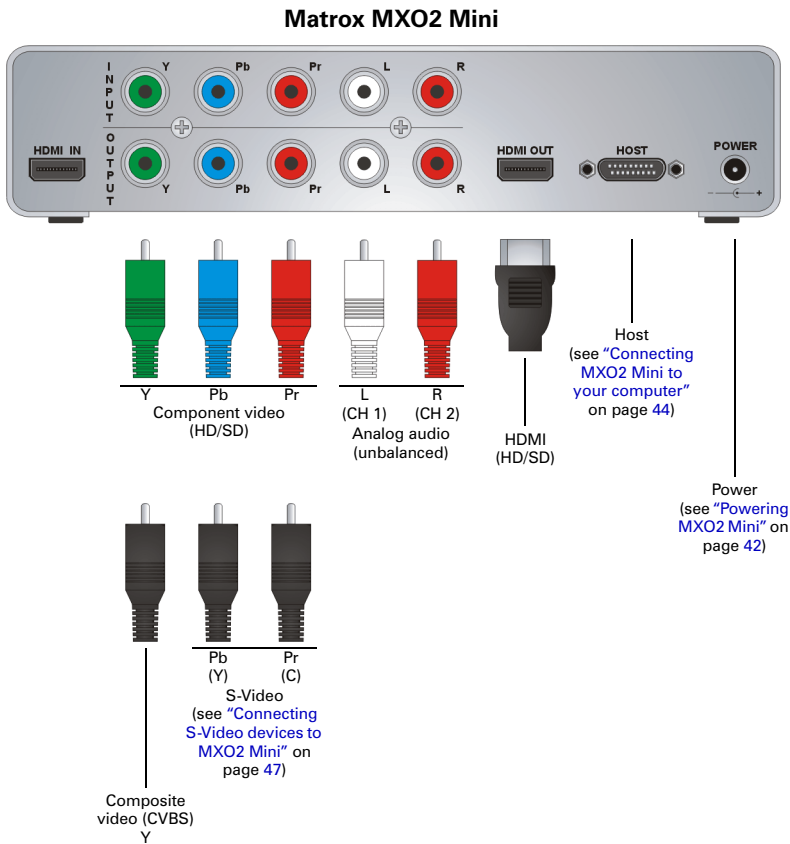
MXO2 Rack outputs



MXO2 LE outputs



MXO2 Mini outputs



Output connector descriptions

This section describes the Matrox MXO2, MXO2 Rack, and MXO2 LE outputs. For MXO2 Mini outputs, see [“Output connector descriptions \(MXO2 Mini\)”](#) on page 171.

HD to SD downscaling, SD to HD upscaling, and cross conversion are supported on all video outputs simultaneously. To select your video output settings, see [“Specifying your video output settings”](#) on page 58. You can also map any audio track in your video application to any MXO2 audio output (see [“Specifying your audio output settings”](#) on page 62). For a list of the video formats that you can output from the MXO2 outputs, see [“Video formats supported on MXO2 outputs”](#) on page 184.



Note Depending on your MXO2 hardware, some of the following connectors may not be available or may be available in a limited capacity only. Some connectors on your MXO2 hardware may not appear exactly as shown below.

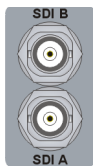


HDMI Provides an output for HD/SD HDMI video, and up to eight channels of embedded audio, to a digital HDMI device. HDCP is not supported on this output. This output supports 1:1 pixel mapping for accurate monitoring on your HDMI display of NTSC, PAL, 1280×720, and 1920×1080 video. Connect a standard HDMI video/audio cable to an HDMI monitor, VTR, or other digital HDMI device. You can also connect directly to a home theatre system for surround sound monitoring.

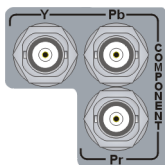


Note The HDMI output supports YUV and RGB devices. To set the HDMI output type, see [“Specifying your video output settings”](#) on page 58.

HDMI monitor calibration is available through this output. Use the Matrox HDMI Calibration Utility to calibrate your HDMI monitor (see [Chapter 8, “Calibrating Your HDMI Monitor for Video”](#)).



SDI A and SDI B Provide two simultaneous outputs of the same HD-SDI or SD-SDI video, with up to 16 channels of embedded audio. You can also output closed captioning and AFD data using the SDI outputs (see [“Matrox 4VANC capture and playback”](#) on page 66). For each output, connect an SDI video/audio cable to a video monitor, VTR, or other SDI device. You can also perform surround sound monitoring through the SDI output by connecting to a third-party device, such as an SDI audio de-embedder.



Component video (Y, Pb, Pr) Allows you to output HD or SD video to an analog component device. Connect component Y, Pb, Pr video cables to a video monitor, VTR, or other component device.



Note The component output supports YUV and RGB devices. To set the component output type, see [“Specifying your video output settings”](#) on page 58.



Y/C (S-Video) Provides an output for SD video to an analog S-Video device. Connect an S-Video cable to a video monitor, VTR, or other S-Video device.



Composite video (CVBS) Allows you to output SD video to an analog NTSC or PAL device. Connect a composite video cable to a video monitor, VTR, or other NTSC or PAL device.



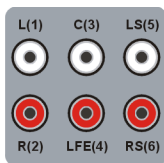
AES/EBU digital audio Allows you to output stereo digital audio. Connect a coaxial BNC audio cable to a VTR, audio mixer, speakers, or other audio device.



Note Not available on MXO2 LE.



Analog audio (balanced) Allows you to output balanced stereo analog audio. Connect XLR cables to a VTR, audio mixer, speakers, or other audio device.



Analog audio (unbalanced) Provide outputs for unbalanced analog audio. Matrox MXO2 offers outputs for channels one to six, or three stereo pairs suitable for 5.1 surround sound monitoring. Connect RCA cables to a VTR, audio mixer, speakers, or other audio device.

Output connector descriptions (MXO2 Mini)

This section describes the Matrox MXO2 Mini outputs. For other MXO2 products, see [“Output connector descriptions”](#) on page 169.

HD to SD downscaling, SD to HD upscaling, and cross conversion are supported on all video outputs simultaneously. To select your video output settings, see [“Specifying your video output settings”](#) on page 58. You can also map any audio track in your video application to any MXO2 Mini audio output (see [“Specifying your audio output settings”](#) on page 62). For a list of the video formats that you can output from the MXO2 Mini outputs, see [“Video formats supported on MXO2 outputs”](#) on page 184.



Note Analog A/V cables connected to Matrox MXO2 Mini must be limited to less than three meters to comply with EEC and EMC directives.



HDMI Provides an output for HD/SD HDMI video, and up to eight channels of embedded audio, to a digital HDMI device. HDCP is not supported on this output. This output supports 1:1 pixel mapping for accurate monitoring on your HDMI display of NTSC, PAL, 1280×720, and 1920×1080 video. Connect a standard HDMI video/audio cable to an HDMI monitor, VTR, or other digital HDMI device. You can also connect directly to a home theatre system for surround sound monitoring.



Note The HDMI output supports YUV and RGB devices.

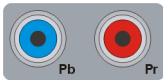
HDMI monitor calibration is available through this output. Use the Matrox HDMI Calibration Utility to calibrate your HDMI monitor (see [Chapter 8, “Calibrating Your HDMI Monitor for Video”](#)).



Component video (Y, Pb, Pr) Allows you to output HD or SD video to an analog component device. Connect component Y, Pb, Pr video cables to a video monitor, VTR, or other component device.



Note The component output supports YUV devices only. When you connect an analog component device to MXO2 Mini, you won't be able to connect an S-Video or composite device at the same time.



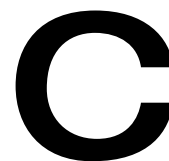
S-Video Output connectors **Pb** and **Pr** allow you to connect the MXO2 S-Video adapter cable for outputting SD video to an analog S-Video device. Connect an S-Video cable, via the MXO2 S-Video adapter cable, to a video monitor, VTR, or other S-Video device. For instructions on how to connect S-Video devices to MXO2 Mini, see [“Connecting S-Video devices to MXO2 Mini”](#) on page 47.



Composite video (Y) Allows you to output SD video to an analog NTSC or PAL device. Connect a composite video cable to a video monitor, VTR, or other NTSC or PAL device.



Analog audio (unbalanced) Provide outputs for unbalanced analog audio channels one and two, or one stereo pair. Connect RCA cables to a VTR, audio mixer, speakers, or other audio device.



Matrox MXO2 Supported Input and Capture Formats

This appendix provides information on the video input and capture formats that are supported on all MXO2 products.

Supported input formats

The following tables list the video formats that are supported on the various MXO2 inputs.

For descriptions of the inputs, see “[Inputs](#)” on page 158, and for a list of the supported capture formats, see “[Supported capture formats](#)” on page 176.

Matrox MXO2, MXO2 Rack, and MXO2 LE

Source video format	Matrox MXO2 input				
	HDMI	SDI	Component (Y, Pb, Pr)	S-Video (Y/C)	Composite (CVBS)
NTSC	—	✓	✓	✓	✓
PAL	—	✓	✓	✓	✓
NTSC 16:9	—	✓	✓	✓	✓
PAL 16:9	—	✓	✓	✓	✓
720p at 50 fps	✓	✓	✓	—	—
720p at 59.94 fps	✓	✓	✓	—	—
1080i at 25 fps	✓	✓	✓	—	—
1080i at 29.97 fps	✓	✓	✓	—	—
1080PsF at 23.98 fps	—	✓	✓	—	—
1080PsF at 25 fps	✓	✓	✓	—	—
1080PsF at 29.97 fps	✓	✓	✓	—	—
1080p at 23.98 fps	✓	✓	—	—	—
1080p at 24 fps	✓	✓	—	—	—
1080p at 25 fps	✓	✓	—	—	—
1080p at 29.97 fps	✓	✓	—	—	—
1080p at 30 fps	✓	✓	—	—	—

Matrox MXO2 Mini

Source video format	Matrox MXO2 Mini input			
	HDMI	Component (Y, Pb, Pr)	S-Video (Pb, Pr)	Composite (Y)
NTSC	—	✓	✓	✓
PAL	—	✓	✓	✓
NTSC 16:9	—	✓	✓	✓
PAL 16:9	—	✓	✓	✓
720p at 50 fps	✓	✓	—	—
720p at 59.94 fps	✓	✓	—	—
1080i at 25 fps	✓	✓	—	—
1080i at 29.97 fps	✓	✓	—	—
1080PsF at 23.98 fps	—	✓	—	—
1080PsF at 25 fps	✓	✓	—	—
1080PsF at 29.97 fps	✓	✓	—	—
1080p at 23.98 fps	✓	—	—	—
1080p at 24 fps	✓	—	—	—
1080p at 25 fps	✓	—	—	—
1080p at 29.97 fps	✓	—	—	—
1080p at 30 fps	✓	—	—	—

Supported capture formats

The following table lists the capture formats that are supported on MXO2 based on the format of your source video. If the format to which you want to capture does not match the format of your source video, you must enable scaling on the input. For a list of the video formats that are supported on the Matrox MXO2 inputs, see [“Supported input formats”](#) on page 174.

Avid Media Composer/Symphony

Source video format	Supported capture format (project video format)													
	23.976p NTSC	30i NTSC	25p PAL	25i PAL	720p/23.976	720p/25	720p/50	720p/59.94	1080p/23.976	1080p/24	1080p/25	1080p/29.97	1080i/50 (25 fps)	1080i/59.94 (29.97 fps)
NTSC	✓ ¹	✓	—	—	✓ ¹	—	—	✓ ¹	✓ ¹	—	—	✓ ¹	—	✓ ¹
PAL	—	—	✓	✓	—	✓ ¹	✓ ¹	—	—	—	✓ ¹	—	✓ ¹	—
NTSC 16:9	✓	✓	—	—	✓ ¹	—	—	✓ ¹	✓ ¹	—	—	✓ ¹	—	✓ ¹
PAL 16:9	—	—	✓	✓	—	✓ ¹	✓ ¹	—	—	—	✓ ¹	—	✓ ¹	—
720p at 50 fps	—	—	✓ ¹	✓ ¹	—	✓	✓	—	—	—	✓ ¹	—	✓ ¹	—
720p at 59.94 fps	✓ ¹	✓ ¹	—	—	✓	—	—	✓	✓ ¹	—	—	✓ ¹	—	✓ ¹
1080i at 25 fps	—	—	✓ ¹	✓ ¹	—	✓ ¹	✓ ¹	—	—	—	✓	—	✓	—
1080i at 29.97 fps	✓ ¹	✓ ¹	—	—	✓ ¹	—	—	✓ ¹	✓	—	—	✓	—	✓
1080PsF at 23.98 fps	—	—	—	—	✓ ¹	—	—	—	✓	—	—	—	—	—
1080PsF at 25 fps	—	—	✓ ¹	✓ ¹	—	✓ ¹	✓ ¹	—	—	—	✓	—	✓	—
1080PsF at 29.97 fps	✓ ¹	✓ ¹	—	—	—	—	—	✓ ¹	—	—	—	✓	—	✓
1080p at 23.98 fps	—	—	—	—	✓ ¹	—	—	—	✓	—	—	—	—	—
1080p at 24 fps	—	—	—	—	—	—	—	—	—	✓	—	—	—	—
1080p at 25 fps	—	—	✓ ¹	✓ ¹	—	✓ ¹	✓ ¹	—	—	—	✓	—	✓	—
1080p at 29.97 fps	✓ ¹	✓ ¹	—	—	—	—	—	✓ ¹	—	—	—	✓	—	✓

¹ You must enable **Scale input for capture** in the **Matrox Utilities** preferences window (see [“Specifying your A/V input settings”](#) on page 23).

Adobe Premiere Pro

Source video format	Supported capture format															
	NTSC	NTSC 16:9	PAL	PAL 16:9	720p 23.98	720p 25	720p 29.97	720p 50	720p 59.94	1080p 23.98	1080p 24	1080p 25	1080p 29.97	1080p 30	1080i 25	1080i 29.97
NTSC	✓ ¹	✓	—	—	✓ ¹	—	✓ ¹	—	✓ ¹	✓ ¹	—	—	✓ ¹	—	—	✓ ¹
PAL	—	—	✓	✓	—	✓ ¹	—	✓ ¹	—	—	—	✓ ¹	—	—	✓ ¹	—
NTSC 16:9	✓	✓	—	—	✓ ¹	—	✓ ¹	—	✓ ¹	✓ ¹	—	—	✓ ¹	—	—	✓ ¹
PAL 16:9	—	—	✓	✓	—	✓ ¹	—	✓ ¹	—	—	—	✓ ¹	—	—	✓ ¹	—
720p at 50 fps	—	—	✓ ¹	✓ ¹	—	✓	—	✓	—	—	—	✓ ¹	—	—	✓ ¹	—
720p at 59.94 fps	✓ ¹	✓ ¹	—	—	✓	—	✓	—	✓	✓ ¹	—	—	✓ ¹	—	—	✓ ¹
1080i at 25 fps	—	—	✓ ¹	✓ ¹	—	✓ ¹	—	✓ ¹	—	—	—	✓	—	—	✓	—
1080i at 29.97 fps	✓ ¹	✓ ¹	—	—	✓ ¹	—	✓ ¹	—	✓ ¹	✓	—	—	✓	—	—	✓
1080PsF at 23.98 fps	—	—	—	—	✓ ¹	—	—	—	—	✓	—	—	—	—	—	—
1080PsF at 25 fps	—	—	✓ ¹	✓ ¹	—	✓ ¹	—	✓ ¹	—	—	—	✓	—	—	✓	—
1080PsF at 29.97 fps	✓ ¹	✓ ¹	—	—	—	—	✓ ¹	—	✓ ¹	—	—	—	✓	—	—	✓
1080p at 23.98 fps	—	—	—	—	✓ ¹	—	—	—	—	✓	—	—	—	—	—	—
1080p at 24 fps	—	—	—	—	—	—	—	—	—	—	✓	—	—	—	—	—
1080p at 25 fps	—	—	✓ ¹	✓ ¹	—	✓ ¹	—	✓ ¹	—	—	—	✓	—	—	✓	—
1080p at 29.97 fps	✓ ¹	✓ ¹	—	—	—	—	✓ ¹	—	✓ ¹	—	—	—	✓	—	—	✓
1080p at 30 fps	—	—	—	—	—	—	—	—	—	—	—	—	—	✓	—	—

¹ You must enable **Scale input for capture** in the A/V Input pane of the **Matrox Utilities** preferences window (see [Chapter 7](#), “Configuring Your MXO2 System”).

Your notes

D

Matrox MXO2 Supported Output Formats

This appendix provides information on the video output formats that are available on the MXO2 main and SD channels, and the video formats that are supported on the MXO2 outputs.

Supported main and SD video output formats

This section lists the video output formats that are available on the MXO2 main and SD channels based on your project's video format. You can specify the main and SD channel settings on the **Video Output** pane of the **Matrox Utilities** preferences window (see [Chapter 7, “Configuring Your MXO2 System”](#)).

Apple Final Cut Pro X, Adobe Premiere Pro, Prelude, and Encore

Project's video format ^{1,2}	Main channel output					SD channel output ^{3,4}
	Follow application	486p/576p ⁴	720p	1080i/PsF	1080p	
NTSC (720×486i)	NTSC	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
NTSC 16:9 (720×486i)	NTSC 16:9	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
PAL (720×576i)	PAL	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fps	PAL
PAL 16:9 (720×576i)	PAL 16:9	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fp	PAL
DV-NTSC (720×486i)	NTSC	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
DV-NTSC 16:9 (720×486i)	NTSC 16:9	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
DV-PAL (720×576i)	PAL	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fps	PAL
DV-PAL 16:9 (720×576i)	PAL 16:9	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fps	PAL
486p at 23.98 fps	720×486p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
486p at 23.98 fps 16:9	720×486p at 59.94 fps 16:9	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
486p at 29.97 fps	720×486p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 29.97 fps	1920×1080p at 29.97 fps	720×486PsF at 29.97 fps
486p at 29.97 fps 16:9	720×486p at 59.94 fps 16:9	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 29.97 fps	1920×1080p at 29.97 fps	720×486PsF at 29.97 fps
576p at 25 fps	720×576p at 50 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
576p at 25 fps 16:9	720×576p at 50 fps 16:9	720×576p at 50 fps	1280×720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
960×720p at 23.98 fps	1280×720p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
960×720p at 25 fps	1280×720p at 50 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps

Project's video format ^{1,2}	Main channel output					SD channel output ^{3,4}
	Follow application	486p/576p ⁴	720p	1080i/PsF	1080p	
960×720p at 29.97 fps	1280×720p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 29.97 fps	1920×1080p at 29.97 fps	720×486PsF at 29.97 fps
960×720p at 50 fps	1280×720p at 50 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fps	PAL
960×720p at 59.94 fps	1280×720p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
1280×720p at 23.98 fps	1280×720p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
1280×720p at 25 fps	1280×720p at 50 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
1280×720p at 29.97 fps	1280×720p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 29.97 fps	1920×1080p at 29.97 fps	720×486PsF at 29.97 fps
1280×720p at 50 fps	1280×720p at 50 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fps	PAL
1280×720p at 59.94 fps	1280×720p at 59.94 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
1280×1080i at 29.97 fps	1920×1080i at 29.97 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
1440×1080i at 25 fps	1920×1080i at 25 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fps	PAL
1440×1080i at 29.97 fps	1920×1080i at 29.97 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
1920×1080i at 25 fps	1920×1080i at 25 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080i at 25 fps	1920×1080p at 25 fps	PAL
1920×1080i at 29.97 fps	1920×1080i at 29.97 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080i at 29.97 fps	1920×1080p at 29.97 fps	NTSC
1280×1080p at 23.98 fps	1920×1080p at 23.98 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
1440×1080p at 23.98 fps	1920×1080p at 23.98 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
1440×1080p at 24 fps	1920×1080p at 24 fps	—	—	—	1920×1080p at 24 fps	—
1440×1080p at 25 fps	1920×1080p at 25 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
1440×1080p at 29.97 fps	1920×1080p at 29.97 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 29.97 fps	1920×1080p at 29.97 fps	720×486PsF at 29.97 fps
1440×1080p at 30 fps	1920×1080p at 30 fps	—	—	—	1920×1080p at 30 fps	—
1920×1080p at 23.98 fps	1920×1080p at 23.98 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC

Project's video format ^{1,2}	Main channel output					SD channel output ^{3,4}
	Follow application	486p/576p ⁴	720p	1080i/PsF	1080p	
1920×1080p at 24 fps	1920×1080p at 24 fps	—	—	—	1920×1080p at 24 fps	—
1920×1080p at 25 fps	1920×1080p at 25 fps	720×576p at 50 fps	1280×720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
1920×1080p at 29.97 fps	1920×1080p at 29.97 fps	720×486p at 59.94 fps	1280×720p at 59.94 fps	1920×1080PsF at 29.97 fps	1920×1080p at 29.97 fps	720×486PsF at 29.97 fps
1920×1080p at 30 fps	1920×1080p at 30 fps	—	—	—	1920×1080p at 30 fps	—
RED 1K 2:1 at 23.98 fps (1024×512)	1080p at 23.98 fps	486p at 59.94 fps	720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
RED 1K 16:9 at 23.98 fps (1024×576)	1080p at 23.98 fps	486p at 59.94 fps	720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
RED 2K 2:1 at 23.98 fps (2048×1024)	1080p at 23.98 fps	486p at 59.94 fps	720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
RED 2K 16:9 at 23.98 fps (2048×1152)	1080p at 23.98 fps	486p at 59.94 fps	720p at 59.94 fps	1920×1080PsF at 23.98 fps ⁵	1920×1080p at 23.98 fps	NTSC
RED 1K 2:1 at 25 fps (1024×512)	1080p at 25 fps	576p at 50 fps	720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
RED 1K 16:9 at 25 fps (1024×576)	1080p at 25 fps	576p at 50 fps	720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
RED 2K 2:1 at 25 fps (2048×1024)	1080p at 25 fps	576p at 50 fps	720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps
RED 2K 16:9 at 25 fps (2048×1152)	1080p at 25 fps	576p at 50 fps	720p at 50 fps	1920×1080PsF at 25 fps	1920×1080p at 25 fps	720×576PsF at 25 fps

¹ If working with a non-standard video broadcast format, the video is scaled to the closest video broadcast format.

² Some of the listed video formats may not be available in all the supported applications.

³ The SD channel is not supported and is output as black video when cross-converting your project's video output between 720p and 1080p/i/PsF.

⁴ If your project's aspect ratio is 16:9, set **Aspect ratio formatting** to **Anamorphic** in the **Video Output** pane of the **Matrox Utilities** preferences window to output as 16:9 (see [Chapter 7, "Configuring Your MXO2 System"](#)).

⁵ Enable **Pulldown** in the **Video Output** pane of the **Matrox Utilities** preferences window to output 1080i at 29.97 fps (see [Chapter 7, "Configuring Your MXO2 System"](#)).

Avid Media Composer/Symphony

Project's video format	Main channel output					SD channel output ^{1,2}
	Follow application	486p/576p ²	720p	1080i/PsF	1080p	
23.976p NTSC	NTSC	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC
23.976p NTSC 16:9	NTSC 16:9	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC
24p NTSC	NTSC	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC
24p NTSC 16:9	NTSC 16:9	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC
30i NTSC	NTSC	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC
30i NTSC 16:9	NTSC 16:9	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC
24p PAL	PAL	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
24p PAL 16:9	PAL 16:9	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
25p PAL	PAL	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
25p PAL 16:9	PAL 16:9	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
25i PAL	PAL	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
25i PAL 16:9	PAL 16:9	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
720p/23.976	720p at 59.94 fps	486p at 59.94 fps	720p at 59.94 fps	1080PsF at 23.98 fps ³	1080p at 23.98 fps	NTSC
720p/25	720p at 50 fps	576p at 50 fps	720p at 50 fps	1080PsF at 25 fps	1080p at 25 fps	576PsF at 25 fps
720p/29.97	720p at 59.94 fps	486p at 59.94 fps	720p at 59.94 fps	1080PsF at 29.97 fps	1080p at 29.97 fps	486PsF at 29.97 fps
720p/50	720p at 50 fps	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
720p/59.94	720p at 59.94 fps	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC
1080p/23.976	1080p at 23.98 fps	486p at 59.94 fps	720p at 59.94 fps	1080PsF at 23.98 fps ³	1080p at 23.98 fps	NTSC
1080p/24	1080p at 24 fps	—	—	—	1080p at 24 fps	—
1080p/25	1080p at 25 fps	576p at 50 fps	720p at 50 fps	1080PsF at 25 fps	1080p at 25 fps	576PsF at 25 fps
1080p/29.97	1080p at 29.97 fps	486p at 59.94 fps	720p at 59.94 fps	1080PsF at 29.97 fps	1080p at 29.97 fps	486PsF at 29.97 fps
1080i/50	1080i at 25 fps	576p at 50 fps	720p at 50 fps	1080i at 25 fps	1080p at 25 fps	PAL
1080i/59.94	1080i at 29.97 fps	486p at 59.94 fps	720p at 59.94 fps	1080i at 29.97 fps	1080p at 29.97 fps	NTSC

¹ The SD channel is not supported and is output as black video when cross-converting your project's video output between 720p and 1080p/i/PsF.

² If your project's aspect ratio is 16:9, set **Aspect ratio formatting** to **Anamorphic** in the **Video Output** pane of the **Matrox Utilities** preferences window to output as 16:9 (see [Chapter 7, "Configuring Your MXO2 System"](#)).

³ Enable **Pulldown** in the **Video Output** pane of the **Matrox Utilities** preferences window to output 1080i at 29.97 fps (see [Chapter 7, "Configuring Your MXO2 System"](#)).

Video formats supported on MXO2 outputs

The following table lists the video formats that you can output from the various Matrox MXO2 outputs. The listed video output formats are those that are supported on the main and SD channels (see [“Supported main and SD video output formats”](#) on page 180). To assign the main or SD channel to an MXO2 output, see [“Specifying your video output settings”](#) on page 58. For descriptions of the MXO2 outputs, see [“Outputs”](#) on page 165.

Matrox MXO2 output					
Video output format	HDMI	SDI ¹	Component (Y, Pb, Pr)	S-Video (Y/C)	Composite (CVBS)
NTSC	NTSC	NTSC	NTSC	NTSC	NTSC
NTSC 16:9	NTSC 16:9	NTSC 16:9	NTSC 16:9	NTSC 16:9	NTSC 16:9
PAL	PAL	PAL	PAL	PAL	PAL
PAL 16:9	PAL 16:9	PAL 16:9	PAL 16:9	PAL 16:9	PAL 16:9
486PsF at 29.97 fps	486PsF at 29.97 fps	486PsF at 29.97 fps	486PsF at 29.97 fps	486PsF at 29.97 fps	486PsF at 29.97 fps
486PsF at 29.97 fps 16:9	486PsF at 29.97 fps 16:9	486PsF at 29.97 fps 16:9	486PsF at 29.97 fps 16:9	486PsF at 29.97 fps 16:9	486PsF at 29.97 fps 16:9
576PsF at 25 fps	576PsF at 25 fps	576PsF at 25 fps	576PsF at 25 fps	576PsF at 25 fps	576PsF at 25 fps
576PsF at 25 fps 16:9	576PsF at 25 fps 16:9	576PsF at 25 fps 16:9	576PsF at 25 fps 16:9	576PsF at 25 fps 16:9	576PsF at 25 fps 16:9
486p at 59.94 fps	480p at 59.94 fps	NTSC	—	—	—
486p at 59.94 fps 16:9	480p at 59.94 fps 16:9	NTSC 16:9	—	—	—
576p at 50 fps	576p at 50 fps	PAL	—	—	—
576p at 50 fps 16:9	576p at 50 fps 16:9	PAL 16:9	—	—	—
720p at 50 fps	720p at 50 fps	720p at 50 fps	720p at 50 fps	—	—
720p at 59.94 fps	720p at 59.94 fps	720p at 59.94 fps	720p at 59.94 fps	—	—
1080i at 25 fps	1080i at 25 fps	1080i at 25 fps	1080i at 25 fps	—	—
1080i at 29.97 fps	1080i at 29.97 fps	1080i at 29.97 fps	1080i at 29.97 fps	—	—
1080PsF at 23.98 fps	—	1080PsF at 23.98 fps	1080PsF at 23.98 fps	—	—
1080PsF at 25 fps	1080PsF at 25 fps	1080PsF at 25 fps	1080PsF at 25 fps	—	—
1080PsF at 29.97 fps	1080PsF at 29.97 fps	1080PsF at 29.97 fps	1080PsF at 29.97 fps	—	—
1080p at 23.98 fps	1080p at 23.98 fps	1080p at 23.98 fps	—	—	—
1080p at 24 fps	1080p at 24 fps	1080p at 24 fps	—	—	—
1080p at 25 fps	1080p at 25 fps	1080p at 25 fps	—	—	—
1080p at 29.97 fps	1080p at 29.97 fps	1080p at 29.97 fps	—	—	—
1080p at 30 fps	1080p at 30 fps	1080p at 30 fps	—	—	—

¹ The SDI output is not available on Matrox MXO2 Mini.

E

Connecting and Using Matrox MXO2 Dock

This chapter shows how to power MXO2 Dock, how to connect it to your MXO2 system, and lists the available connections for use with your peripheral devices.

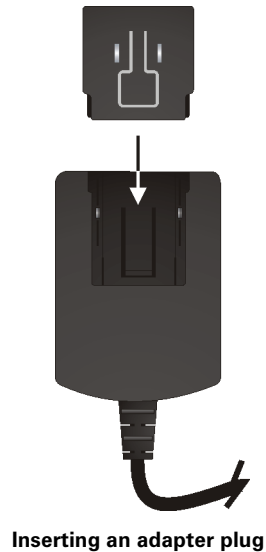
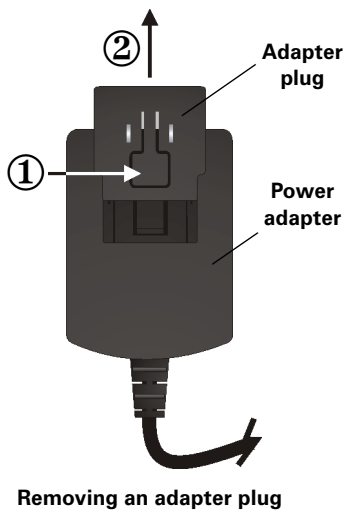
Powering Matrox MXO2 Dock

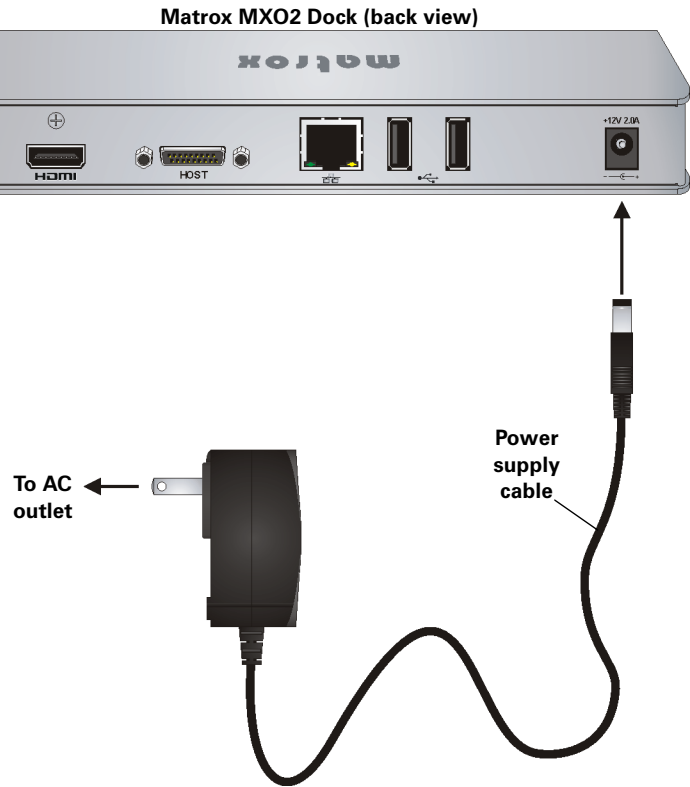
To power Matrox MXO2 Dock, connect the power supply cable to MXO2 Dock and an AC outlet as shown in this section. To remove power from MXO2 Dock, unplug the power supply cable from the AC outlet.

MXO2 Dock power supply and adapter plugs

Matrox MXO2 Dock provides a power supply cable with international adapter plugs for use in different regions:

- To remove an adapter plug from the power adapter, hold down the button on the adapter plug, and then slide the adapter plug up until it releases from the power adapter.
- To insert an adapter plug into the power adapter, ensure that the adapter plug is properly aligned with the corresponding slot on the power adapter, and then slide the adapter plug down into the power adapter until it locks into place.





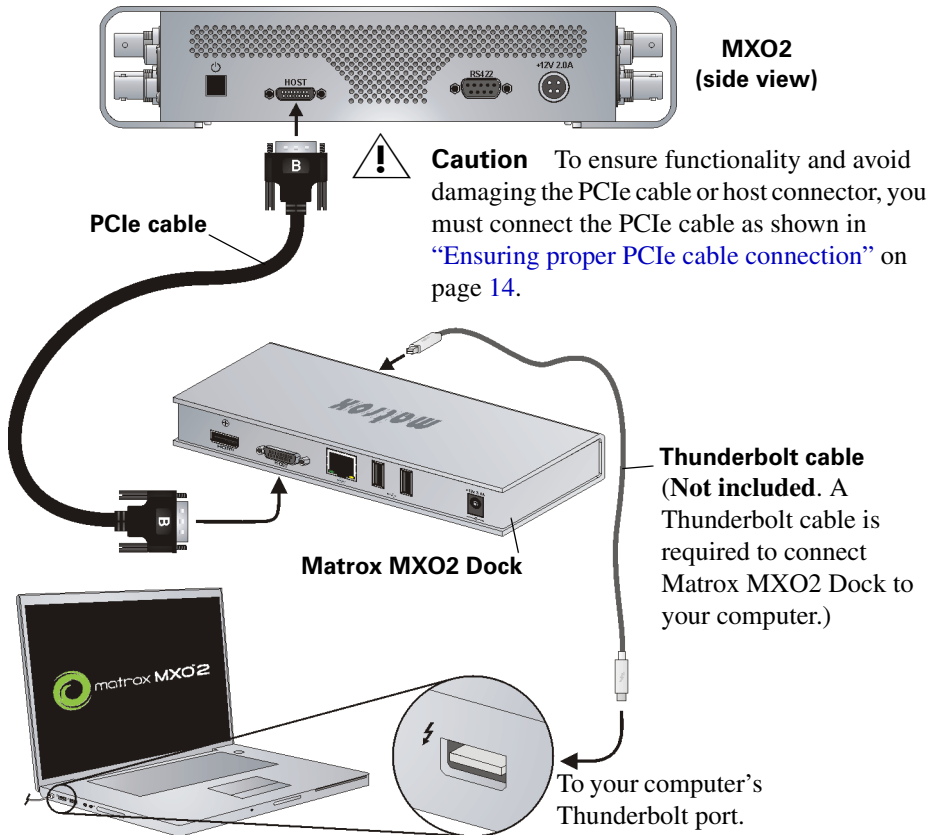
Connecting MXO2 Dock to your MXO2 system

Use the Matrox MXO2 Dock docking station to connect MXO2 to your computer's Thunderbolt port. When doing this, it may take up to ten seconds for your MXO2 to be detected by your system and its applications.

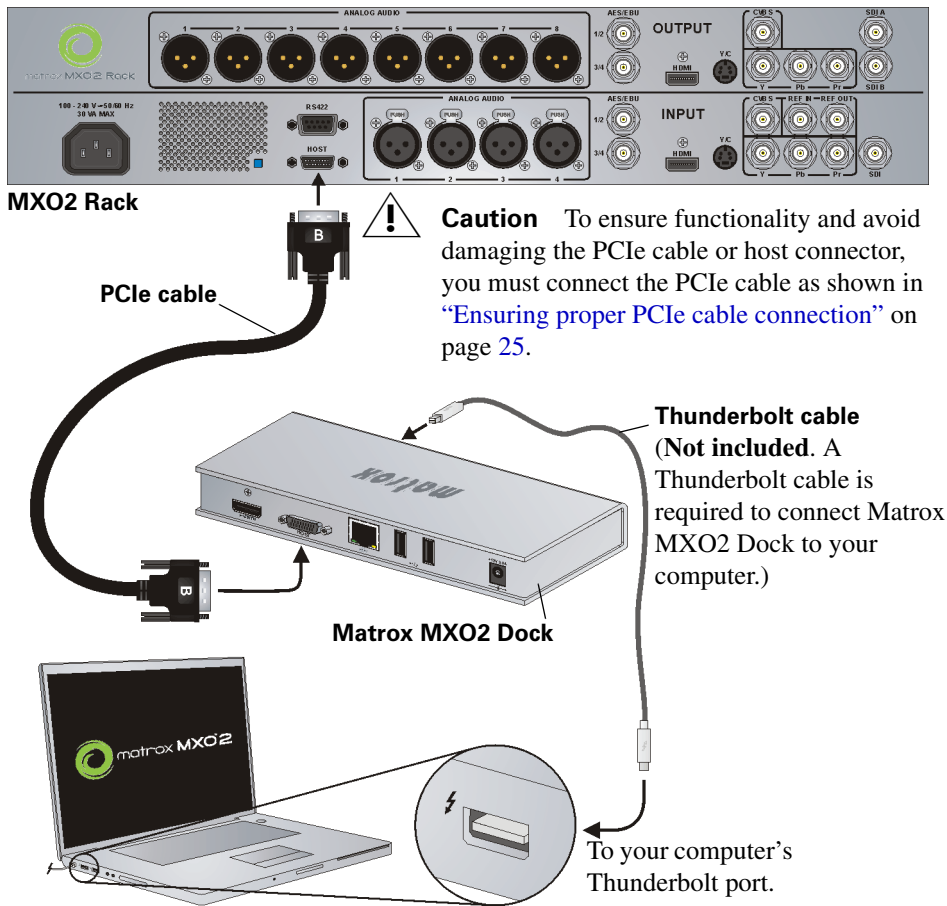


Important Make sure that the Matrox PCIe cable is connected to MXO2 Dock and MXO2 before connecting MXO2 Dock to your computer via the Thunderbolt cable. If you want to disconnect or connect MXO2 when your system is running, you must do it by disconnecting/connecting the Thunderbolt cable. Do not disconnect the Matrox PCIe cable from MXO2 Dock, or MXO2, when your Mac system is running.

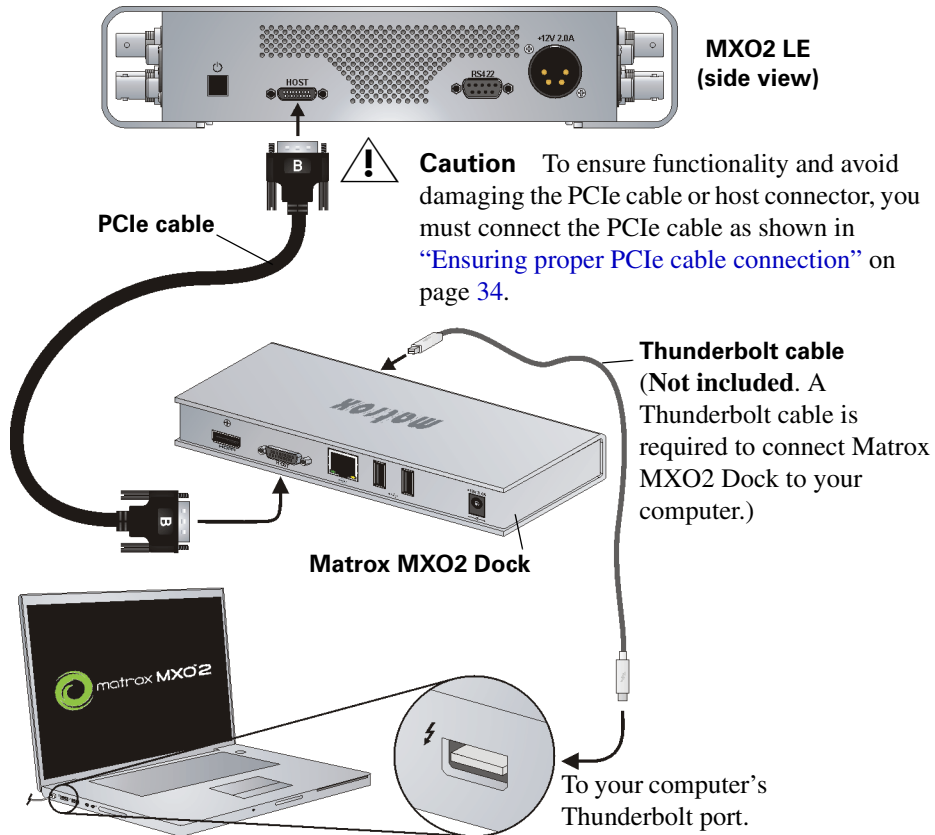
Connecting to Matrox MXO2



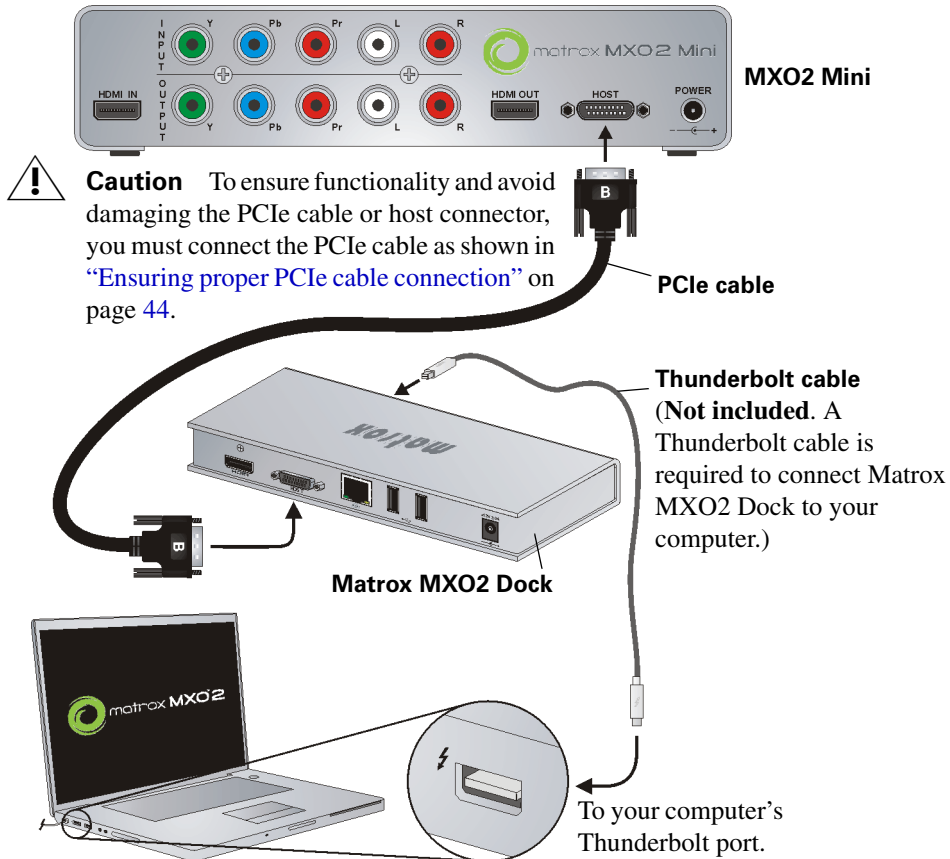
Connecting to Matrox MXO2 Rack



Connecting to Matrox MXO2 LE

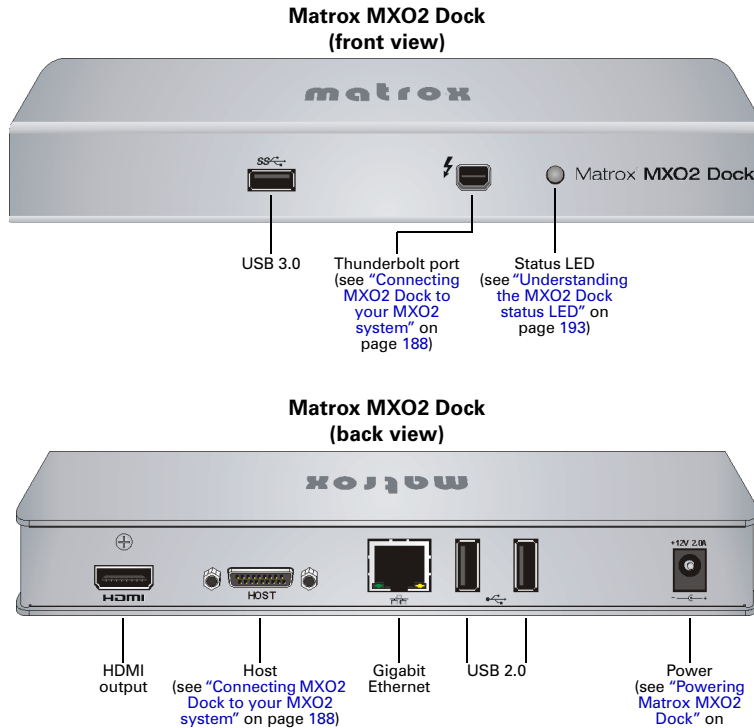


Connecting to Matrox MXO2 Mini



Available MXO2 Dock connections

When your computer is connected to MXO2 Dock (see [“Connecting MXO2 Dock to your MXO2 system”](#) on page 188), all peripheral devices connected to MXO2 Dock are automatically detected by your Mac system. Matrox MXO2 Dock features the following connections for your peripheral devices:



HDMI

Matrox MXO2 Dock features one HDMI connector for connecting an HDMI monitor.

By default, the monitor connected to MXO2 Dock is detected by your system as a secondary monitor. However, you can change your system’s display settings (**System Preferences > Display**) so that the HDMI monitor connected to MXO2 Dock’s HDMI output is the primary monitor. When you disconnect MXO2 Dock from your computer, your computer’s display settings return to default settings. When re-connecting MXO2 Dock to your computer, the display settings that were specified when MXO2 Dock was last connected are restored.



Note The Matrox MXO2 Dock HDMI output supports the playback of HDCP (content-protected) sources.

Gigabit Ethernet

Matrox MXO2 Dock has one Gigabit Ethernet port for connecting to a Gigabit Ethernet network.

The network connected to MXO2 Dock is automatically selected by your computer. If for any reason you need to select the network connected to MXO2 Dock, the MXO2 Dock port appears as **Thunderbolt Ethernet Slot** in **System Preferences > Network**. If your network connection goes through a proxy server, select **Thunderbolt Ethernet Slot** in **Network** preferences, and then set the appropriate proxy settings in the **Advanced** options. If a network cable is connected to MXO2 Dock's Gigabit Ethernet port and another network cable is connected to an Ethernet port on your computer, the network connected directly to your computer is used.



Note The MXO2 Dock Gigabit Ethernet port supports wake-on-LAN (WOL).

USB

Matrox MXO2 Dock includes two USB 2.0 ports for connecting USB devices such as a keyboard, mouse, printer and scanner. MXO2 Dock also features one front-mounted USB 3.0 port for connecting a SuperSpeed device, such as a flash drive or storage.



Note The MXO2 Dock USB ports support wake-on-USB.

Understanding the MXO2 Dock status LED

Matrox MXO2 Dock features a status LED on the front of the unit to indicate the following conditions:

- **Green** Matrox MXO2 Dock is connected to a computer via the Thunderbolt cable, and is functioning properly.
- **Red** The computer to which MXO2 Dock is connected via the Thunderbolt cable is shut down, or MXO2 Dock is not connected to a computer via the Thunderbolt cable.
- **Amber** The computer to which MXO2 Dock is connected via the Thunderbolt cable is in sleep mode.

Your notes



Matrox MXO2 Specifications

This appendix provides specifications for all Matrox MXO2 products.

Matrox MXO2 specifications

General

- **Video formats** NTSC, PAL, NTSC-EIAJ, 1080p/i/PsF, 720p, 576p, 480p
- **Regulatory compliance**
 - FCC Class A, CE Mark Class A, ACMA C-Tick Mark, VCCI
 - RoHS Directive 2002/95/EC
- **Dimensions**
 - Length 330 mm (13")
 - Width 241 mm (9.5")
 - Height 51 mm (2")
- **External AC/DC adapter**
 - 100-240 VAC 50-60 Hz
 - Input: IEC320-C14 inlet
 - Output: +12V DC, 3A max
 - Dimensions: L 104 mm × W 46 mm × H 36 mm (4.1" × 1.8" × 1.4")
- **Total power consumption** 15 watts

Connections

- **Genlock reference input**
 - HD analog tri-level sync or SD analog bi-level black burst
 - BNC connector (75 Ω), terminated
- **RS-422** D-sub connector (9 pins)

Video

- **HDMI**
 - **HD input and output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)
 - **SD output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)
- **SDI**
 - **HDTV input**
 - HD-SDI with 16 channels of embedded SDI audio

- 24-bit, 48 kHz
- Compliant with SMPTE 292M, SMPTE 299M
- BNC connector (75 Ω), terminated
- Equalized input for maximum cable length support
- **HDTV output**
 - HD-SDI with 16 channels of embedded SDI audio
 - 24-bit, 48 kHz
 - Compliant with SMPTE 292M, SMPTE 299M
 - BNC connector (75 Ω)
- **SDTV input**
 - SD-SDI with 16 channels of embedded audio
 - 24-bit, 48 kHz
 - BNC connector (75 Ω), terminated
 - Equalized input for maximum cable length support
 - Compliant with SMPTE 259M-C, SMPTE 272M
- **SDTV output**
 - SD-SDI with 16 channels of embedded audio
 - 24-bit, 48 kHz
 - BNC connector (75 Ω)
 - Compliant with SMPTE 259M-C, SMPTE 272M
- **S-Video and composite video input**
 - **SDTV input**
 - PAL, NTSC, NTSC-EIAJ
 - BNC connector for composite (75 Ω), terminated
 - 4-pin mini-DIN S-Video connector (75 Ω), terminated
 - 12-bit ADC
 - 2x oversampling
 - Anti-aliasing filtering
 - Automatic gain control
 - **SDTV output**
 - PAL, NTSC, NTSC-EIAJ
 - BNC connector for composite (75 Ω)
 - 4-pin mini-DIN S-Video connector (75 Ω)
 - 12-bit DAC
 - 8x oversampling

- **Analog component video input**
 - **HDTV input**
 - EIA-770.3 compliant
 - BNC connectors (75 Ω)
 - 12-bit ADC
 - Anti-aliasing filtering
 - **HDTV output**
 - EIA-770.3 compliant
 - BNC connectors (75 Ω)
 - 12-bit DAC
 - 2x oversampling
 - **SDTV input**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - BNC connectors (75 Ω)
 - 12-bit ADC
 - 4x oversampling
 - Anti-aliasing filter
 - **SDTV output**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - BNC connectors (75 Ω)
 - 12-bit DAC
 - 8x oversampling
- **Analog video performance**
 - **HDTV analog component video (passthrough)**
 - Frequency response Y: +/- 1.0 dB max to 28 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 12 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 50 dB, unified weighted
 - **SDTV S-Video and composite video (passthrough)**
 - Amplitude error: < 4%
 - Frequency response: +/- 0.5 dB max to 5 MHz
 - 2T pulse response: 1.0% max
 - Diff. Gain: < 2%, Diff. Phase: < 1 degree

- S/N: > 58 dB, unified weighted
- **SDTV analog component video (passthrough)**
 - Frequency response Y: +/- 0.5 dB max to 5 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 2 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 54 dB, unified weighted

Audio

- **Unbalanced analog audio inputs**
 - 1x stereo pair
 - RCA connectors
 - Input impedance: Hi-Z
 - Line level with 18 db headroom (max level)
- **Unbalanced analog audio outputs**
 - 3x stereo pair
 - RCA connectors
 - Output impedance: 100 Ω
 - Line level with 18 db headroom (max level)
- **Balanced analog inputs**
 - 1x stereo pair
 - 2x XLR female connectors
 - Nominal levels: +4 dBu (+4 dBm)
 - Input impedance: Hi-Z
 - Line level with 18 db headroom (max level)
- **Balanced analog outputs**
 - 2x stereo pair
 - 4x XLR male connectors
 - Nominal levels: +4 dBu (+4 dBm)
 - Output impedance: 50 Ω
 - Line level with 18 db headroom (max level)
- **Unbalanced digital (AES/EBU) input**
 - 1x stereo pair
 - BNC connector (75 Ω), terminated
 - Maximum input level: 5 V_{p-p}
- **Unbalanced digital (AES/EBU) output**
 - 1x stereo pair

- BNC connector
- Output impedance: 75 Ω
- Nominal output level: 1V_{p-p}
- **Balanced and unbalanced analog audio performance**
 - Sampling frequency: 48 kHz (using 64x oversampling)
 - Quantization: 24 bits
 - S/N: > 85 db
 - THDN at 1 kHz, nominal level: < 0.05%

Environmental specifications

- Minimum/maximum ambient operating temperatures: 0 to 40° C
- Minimum/maximum storage temperature: –40 to 75° C
- Maximum altitude for operation: 3,000 meters
- Maximum altitude for transport: 12,000 meters
- Operating humidity: 20 to 80% relative humidity (non-condensing)
- Storage humidity: 5 to 95% relative humidity (non-condensing)

Matrox MXO2 Rack specifications

General

- **Video formats** NTSC, PAL, NTSC-EIAJ, 1080p/i/PsF, 720p, 576p, 480p
- **Regulatory compliance**
 - FCC Class A, CE Mark Class A, ACMA C-Tick Mark, VCCI
 - RoHS Directive 2002/95/EC
- **Dimensions (without rackmount brackets)**
 - Length 437 mm (17.2")
 - Width 208 mm (8.2")
 - Height 86 mm (3.4") (two rack units)
- **Dimensions (with rackmount brackets)**
 - Length 483 mm (19")
 - Width 208 mm (8.2")
 - Height 89 mm (3.5") (two rack units)
- **AC power**
 - 100-240 VAC 50-60 Hz
 - Input: IEC320-C14 inlet
 - Output: +12V DC, 3A max

- **Total power consumption** 15 watts

Connections

- **Genlock reference input**
 - HD analog tri-level sync or SD analog bi-level black burst
 - BNC connector (75 Ω)
- **Genlock reference output**
 - HD analog tri-level sync or SD analog bi-level black burst
 - Loop through
 - BNC connector (75 Ω)
- **RS-422** D-sub connector (9 pins)

Video

- **HDMI**
 - **HD input and output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)
 - **SD output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)
- **SDI**
 - **HDTV input**
 - HD-SDI with 16 channels of embedded SDI audio
 - 24-bit, 48 kHz
 - Compliant with SMPTE 292M, SMPTE 299M
 - BNC connector (75 Ω), terminated
 - Equalized input for maximum cable length support
 - **HDTV output**
 - HD-SDI with 16 channels of embedded SDI audio
 - 24-bit, 48 kHz
 - Compliant with SMPTE 292M, SMPTE 299M
 - BNC connector (75 Ω)

- **SDTV input**
 - SD-SDI with 16 channels of embedded audio
 - 24-bit, 48 kHz
 - BNC connector (75 Ω), terminated
 - Equalized input for maximum cable length support
 - Compliant with SMPTE 259M-C, SMPTE 272M
- **SDTV output**
 - SD-SDI with 16 channels of embedded audio
 - 24-bit, 48 kHz
 - BNC connector (75 Ω)
 - Compliant with SMPTE 259M-C, SMPTE 272M
- **S-Video and composite video input**
 - **SDTV input**
 - PAL, NTSC, NTSC-EIAJ
 - BNC connector for composite (75 Ω), terminated
 - 4-pin mini-DIN S-Video connector (75 Ω), terminated
 - 12-bit ADC
 - 2x oversampling
 - Anti-aliasing filtering
 - Automatic gain control
 - **SDTV output**
 - PAL, NTSC, NTSC-EIAJ
 - BNC connector for composite (75 Ω)
 - 4-pin mini-DIN S-Video connector (75 Ω)
 - 12-bit DAC
 - 8x oversampling
- **Analog component video input**
 - **HDTV input**
 - EIA-770.3 compliant
 - BNC connectors (75 Ω)
 - 12-bit ADC
 - Anti-aliasing filtering
 - **HDTV output**
 - EIA-770.3 compliant
 - BNC connectors (75 Ω)

- 12-bit DAC
- 2x oversampling
- **SDTV input**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - BNC connectors (75 Ω)
 - 12-bit ADC
 - 4x oversampling
 - Anti-aliasing filter
- **SDTV output**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - BNC connectors (75 Ω)
 - 12-bit DAC
 - 8x oversampling
- **Analog video performance**
 - **HDTV analog component video (passthrough)**
 - Frequency response Y: +/- 1.0 dB max to 28 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 12 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 50 dB, unified weighted
 - **SDTV S-Video and composite video (passthrough)**
 - Amplitude error: < 4%
 - Frequency response: +/- 0.5 dB max to 5 MHz
 - 2T pulse response: 1.0% max
 - Diff. Gain: < 2%, Diff. Phase: < 1 degree
 - S/N: > 58 dB, unified weighted
 - **SDTV analog component video (passthrough)**
 - Frequency response Y: +/- 0.5 dB max to 5 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 2 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 54 dB, unified weighted

Audio

- **Balanced analog inputs**
 - 2x stereo pair
 - 4x XLR female connectors
 - Nominal levels: +4 dBu (+4 dBm)
 - Input impedance: Hi-Z
 - Headroom (max level): 18 db
- **Balanced analog outputs**
 - 4x stereo pair
 - 8x XLR male connectors
 - Nominal levels: +4 dBu (+4 dBm)
 - Output impedance: 50 Ω
 - Headroom (max level): 18 db
- **Unbalanced digital (AES/EBU) input**
 - 2x stereo pair
 - 2x BNC connector (75 Ω), terminated
 - Maximum input level: 5 V_{p-p}
- **Unbalanced digital (AES/EBU) output**
 - 2x stereo pair
 - 2x BNC connector
 - Output impedance: 75 Ω
 - Nominal output level: 1 V_{p-p}
- **Balanced analog audio performance**
 - Sampling frequency: 48 kHz (using 64x oversampling)
 - Quantization: 24 bits
 - S/N: > 85 db
 - THDN at 1 kHz, nominal level: < 0.05%

Environmental specifications

- Minimum/maximum ambient operating temperatures: 0 to 40° C
- Minimum/maximum storage temperature: –40 to 75° C
- Maximum altitude for operation: 3,000 meters
- Maximum altitude for transport: 12,000 meters
- Operating humidity: 20 to 80% relative humidity (non-condensing)
- Storage humidity: 5 to 95% relative humidity (non-condensing)

Matrox MXO2 LE specifications

General

- **Video formats** NTSC, PAL, NTSC-EIAJ, 1080p/i/PsF, 720p, 576p, 486p
- **Regulatory compliance**
 - FCC Class A, CE Mark Class A, ACMA C-Tick Mark, VCCI
 - RoHS Directive 2002/95/EC
- **Dimensions**
 - Length 237 mm (9.3")
 - Width 241 mm (9.5")
 - Height 51 mm (2")
- **External AC/DC adapter**
 - 100-240 VAC 50-60 Hz
 - Input: IEC320-C14 inlet
 - Output: +12V DC, 3A max
 - Dimensions: L 104 mm × W 46 mm × H 36 mm (4.1" × 1.8" × 1.4")
- **Total power consumption** 15 watts

Connections

- **Genlock reference input**
 - HD analog tri-level sync or SD analog bi-level black burst
 - BNC connector (75 Ω), terminated
- **RS-422** D-sub connector (9 pins)

Video

- **HDMI**
 - **HD input and output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)
 - **SD output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)
- **SDI**
 - **HDTV input**
 - HD-SDI with 16 channels of embedded SDI audio

- 24-bit, 48 kHz
- Compliant with SMPTE 292M, SMPTE 299M
- BNC connector (75 Ω), terminated
- Equalized input for maximum cable length support
- **HDTV output**
 - HD-SDI with 16 channels of embedded SDI audio
 - 24-bit, 48 kHz
 - Compliant with SMPTE 292M, SMPTE 299M
 - BNC connector (75 Ω)
- **SDTV input**
 - SD-SDI with 16 channels of embedded audio
 - 24-bit, 48 kHz
 - BNC connector (75 Ω), terminated
 - Equalized input for maximum cable length support
 - Compliant with SMPTE 259M-C, SMPTE 272M
- **SDTV output**
 - SD-SDI with 16 channels of embedded audio
 - 24-bit, 48 kHz
 - BNC connector (75 Ω)
 - Compliant with SMPTE 259M-C, SMPTE 272M
- **S-Video and composite video input**
 - **SDTV input**
 - PAL, NTSC, NTSC-EIAJ
 - BNC connector for composite (75 Ω), terminated
 - 4-pin mini-DIN S-Video connector (75 Ω), terminated
 - 12-bit ADC
 - 2x oversampling
 - Anti-aliasing filtering
 - Automatic gain control
 - **SDTV output**
 - PAL, NTSC, NTSC-EIAJ
 - BNC connector for composite (75 Ω)
 - 4-pin mini-DIN S-Video connector (75 Ω)
 - 12-bit DAC
 - 8x oversampling

- **Analog component video input**
 - **HDTV input**
 - EIA-770.3 compliant
 - BNC connectors (75 Ω)
 - 12-bit ADC
 - Anti-aliasing filtering
 - **HDTV output**
 - EIA-770.3 compliant
 - BNC connectors (75 Ω)
 - 12-bit DAC
 - 2x oversampling
 - **SDTV input**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - BNC connectors (75 Ω)
 - 12-bit ADC
 - 4x oversampling
 - Anti-aliasing filter
 - **SDTV output**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - BNC connectors (75 Ω)
 - 12-bit DAC
 - 8x oversampling
- **Analog video performance**
 - **HDTV analog component video (passthrough)**
 - Frequency response Y: +/- 1.0 dB max to 28 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 12 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 50 dB, unified weighted
 - **SDTV S-Video and composite video (passthrough)**
 - Amplitude error: < 4%
 - Frequency response: +/- 0.5 dB max to 5 MHz
 - 2T pulse response: 1.0% max
 - Diff. Gain: < 2%, Diff. Phase: < 1 degree

- S/N: > 58 dB, unified weighted
- **SDTV analog component video (passthrough)**
 - Frequency response Y: +/- 0.5 dB max to 5 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 2 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 54 dB, unified weighted

Audio

- **Unbalanced analog audio inputs**
 - 1x stereo pair
 - RCA connectors
 - Input impedance: Hi-Z
 - Line level with 18 db headroom (max level)
- **Unbalanced analog audio outputs**
 - 1x stereo pair
 - RCA connectors
 - Output impedance: 100 Ω
 - Line level with 18 db headroom (max level)
- **Balanced analog inputs**
 - 1x stereo pair
 - 2x XLR female connectors
 - Nominal levels: +4 dBu (+4 dBm)
 - Input impedance: Hi-Z
 - Headroom (max level): 18 db
- **Balanced analog outputs**
 - 1x stereo pair
 - 2x XLR male connectors
 - Nominal levels: +4 dBu (+4 dBm)
 - Output impedance: 50 Ω
 - Headroom (max level): 18 db
- **Balanced and unbalanced analog audio performance**
 - Sampling frequency: 48 kHz (using 64x oversampling)
 - Quantization: 24 bits
 - S/N: > 85 db
 - THDN at 1 kHz, nominal level: < 0.05%

Environmental specifications

- Minimum/maximum ambient operating temperatures: 0 to 40° C
- Minimum/maximum storage temperature: –40 to 75° C
- Maximum altitude for operation: 3,000 meters
- Maximum altitude for transport: 12,000 meters
- Operating humidity: 20 to 80% relative humidity (non-condensing)
- Storage humidity: 5 to 95% relative humidity (non-condensing)

Matrox MXO2 Mini specifications

General

- **Video formats** NTSC, PAL, NTSC-EIAJ, 1080p/i/PsF, 720p, 576p, 486p
- **Regulatory compliance**
 - FCC Class A, CE Mark Class A, ACMA C-Tick Mark, VCCI
 - RoHS Directive 2002/95/EC
- **Dimensions**
 - Length 166 mm (6.5")
 - Width 110 mm (4.3")
 - Height 40 mm (1.6")
- **Operating voltages and power consumption**
 - Included AC/DC adapter: 100-240 V AC 50-60 Hz (5 V DC, 3 A max)
 - MXO2 Mini unit: 5-25 V DC, 2.5 mm barrel-type connector
 - 9 watts power consumption

Connections

Video

- **HDMI video**
 - **HD input and output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)
 - **SD output**
 - HDMI Y,Cb,Cr 4:2:2 (10-bit) / RGB (8-bit)
 - Eight channels of embedded audio
 - Standard Type A HDMI connector (19 pins)

- **Composite video** (not available if using analog component input/output)
 - **SDTV input**
 - PAL, NTSC, NTSC-EIAJ
 - RCA connector
 - 10-bit ADC
 - 4x oversampling
 - Anti-aliasing filtering
 - Automatic gain control
 - **SDTV output**
 - PAL, NTSC, NTSC-EIAJ
 - RCA connector
 - 12-bit DAC
 - 16x oversampling
- **S-Video** (not available when using analog component input/output)
 - **SDTV input**
 - PAL, NTSC, NTSC-EIAJ
 - RCA connectors
 - 10-bit ADC
 - 4x oversampling
 - Anti-aliasing filtering
 - Automatic gain control
 - **SDTV output**
 - PAL, NTSC, NTSC-EIAJ
 - RCA connectors
 - 12-bit DAC
 - 16x oversampling
- **Analog component video** (not available when using composite, or S-Video input/output)
 - **HDTV input**
 - EIA-770.3 compliant
 - RCA connectors
 - 10-bit ADC
 - Anti-aliasing filtering
 - **HDTV output**
 - EIA-770.3 compliant

- RCA connectors
- 12-bit DAC
- 4x oversampling
- **SDTV input**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - RCA connectors
 - 10-bit ADC
 - 2x oversampling
 - Anti-aliasing filter
- **SDTV output**
 - Betacam, Betacam SP (NTSC and NTSC-EIAJ)
 - SMPTE/EBU N10 (PAL)
 - RCA connectors
 - 12-bit DAC
 - 16x oversampling
- **Analog video performance**
 - **HDTV analog component video**
 - Frequency response Y: +/- 1.0 dB max to 28 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 12 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 50 dB, unified weighted
 - **SDTV S-Video and composite video**
 - Amplitude error: < 4%
 - Frequency response: +/- 0.75 dB max to 5 MHz
 - Diff. Gain: < 2%, Diff. Phase: < 1 degree
 - S/N: > 54 dB, unified weighted
 - **SDTV analog component video**
 - Frequency response Y: +/- 0.75 dB max to 5 MHz
 - Frequency response Pb, Pr: +/- 1.0 dB max to 2 MHz
 - Component channel delay: < 8 ns
 - Component S/N (Y, Pb, Pr): > 54 dB, unified weighted

Audio

- **Unbalanced analog audio inputs**
 - 1x stereo pair
 - RCA connectors
 - Input impedance: $> 10\text{ k}\Omega$
 - Line level with 18 db headroom (max level: +8 dBv)
- **Unbalanced analog audio outputs**
 - 1x stereo pair
 - RCA connectors
 - Output impedance: $< 200\ \Omega$
 - Line level with 18 db headroom (max level: +8 dBv)
- **Unbalanced analog audio performance**
 - Sampling frequency: 48 kHz (using 128x oversampling)
 - Quantization: 24 bits
 - S/N: $> 90\text{ db}$
 - THDN at 1 kHz, nominal level: $< 0.02\%$
 - Frequency response: $\pm 0.5\text{ dB}$, 20 Hz to 20 kHz
 - Channel separation: $> 100\text{ db}$

Environmental specifications

- Minimum/maximum ambient operating temperatures: 0 to 40° C
- Minimum/maximum storage temperature: -40 to 75° C
- Maximum altitude for operation: 3,000 meters
- Maximum altitude for transport: 12,000 meters
- Operating humidity: 20 to 80% relative humidity (non-condensing)
- Storage humidity: 5 to 95% relative humidity (non-condensing)

Matrox MXO2 Thunderbolt adapter specifications

- **Dimensions**
 - Length 87 mm (3.4")
 - Width 48 mm (1.9")
 - Height 19 mm (.75")
- **Power consumption** 3.6 watts
- **Minimum/maximum ambient operating temperatures** 0 to 40° C

Matrox MXO2 Dock specifications

- **Regulatory compliance**
 - FCC Class B, CE Mark Class B
 - RoHS Directive 2002/95/EC
- **Dimensions**
 - Length 91 mm (3.6")
 - Width 201 mm (7.9")
 - Height 32 mm (1.25")
- **Weight** 484 g (1.07 lbs)
- **External AC/DC adapter**
 - Input: 100-240 VAC 50-60 Hz
 - Output: +12V DC, 2A max
 - Dimensions: L 78 mm × W 46 mm × H 36 mm (3.1" × 1.8" × 1.4")
- **Unit voltage and amperage** 12V/2A
- **Total power consumption** 24 W

Connections

- **HDMI output:**
 - One Standard Type A HDMI connector (19 pins)
 - Eight channels of embedded audio
 - Maximum resolution: 1920 × 1080 at 60 fps
 - HDCP compliant for protected content playback
- **Data ports:**
 - One Thunderbolt port
 - One USB 3.0 port with wake-on-USB, and a maximum theoretical data transfer speed of 2.5 Gb/s.
 - Two USB 2.0 ports with wake-on-USB

- One Gigabit Ethernet port with wake-on-LAN (WOL)

Environmental specifications

- Minimum/maximum operating temperature: 10° C to 35° C
- Minimum/maximum storage temperature: –20° C to 47° C
- Maximum altitude for operation: 3,000 m
- Maximum altitude for transport: 10,000 m
- Operating humidity: 20% to 80% relative humidity (non-condensing)

Matrox PCIe host adapter specifications

Matrox PCIe host ExpressCard/34 adapter (for laptops)

- Standard ExpressCard/34
- Dimensions: L 96 mm × W 33 mm × H 13 mm (3.8" × 1.3" × 0.5")

Matrox PCIe host adapter (for desktops)

- Standard low-profile PCIe (x1) card
- PCB dimensions
 - L 66 mm × H 69 mm (2.6" × 2.7")
 - overall thickness including components: 19 mm (0.75")



Matrox Customer Support

This appendix explains how you can register your Matrox product and obtain customer support.

How to get Matrox customer support

If you have a problem that you're unable to solve by referring to the documentation for your Matrox product, please contact your Matrox representative. He or she should be able to help you quickly correct any installation or system configuration problem.

If your representative is unable to solve your problem, contact Matrox for further information and assistance.

Registration

You can register your Matrox product in the Matrox Support section of our website at www.matrox.com/video/support.



Important Only registered users are entitled to customer support, software updates, special promotional offers, and access to our user forum.

Keep up to date with our website

In addition to registering your Matrox product, our website offers you up-to-the-minute information about Matrox products and software updates. Be sure to place our site in your favorites or bookmarks:

www.matrox.com/video/support.

Contacting us

Matrox is proud to offer worldwide customer support. Please use the contact information for your Matrox product and area as provided on our website at www.matrox.com/video/support.

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Compliance Statements

USA

FCC Compliance Statement

Remark for the Matrox hardware products supported by this guide

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 manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or modifications to this unit not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment. The use of shielded cables for connection of the equipment and other peripherals is required to meet FCC requirements.

Canada

(English) Industry Canada Compliance Statement

CAN ICES-3 (A)/NMB-3 (A)

Remark for the Matrox hardware products supported by this guide

These digital devices do not exceed the Class A limits for radio noise emission from digital devices set out in the Radio Interference Regulation of Industry Canada.

(Français) Conformité avec les exigences de l'Industrie Canada

CAN ICES-3 (A)/NMB-3 (A)

Remarque sur les produits matériels Matrox couverts par ce guide

Ces appareils numériques n'émettent aucun bruit radioélectrique dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par Industrie Canada.

Europe

(English) European user's information – Declaration of Conformity

Remark for the Matrox hardware products supported by this guide

These devices comply with EC Directive 2006/95/EC for a Class A digital device. They have been tested and found to comply with EN55022/CISPR22 and EN55024/CISPR24. In a domestic environment these products may cause radio interference in which case the user may be required to take adequate measures. To meet EC requirements, shielded cables must be used to connect the equipment and other peripherals. Analog A/V cables connected to Matrox MXO2 Mini must be limited to less than three meters to comply with EEC and EMC directives. These products have been tested in a typical Class A compliant host system. It is assumed that these products will also achieve compliance in any Class A compliant system.

(Français) Informations aux utilisateurs Européens – Déclaration de conformité

Remarque sur les produits matériels Matrox couverts par ce guide

Ces unités sont conformes à la directive communautaire 2006/95/EC pour les unités numériques de classe A. Les tests effectués ont prouvé qu'elles sont conformes aux normes EN55022/CISPR22 et EN55024/CISPR24. Le fonctionnement de ces produits dans un environnement résidentiel peut causer des interférences radio, dans ce cas l'utilisateur peut être amené à prendre les mesures appropriées. Pour respecter les impératifs communautaires, les câbles de connexion entre l'équipement et ses périphériques doivent être blindés. Afin de se conformer aux exigences des directives de la CEE et de l'EMC, les câbles analogiques audio/vidéo reliés à Matrox MXO2 Mini ne doivent pas dépasser trois mètres. Ces produits ont été testés dans un système hôte typique compatible classe A. On suppose qu'ils présenteront la même compatibilité dans tout système compatible classe A.

(Deutsch) Information für europäische Anwender – Konformitätserklärung

Anmerkung für die Matrox Hardware-Produktunterstützung durch dieses Handbuch

Diese Geräte entsprechen EG Direktive 2006/95/EC für ein digitales Gerät Klasse A. Sie wurden getestet und entsprechen demnach EN55022/CISPR22 und EN55024/CISPR24. In einer Wohnumgebung können diese Produkte Funkinterferenzen erzeugen, und der Benutzer kann genötigt sein, entsprechende Maßnahmen zu ergreifen. Um EG-Anforderungen zu entsprechen, müssen zum Anschließen des ausrüstung und anderer Peripheriegeräte abgeschirmte Kabel verwendet werden. Analoge A/V Kabel, die an Matrox MXO2 Mini angeschlossen werden, müssen eine Länge von weniger als drei Metern aufweisen um den EWG- und EMV-Richtlinien zu entsprechen. Diese Produkt wurden in einem typischen, der Klasse A entsprechenden, Host-System getestet. Es wird davon ausgegangen, daß diese Produkte auch in jedem Klasse A entsprechenden System entsprechend funktionieren.

(Italiano) Informazioni per gli utenti europei – Dichiarazione di conformità

Nota per i prodotti hardware Matrox supportati da questa guida

Questi dispositivi sono conformi alla direttiva CEE 2006/95/EC relativamente ai dispositivi digitali di Classe A. Sono stati provati e sono risultati conformi alle norme EN55022/CISPR22 e EN55024/CISPR24. In un ambiente domestico, questi prodotti possono causare radiointerferenze, nel qual caso all'utente potrebbe venire richiesto di prendere le misure adeguate. Per soddisfare i requisiti CEE, l'apparecchiatura e le altre periferiche vanno collegati con cavi schermati. I cavi analogici A/V collegati a Matrox MXO2 Mini devono essere limitati a meno di tre metri per essere conformi alle direttive di compatibilità elettromagnetica e del EEC. Questi prodotti sono stati provati in un tipico sistema host conforme alla Classe A. Inoltre, si dà per scontato che questi prodotti acquisiranno la conformità in qualsiasi sistema conforme alla Classe A.

(Español) Información para usuarios europeos – Declaración de conformidad

Observación referente a los productos de hardware de Matrox apoyados por este manual

Estos dispositivos cumplen con la directiva de la CE 2006/95/EC para dispositivos digitales de Clase A. Dichos dispositivos han sido sometidos a prueba y se ha comprobado que cumplen con las normas EN55022/CISPR22 y EN55024/CISPR24. En entornos residenciales, estos productos pueden causar interferencias en las comunicaciones por radio; en tal caso el usuario deberá adoptar las medidas adecuadas. Para satisfacer las disposiciones de la CE, deberán utilizarse cables apantallados para conectar el equipo y demás periféricos. Los cables análogos de A/V conectados con Matrox MXO2 Mini se deben limitar a menos de tres metros para conformidad con las directivas del EEC y del EMC. Estos productos han sido sometidos a prueba en un típico sistema anfitrión que responde a los requisitos de la Clase A. Se supone que estos productos cumplirán también con las normas en cualquier sistema que responda a los requisitos de la Clase A.





www.matrox.com/video