Signal & Distribution

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Signal Types

Video Signal

// Some have embedded audio capabilities, but these signal types are primarily for video

HDBaseT is good and usually cheap. Some carry USB and network, too, so you only need to run one cable for all things. Max run is 100m. Some projectors receive HDBaseT natively, which means you don’t need an RX box. Flow example: Computer → 5’ HDMI → HDBase TX → Cat up to 100m → HDBase RX → 5’ HDMI → Projector. Network cable (cat) is cheap and can be abused.

HDMI is good for short runs <25’. Avoid longer cables with in-line boosters. They fail regularly and are super finicky.

3G SDI (1920x1080) is allegedly good up to 100m. Some projectors take this natively. I find SDI to be a pain.

12G SDI (3840x2160) is allegedly good up to 100m. Some projectors take this natively. I find SDI to be a pain.

Optical HDMI is good for runs <100m. This is a unidirectional optical cable with HDMI ends. Supports up to 4k60. Fragile. No right angles in the cable. Keep it to curves. The price is right. Can recommend.

Optical Displayport is good for runs <100m. This is a unidirectional optical cable with DP ends. Supports up to 8k(?) Fragile. No right angles in the cable. Keep it to curves. The price is right. Still need to test these bad boys, but I’m guessing they are just like their HDMI cousins, but with better EDID.

Fiber is good for super long runs >100m but it is very expensive. You need a TX (transmitter) and an RX (receiver) and the fiber cable itself. Flow example: Computer → 5’ HDMI → Fiber TX → Fiber up to 1000m → Fiber RX → 5’ HDMI → Projector. Very fragile. Keep it to curves.

VGA Lol sorry

DVI Man I wish LED drivers and rack-mountable display drawers would stop using this.

Audio Signal

> Send help

Signal Distribution Devices

Adapters

Remember when you had to buy active DVI adapters for trash can Mac Pros to get more than 3 outputs? There was one time that I was in China and needed a dozen of them and… it was hard.

If something weird is happening on a Matrix, chances are that either you've configured it wrong, or your adapter from the video card (DP to HDMI, USB-C to HDMI etc) is "passive." In situations with managed EDID (say with a decimator or an RTX A Card or headless passthrough), the adapter type is irrelevant. Passive adapters also tend to not work with LED drivers (Brompton, Novastar). Most of the time, just pay the extra dough and buy an active adapter. Like this one. Xcellon works!

> Here's a mnemonic for you: If it's iVANKY it's Janky, if it's Xcellon, you're right on!

Warning that if a shop is preparing your rack for you, you need to specify this and keep your fingers crossed that they listen. Anker's USB-C to HDMI do not work with Matrixes. I have yet to test an adapter that is still available that still works, that said, the Pengo 8RDON-C01H01T1PE will work on an Apple Device and a matrix – it's sadly no longer for sale! Maybe our friends at SimplyNuc are building active adapters that are actually active… putting that on my to-do list.

AJA

HA5-4k

Works exactly the same as an FX4, but with less flexibility/expandability. 1x 4k60 split into 4 channels of 1080 in a 2x2 grid (essentially default mode of FX4). Highly recommended and a better price point. But no hardware sync! Who needs that anyway…

Blackmagic Design (BMD)

In general, I love BMD devices, but they can be finicky, particularly if you don't use them often. If you plug in a BMD device and it doesn't recognize, it's probably because the firmware on the device needs updating. If you install the latest version of Desktop Video, and it still doesn't recognize, you need to roll back to an older version of Desktop Video and then verify functionality and slowly update, with verification, until you get to the most recent version. To uninstall a new version that doesn't work, first run the uninstaller, then delete the following BMD files in these two

paths: /Macintosh HD/Library/Preferences/Blackmagic Design/DaVinci Resolve and /Macintosh HD/Users/me/Library/Preferences – you can read more about this technique here. Worked great for me when my Monitor 3G wasn’t recognizing.

> Why my BMD Monitor and/or Recorder ins't working anymore when I plug it into my computer?

Welcome to Hell! You're going to need to find the latest functional driver by going through old versions of BMD's Desktop Video.

> Why does this HDMI to SDI converter not recognize the input signal?

There are two different SDI standards: A and B.

Some projectors with native SDI use A (such as Epson’s 25k), whereas, BMD (Blackmagic Design) uses B. In order to convert SDI type you can use: a DAC70 converter. A decimator will also solve this. **Jason Batcheller** says you can easily switch BMD from standard B to standard A. That USB port on the device can be connected to a computer and managed via BMD software - it will allow you to change standards/update firmware.

Also, level A and B standards can cause tearing on devices that receive both types. Just test the other type and the tearing should go away!

Design Mini Monitor / UltraStudio Monitor 3G

Love this thing, but it definitely reduces frame rate over native outputs (at least on M1 OS 12.5). It also has limited rez and hz options. No WUX. Technically an EDID ghost that doesn’t consume a native output.

Datapth

FX4

The FX4 is an old standby for getting 4 channels out of a single 4k output. It also keeps those channels in-sync, so it’s an easy way to get sync out of a machine that would otherwise struggle with 4x direct 1080 outputs, but can handle a single 4k out. These devices have tons of features, including:

- Custom layouts
- Display bezel math
- Daisy-chaining (I have no idea what this does)
- External Sync
- Network Control

- USB Control

There is a cross-platform “Wall Designer” app to change settings via USB2. It’s clunky. At some point, I’ll do a write up.

Matrox

DoubleHead2Go or TripleHead2Go

A device that works like an FX4 but is limited to a lower display quantity. The advantage with this is that it creates a display that otherwise wouldn’t exist: 5,760x1080. This is a TripleHead configured as 3x HD outputs. Otherwise, no bells and whistles. Haven’t used these in 10 years or so, but were great back in the day and probably still useful in select situations. Works on all systems.

MST Hubs

Oddly, MST hubs achieves the same ends as an FX4, but are way cheaper as they don’t have any bells or whistles. Initial testing (circa 2019) with these devices on P4000 cards has shown that these hubs can only be used with video cards that support them, and video cards must have a native displayport, as well. This means: doesn’t work with Mac.

All Things EDID

EDID Overview

EDID is the thing that tells a computer what kind of thing it’s plugged in to. When you open up system prefs and it says “LG Ultra HD” that’s the monitor telling the computer “what” it is. EDID emulation is helpful for when you’re doing a lot of swapping of outputs or you turn your outputs off while leaving the computer on. Managing EDID is critical for installations because when some joker accidentally unplugs a projector, you won't get a display re-arrange.

On **Mac** systems, you need to use Headless/Passthroughs/**Decimators** to emulate EDID. You can also use an FX4 to keep EDID alive while the outputs are off.

On **Windows** systems, you need to use the same emulationd devices, unless you’ve got your own video cards that has EDID emulation via Software. Any P-series or A-series NVIDIA card allows you to save EDID to specific outputs. Adding a headless/pass to that chain will not work. Whereas, a decimator or FX4 will work. Bonus: capture EDIDs with this software and start building a library of them so that you can emulate performance easily.

Headless & Passthroughs

Headless, also called EDID Ghosts (Fubbi), allow you to trick a computer into thinking a display is plugged in, even if it isn’t. This prevents displays from being rearranged on restart or if a projector isn’t on. A regular Headless doesn’t have a passthru. Passthrus allow you to plug something into the EDID emulation. Passthroughs are preferred if you ever want to plug something in. They are more expensive than regular headless, but worth it in almost all situations.

Edge Case: If you need to mirror a display to a headless for some utility reason, then you don’t need a headless *with* passthrough (a headless without passthrough is just fine). There was a bug on the GPU of the old Mac Pro trashcans (ca. 2013), that was fixed if you threw a headless on the native HDMI port In general, headeless *with* passthrough are more useful and the difference in cost in nominal.

Types of Passthroughts: 4k60, Wux (1920x1200), 1080p60

They come in HDMI and DisplayPort flavors. I only own HDMI versions.

Decimators

These are custom EDID emulators - they are expensive swiss army knives that allow you to trick a computer into thinking it’s receiving whatever signal at whatever HZ. Incredibly useful. Highly

recommended. Expensive.

Signal & Distro Troubleshooting

General Signal Troubleshooting

Just keep removing variables to find out where the problem is. This usually solves or is the debug process for most issues:

1. Turn off everything.
2. Disconnect cable from display.
3. Reconnect cable to source.
4. Turn on source.
5. Wait until source is booted up.
6. Turn on display.
7. Wait until display is booted up.
8. Plug in display.

If you have signal chaos in between your source and display, such as a KVM, or HDBaseT, or a Matrix, try removing that variable or swapping it for another device. Adapters, sadly, can also be the culprit. Avoid couplers, too!

If none of that works, try unplugging all peripherals from the source.

Matrixes or Passthroughs aren't Persisting or Recognizing

Headless passthroughs aren’t consistently recognized by MAC OS on M1s using USB-C to HDMI adapters. This is only true of certain adapters (passive ones).

- What works:
  - Surprisingly, this Insignia adapter
  - This Belkin adapter
- What doesn’t work:
  - Surprisingly, this Anker adapter
  - This J5Create adapter

I suspect this has something to do with active vs passive adapters. Unfortunately, none of the above tell you one way or the other in their product pages. I suspect this would be a problem on WINDOWS too, but I always use P or A cards where I’ve got EDID management, and it’s display port so it doesn’t matter.

All of these adapters support 4k60, so if you don’t have EDID requirements or persist requirements, then this doesn’t matter.

Persist Displays on Apple Silicon aren't... Persisting

On M1 Studios, if you want video to persist and you've the same devices plugged in to multiple ports, you shouldn't reorder or rearrange the displays (in sys prefs). From right (close to HDMI native port) to left, it will automatically order the ports. EDII0216(1) will always be far right, and EDII0216(2) will be just to the left. If you reassign these in sys prefs, it will not persist after a restart. This is old style and I suspect an OS bug.

Missing Windows

Plugged into a monitor on a PC and can't find your windows? If you're connected to the internet and the computer has a VNC client installed, then just use that.

Otherwise:

- Windows-Shift-Left or RIght Arrow
- Alt+Enter for fullscreen

HDCP

Overview

HDCP, or High-bandwidth Digital Content Protection, is a technology that prevents the unauthorized copying of digital audio and video content. It works by encrypting the audio and video signal between the device sending the content and the device receiving it.

HDCP is required to stream content from services like Netflix, Amazon Video, and Virgin, and to play Blu-Ray discs. If a device doesn't support HDCP, or if the connection between devices isn't HDCP compliant, you might see an error message and not be able to play content. For example, if you try to connect a 4K streaming box to a TV that only supports HDCP 1.4, you might only be able to watch content in 1080p.

Here are some common HDCP error messages:

- "HDCP Unauthorized. Content Disabled"
- "HDCP Error Detected: To play this content, all HDMI connections must support High-bandwidth Digital Content Protection (HDCP)"
- "Your video will play in Standard Definition because your computer hardware, HDMI cables, and display must all meet content protection (HDCP) requirements for HD video"

HDCP Troubleshooting

HDCP can be unpredictable with various setups, break or “stripping” HDCP is considered illegal, but there are a number of ways to do this for “legal” reasons. When the HDCP “handshake” is made, both the sending and receiving device (TV, capture card, projector, etc.) agree that HDCP content is being transmitted and act accordingly. HDMI capture cards made by Elgato, BlackMagic Design, Magewell, Matrox, etc. will not “strip” HDCP content. In order to have their products sold and licensed in the USA, they agree to meet HDCP standards. When HDCP is enabled you may see a signal that drops, is all Black, Green, or Purple. For example, older HDCP standards tend to produce some image with a wash of green color over it.

Apple computers are known to have more issues with HDCP handshakes as Apple's integrated system may trigger an HDCP “event” when certain applications are open. For example, you are plugged into a projector that does not accept HDCP (perhaps an older projector), while performing, you open a web-browser and a Netflix tab launches. This can cause your signal to drop if the device you are connected to is not HDCP compliant. On Windows machines this is a mixed bag, as there are many manufacturers and software developers, doing things differently.

Oftentimes, unbranded, or “generic” HDMI splitters, HDMI Capture Cards, and HDMI monitors, will strip the HDCP chain. It is believed that they do this by declaring / cloning an EDID that is registered as HDCP compliant, when they are not. You can find these splitters on Amazon, Ebay, AliExpress, and so on, but by cloning the EDID of another licensed device. It is usually a matter of time before the EDID is reported and blacklisted in an OS or security update. For this reason, if you plan to use an HDMI splitter to break HDCP, it is best not to spend too much, as it may only work for a year or less before being blacklisted.

Valid reasons to break HDCP:

1. To record your own computer output / performances, content.
2. Stabile connection to older projectors and screens.
3. Cloning multiple screens.
4. Connecting to devices with DVI (if you are converting HDMI to DVI)

VGA, RCA,DVI, SDI were not designed to carry HDCP (HDMI only). Most HDMI to SDI devices will “break” the HDCP chain, but if you are trying to send copy written HDCP content over HDMI to a name brand SDI converter, the signal may not be passed through, as your computer will withhold the signal to remain compliant. This can also happen with HDBaseT, NDI converters, and HDMI over RJ45 and HDMI over Ethernet converters. If stripping HDCP is important to you, when in doubt, “buy cheap!”-ProjectileObjects

> Written by ProjectileObjects