Welcome to the PSU-4 Instructions for Use

→ New Features in PSU-Software-Version 4.6! ←

This manual provides you with all you need to know for working with the PSU.

If you are already familiar with the PSU, just use this manual to find more detailed information on specific topics.

Use the Search element in the **title bar on the right** to find a specific topic.
For example: Just enter *play* to find the page containing *Playing back takes*.

The **Table of Contents (TOC)** is only displayed if the **browser's width** is wide enough. If it is not visible, just click the *"Burger"*-Symbol (☰) in the **top-left corner** to show it.
All chapters provide an **in-page navigation** on the right – if the browser width permits this - for an easy navigation between the sub-chapters. If the browser width does not permit to show it, this navigation is also available **in the TOC** of the chapter you are reading at the moment.

New Features in PSU-Software-Version 4.6

- **New Next-Scene(/Shot)/Take-Dialog:** Easily accessible by
  - Second press on Cam-buttons
  - Long-press of Take Number Display
  - Quick Set Menu
- **Self-defined cropping and de-squeeze-factors** in "Hawk-Dialog"
- Arbitrary **Screen-Labels** in Picture-Settings (also via "Quick-Menu" dialog)
- Starting with **PSU-Satellite-App**-Version 1.11.8, it is now possible to use the built-in (iOS-)Screen-Recording-Function in combination with the App. It is *linked* to the former "Allow Screenshots"-Button in the **Streaming-Settings**. (Screen Recordings also work if the button on the PSU still only reads "Allow Screenshots" in older versions, because it's a new function on the side of the App.)
- **Authentication** for PSU-(WebDAV)-**Network-Interface**: Additional security when

accessing takes, frame-grabs, shooting-day-reports (PDFs)...

- Take **screenshots from remote** by means of a web-page
- **New take-selection filters** for imported takes, manually recorded takes and auto-recorded takes
- Symbol for imported takes in Take-selection
- **Text/Legend-ON/OFF** for Framelines (Ground Glass Markings)
- **PSU-Satellite-App: Playback-Slider incl. IN/OUT- and Index-points**
- Indication of additional button funtionality (**Longpress**-buttons) by a **dot in the corner**
- **Auto-Compression** (Import-/Export-Dialog) of all takes, for example for **PSU-indpendent playback via network** on client devices.
- Rehearsal-button with LED to enhance visibility of Rehearsal-status
- New „Wifi-Setting" to **allow/forbid V/H-Orientation-Toggle** on WiFi-Satellites
- Press long on Sound-Level-Display to toggle **Mute-All**
- Touch on background to close open dialogs
- Extended Take-Import capabilities
- **Letterboxing and Rotation for Take-Imports**
- **Embedded Timecode and Rec-Trigger on SDI-Outputs**
- Picture Settings: **Blur & Focus Peaking**

... and more...

Get to know the PSU-4

WARNING!

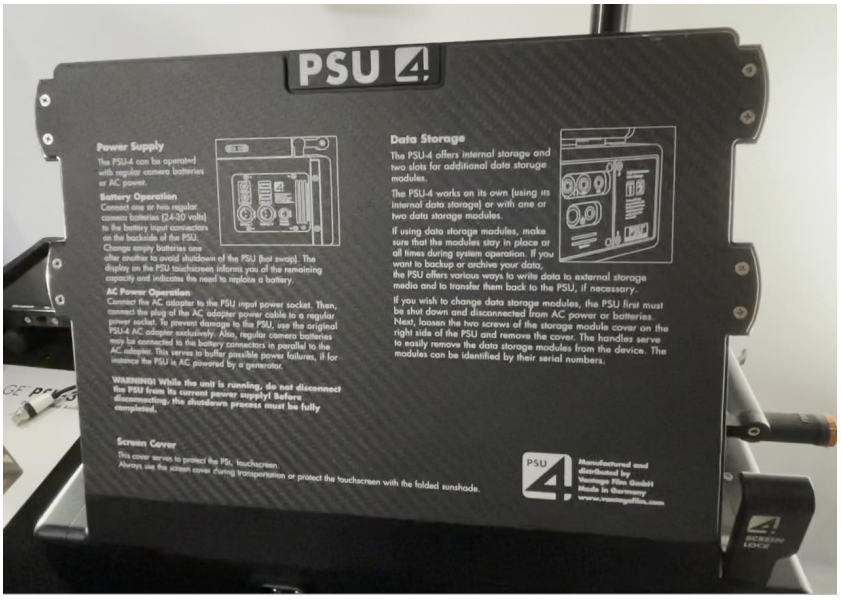
Risk of fire and electrical shock

- Do not expose the unit to rain or moisture
- Do not open the enclosure
- Only qualified personnel is allowed to service the unit
- Do not block ventilation openings

Attention:

Information regarding the PSU-4 Power Supply and Data Storage Module is printed on the PSU Screen Protector.

PSU Screen Protector



Protect the PSU-screen with the provided screen protector if the unit is not in use or placed in the shipping case.

Please remove the PSU Screen Protector before powering on the device - otherwise, the *touch function* of the screen could be calibrated incorrectly! In case you forgot to remove the cover and the screen is already not working as expected, simply power-cycle (shutdown & restart) the unit one more time.

Do not attach the cover on the back of the PSU's screen when working with the PSU (although it would fit) for these reasons:

- The cover is made of carbon fiber and **weakens significantly the WiFi-signal** of the antennas in the screen!
- The monitor cannot be folded down fully onto the PSU anymore and could **damage the cover** when hitting the accessory threads!

Main connectors (left side)

> From right to left:

Video inputs

The four colored BNC-connectors labeled Cam A to Cam D are intended for connecting the HD-SDI signals originating from the cameras. The maximum cable length for **1.5G SDI** (up to 1080p30) is **100 m/330 ft**. The maximum cable length for **3G SDI** (up to 1080p60) is **60 m/200 ft** because of higher attenuation.
The video inputs support **Embedded HD-SDI-Audio** as well as **Recording-Flags**, **Timecode** (Alexa, Sony, Panasonic, Red) and additional **Alexa-Metadata**.

Audio inputs

Audio In 1 & 2 (XLRs) can be configured to:

- two independent analog (line-level) mono audio inputs
- one analog stereo input
- one digital AES stereo input on Audio In 1
- an analog audio time-code input (Audio In 2)

All audio sources can be arbitrarily assigned to camera inputs (see Audio Settings).

Video outputs

Video Out 1-4 provide **four completely independent HD-SDI outputs**. This allows you to set up the signals on each output independently of each other and regardless of the PSU screen display. You can configure up to 8 views with cameras or playbacks on each. Available formats are 720p, 1080i, 1080p up to 60Hz/fps (3G-SDI). Refer to the video inputs for maximum cable lengths. **Embedded HD-SDI-Audio** is not yet supported on the outputs. Refer to HDMI-Out & Extending Outputs to 8 for a work-around to embed audio into SDI output signals.

(Refer to Video Outputs for detials).

Audio outputs

Audio on **Audio Out 1 & 2** always *matches the picture* on Video Out 1 & 2. Audio Out 1 can be switched between analog (line-level) mono and digital AES stereo. Audio Out 2 is only analog mono.

Ethernet network

GbE1 and GbE2 are Gigabit-Ethernet (network) connectors via a Fischer connector (use the red cable provided).
Note the difference between 1 & 2:
On GbE1 the PSU acts as a DHCP client and expects/tries to receive an IP-address from a DHCP-server on the externally connected unit.

GbE2 is connected to the built-in WiFi router of the PSU that operates a DHCP server by default. Refer to Network-Interface for details.

Briefly:

- Use GbE1 to connect the PSU to another router for connecting the PSU to the internet.
- Use GbE2 to directly connect a laptop etc. to the PSU, for example to upload/download files
- Use GbE1 to connect an external Wifi router such as Vantage Film's "Houston".
- Use GbE1 to connect an LTE router (for example for mobile streaming).

Calpad / USB 2.0

This is a multi-purpose connector where you can attach the following (see picture below):

- The Vantage USB-2.0-Hub and thus attach Mouse, Keyboard, USB-Sticks etc. and keep free the USB-3.0 connectors on the back of the PSU.
- The PSU-3-Remote that can remote-control basic functions of the PSU
- The PSU-3-"Calpad" used to control the monitor settings of the PSU-screen. This can be achieved as well from a menu in the User-Settings in software. The "Calpad" is still useful to disable the Boot-Logo and reveal the startup messages during power-up. These messages can be helpful to diagnose problems if the PSU is not starting up correctly...
- The PSU-3 iPhone-charging cable

Extending Inputs & Outputs

Two special kinds of connectors on the right to the Video-Inputs can be used to **double the inputs and outputs** of the PSU-4 to **8**!

SFP 1 & 2 Cages (covered)

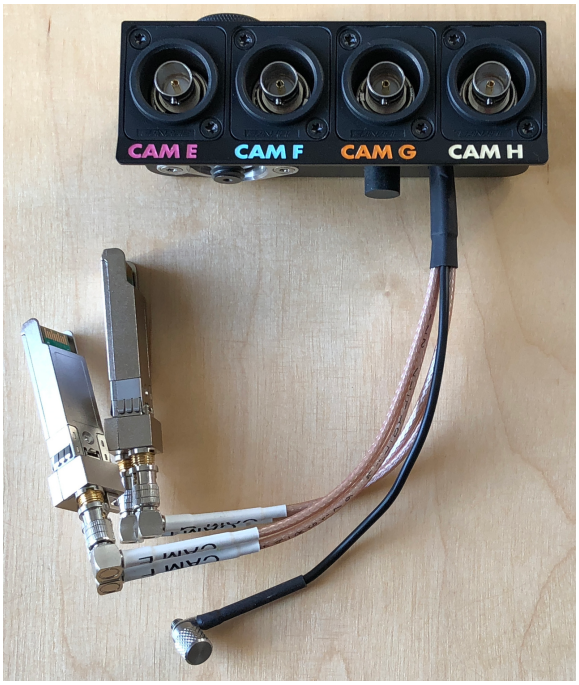
(SFP means “Small Form-factor Pluggable”)

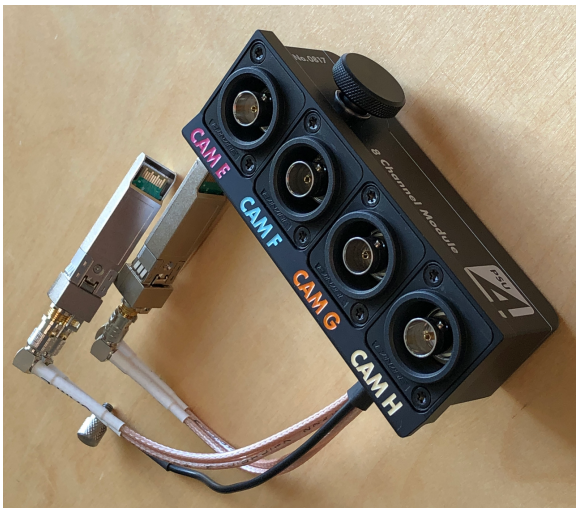
Behind the small cover with the PSU-4-logo you can find two SFP-cages.
Each of those can carry modules that can extend the PSU with

- two high-density-BNC connectors
- two fiber-optical connectors (intended for 4K)
- one HDMI-In
- two (analogue) SD connectors.

(To remove the cover, please use a hexagonal 2.5mm or 1/10” screw driver)

So far, “only” the first option is available:
The **“8 Channel Module”** in combination with the appropriate SFP-Modules extends the PSU with 4 additional BNC-connectors that offer the same capabilities as the built-in connectors to a total of 8 BNC inputs(!)



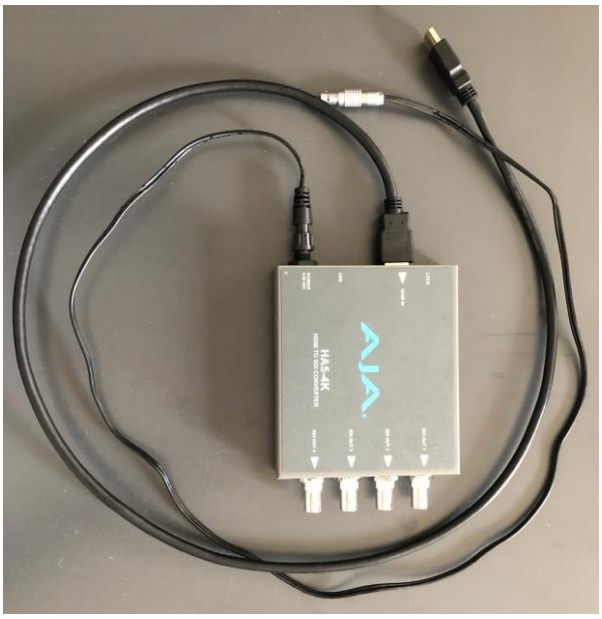


When fitting the 8 *Channel Module* to the PSU, it's the best to start with the black electrical ground cable, then put in SFP2 (Cam G&H) followed by SFP1(Cam E&F), and finally fix the box to the nearest accessory thread with the big knurled screw.

HDMI-OUT

This (HDMI 2.0-)connector can be set to:

- a 5th (independent) 1080p Video-Out
- a 5th (independent) 4K Video-Out (!)
- **additional 4 independent 1080p Video-Outs** by means of e.g. an AJA-HA5-4K (see picture below) or a Blackmagic Design Teranex AV UltraHD 12GSDI Video Wall Controller



For details, also on *embedding audio into a SDI-output signal* see HDMI-Out & Extending Outputs to 8

Power & USB connectors (back side)

AC Power Supply

To the smaller connector on the right you attach the PSU's AC power supply (100-240V AC to 24V DC). In fact the PSU doesn't care about the power source as long as the voltage is between 20-30V DC here. For normal operation the PSU needs around 100-130 W depending on the "load". But if additional devices are connected that draw power, like for example a video-transmitter on the 12V Acc connectors or external hard drives on the USB-3.0, the consumption will rise accordingly.

Battery 1 & 2

The PSU can be operated with batteries. The two big connectors “expect” at least 24V nominal voltage batteries, otherwise the PSU treats them as “empty” and shuts down automatically. If two batteries are attached at once, operation time is doubled. Batteries can be hot-plugged i.e. if one battery is full, you can remove the other one without shutting down the PSU first. There are some unexpected things to keep in mind when using Anton Bauer Cine VCLX batteries - for these and other details please see Battery Operation.

12V Acc

The two 12V Accessory connectors are **outlets** that provide 12V DC for external devices that run on 12V and don’t consume more than **20W altogether**. You can attach for example the AJA mentioned above, two Teradek Transmitters, external LTE or WiFi routers, audio transmitters etc.

USB 3.0

These USB connectors are intended for

- External hard discs or storage media for backup or data exchange
- Mouse and Keyboard
- Charge iPhones and especially iPads with 12W (needs special cable)

The USB connectors are specially designed to provide up to 15W of power per connector (!), so also devices with relatively high power consumption could be attached here. (USB provides 5V.)

Battery fuses

Behind the cover are two T8H 250V ceramic fuses to protect PSU internals. They can be easily exchanged by removing the 4 Phillips screws.

Fan, Speaker & more (right side)

Power on & boot sequence

To turn the PSU on, press the stainless steel power switch on the right side of the PSU. The green operating LED will start flashing (0.5s green/dark). After 10 seconds one should hear a single beep. Shortly after power-on, the PSU-4 logo appears in the middle of the screen until the actual software takes control and switches off the logo (after about 25 seconds).

Sometimes (on a regular basis) the operating system conducts a file system check that might take significantly longer. If the software does not come up after one minute, the (single) PSU-logo will go away, the fans will increase air flow and the LED will blink shorter to indicate the unusual state. If the software isn't coming up after 3-5 minutes, there might be a real problem (→ Troubleshooting)

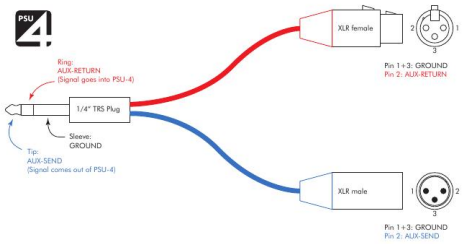
Power down

You can turn the PSU off by either “Exit” followed by “Shutdown” (press >3 seconds) or pressing twice the power button (first press opens Exit-dialog, second shuts down the machine). While the PSU is shutting down, the logo will appear and the operating LED will blink again, like during boot-up. **Pulling the power before the PSU shuts off itself bears the risk of data corruption on the recorded footage or file system structures.** This can cause that the PSU does not come up the next time it is turned on again (or needs longer to boot). (→ Troubleshooting)

Headphone & Microphone jacks

The PSU has two stereo capable headphone 6,5mm jacks. If the audio footage is stereo you can hear stereo on the headphones. The middle jack can be switched to an additional pair of mono line-in and out (“AUX”). The AUX-input can be assigned to any camera input as its audio source and the AUX-output matches the picture on Video-Out 3. The AUX adapter is no official accessory for the PSU, yet, but we can provide you with one if you need it, or you build one yourself with the following scheme:

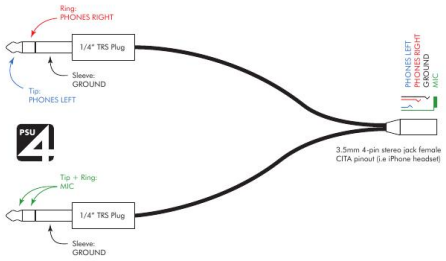
Wiring of the AUX jack:



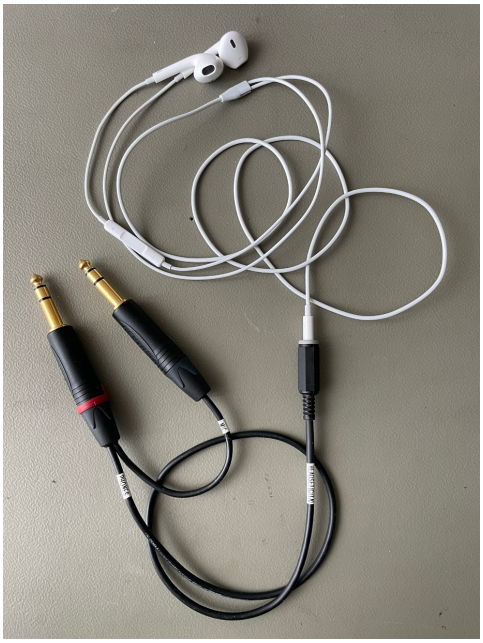
Example of an AUX adapter:

The right jack is a microphone input that can be used for the PSU-Satellite-Intercom function, to talk to all or selected iPads or iPhones. (See Wifi Streaming for details.) The microphone jack can be configured to support balanced and unbalanced microphones, and the gain can be adjusted in the Intercom settings.

Here is a schematic that also contains the wiring of the microphone jack:



We offer a 3.5mm to 2x 6,5mm **headset adapter** as a **PSU-Accessory** (for headphone and Mic in one plug with four contacts). It is compatible to the original analog iPhone-Headsets which offer relatively good speech quality and are still commonly available:



Speaker

On the built-in speaker you can hear the audio that is matching the situation on the PSU screen and if Intercom is enabled, you (can) get the Intercom originating from the “Satellites”. (See Wifi Streaming for details.)

Data storage

Behind the cover (labeled “High-Performance Data Storage”) with the two hexagon screws, up to two modules can be inserted to store the recorded footage. **The PSU can even be operated without any of these modules** - then roughly one TB (Terabyte) is available, which should be enough for 38 hours of 1080p25-(compressed-)footage. Most our rental PSU-4 are equipped with one 4TB module (→ 38h + 152h = 190h 1080p25-capacity), so that it can be extended with an additional module to the double capacity (38h + 152h + 152h = 342h). We also offer higher capacities with 8TB or 16TB **per module** on special request or could equip PSUs with 4 or 8 TB as the built-in drive.
The technical maximum at the moment is ~40TB that *could* be built to order. The following table illustrates the situation as of 2021:

Config.	**Built-In**	**Module 1**	**Module 2**	**Sum TB**	**Shooting Time 1080p25**
PSU-4 Standard 1x4	1 TB	4TB	-	5 TB	190h
PSU-4 Double 2x4	1 TB	4TB	4TB	9 TB	342h
PSU-4 1x8	1 TB	8TB	-	9 TB	342h
PSU-4 2x8	1 TB	8TB	8TB	17 TB	646h

Config.	Built-In	Module 1	Module 2	Sum TB	Shooting Time 1080p25
PSU-4 MAX	8 TB	16TB	16TB	40 TB	1520h

Main Fan

The ventilation grid should always be kept free to allow air flow and thus cooling the PSU. It can be removed to clean the fan from dust if necessary (4 Phillips screws). The mode of fan regulation can be changed in Audio Settings). The effectiveness of the main fan could be doubled without the grid for extreme environments like shooting in the desert. (Or use an additional external fan.)

Top side

Accessory Threads

On the top side of the PSU are three UNC ⅜"-16 threads to attach accessories like

- our Vantage Arms:

- the 8 *Channel Module* mentioned above:

- Video and Audio Transmitters
- iPad as a screen extension (Video-Out-Monitoring → Wifi Streaming)

Screen

The brightness of the touchscreen can be increased in *Settings* → *Settings* → *Touchscreen*. At maximum level it is bright enough to be readable in direct sunlight. But there is also a sun shade and a rain cover available.

The screen can be cleaned with any glass cleansing agent. There is a dedicated mode invoked by *Settings* → *Settings* → *Clean* screen that blocks and hides all buttons while you are wiping the screen.

Screen Lock

To change the PSU screen angle, open the screen lock by pulling it upwards. To lock it, push it back down.

Bottom side

Ventilation Openings

On the bottom side of the PSU is the main air outlet that should never be blocked when the device is turned on.

Operating System Disc

Below the cover in the middle (4 Phillips screws) there is the operating system disc of the PSU. On very rare occasions it might be necessary to replace it.

Getting started

Basic Settings before first use

Although you can immediately start to work with the PSU after powering it up, here is a list with some basic settings you should configure before the first "Camera is rolling!".

Check Date and Time

It is important that date and time are set correctly on the PSU, because this information is stored in the metadata of the recorded takes. They can be searched by shooting-day and are ordered by timestamp. Of course we adjust date and time before the PSU leaves the rental house, but it's a crucial information... Open *Settings → Settings → Date & Time* to set it. Here you can also toggle between 12h/24h display of the time. The current time is always visible on the yellow EXIT-button on the main screen.

Check Battery Setting

If you plan to use "normal" batteries without built-in logic, select the appropriate voltage in *Settings → Settings → Battery Select. The PSU tries to guess the remaining battery capacity based on the this setting and the measured voltage. You can add support for 24V and 26.4V batteries in the *Owner-Settings*. For details please see Battery Operation.

Check Frame Rate Settings

To avoid stutter and confusion:

- Set the correct **frame rate for the Video-Outs** in *Settings → Settings → Video-/HDMI-Out*, i.e. to the same frequency as the project is based on. Rule of thumb: American TV: 30 fps, most european TV: 25 fps, Cinema: 24 fps.
- Check if the correct rates are really coming in on the Camera-Inputs: You can see the **detected rates** in the green **fps-diplays between "fps" and "grab"**. If, for example, the incoming signal says "30fps" but you are working on a 24fps project, the camera's monitoring output or a video-transmitter in between is not set up correctly and will cause stutter problems!

- For framerate simulations (slow-motion & time lapse) the **sync-speed** has to match the project-speed as well. Touch fps-display → sync speed to set it.

For detailed information please read the basics about Frame Rates

Audio source

By default, Audio-In 1 is assigned to all camera inputs as the audio source. If this is not the way you want it, change it in *Settings* → *Audio* → *Audio Source*.

Hawk Anamorphic® Desqueezing

If the Desqueezing is not set on the camera, the Hawk Format Selector in Settings → Picture* allows proper desqueezing for all current anamorphic formats either 2x Squeeze or 1.3x Squeeze. Each of the camera inputs can be desqueezed separately. In theory it's better to desqueeze on the PSU and feed the original squeezed signal to the PSU, because that way more resolution is available on the PSU (→ higher quality).

Clean Picture

If the workflow can be centered around the PSU, it's also reasonable to feed a clean picture to the PSU (without frames, center cross and camera information around the image. Format markings can always be added by the PSU, but not removed if it's burned into the picture...

Recording File Format

The recommended and **standard setting is Full HD compressed**. You can lower the resolution to increase recording capacity in *Settings* → *Settings* → *Capacity Control*.
Full HD uncompressed offers the highest possible image quality and is free of any compression artifacts. But this comes at the very high cost of 10-20 times lower disc capacity! When using a clean picture (witout the black camera info border and frame lines etc.) the footage on the PSU is close to "Backup Quality" (YCbCr 422 8-bit) and could be used in the worst-case scenario when original footage is lost...
In the *Capacity Control* Dialog you can see the estimated time you can record - make sure it fits for your imminent project. Alternatively you can add (order) another storage module later if the second slot is still empty.

More than 2 cameras...

If you need more than two cameras press *Settings* on the bottom left and a dialog will pop up that has 4 pages. The pages are labeled *Picture*, *Audio*, *Tools* and *Settings*.

Select *Tools*, then *Record Channels / Number Players* and choose for example "4". For more than 4 recording channels you need additional hardware, see Extending Inputs & Outputs.

Basic Operation

General Notes

- Starting with software version 4.6, all elements (like buttons and displays), that offer additional functionality when **pressed longer** (>0.5 to 1 sec), indicate that fact by a small **dot in their top right corner**. See for example in the picture below the *Play*, *Settings* and *Rec-* buttons (among others). Most screenshots and illustrations of this manual have not been updated to the latest version, yet, but the additional functionality will always be explained in the texts.
- Also since version 4.6, if you touch the **background** of the PSU interface, that means areas without buttons, displays, menus, the picture itself and so on, the currently opened dialog will be **closed,** (like when you press the button that opened the sub-dialog initially or "OK" etc.)

After powering on, the screen on the PSU will look like this, initially:

Let's start in the top left corner and go around counterclockwise:

Exit or Lock the PSU

The yellow EXIT-Button opens a small dialog where you can **shutdown** the PSU (press longer than 3 seconds) or just **lock the screen**, so that nobody can "fool around" with the PSU while you are away for a break etc. When the screen is locked, the current state of the PSU stays operative, for example if the camera starts to record, the PSU will record as well (if automatic recording is set up), or if you leave a playback of the last Take looping, or just show the live cameras and so on. To quit the locked screen you need to enter a 4-digit PIN which you can set or change in the Settings. (*Settings → Settings-Page → Lock Screen*)
By the way - **downloading Takes** via the Network/WebDAV-Interface **is blocked** while the screen is locked. You can allow this in Settings → Settings → WebDAV. Below *EXIT* you can see the current time - it is important that the time is set correctly. (*Settings → Settings → Date & Time*. You can also toggle between 12h/24h display there.)

Battery displays

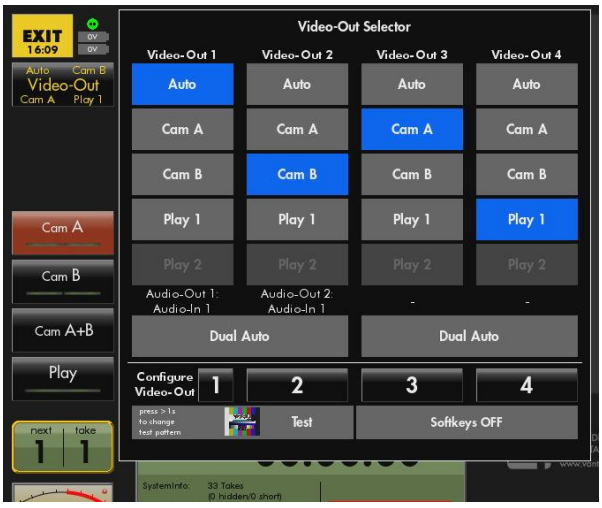
Right next to the EXIT-button you can see if the PSU is running on AC power (the circle symbolizes a wall outlet) or on batteries, and the battery voltages. For exhaustive details, please see Battery Operation.

Control Video-Outs

The underlying dialog of the *Video-Out*-button is the place to control the content on all external Video-Out-Monitors, Wifi-Clients and Internet-Streaming-Clients. (WiFi- and Internet-Clients can also control that themselves - if they are given the right to do so.)
On the button itself you can see what is set up on the four main outputs.
For example on 

you can see that 1-4 are set up as follows:
Video-Out 1: Cam A
Video-Out 2: Cam B
Video-Out 3: Cam C
Video-Out 4: Cam D.

With only 2 inputs, single playback and Streaming being disabled, the dialog looks very "clearly" arranged:



Every (vertical) column corresponds to one Video-Out. You can select multiple cameras (here: *Cam A* & *Cam B*) plus *Play 1* (playback of recorded Takes) to make them appear on the Video-Out. In the above situation of the screenshot, Video-Out 1 is set to *Auto*, Video-Out 2 shows *Cam B*, Video-Out 3 displays *Cam A*, and *4* the first playback *Play 1*. **Up to 8 sources and playbacks can be shown per Video-Output.**

Auto means that the output "follows" the PSU screen, for example if *Cam A* is selected on the PSU screen, then *Cam A* will be seen on all outputs that are in "Auto" mode. To **deselect** sources just **select** them **again**: The blue hi-lite will turn gray. By deselecting all sources and *Auto* you can turn off the Video-Out completely (→ black).

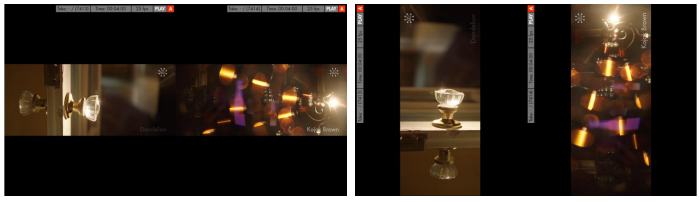
Below the available sources, the audio state is shown: *Audio-Out 1* always matches *Video-Out 1*, *Audio-Out 2* matches *Video-Out 2* - because of that, *Audio-Out 1* puts out the sound of *Audio-In 1 as well as* **Audio-Out 2* does (initially, Audio-In 1 is the audio source that is assigned to all cameras).

Next follows *Dual Auto* - this is a special *Auto* mode that affects **two outputs at once:** If you switch to Cam A+B or Play 1+2 on the PSU, Video-Out 1 will show Cam A (or Play 1) and Video-Out 2 will show Cam B (or Play 2 respectively). In other words: *Dual Auto distributes dual cameras or dual playbacks to dual monitors*.

If at least 4 inputs (A-D) **and** 4 playbacks are enabled (see More than 2 cameras), below *Dual Auto* there will also be *Quad Auto* that spans across all 4 outputs and controls outputs 1-4 similar to *Dual Auto*.

With the following **Configure Video-Out** buttons one can affect:

- The **alignment or order** of multiple inputs or playbacks on the Video-Out: The PSU maximizes the used image area ("make images as big as possible"). This results, for example, with two desqueezed images in a vertical arrangement. With the option *Horizontal Layout ON* this behavior can be overridden to force a side-by-side layout although images are much smaller.
- The **Orientation** of the Video-Out: With *Vertical mode* you can turn the monitor 90° around into portrait mode and have less black borders when multiple sources are shown. Example:



- The **labeling** of the Video-Outs: You can name them so that you don't have to memorize which number is which monitor or place on the set, for example "Director", "Production", "VFX", "Make up"... See first output in the above screenshot.

In the bottom line there is **Test** and **Softkeys**. (If you enable support for the *Blackmagic Desgin Smart Videohub* in *Settings → Tools*, there is a third button to control those Videohubs, here).

Test displays a Test-Image on all Views of all outputs everywhere, and also puts out a 1000 Hz test tone at -18dBFS. The test pattern can be changed by pressing the Test-button for longer than 1 second. You can also integrate **your own test pattern** here (see Import & Export).

Softkeys adds three rows of buttons which can switch multiple input and playback channels at once on one or more Video-Outs in arbitrary combinations. To program a softkey, you just have

to press one for longer than 2 seconds and the current state gets stored "on" that button. There are softkeys that control two outputs at once, or four, or eight. There are also softkeys to control the Wifi and Internet streams.

Camera & Play Buttons

Conceptually, the *PSU (screen)* is either in *Playback mode* or *Live/Record mode*. If you press one of the Cam buttons you go to *Live mode*, that means you will immediately see the picture from the camera. The selected source will be indicated on the upper right corner of the screen next to a Live/Run/Rec indicator. All common HD signals will be automatically detected for each channel as well. There is no need to preset the PSU inputs.

If you press one of the *Play* buttons or one of the playback control buttons (like *pause*, *skip*, etc.) you go into *Play/Playback/Disc mode*. With buttons labeled A & B, 1+2, A-D pictures will be shown side by side or 2x2 or 2x3 and so on, also depending on the image ratio. **You can not see cameras and playbacks at the same time on the PSU screen**, but already running playbacks will continue to play if you switch to *Live mode* and Camera (Live) views will continue on any of the outputs as well if you switch to *Play mode* on the PSU. This is kind of different compared to what you can see on the Video-Outs: There you can freely mix playbacks and cameras as you like.

The green LED on a Play-button shows a running playback on that player, that is visible *somewhere*, like on Video-Out or on a Stream. If playback is not visible anymore anywhere - although still running - it gets paused until it gets shown somewhere again.

Depending on the number of inputs and playbacks you have set up (see More than 2 cameras), there will be **at least** buttons for *Cam A*, *Cam B*, *Cam A+B* and *Play*:

2 Cams	4 Cams	6 Cams	8 Cams	8 Cams & 2x Play	8 Cams & 4x Play

2 Cams	4 Cams	6 Cams	8 Cams	8 Cams & 2x Play	8 Cams & 4x Play
					

If you work with at least 4 cameras, you can configure two of those Cam-buttons yourself to which channels should be shown when you press them. Initially, the first one switches to Camera A & B, the other one C & D. To “program” them, press for more than 2 seconds and select the channels you would like to have on the button. For example:

Meaning of the LEDs in the Cam-Buttons

Generally speaking, the left LED indicates the PSU state, the right LED the camera state, which results in the following:

Left	Right	Meaning
		No camera is connected to this channel

Left	Right	Meaning
		The PSU is receiving video signals from a connected camera
		The PSU is recording this channel, **no** auto-rec. available
		The PSU is receiving video- and auto-rec.-signals from the connected camera
		The camera is **not** running, the PSU is recording this channel **mannually**
		The camera is running, the PSU is **not** recording this channel
		The camera is running and the PSU is recording

By **pressing any "Play" labeled button for more than 1 second**, you can switch to special Takes/Shots-related "levels" or operation modes:

- *Delete*: Delete the current Take, a selection of Takes, **All Takes** or other files stored on the PSU.
  Deleted Takes can't be recovered! They are definitely lost, unless they were backed up to external media!
- *Editing*: Switch to Editing where you can do rough cuts of multiple Takes. The main displays in this mode are colored red.

- *Import/Export*: This is one way to get to the Import/Export dialog, where you can render Takes to different formats for exportation or import Takes, Stills, LUTs and more from USB-devices.
- *Hidden Takes*: Instead of deleting Takes it might be better to just "hide" them, so that they can be recovered. On the "Hidden Takes" level, you only "see" the hidden Takes and no longer the "normal" Takes. For example you can play them back here without having to uncover them first. In this mode the main displays turn gray.
- *Short Takes*: Every Take below a certain duration (initially 3 seconds) is marked as a *Short Take* automatically, and doesn't show up in the "normal" Takes. Here you can switch to this level, play them back or delete them specifically. You can change the duration in *Settings* → *Settings* → *Short Takes*. In this mode the main displays are bright-green.

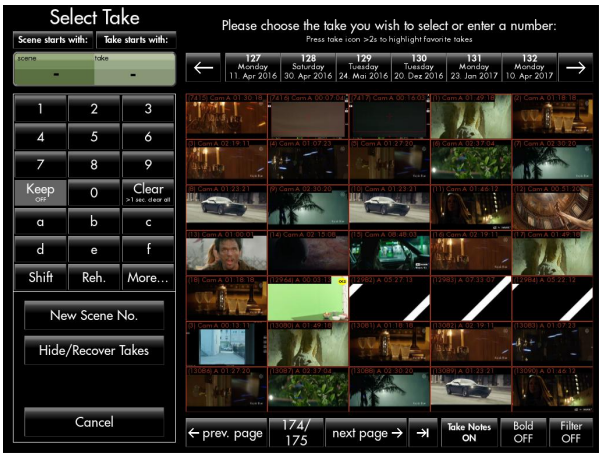
To return to "normal" mode, press *Play*, *Play 1*,... etc. again!

Take Number Display

The first green LCD-style display on the left shows the Take number or Scene/(Shot/)Take-Label of the

- currently selected take
- next recording in *Live mode*
- current recording in *Rec mode*
- or last recording for 10 seconds after Rec-Stop.

But there is much more! When you **press that display** you get to the **Takes-Selection** (<1s) or **Takes-Renaming Dialog** (>1s), where you can browse through all recorded shots by thumbnails and find Takes by date, Take-Labels and many more filters. Please see the dedicated chapters dealing with handling and labeling Takes for more on these topics!



Sound Level Meter

If it hasn't been turned off (*Settings → Audio → Sound Level ON/OFF*), the needle on the meter animates the current sound level of the picture you see. If you watch multiple cameras, the audio source of the first view is "shown", when playing back multiple Takes you "see" the audio of the player that was last actively controlled with the playback buttons or selected by pressing the image itself (→ Quick-Set-Menu) Or in other words: You see on the meter what you hear on the built-in Speaker.

The meter is also a **shortcut to open the Audio-Settings** (normally *Settings → Audio*), for example to **quickly Mute all audio outputs** of the PSU.

Pressing the meter for >1 sec will toggle **Mute all** as well (without opening the Audio-Settings).

Overlay

As the name implies: Here you can overlay up to 8 different (or same) moving or still sources like cameras, playbacks and single images/stills and distribute the result to all outputs. Please see chapter Overlay for details.

Settings Button

The last button on the left side opens a dialog that has 4 pages. The pages are labeled *Picture*, *Audio*, *Tools* and *Settings*. On these pages most of the PSU's functions and settings can be found, activated and configured.

- Picture-Settings: For every input channel (A,B,C,...) you can apply different Picture-Settings, like:
  - Anamorphic and self defined desqueezing
  - Chroma-Keying
  - LUTs
  - Color grading
  - Special effects and screen labels
  - Scopes (Waveforms)
  - Ground Glass Markings
  - Mask, Zoom, Rotate, Mirror, Move

  Every Take or Shot originates from or has to be assigned to a channel, even imported ones. So, if you change Picture-Settings for Cam A, all A-Takes are affected by them. And yes, you can change the channel of a Take anytime.
- In Audio-Settings you
  - assign audio sources to cameras,
  - set the volume of speaker and headphones,
  - control muting behavior,
  - enable automatic fan-switching-off during recordings ("Fan Control ON/OFF"),
  - adjust sync between audio and picture
  - enable analog Timecode support,
  - enable AES and AUX inputs and outputs
  - increase Audio-In-Gains and, last but not least,
  - enable audio for time-lapse or slow-motion playback.
- In **Tools** you can
  - configure the number of inputs (cameras) and playbacks,
  - set up automatic recording,
  - enable the Action Master (In-, Out- and Index-Points),
  - turn on scene numbering or labeling (like "Rehearsal"),
  - enable Take Notes (shows an arbitrary or metadata filled text whenever a certain Take is accessed),
  - enable Multiple Frame Print,

- set up Multi Camera Recording mode,
- enable support for Blackmagic Smart VideoHubs,
- unlock some “Expert Features”,
- configure the occasional showing of Tooltips
- take and manage *Frame Grabs* from arbitrary inputs and playbacks, with or without effects.

- And in the final **Settings** tab you configure
  - a temperature display, that shows the highest temperature of vital PSU-components
  - the time span that menus and dialogs stay open before they get closed automatically
  - the language of an attached (USB-)Keyboard
  - what labels and state indicators (Play/Live/Rec) are shown on the PSU or on Video-Outputs and WiFi-/Internet-Streams
  - parameters of the PSU-Screen (Brightness, Contrast, Color Temperature etc);
  - the code to unlock the PSU from “Locked mode”
  - resolution and compression of recordings (affects usable *capacity*)
  - the frequency and HD-SDI-format of Video-Outputs,
  - HDMI-Out frequency and mode
  - what is considered as a “Short Take” that gets hidden automatically
  - Slow-Motion-Interpolation
  - WiFi-Streaming
  - settings of the built-in Wifi-Router
  - Internet streaming
  - Authorization for accessing files on the PSU via its network interface (WebDAV)
  - the attached battery type
  - and of course: Date & Time

Time-Display & Take-Info

The Time-Display shows the **running time** of the selected take. With Action Master turned on, the absolute running time without the In-mark is shown in small on the left.
Press the Time-Display to switch to **remaining time** mode (counting backwards) or **timecode**.
A *Take-Info* or *System-Info* is displayed right below the Time-Display. *Take-Info* is only available in playback mode and shows recording date, recording time, shooting time, and screen time (the screen time differs from the recording time, if a playback speed higher or lower than sync speed is selected). By pressing these text lines, the Take-Info will switch to *System-Info*. This will show the number of recorded takes, hidden takes, short takes, free disc capacity in hours, and total shooting and screen time. On the lower right side, the used storage capacity, or import / export progress-bars are displayed.

Playing back Takes

Basics

These are the basic playback controls - if you press any one of them, the PSU switches immediately to Play(back) mode - if it wasn't there already.

To playback a shot, press *play*. The PSU will show the shot as it was recorded at the selected sync-speed. To play the shot in reverse mode (i.e. backwards), press *reverse* (or *rev.*). BTW: Audio will also play backwards!
To navigate within the shot, use the *slow* buttons or the *Navigator* on the bottom ("slider" element). If you press *play* **long** (for >1 sec), the take will be constantly repeated in a **loop** until you press *play* long again or press *stop*.

To play all recorded shots **continuously**, one after another, press *play* (or *reverse*) **twice**. Return to normal by either pressing twice again or *stop*.

The PSU is able to **play shots while they are still recording** ("immediate playback"). To do this, you have to select them in the "Select Take" dialog.

To change takes, either select them in the mentioned dialog or use the *skip* buttons. If you press and hold a *skip* button, the PSU will start to rapidly skip through all takes, until it reaches the first or last take. (Normally skipping from last to first take is blocked. You can enable this in *Settings → Tools → Expert Mode → First/Last Take Skip*.)

More buttons will be added to the Playback Section as more functions get activated...

Action Master (In-/Out-/Index- Marks)

To easily skip parts of shots before *Action!* or after *Cut!*, you can set In-, Out- and Index-marks. Parts "outside" of *In* and *Out* will be skipped during normal playback, but can still be reached with the *Navigator*. Activate In- and Out-marks in *Settings* → *Tools* → *Action Master* → *In/Out Marks*. You can press *IN* and *OUT* and thus set the points anytime during playback or recording. To **delete** them, the (paused) playback position has to be **on the mark** and *IN* our *OUT* must be pressed for >1 sec. To just change In or Out, you only have to press the buttons on a different position again without the need to delete the marks first. The Time-Display shows the running time between both marks. *Auto Trimming* sets In- and Out-marks automatically. The "trim off time" can be preset between 0,5 and 7 seconds.

Additionally you can set Index-marks that are like "chapters" within takes. They can be navigated to with the rounded *Index-Skip* buttons, which appear between *skip* and *slow* as soon as the get activated in *Settings* → *Tools* → *Action Master* → *Index Marks*.

To set an Index-mark press *INDEX* (left of the *Navigator*) while playback is paused or running at the desired position. **You can change the color of Index-marks** by pressing repeatedly *INDEX* when playback is paused **on the Index-mark**. You can **delete** a mark by pressing *INDEX* for >1 sec on the mark.

Slow Motion & Time Lapse

Cameras can only output a few defined speeds via HD-SDI, mostly 24, 25 or 30 fps. That doesn't (necessarily) correspond to the speed the camera is recording. So any changes to the playback speed on the PSU must result in an **interpolation** (in case of *Slow Motion*), that means that frames which did not come from the camera, have to be generated by the PSU. (Interpolation can be turned off in *Settings* → *Settings* → *Interpolation*, resulting in simple frame-doubling.)

Most speed related settings can be done in the **FPS-Keyboard**, that opens when you press the **FPS-Display** right to the Time-Display.
It is important that the correct **sync-speed** (presentation speed) is set once. Otherwise the interpolation factor is probably wrong... To adjust it, press the Sync-Speed-Display in the FPS-Keyboard. Supported sync-speeds are 24, 25, 30, 48, 50, 60 and the corresponding NTSC-rates, like 29.97 fps. Three buttons in the numeric keyboard are programmable soft keys for frequently used speeds - press >1 sec to set.

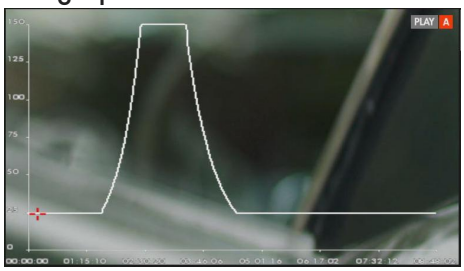
The playback speed range on the PSU is between 0.1 fps to 2000 fps.
More information on Frame Rates can be found here: Frame Rates in the PSU.

By activating *Settings* → *Audio* → *Variable Sound Speed*, Slow Motion and Time Lapse will be applied to Audio as well!
"Close" to the recorded framerate (±25%), the audio pitch will be preserved.

The speed setting on the PSU can be one of **three modes:**

- **Constant speed:** To change the constant playback speed of a take, use the -/+ buttons under the FPS-Display. By pressing the FPS-Display, a numeric keyboard will appear to quickly enter playback speeds (→ "FPS-Keyboard").
- **Original Camera Speed:** Shots recorded with Extended Alexa Metadata utilize the sensor-FPS information and show an OCS label (*Original Camera Speed*). The playback speed corresponds to the recording camera including any possible ramping. The use of the original camera speed information can be toggled in the FPS-Keyboard (see above).
- **Ramps** programmed on the PSU: Ramps are speed changes within a take and can be

arbitrarily defined in software. The idea is to find the optimal setting before shooting, for example with a Rehearsal shot. The Ramp Settings dialog opens by pressing *Ramp*, also to be found in the FPS-Keyboard. Navigate to the points within the take where the speed should change and press *Set*. The points will be stored and listed. By pressing on these listed points, you can select them and change the camera speed by using -/+ buttons or directly enter the speed with the keypad. You can also move these ramping points by changing the playback position while a point is selected. Of course it's possible to set/change position and speed in one go before pressing *Set* once.
The graphic simulation laid over the image will help you program the required ramp:



After putting all points and speeds together, press OK to activate the ramp. The PSU will be ready for playback. If the ramp is already calculated, you can press *Edit* to adjust it again. By pressing *Clear*, you can delete the marked point within the ramp. By pressing *Clear* >1 sec, you will delete the entire ramp. Press *Close* for >1 sec to lock the ramp in regular playback mode to this take. Otherwise the ramp will only be applied as long as the ramp-dialog is opened. You can also toggle the ramp-lock in the FPS-keyboard by pressing the ramp button for >1s.
If the ramp is locked, you can see this in the FPS-Display:
Locked: 

, Present but inactive: 

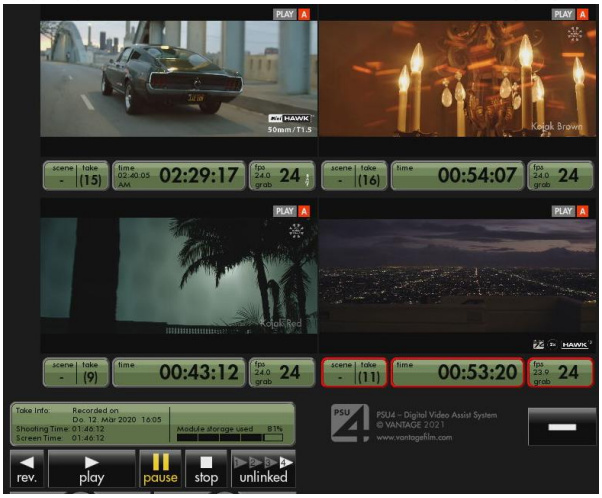
There is an additional speed related special effect: **Multiple Frame Print**. It simulates a printing of the same frame several times while the camera speed can be reduced (e.g. cam speed 4 fps, printing ratio 6x to reach 24 fps or 8x for 32 fps post speed. It can be activated in *Settings* → *Tools* → *Multiple Frame Print*, which adds a control to enter the factor below the -/+ buttons:

It can also be combined with *Original Camera Speed* and *Ramps*.

Dual-Playback / Multi-Playback

The PSU offers up to four individual players. Initially only one player is visible - you can activate two- or four-players mode in *Settings → Tools → Record Channels / Number (of) Players*:

The players can be used *linked* or *unlinked*, that means playback control affects only a certain player or all players at once, that got linked together to a group. This is controlled via the *Link-Button* that appears the right to the *stop* button. If the players are *unlinked*, simple repeated clicks on the button just change the *current player* successively. You can also select the current single player by touching the corresponding image directly. The current single player is highlighted with red frames around its displays and it's also shown on the Link-button:



In dual-mode a press >1 sec links both players, in quad-mode you must specify which players should be linked to a group. If you, for example, press play in linked mode, all linked players start to play.

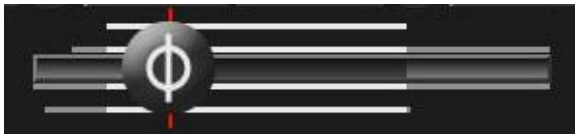
There are two fundamentally different cases regarding the frame- or sync- alignment of parallel playbacks:

- **Parallel Takes:** Takes which were **shot at the same time**, for example A/B shots with

two cameras, are **linked together at the first matching time code** automatically. If time code from the camera was recorded, it takes precedence over the PSU-internal time code (which is always present), otherwise the internal time code is used to sync the playbacks. If there is a problem with the camera time code (not in-sync...) this behavior can be changed in the *...Number (of) Players" menu (see above):

- Cam. TC: Use camera time code if present
- PSU TC: Use alway PSU-internal time code
- Manual postion: Recording time is ignored and takes must always be aligned manually like independent takes.

- **Independent Takes:** Takes recorded at **non-overlapping** periods of time **must be aligned manually** by positioning the playbacks for every player with for example the slow-buttons at the desired point. It's recommended to **set an Index-mark** there, or even better an IN-Point (if possible) before linking, so that the position can be found easily after pressing link.
  Reason: **The playback-start position will be on the first frame where all takes intersect** (have a valid frame) **in all players**, or on the first In-Point (if present) in one of the players. The navigator displays the relative positions of the players:



The longest take (in the example the third line) defines the complete navigator range. The white parts of the four lines illustrate the range where all players "have parallel frames", the gray parts are ranges where *some* players have a picture in relation to the others. Index-marks and In/Out-Points can be set in linked mode - they will replace In- and Out and add the Index-marks in all linked players!

To *unlink* the playback, a normal press on the button is sufficient.

When **skipping** or selecting a take via the "Select Take"-Dialog **in linked-playback mode**, the PSU tries to load the corresponding parallel takes if possible, and also tries to distribute them reasonably into the players, like the A-take into the first player and the B-take into the second, and so on.

The Video-Out Selector offers dedicated Multi-Playback options to automatically distribute Dual- or Quad-Playbacks to multiple monitors ("Dual Auto" & "Quad Auto") when switching the PSU between Live and Playback mode.

Recording Shots

Manual Recording

To start recording, press the appropriate Rec-Button. It will turn red. To stop, simply press it again. If you press for longer >1 sec while recording, you can

- just stop the current recording
- stop **and hide** it, or
- stop **and delete** it instantly. To start recording A&B at once, press Rec A or Rec B for >1s. The same pairwise shortcut exists for the other channels.

The takes will be numbered and ordered chronologically based on recording start time-stamps.

Multi-Camera-Recording

If you are constantly shooting multi-camera, like Cam A & B always running in parallel, you can facilitate the working process with *Settings → Tools → Multi Camera Recording:*

In the left example the A&B and C&D inputs shall *always* run together. The setup results in two **recording buttons** that always start two channels at once. In this case the PSU is also switched to Dual-Playback automatically, so that playbacks of A&B and C&D are linked **automatically** (by timecode). If this is not desired, simply unlink the playback once, until you need multi-playback again.

The second example links Cam A-D and E & F to one recording button, respectively. This also switches to Quad-Playback automatically.

Automatic Recording

All settings related to automatic recording can be configured in *Settings → Tools → Auto Recording*.

To use the Auto-Rec Function, a "flag" in SDI must be present. On the Alexa it is called *SDI-Remote*, on the Sony Venice it seemed to work only on SDI-OUT 1 and "*SDI Rec Remote Trigger*" had to be set to "HD-SDI-Remote I/F" (not "Parallel Rec"). The PSU supports both standards - the "Sony-Rec-Flag" (Alexa, Sony) and the "*SMPTE-RP188 timecode VITC-2 HANC metadata record flag*" (Red, Panasonic).

If the right LED inside the CAM buttons is green, it indicates the presence of the flag in the attached SDI. If the right LED is red (flashing), it means the camera is running. For more on the Cam-buttons' LEDs see here.

By starting the camera, the PSU will automatically record the video input as well as the sensor speed information (only with enabled Alexa metadata) for each channel. The recording will stop automatically when the camera is switched off. You can stop the automatic recording manually at any time by pressing the STOP button >1 sec. The *automatic recording stop* can be turned off (that means it will be ignored by the PSU and you have to always stop recordings manually).

With *Switch / Keep* you can determine if the PSU **switches to** the recording channel **automatically** when the camera starts (Semi-Auto: When *rec* is pressed, see below).

There are several options for Auto-assisted recording:

- Auto: The default mode starts and stops to record on the PSU synchronously to the camera.
- Semi Auto: When the camera starts, the PSU starts to record without notification. After the time that defines a *Short Take*, you will be asked if the recording should be kept or discarded:

Press *rec* at any time while the message is displayed, to record the entire take(s) with an automatic stop at the end of the shot(s). Press *No Recording* to avoid recording. The time the message gets displayed can be adjusted below. If no action is taken, the shot will be discarded after that time or when a new recording on the same channels starts in the meantime.

- Manual: Deactivates any automatic or semi-automatic mode. The recordings have to be started and stopped by hand. However, the camera speed will still be recorded (taken from Alexa metadata) and applied to the shot as *Original Camera Speed* (OCS).
- OFF: Like *Manual*, but neither recording, nor frame rates will be captured.

Rec.Beep: The PSU will beep with adjustable volume when an automatic recording starts. "0" turns the beep off.

> **Note:**
>
> When an automatic mode is active, the Next-Scene/Take-Labels will only be applied to automatic (i.e. "real") recordings, but not to manually started ones!

> **Note2:**
>
> When an automatic mode is active and the automatic stop seems to be wrong, like stopping although the camera is still running, maybe the signal is not stable / dropping out. The only workaround under this condition is to switch to manual mode or let Auto-Rec-Stop be ignored (needs manual stop).
> Starting with version 4.4, **automatic recordings keep on running for 5 seconds until they get stopped when camera signal is lost (expecting the return of the signal).** This has the side effect with all cameras that don't provide the *Sony-Rec-Flag* (i.e. RED, BlackMagic,...), that all automatic recordings stop 5 seconds late after camera stop.

Full Screen

If you don't need many functions and would rather like to see a bigger picture with less controls, you can switch to *Full Screen Mode* in the top right screen corner.

By pressing Full Screen for > 1 sec, you can also **hide all buttons and controls** and show only the picture like on a monitor. To return from this *Pure Full Screen*, simply touch the screen *somewhere*.

Quick Set Menu

Touching the picture itself opens a menu to quickly access some frequently needed functions:

- Zoom-/Move-/Rotate (Picture-Setting)
- Mask parts of the image (Picture-Setting)
- Change/Apply a LUT to the current channel (Picture-Setting)
- Take a Screen-/ Frame-Grab
- Define an overlay based on the current channel or playback
- (Re-)Label (set Scene/(Shot)/Take of) the current take or (next) recording
- Add Screen Labels to the picture
- Mark a take with one of the *Favorite-Labels*
- Specify if camera is *part of Rehearsal* (in *Live-Mode*)

The Quick Set Menu is colored matching the channel-color.

Sliders

A general word about *Slider*-Controls on the PSU:
Except for the main Playback-Slider (aka "Navigator", see above Playing back Takes), you can fine-adjust *step-by-step* the position and thus the value of a setting related to it, by **pressing somewhere left or right of the middle on the slider's "rail"**. This is also indicated by the -/+ symbols on the left and right of the rail and in the middle. Example: To change the *Gamma* value to exactly 101 (now: 100) in the dialog shown above, press once right of the rail's middle, to set it back to 100 press once left of the middle. This would be difficult by dragging the slider itself... The slider's button always shows the exact numerical value of the setting, for example for later reference.

"OK": Getting out of (Sub-)Dialogs

And a general word about the "OK"-Buttons in (Sub-)Dialogs: If you descend down into sub-menus of sub-menus, you can quickly "get back" i.e. close the current and all parental dialogs by **"pressing long"** on OK (> 0.5s).

Navigating & Handling Takes

Finding and selecting Takes

After starting up the PSU, the players are loaded again with the previously played takes. To load a different shot there are two ways to **open the Take-Selection Dialog:**

- Pressing the 

Take Number Display and
- pressing a Play Button (underneath the Cam-Buttons) when the PSU is already in *Playback Mode*, like *Play 2* and the PSU is already showing player 2 (exclusively).

The PSU will show all recorded takes as icons / thumbnails. The takes are framed with different colors corresponding the general camera color scheme of the PSU (Red → A, Blue → B...):

When you press one of these icons, the take will be selected immediately and the dialog be closed.

> **Note:**
>
> When you open the Take-Selector (or the other dialogs that look and work similarly), the current icon-page will contain the currently loaded take “outside”.

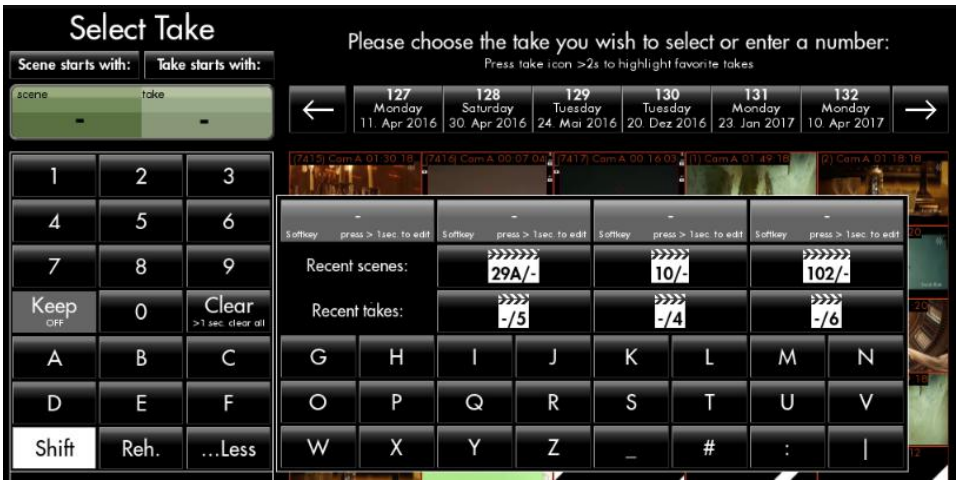
An **arrow pointing down** indicates that a take has been imported via USB or network.

Searching

When you open the Take-Selector (or the other dialogs that look and work similarly), the current icon-page will contain the currently loaded take outside.

If the take you are looking for isn’t on the current page, use

- ← prev.page / next-page →, first-page → / ← final-page, to step through page-by-page (“→|” always goes to the final page),
- enter the page-number directly by pressing the button that displays the current page number
- the **weekday-buttons above the thumbnails** to select a specific shooting day (the number above the date is a **day counter**, it can be activated in Settings → Tools → Expert Mode → Date + Shooting day ON/OFF).
- the **keypad to enter a take number or scene/(shot)/take.** As you type along, the icon-view will narrow down rapidly to all takes **containing** the number or **start with** the number you are entering (if you select *“Scene starts with:”* or *“Take starts with:”* above the display).



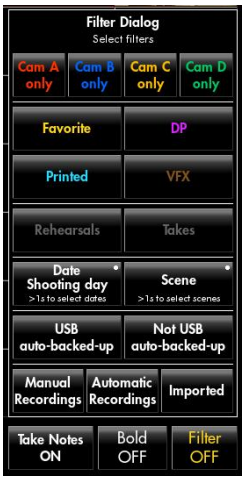
Searching takes is **not case-sensitive**, that means the result will also contain names with 'A' if you searched for 'a'. *Shift* switches the letters to upper-case. *Reh.* adds an R to the take number to search for *Rehearsals*. *More...* expands the keypad to all characters, and also contains predefined buttons that contain the last couple of scene- and take- numbers that were entered for New-Scene-numbers before (*"Recent scenes"*, *"Recent takes"*,...). You can also define your own shortcuts in the keypad, to not have to enter the same (maybe complicated) numbers again and again. Just press the *Softkeys* > 1s and enter your text.
Keep ON/OFF toggles if the entered Scene/Take search will be kept accross closing and re-opening the dialog, or not.

Take Notes ON/OFF toggles the display of *Take Notes* on the thumbnails.

> **Note:**
>
> It is not possible to search for takes with a specific *Take Note*, yet.

Bold ON/OFF toggles the display of Scene/Take with big letters accross the icons.

Filtering the view

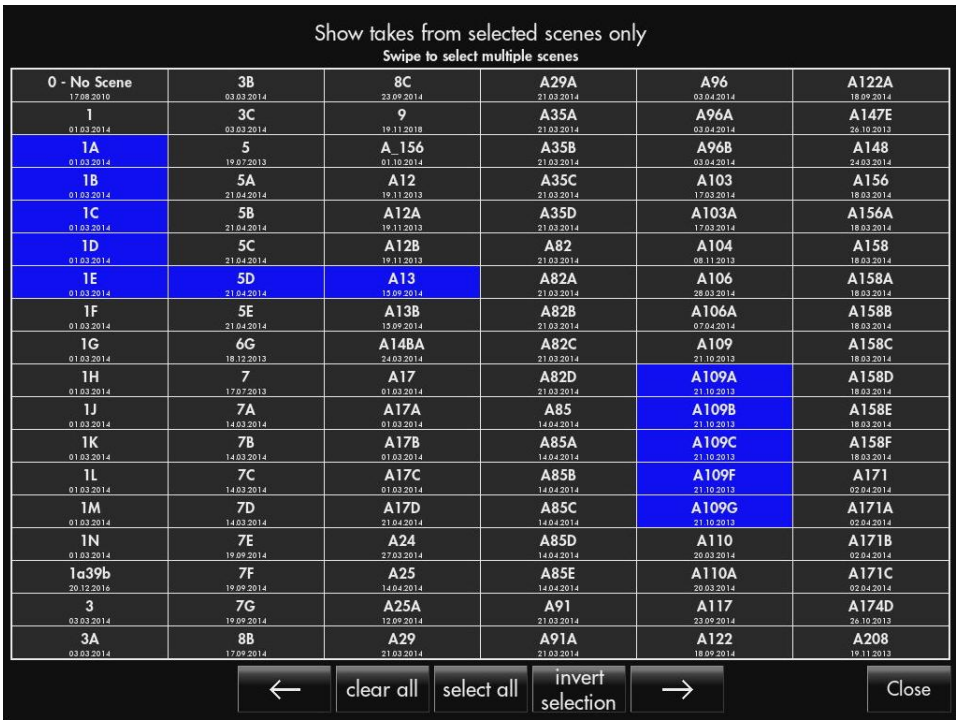


When working with a lot of takes, it might be interesting to filter or limit the icon view to certain attributes. Press the Filter-button on the bottom right to open the menu. It is possible to select and combine the following characteristics:

- The **Camera** the take was recorded from
- The **Favorite** label type (see Labeling Takes Labeling Takes)
- **Rehearsals** / ("normal") Takes
- **Changed Channel**
- A range or set of **dates/shooting days**
- A range or set of **Scene numbers**
- Takes that have or have not been **backed-up** (copied) to a backup drive (see Import / Export for details.
- **Manually recorded** takes (by using the *Reord-Buttons*)
- **Automatically recorded** takes (recording was triggerd by a flag in the SDI stream, see Automatic Recording)
- **Imported** takes (imported via USB or the Network Interface

To define a set of dates or scenes that shall be visible **only**, press the respective button > 1 sec and select the elements you want. If nothing is selected, **every** take will be filtered out when applied, because you have to select what should be visible! You can toggle filtering by simple/ normal pressing the buttons.

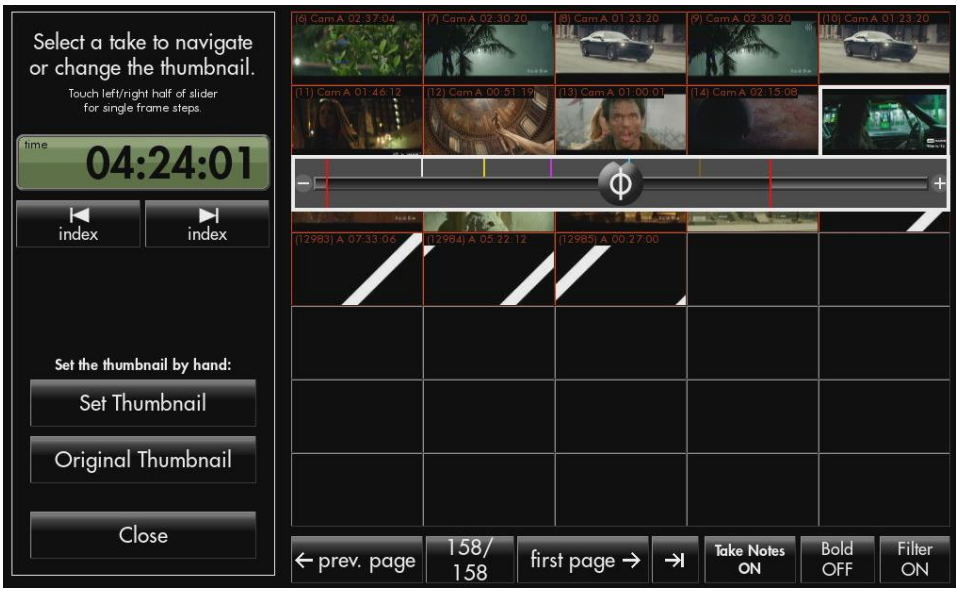
Example of setting up a Scene-Filter:



Adjusting Thumbnails

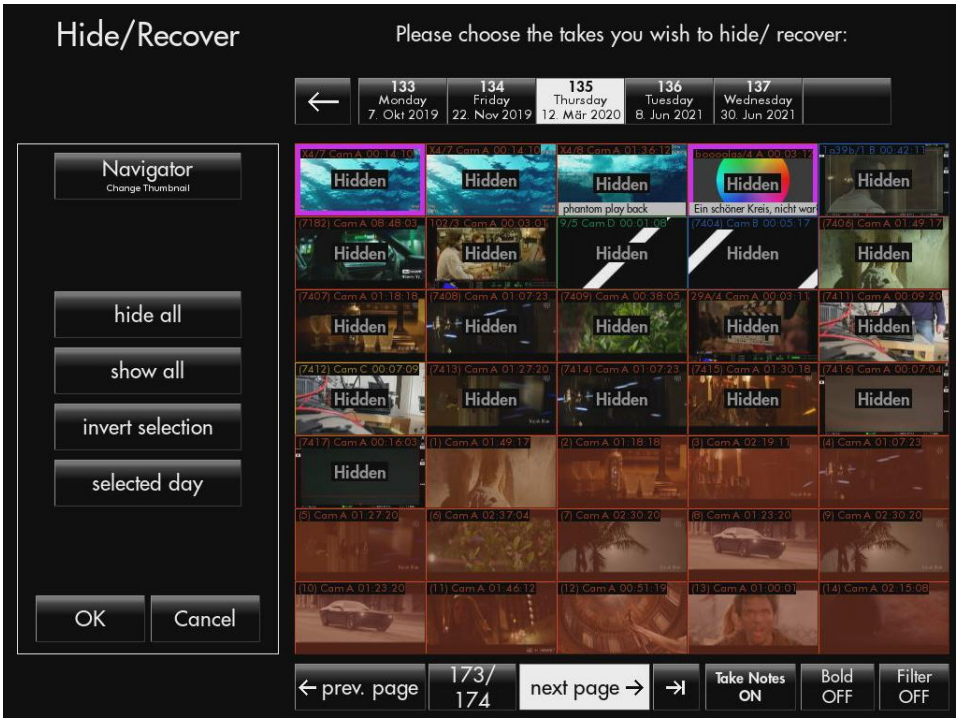
The PSU always chooses the middle frame of a shot as the thumbnail. This can be changed take-wise. To do this, enable the *Navigator Change Thumbnail* button in *Settings → Tools → Expert Mode*, which will add an additional button in the Take-Selector and its "relatives". Pressing the *Navigator* button will select the current take (that is loaded outside) indicated by a white frame, and the *Navigator* (a slider to select a frame in the take) is positioned below. Select a different take anytime. In- and Out- as well as Index-Marks will be shown on the *Navigator*, if present.

Example:



You can jump through the take with the index-skip-buttons or move the *Navigator* until you find the right image, then store it with *Set Thumbnail* or revert back with *Original Thumbnail*.

Hiding Takes



To "clean things up" you can **remove takes temporarily, without having to delete them** by just "hiding" them instead. Hidden takes won't show up anymore until they get

recovered. Press *Hide/Recover Takes* in the *Select Take*-Dialog to get into the dialog. There you can select multiple takes individually or automatically that will be hidden when you press *OK*. Example: To select all takes of a shooting day, press a certain date followed by *selected day*. Repeat this for multiple days if applicable. If you want to hide most of the takes, and just keep for example a certain day, begin like above and press *invert selection* to **keep only** the selected days. You can also begin with *hide all*, select a day + *selected day* to deselect the takes you wish to keep. By the way: Filters can be used in combination for even more sophisticated cases...

Press *OK* when you want to apply the selection, or *Cancel* to back out without any changes. Pressing *OK* or *Cancel* for > 1 sec will take you back to the main screen without going through the *Select Take*-Dialog.

As explained in Basic Operation, you can switch the PSU to different *Playback-Modes:* One of them is the "Hidden Takes Level" where you can only see and playback all the hidden takes, so that you don't need to recover them just for a rare playback request.

For an explanation of the remaining buttons, please see chapter Finding and selecting Takes.

Deleting

As also explained in Basic Operation, pressing *Play* (underneath the Cam-Buttons) for > 1 sec will bring up *Delete*. Then *Delete* opens a small option dialog to

1. *Delete Take:* Deletes the current take that is loaded in *Playback 1* (**Code: 1234**)
2. *Delete more Takes:* Delete a selection of takes (**Code: 4567**)
3. *Delete Disc:* Delete all takes including all hidden & short takes, cuts, and compressed versions (generated for exports). (**Code: 7890**)

4. *Delete other Files:* Open a sub menu where you can specifically delete the user-uploaded Test and No-Input-Images, LUTs (Color-Look-up-Tables) and CDLs (Color Decision Lists). These can be deleted without a code.

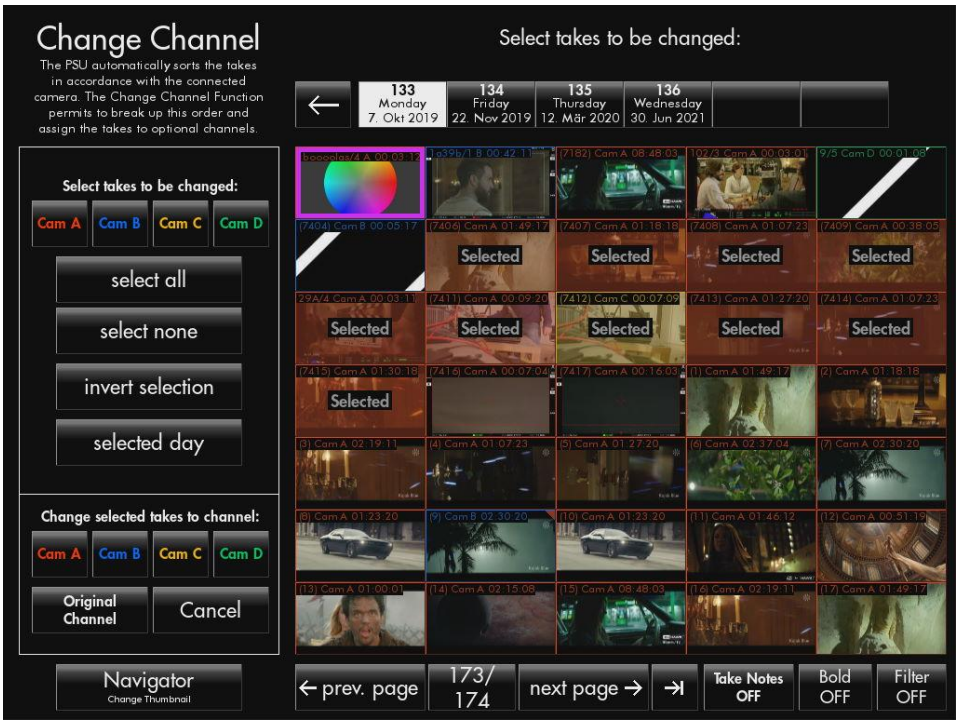
Selecting 1. or 3. leads to a *PIN-Keypad* to enter the code followed by "OK".

To delete a certain selection of takes, like "all Rehearsals" or a certain shooting day, *Delete more Takes* provides a Takes-Selection that looks and works similar to *Hiding Takes* above. *Filters* take effect as well, for example *Cam B only* + *select a day* + *selected day* would mark all B-takes of that day for deletion. The *Pin-Keypad* is included here.

After "OK" you still have a few seconds time to stop the deletion with *Stop Take Deletion*, and you can also interrupt the running process. But of course all takes, that have been deleted until then, are **definitely lost and can not be recovered** (without a backup).

To delete only hidden takes or only short takes, enter that level as described above or inn Basic Operation. Then the delete-function only works for this level and does not affect any takes at the "normal" level.

Change Take-Channel



For several reasons it is sometimes needed to change the recording channel of takes, for example to turn an A-Take into a B-Take. This can be achieved by enabling *Change Channel* in

Settings → Tools → Expert Mode. This adds another button in *Select Take* that gets you to the *Change Channel*-Dialog.

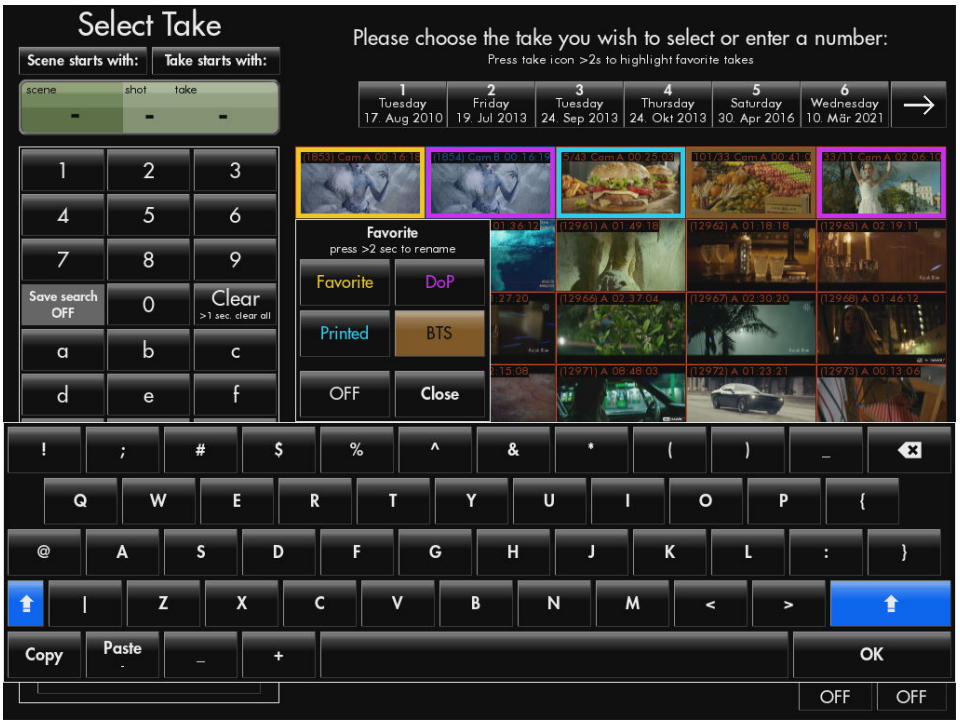
There you first select the takes you wish to change by the same means as explained in *Hiding Takes* and *Deleting Takes*. The only difference is that you additionally have dedicated Cam-buttons on the top to select all takes of a certain channel at once (without the need to use a filter). Then you press a Cam-button in the bottom row to immediately change all selected takes to that channels. *Original Channel* reverts any changes done earlier on the selection.

As there is no OK-button here, exit this dialog by *Cancel*. Pressing it for > 1 sec will take you back to the main screen without going through the *Select Take*-Dialog.

Take naming and annotating

There are several possibilities to label recorded or imported takes on the PSU.

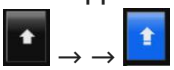
Favorite Takes



The most basic "annotations" are *Favorite-Labels* - they are intended to **indicate important takes** of some kind. You can choose from **four categories you can define yourself** as it suits you most!

On first use, they are predefined as "Favorite" (yellow), "DoP"(magenta), "Printed"(cyan), "VFX"(brown). (Yes, we know e.g. *DoP* is not common in the US...)

You can set or change a Favorite-Label of a take in the
* Select Take Dialog: Press any of the icons for >2s to mark it as a Favorite Take. Press any of the Favorite-Category buttons for >2s to change the name itself (see picture above.)
* Quick Set Menu
* Take Notes Keyboard: Press the "Favorite"-Button on the top right corner there.

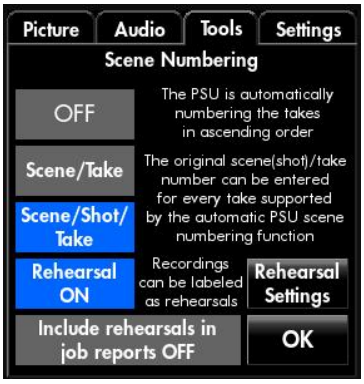
> **Note:**
>
> In every keyboard on the PSU, pressing the "shift-case"-button **twice** locks it, so that you can enter upper-case letters in-one-go until you press it again!
> 

You can filter every Take-Icon-View by one or more Favorite-Label(s).

After assigning a Favorite-Label to a take, its icon will always be **hilited** with a blinking frame of the color of the selected category.

Scene/(Shot)/Take & Rehearsal

Conceptually, the PSU doesn't need much setup and knowledge to work with it. Power-On, Record, Playback - that's it. Because of that, the PSU just increments a simple Take-Number that is displayed in the Take Number Display.



In *Settings → Tools → Scene Numbering* one can enable support for
* Scene / Take or
* Scene / Shot / Take, and additionally
* Rehearsal labeling.

Neither Scene, Shot or Take is limited to just "numbers" - you can enter letters, numbers and a few special characters in any combination. If the *Next Recording Labels* are not set explicitly, the PSU tries to guess the next Take number automatically based on the last recording of the respective recording channel (Cam A, B etc.). For that matter it increments the Take number either numerically (if a numeric value is present!) or alphabetically and keeps the Scene (and Shot) number as it is.

Some examples of this automatism:

Last Recording	Auto-Incrementation
42/2	42/3
42/99	42/100
X22/2/abc1	X22/2/abc2
X22/2/abc	X22/2/abd
X22/abC	X22/abD
X22/12CC	X22/13CC

Admittedly, this algorithm might be wrong in many cases. To check before the next recording, its *Next Take* label is shown in the Take Number Display in *Live mode*.

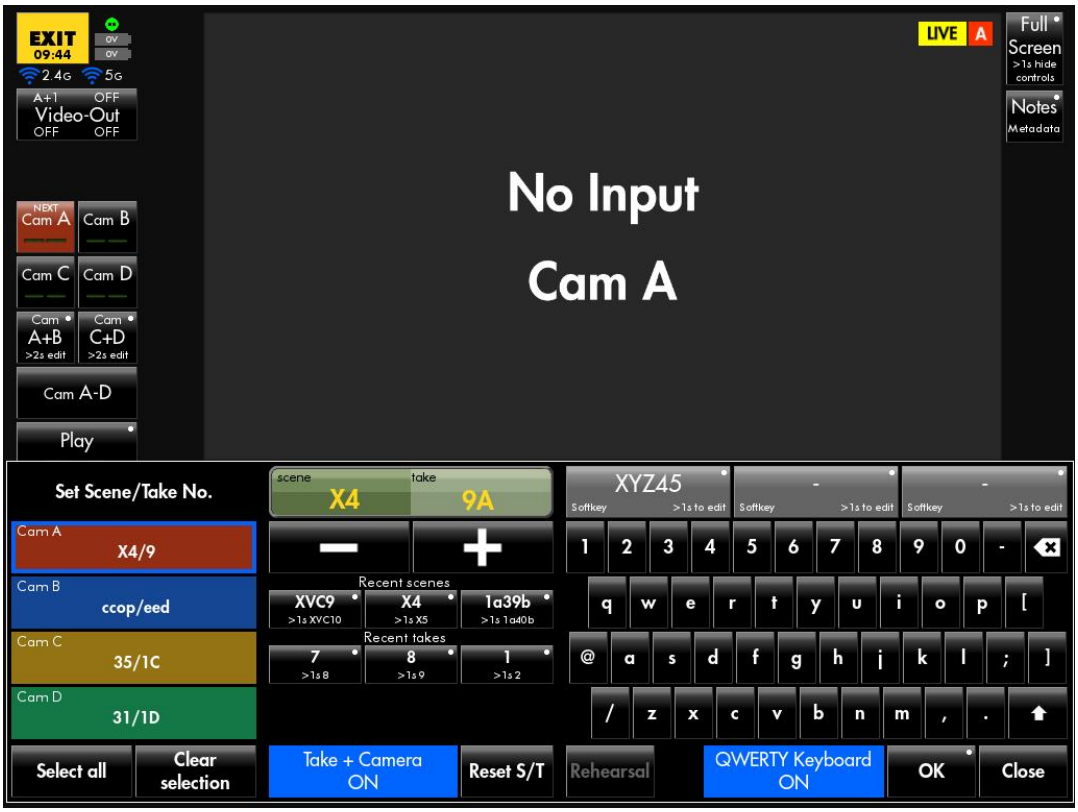
It is always possible to edit Scene/Shot/Take - you can do it *before* the the next recording, *during* recording, or anytime *after*!

"Set Scene/Take No."-Dialog

Starting with software version 4.6, there are three ways to open the ***Set Scene/Take No.-Dialog***:

- When the camera(s) that will be recorded for the next take(s) is already visible, i.e. when the PSU is in "Live-Mode", the corresponding Cam-button will have an additional "Next" label. When this button is pressed (again), the Set Scene/Take No. Dialog will appear. Or in other words, press the Cam-button twice if the camera is not already shown...
- Press the Take Number Display for >1s (Note: This has been changed compared to former versions, where this would open the also still existing "New Scene"-Dialog a.k.a. "Takes-Renaming"-Dialog, see below.)
- Press the *"Set Scene / Take"-button* in the Quick-Set-Menu

Example: The PSU is in Cam/Live-A mode - note the "Cam A"-button showing "Next". The dialog is opened to set the Scene/Take for the **next recording**:



On the left side, select the camera(s) to set up - if you select multiple channels, the scene and take label (of the green display) will be applied to all of them. If **Take + Camera** is active, the **camera letter** ('A', 'B',...) is appended to the take-label **automatically.**
With the **+/-** - buttons one can quickly adjust the currently selected part of a label by "one".
The **Scene/Take-Display** is pre-loaded with the label of the last recorded take on this channel incremented by one (in yellow).

Recent scenes and **Recent takes** are pre-initialized shortcuts with recent labels that were already used on past recordings. A "normal press" copies the value into the current label. If you press for >1 sec, a value incremented by one is transferred as it is written in small on the button.

The three **gray buttons** are programmable **"softkeys"** for example for lengthy scene numbers. Press >1 sec to edit, and press the button again to end the "programming". The alphanumeric keyboard can be toggled between "QWERTY" and alphabetical mode. In "QWERTY-mode, it honors the language configured in *Settings → Settings → Keyboard Language*.

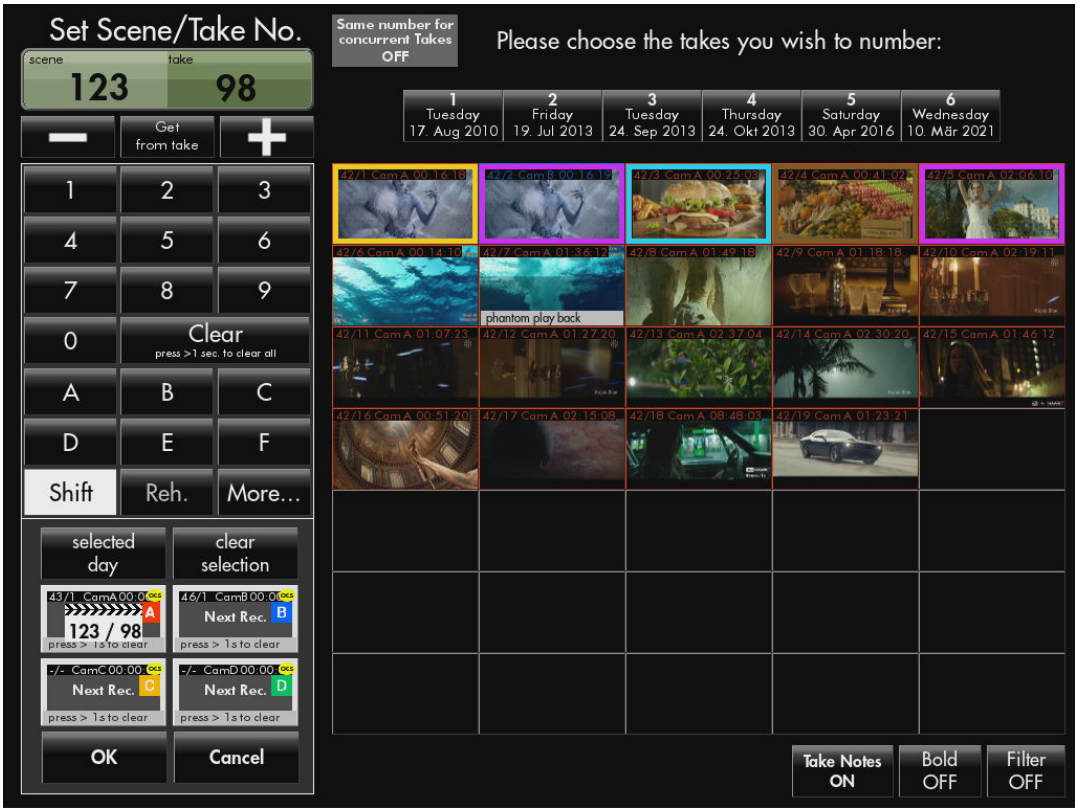
Rehearsal toggles the Rehearsal-Attribute of **existing takes**, it can't be changed for the "next recording", because that would conflict with the Rehearsal-state of the recording buttons.

Most importantly, **OK** finally applies the entered Scene/Take - pressing it for >1 sec closes the dialog, additionally.

Needless to say - if you select the **"Scene/Shot/Take"**-Scheme in *Settings → Tools → Scene Numbering*, the above dialog is extended to support entering the Shot-Number as a third attribute accordingly.

"New Scene No."-Dialog

The (historically) **former way of setting Scene/(/Shot)Take is still available.**
It's main advantage is the possibility to **re-number an existing set of takes in one go**. In favor of the dialog explained above, it can (now) only be accessed via
Select Take Dialog → **New Scene No.**
It looks like this:



Depending on *where you came from*, either the current take (Playback Mode) is already pre-selected with a slate symbol, or the *Next Rec.*- button (Live Mode) matching the Take Number Display which you pressed to get into "Select Take".

After marking *what you like to number* and entering the basic Scene/(Shot)/Take, press **OK** on the bottom left. The labels on the selected items will change. The dialog will stay open to allow for further changes. **You can return** either by *Cancel* or **pressing OK for >1s**.

> **Note:**
>
> To display the labels in "big" across the icons, toggle *Bold* in the lower right corner...

There are a lot of convenience functions to edit the numbers:

- **Fetch** Scene/Shot/Take respectively **from a certain take:** Press *Get from take* and then some take icon
- **Increase / Decrease by one** with + / -
  Pressing *More...* will give you:
- **3** Softkeys to define for yourself, so that you don't have to enter i.e. the same long Scene-Text again and again.
- **The last 3** Scene, Shot and Take **numbers**
- **Fetch** Scene/Take **from Alexa Extended Metadata Fields** if present.

As mentioned above, **Set Scene / Take No.** is *the* tool to re-number a sequence of already recorded takes of a certain scene. You can select multiple takes which will be (re)numbered based on the label you enter on the left. If simultaneously recorded takes from different cameras shall receive the **same** take number in this process, activate "Same number for concurrent takes".

Quickly adjust Scene/Take in main view

In *Live* or *Rec Mode*, there is an **additional way to quickly adjust Scene/Shot/Take** with the + / - buttons on the right of the **main view:**

Toggle between Scene/Shot/Take by repeatedly pressing *Change ... Number* in between + / -. If you change *Scene* by this, *Shot* and *Take* are reset to 1. If you change the *Shot* number, only *Take* gets re-set.

Rehearsals

Activating support for **Rehearsals** in *Settings → Tools → Scene Numbering* gives an additional button above the *Recording-Buttons* on the bottom right. All takes recorded in *Rehearsal Mode* get an **"R" prepended** to the take number automatically.

Rehearsal Mode is **active** when the (Rec-)buttons are **gray** and the **light** or "LED" on the bottom of the Rehearsal-Button is shining **bright!**

The Rehearsal-Flag of existing takes or running recordings can be toggled anytime by pressing the Rehearsal-button for >1s. (Normal/short toggling just switches the Rehearsal Mode for future recordings.)

You can also edit the Rehearsal-Flag of existing takes in the *Set Scene / Take No.* dialog with the "Reh." button in the keypad there, or in the Quick Set Menu, like the Favorite Labels.

When searching for takes in any of the icon-views, you can filter by the Rehearsal-Flag. To filter explicitly for *non-rehearsals* use *takes* in the filter menu.

Initially, the Rehearsal-Flag is applied to all active inputs in the same way, when the Rehearsal-Button is pressed, like in the above example. In *Settings → Tools → Scene Numbering →* **Rehearsal Settings** you can specify the Rehearsal-Mode **for every camera individually:**

Here Cam C and D won't be set to Rehearsal Mode when the Rehearsal-Button is pressed. You can also switch the Rehearsal Setting in the (→ Quick-Set-Menu) of every input, e.g. for Cam B ("Camera part of rehearsal"):

Notes & Metadata

Additionally to the above, you can also add arbitrary *Notes* to takes, that get displayed every time you access a take, i.e. when you skip to it or select it via Select Take. To activate, turn on *Notes/Metadata* in *Settings* → *Tools* → *Take Notes / Metadata*.

After activation, the Notes-Button will appear below *Full Screen* in the top right corner.

A longer tap (>0,5s) on it opens the big *Notes-Keyboard*.
A simple tap will *show* or *hide* the note of the current take.

In the Notes settings you can adjust how long *Take Notes* shall be shown after accessing a take:

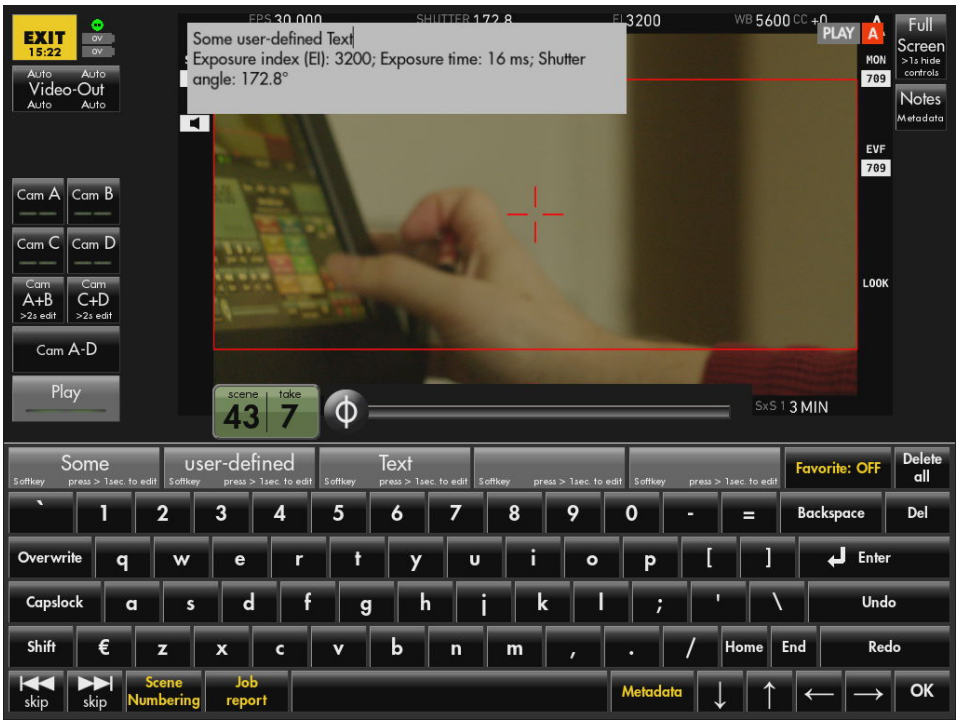
- Manually ("MAN"): Notes will **only** be shown when you press the Notes-Button.
- A time-span from 0,5 to 30 seconds, after which it fades away automatically. You can always bring it up again by pressing the Notes-button less than 0,5s (i.e. normally)
- Permanently: Notes will always be shown, unless you press the Notes-Button to hide them until the next take gets accessed.

Below the setting of the display time, you can specify on which Video-Outs and Stream-Outs *Notes* shall be visible.

> **Note:**
>
> The first few words of a Note can also be seen in all take-selection dialogs on the small icons, if "Take Notes" is set to ON, there.

Entering Notes

Pressing the *Notes-Button* (below Full Screen) for >0,5s brings up the *Notes-Keyboard*:



The text-box appears on top of the image. On the keyboard, the first 5 gray buttons are "soft-keys", that you can initialize yourself with often-needed text modules (press >1s to edit).

> **Note:**
>
> You can change the keyboard language in *Settings → Settings -> Keyboard Language*

There are some special keys worth mentioning:

- **Overwrite:** Normally everything you type is *inserted* at the position of the cursor. *Overwrite* changes this mode so that typing will replace the characters at the cursor.
- **Capslock:** Permanently *shifts* the keyboard to upper-case and different special keys

- **Skip back-/forward:** Skips takes but keeps the keyboard opened, to successively enter Notes for different takes.
- **Scene Numbering:** This a shortcut to open the *"Set Scene/Take No."* dialog from here, with the current take pre-selected.
- **Backspace** deletes left from cursor, **Del** right from it.
- **Home** sets cursor to the beginning of the current line, **End** to the end of the line.
- **Favorite** marks the current take with one of the four Favorite Labels explained above.
- **Delete all**: Press >1s to delete the complete Note of the current take!
- **Enter** begins a new line in the Note.
- **Undo** reverts the changes you made since you "opened" the current Note
- **Redo** applies the changes again you reverted with *Undo*.
- The four arrows are there to move the cursor around in text of the Notes field.
- Pressing **OK** or the **Notes-Button** (below Full Screen) saves the current Note and hides the keyboard.

Metadata and **Job Report** deserve their own chapters:

Metadata

When available in the HD-SDI signal, the PSU records the Extended ARRI Metadata of every take. Pressing the **Metadata** button in the Take Notes Keypad opens a new dialog that lists all metadata fields and their contents like this:

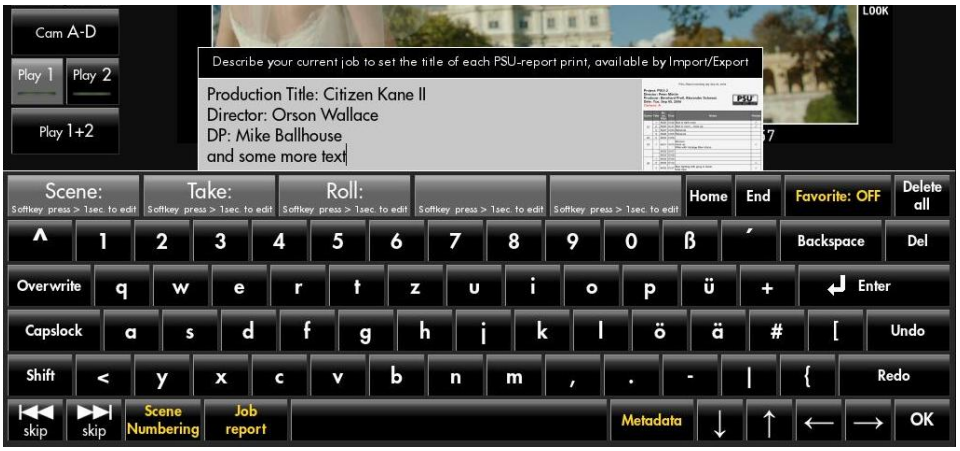
For every individual field you can select to display (append) the data to every Take Note automatically (Notes Column). The same can be done for the Notes shown in the Job- or PDF-Reports.

By default all metadata fields are shown, but you can shrink or expand all or selective metadata categories with *Hide all*, *Show all* and pressing the category names like e.g. “Root information”, “Image data information” and so on.

With **FCP XML Metadata Download** (FCP = Final Cut Pro) you can toggle the download availability of the ARRI Metadata for every take (if available) in separate XML-Files via the WebDAV-/Network-Interface of the PSU.

Job Report Header

Pressing the **Job Report** button in the Take Notes Keyboard opens a special text/notes field, where you can enter the heading text that will be integrated at the beginning of every Job- or Shooting-Day- PDF-Report.



Live/Rec Take Notes

It is possible to enter Take Notes **in advance** in *Live Mode* or **while recording**. If more than one camera is displayed on the PSU at that time, like shooting and showing A&B etc, the Notes are applied to ALL visible channels at once. If you want to enter different Notes for different cameras in Live Mode, you have to enter them one after the other switching through the channels. Some buttons of the keyboard are not available in Live-Mode, for example those to skip through takes.

Video-Outputs

If you are looking for information on how to control of what is shown on the Video-Outs, please go to Control Video-Outs

This chapter will focus on technical specifications, setting up HD-SDI- and HDMI-Outputs, monitoring their state and controlling external BlackMagic Smart Videohubs.

The term *Output* in the context of the PSU always means a picture that can contain up to 8 different and mixed *Views* on cameras and playbacks. **Every Output is always completely independent and "unlimited" from the state of all other Outputs**. All *Outputs* originate from the PSU and can not be just looped through/around it, without external devices, like a Videohub. The benefit of this approach is, that you always get the configured picture effects on all outputs. The downside is, of course, latency.

Technical Specs

Speaking of latency: A picture fed into the PSU shows up on the PSU's monitor one frame later, and an additional 0,5-1 frame later on the Video-Out-connector electrically (drifting a little). So in sum **the PSU introduces a latency of (just!) 1,5-2 frames into the signal chain**. If the actual experienced latency on the whole setup is longer, it stems from the camera itself and the attached transmitters, hubs and monitors.

> **Note:**
>
> The above applies for example to 30 fps in / 30 fps out. The situation can be **further improved by utilizing SDI-3G modes** (p48, p50, p60) on the outputs, if cable lengths and monitors allow that(!)
> If you want to do that, you should always use multiples of 2 of the input frequency, for example if input is 24Hz, set the outputs to 48Hz!

Regarding HD-SDI **cable lengths**: For **1.5G SDI** (up to 1080p30) you can use up to **100m/330ft** of (good) cable. Because higher frequency always means higher signal attenuation, the maximum cable length for 3G-SDI (up to 1080p60) results in **60m/200ft**!

Setup

To set up signal formats of the Video-Outputs and more open *Settings* → *Settings* → *Video/ HDMI-Out Settings*.

The basic version looks like this:

It is highly recommended to **set all Video-Outs to the same frequency** - and especially also **to the same frequency as the input signal** - to avoid unnecessary stutter.
The basic version of the dialog does exactly this: Set all outputs to the same speed and format. If you absolutely want or need to set up one or more outputs differently, e.g. because one connected device can not handle the desired format, activate *Export Mode*. This allows you to set up different modes for all 4 outputs:

First select a specific output by its number and then adjust the format.

Monitoring

With *Monitoring* ON/OFF, you can activate a small live monitoring area showing all 4 Video-Outs on the PSU screen! The displays will normally be arranged between Playback and Recording buttons if no Settings menu is opened. Otherwise monitoring will show up somewhere else...

Here you can see that Video-Out-1 is displaying Cam A, Video-Out-2 Cam B, and so on. If you **press somewhere** on the monitoring, the main 4 outputs are shown **enlarged** on the picture area, and small versions of the Internet/Wifi- Streams, and or HDMI-Outputs are shown *additionally* (if activated). You switch back to "normal" by pressing one of the previews again.

> **Sidenote:**
>
> There is also a Video-Out-Monitoring option for every Internet/Wifi-Stream. So you could - for example - use one of those as your Video-Out-Monitoring-Stream as an **extension to the PSU-Screen**. (See Wifi Streaming)

Embedded Timecode & Recording Flag

The built-in SDI-Video-Outputs 1-4 can output timecode and recording flag of the currently visible picture. If more than one camera or playback is visible on the respective output, timecode and flag **belong to the first** (top-left) **picture.**

Field of application: These capabilities were requested by PSU-Operators to control *lights* by the timecode in an Overlay-(SFX)-Shot, the recording flag was desired to silence the fans of wireless transmitters attached to the PSU during recordings.

To activate, open *Settings → Tools → Expert Mode*:

The related settings are under ***Metadata for Video-Out***:

- ***Video-Out Timecode ON/OFF*** in fact toggles the embedding of any metadata into the SDI, that means timecode *and* recording flag.
- ***Rec-Flag OFF:*** Only put out timecode, but no recording flag
- ***Rec-Flag any PSU rec.:*** If the PSU is recording ***any*** camera, the recording flag is active on all Video-Outouts, regardless of the recording being visible there or not!
- ***Rec-Flag monitored cam only:*** The recording flag is only active on an output that displays a running recording (in the first view).
- ***Add. Rec-Flag in TC ON/OFF:*** Normally, the recording flag is only output in "Sony-Rec-Flag-Format", as it is also used by Alexas. Here you can **additionally** embed the recording flag into the timecode, like for example Red- and Panasonic- cameras do. To be precise: The recording flag is also set in Timecode-Userbits-Word 1, Bit 3.

HDMI-Out & Extending Outputs to 8

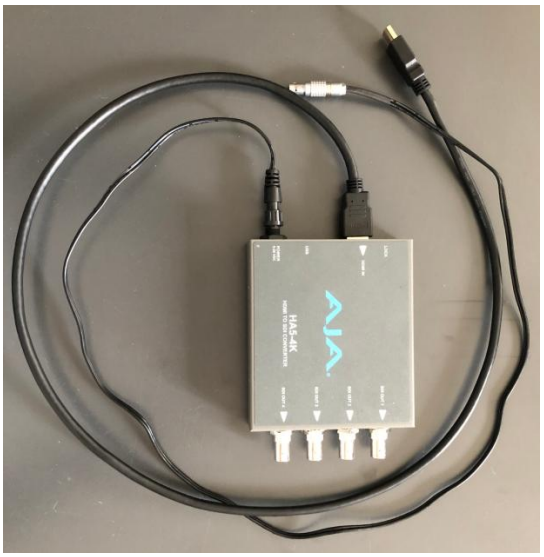
What's left is the "HDMI" labeled button to configure the HDMI-OUT connector of the PSU-4. Press it to open another sub-menu:

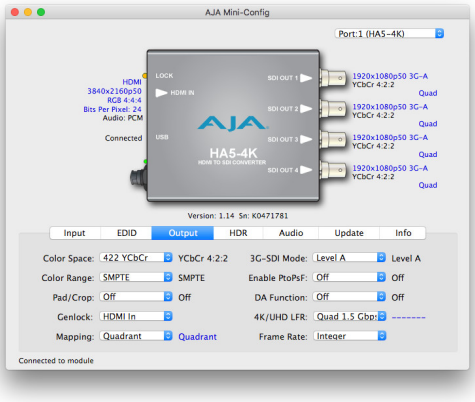
It is highly recommended to first connect the powered HDMI device (like a monitor or splitter) to the PSU before turning it ON, because for example embedded audio might not work otherwise. Then, switch HDMI-Out ON in the Settings dialog (on the left, if not already done).
This extends the PSU-4 either by

- a 5th (independent) 1080p/Full-HD Video-Out called "Video-Out 5"
- a 5th (independent) 4K (3840x2160) Video-Out (!), called "Video-Out 5"
- or **4 additional independent 1080p Video-Outs** labeled Video-Out 5-8 by means of a device that can split up a 4K HDMI picture to 4 single Full-HD pictures. We know of at least two devices that can do this: The *AJA HA5-4K* and the *Blackmagic Design Teranex AV UltraHD 12GSDI Video Wall Controller*. Maybe it would also work with the *QTAKE Output Device QOD+* ☺ (untested...)

> **Note on *Embedded Audio*:**
>
> Audio is embedded in the HDMI-Out signal (if supported by the external device) and thus offers currently the **only** option to integrate audio into some HD-SDI on the output side (besides Streaming) without using another cable from the Audio-(XLR-)Outputs together with the built-in Video-Outputs.
> The four audio pairs that correspond to what you see on Video-Outs 5-8 are embedded into the audio channels 1-8 of the HDMI-Out like the following:
> Video-Out-5-Audio-L/R → HDMI-Audio-Channel 0,1
> Video-Out-6-Audio-L/R → HDMI-Audio-Channel 2,3
> Video-Out-7-Audio-L/R → HDMI-Audio-Channel 4,5
> Video-Out-8-Audio-L/R → HDMI-Audio-Channel 6,7
> **(Embedded Audio is available since PSU-Software-Version 4.4.7)**

The most affordable and easiest-to-get option to add 4 additional video-outputs is probably the AJA box. To make it work, you need to set *"Mapping"* to *"Quadrant"* in the *"AJA Mini-Config"*-Tool:





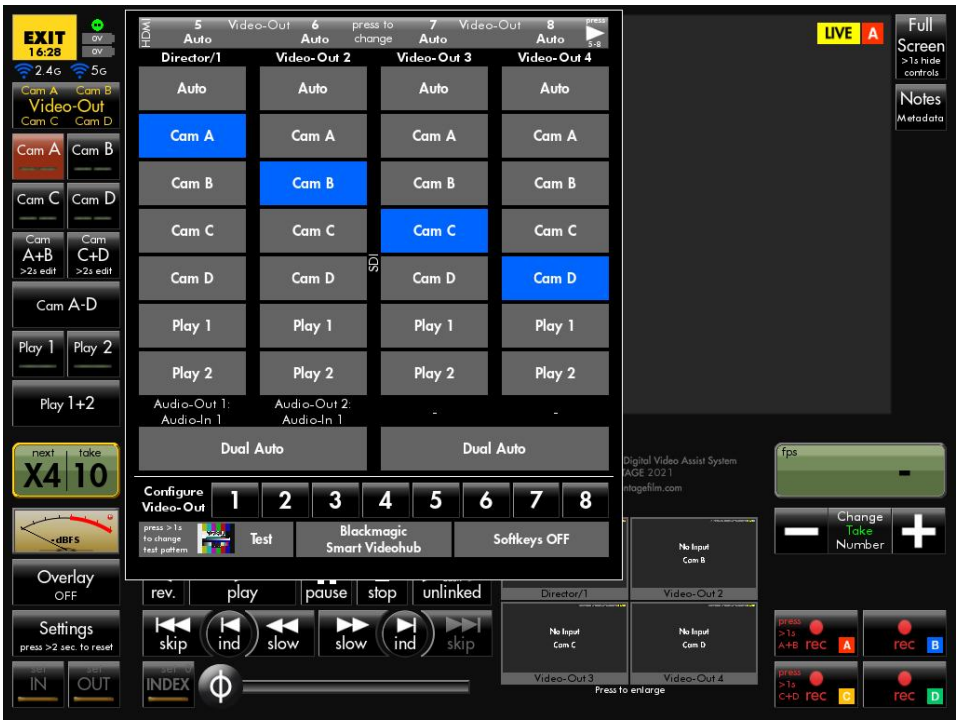
Unfortunately, only SDI-OUT 1 on the AJA HA5-4K carries all the audio, 2-4 are “empty”. Maybe it could be accomplished with the Teranex mentioned above (untested...) If you only need one additional output, you can use simple, one-channel HDMI-to-SDI converters, like the old AJA HA5, or some Blackmagicdesign Mini Converter etc.

As you can see from the frequency options in the HDMI-Out-Settings dialog, you can also utilize the **3G SDI** options as known from the built-in connectors. (The HDMI-OUT is compatible to **HDMI 2.0**, that means up to 4K/UHDp60. The output format of the PSU’s HDMI-Out is always RGB/Full-Range/8 Bits per color - at the moment.)

Auto means, the HDMI-frequency follows the frequency setting in the above Video-Out-Settings.

Refresh applies the HDMI-Settings *again*, needed when the HDMI-device was connected to the PSU *after* turning on HDMI. (Because the PSU can *not* react to a HDMI-Connect automatically...)

By enabling *Video 5-8*, a long button appears at the top of the Video-Out-Control-Dialog, that toggles between controlling the built-in 4 Video-Outs or the additional 4 provided by the third (”Video-Out 5-8”) HDMI-mode:



On this button you can see what the other Video-Outs are set to, which you are **not** controlling at the moment. (In the screenshot, 5-8 are set to *Auto*.) Between the two columns, the vertical text “SDI” or “HDMI” tells what’s being controlled right now. Of course the 4 original “Configure Video-Out” buttons have also been doubled to 8.

Control an external *Smart Videohub*

As mentioned at the beginning of this chapter, the only way to loop camera signals through the PSU, for example to avoid the small latency, you can use one of the Smart Videohubs by

Blackmagic Design.

The PSU can set up labels and routings and switch between them.

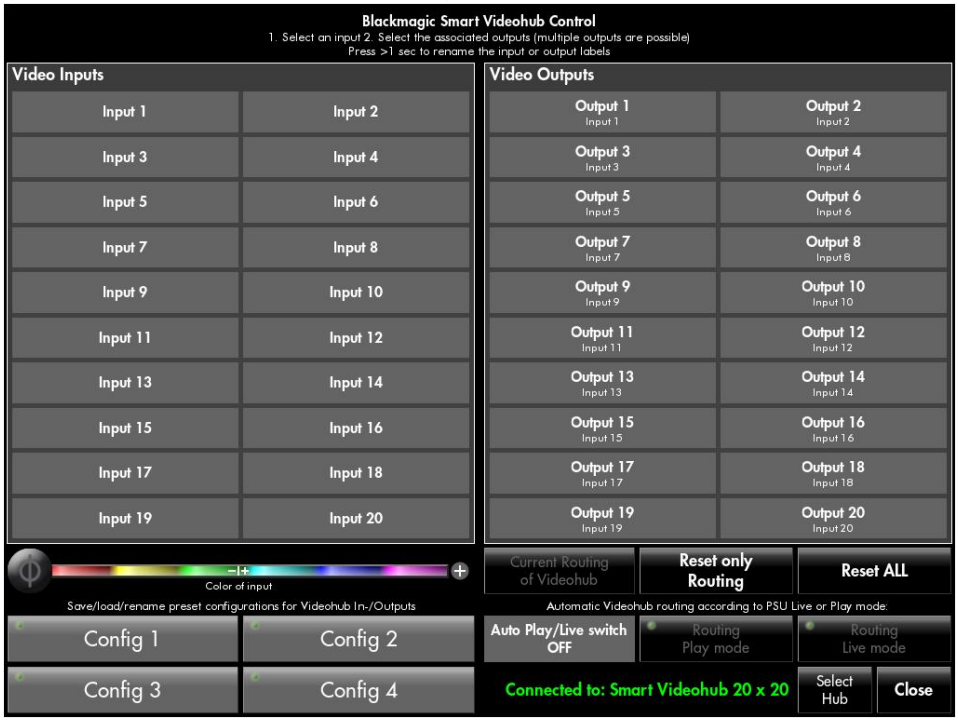
To support the use-case of Loop-Through in Live/Rec and play-out the playback from PSU otherwise, **the PSU can switch automatically between a Playback- and a Live-routing setup** when the PSU itself is switched between Live/Rec and Playback.

Of course a hub also makes sense as just a multiplier, when there are a lot more monitors to connect, than the PSU has outputs...

To do this, activate Videohub-Support in *Settings* → *Tools* → *Blackmagic Smart Videohub* → *ON*.

Then connect a Videohub via Ethernet to the PSU, for example with the provided red cable. If you are *only* connecting the hub to the PSU, the easiest option is maybe to use "GbE 2". Because the Videohubs did not support DHCP last time we checked, their IP must be set **fixed** to e.g. 192.168.**16.9** (**DHCP** server on GbE 2 is serving **..16.10** to ..**16.250**). Please consult the Videohub manual on how to do that. You can also integrate the hub for example into the LAN of your/our external router. The *"Houston"* routers provided by Vantage Film are configured to 192.168.10.x, DHCP-range is ..10.51 to ..10.100. So 192.168.10.9 should be save to use for a VideoHub in this case, when connected to the router.

After that, open the Video-Out-Control-Dialog and there press *Blackmagic Smart Videohub* to get into the *Smarthub-Control-Dialog*:



If the communication with the hub is working, something like "Connected to: Smart Videohub

20x20" will be displayed in green at the bottom (depending on the name you configured the hub to in its settings...).
Otherwise it reads "No Videohub connected!" in red.

Those Videohubs / switches are available in various sizes, like 12x12, 20x20, 40x40, which for example means 20 inputs by 20 outputs. Every output can be linked with one of the inputs and the routing can arbitrarily changed anytime. Every input and output on the switch can and should have a good speaking name. Additionally you can assign a **color** to every input or output on the PSU.

So let's look at the following scenario as an **example to walk through the dialog:**

- We are shooting with 4 cameras A-D
- There are two places where 4 monitors are set up, let's say "Director" and "Production".
- During Live/Rec the picture shall be routed directly from cameras to monitors without going through the PSU.
- The playback from the PSU shall be switched to the monitors otherwise

This boils down to a definition of inputs and outputs like this:

Videohub-Inputs:

- Camera A-D (For recording on PSU and Loop-Through)
- PSU-OUT A-D (For playback)

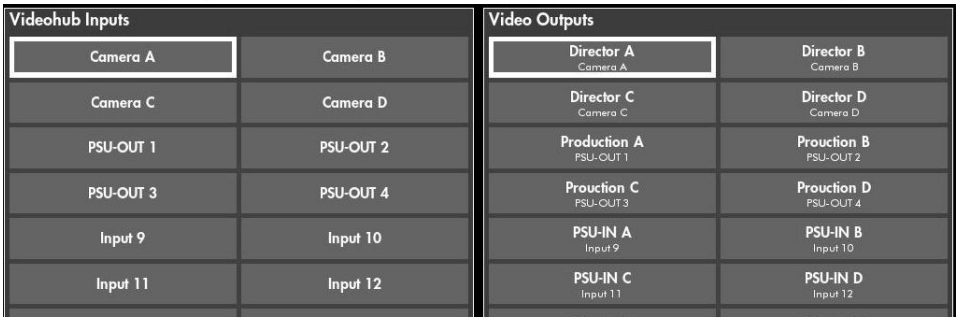
Videohub-Outputs:

- Director A-D (Monitorset 1)
- Production A-D (Monitorset 2)
- PSU-IN A-D (otherwise PSU can't record anything)

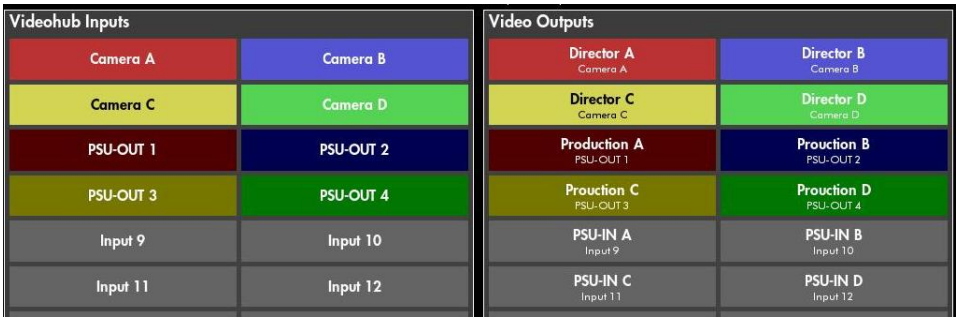
Let's start with the first Video-Hub-Input (initially labeled Input 1). Press it for >1s to bring up the keyboard. So that you don't have to enter the same texts again and again, there are 5 Shortcut- or Preset-Buttons on the top of the keyboard. They need to be pressed for >1s as well, to be programmed.
The keyboard could look like this after setting up the Preset-buttons:

One can't see it here, but all five presets also got a **"blank"** at the end, so that when you use it, you just need to add "A" for example and press OK.

After labeling inputs and outputs as described above, the matrix might look like this at the end:

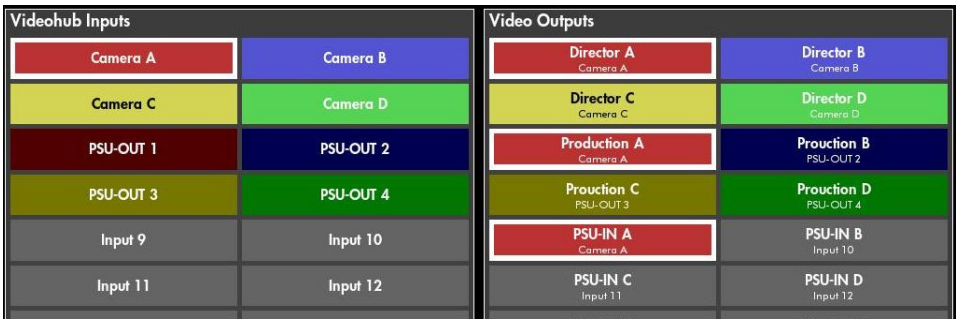


To add colors, press an input (shortly) and move the color slider, then select the next one. Using the color scheme of the PSU, this could result in:

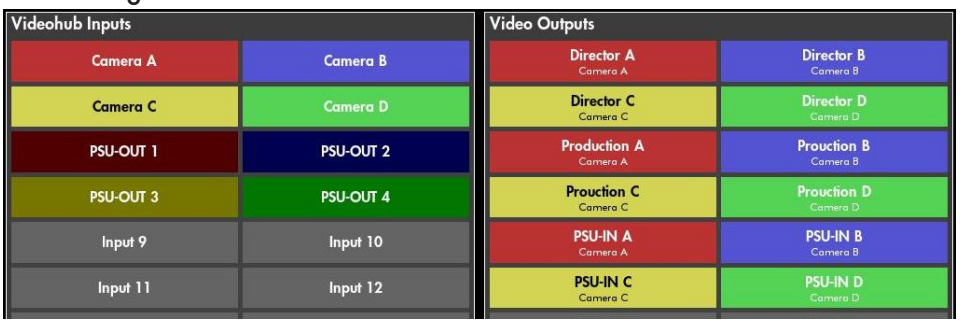


Before saving this setup, maybe a complete routing case should be applied: For the Live/Rec-Case, for example Cam A must be routed to Director A, Production A and PSU-IN A (and likewise for B,C,D).

To set the routing for A, select "Camera A" and then all belonging Videohub-Outputs for this case like this:



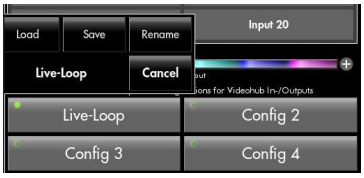
After fixing all other channels:



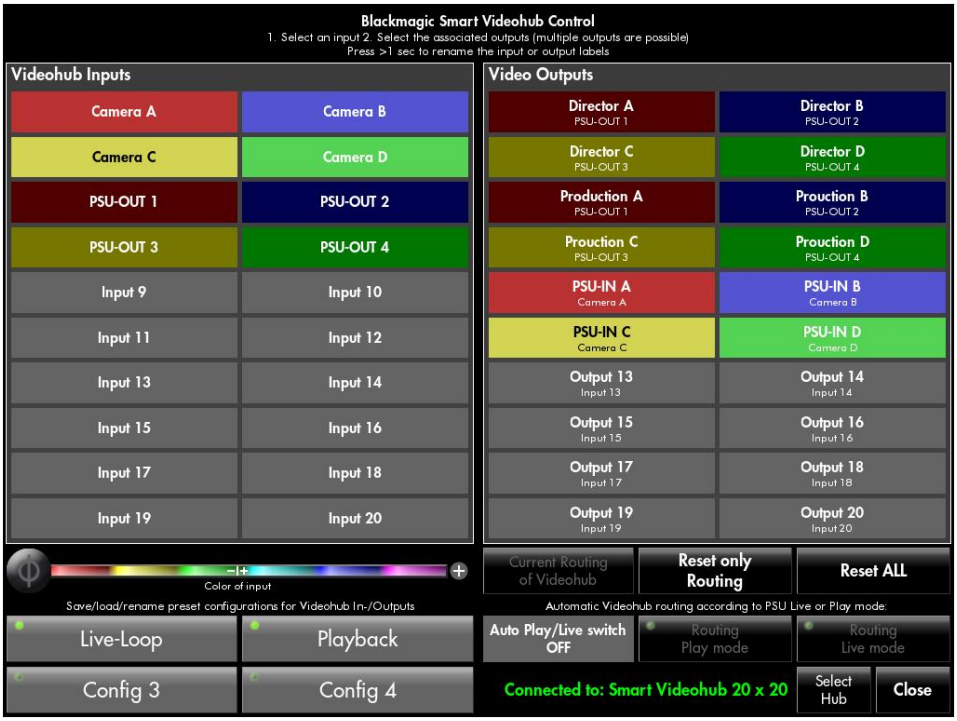
Now it's definitely time to save this! By means of the "Config"- Buttons at the bottoms, up to 4 complete setups can be stored. When you press a Config-Button, you are asked if you want to

- *Save* the current setup,
- *Load* a saved setup and thus overwrite(!) the current one,
- or *Rename* (label) the Config-Button.

So press *Save* and then press again and *Rename* it "Live-Loop" etc:



Now set the routing for the playback case: Here PSU-OUT X must be routed to Director X and Production X, but Camera X should stay unchanged at PSU-IN X. Then save the setup as "Playback":



Now you could already switch between the two setups *manually* by loading them alternately.

To **automatically switch between Live/Rec- and Playback-Mode,** activate ***Auto Play/Live switch***. Then press ***Routing Play mode*** (button turns white) and load your Playback-Setup, then press ***Routing Live mode*** and load the e.g. Live-Loop-Setup. Press the hilited *Routing...* button again to leave the Auto-programming (***Current Routing of Videohub*** will be selected automatically). Thus you won't change any of the two auto-routings accidentially. The green lights on the two buttons indicate that there is already a saved routing setup for the respective mode.

You can now ***Close*** the Videohub-Control-Dialog - every time you now switch between some "Cam"- and "Play"-mode on the PSU screen, the Hub will be switched between the two Auto-setups as well.

The button ***Reset only Routing*** will keep all the labels and colors, whereas ***Reset ALL*** will clear everything of the current setup. **The saved setups**, like "Live-Loop" and "Playback" from above, **are not affected by this**, you can still load them in again etc.

By ***Select Hub***, you can switch control between *different / multiple* Smart Videohubs.

Picture-Settings

Conceptually, every input channel (Cam A, B, C,...) of the PSU can have a combination of the availabe *Picture Settings*. In fact, you can store (and switch between) up to **three different Sets-of-Settings for every channel**. A setting is always applied in **realtime** (no "offline rendering" needed) to every picture from that camera, either Live or Playback (i.e. every take recorded from Cam A will also get applied the settings from Cam A). Picture Settings are also non-destructive and temporary, meaning that the original recordings (the takes/clips) are never changed. There is no way (*yet*), to export or generate takes (like dailies) with Picture Settings, for example with LUTs, in effect. The only workaround - using just the PSU - is to playback a take with effects enabled, and to re-record the playback by means of a cable from one of the Video-Outs to an Input.

> **Note:**
>
> If you only need certain settings in an Overlay situation, it could make more sense to just set "Layer specific picture settings" there (in Overlay-Expert-Mode).

To open the Picture Settings, press the *Settings-Button* and select "Picture":

On the top you see the currently available input or playback channels - for example if there are no recorded takes and only 2 activated recording channels, you only see buttons for Cam A & B. When the Picture Settings are accessed, the currently (first) visible live-channel (or the channel of active playback) is **pre-selected**. If you want to change the settings of a different channel, you need to select that. The color of all buttons in this dialog follows the selected channel, e.g. if you are about to change settings for Cam B, all buttons are blue...

Switching Channels and Sets in Sub-Dialogs

If you notice "too late" (in a sub-dialog) that you are "on the wrong channel", you can **switch sequentially through all by pressing the little channel-indicator on the top-right of every sub-dialog** (here: "press B"):

The same applies for the three *Sets-of-Settings*. You can cycle through them on the top-left corner of every sub-dialog, in the above example "press 1". To change the currently active *Set-of-Settings* in the main Picture Setting Dialog, press one of the Cam-Buttons for >1s.
The *Set-of-Settings* is indicated by the huge number hovering in the middle above the other buttons, there (see above).

Basic Transformations: Mirror, Zoom, Move Rotate

Let's start with the "easy" ones, like "**XY, Zoom Move Rotate:**":

- **Move**: With the **straight arrows** you move the image vertically and horizontally. The arrows behave "inverted", like the picture would move, when you would move the camera in those directions: Pressing the down-arrow will move the picture upwards and so on.
- **Zoom**: The **+** and **-** buttons zoom **in** (0 to 1000%) and **out** (0 to -90%). As long as the dialog is opened and an image with a corresponding channel is visible, you can **drag a zoom-rectangle on the picture itself**. Simply start in a corner of the area to be zoomed and drag the rectangle to the diagonally opposite corner.
- **Mirror X** reflects the image around the horizontal axis, **Mirror Y** around the vertical axis.
- **Rotate:** With the clockwise and the counter-clockwise **turning arrows** you can rotate the image in half-degree-steps. You can store two angles of rotation with the two shortcut-

buttons on the right. When pressing one of those button for >1s (turning blue), change the angle and press the button again. Every simple press on the button applies the stored angle to the picture.

- **Delete** reverts all settings of this dialog back to “normal”.

Zoom Button

If the image is zoomed or moved, a new button close to the related image on the main screen shows up, to **quickly toggle the Zoom(+Move) ON/OFF** without needing to *Delete* the setting in the dialog. The button’s position depends on the number of visible cameras, playbacks, desqueeze settings and Fullscreen Mode.

> **Note:**
>
> If you activated a *Format-Marking* (in *Picture Settings → Ground Glass Markings*), you can **zoom exactly onto the outermost Format-Rectangle** by pressing the Zoom-Button **for >1s.**

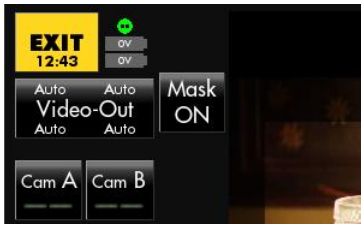
Masking

Next to *Zoom* etc. you can find *Mask*:

First select one of the four edges, then move it into the image with the appropriate arrows. You can also **drag a rectangle** exactly like described above for zooming to quickly define a

rough mask, and then for example fine-adjust it with the arrows. One can **change the transparency** of the mask with the *Adjust shade* **+** and **-** buttons at the bottom.
As usual, *Delete* removes the mask again.

Mask Button



If there is a mask active, a new button close to the related image on the main screen shows up, to **quickly toggle the Mask ON/OFF** without needing to *Delete* the setting in the dialog.
The button's position depends on the number of visible cameras, playbacks, desqueeze settings and Fullscreen Mode.

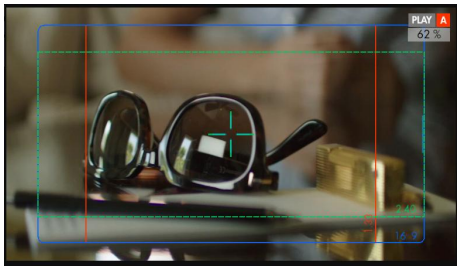
> **Note:**
>
> If you activated a *Format-Marking* (in *Picture Settings* → *Ground Glass Markings*), you can **mask exactly onto the outermost Format-Rectangle** by pressing the Mask-Button **for >1s.**

Example:
Zoomed and masked to a Format-Marking, indicated by a red frame on the buttons:

Ground Glass Markings

You can put various markings onto the picture: Format Markings (aka Frame Lines), an adjustable grid, arrowheads and you can even *remove an existing Center Point/Cross*.

Format Markings



There are 6 pre-defined markings: 1.33 (4:3), 14:9, 1.66, 16:9, 1.85 and 2.40. Additionally you can set up your own with an arbitrary ratio and add a Center Cross.

1. First select the label to position the center of the marking and move it with the arrow buttons.
2. Then adjust the marking's size by selecting the move-edge label (as in the screenshot) and using the arrow buttons.
3. Each Format Marking can be designed by pressing the label for >1s.

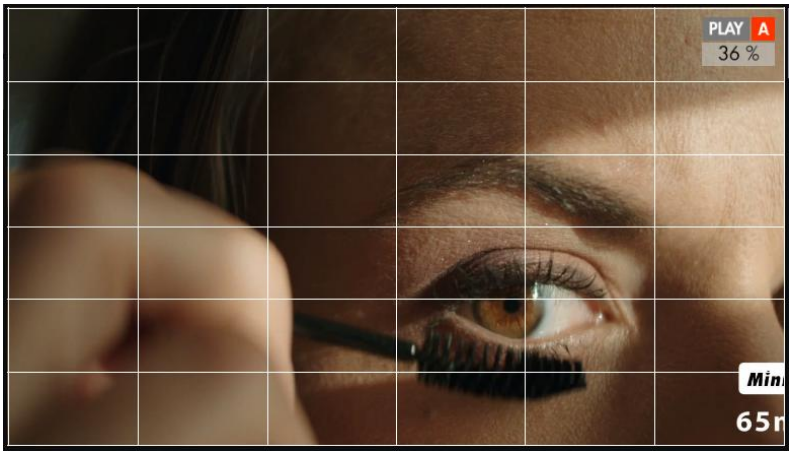
This opens another sub-menu (see right picture above) to adjust the

- Line thickness
- Transparency
- Color (8 fixed colors)
- Line Style (corners only, dashed, rectangle, rounded rectangle

Designing the Center Cross and the Custom Frame Line works similarly to designing the fixed ones.

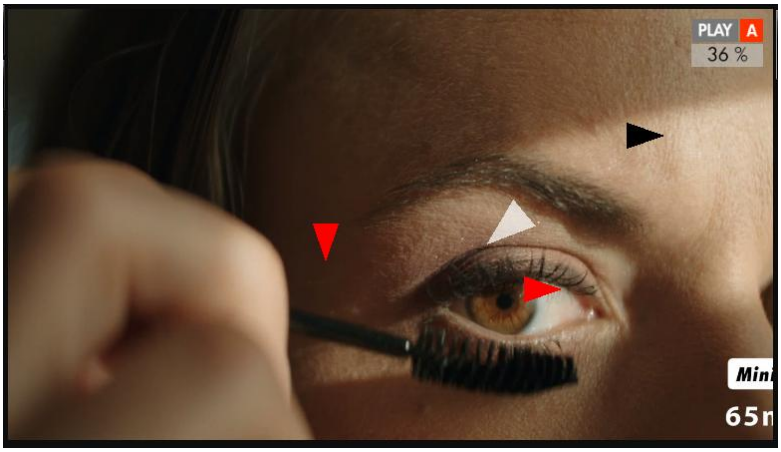
The descriptive text that shows each Frame Line's ratio in the bottom right corner can be toggled with *Legend ON/OFF*.

Grid



Grid let's you put a custom grid accross the image. The "Millimeters" are based on a sensor size of 23.76mm x 13.37mm, like the sensors of Arri ALEXA /AMIRA 16x9 are. That means, that a 1 mm cell corresponds to 1 mm on the sensor.
The cell's size can be adjusted from 1mm to 16.99 mm in 1/100mm steps. Like shown on the above example, you can for example use this setting to evenly divide a picture in 6x6 rectangles.
Ratio of image ON/OFF toggles between "square" and "rectangled" cells that depend on the original signal (like 16:9).
Middle x / Middle y ON/OFF toggles if the middle of a cell or it's beginning should in the center of the image. The first option leads to an even number of cells in that dimension (and to an intersection of lines in the middle), the latter to an odd number cells.
In **Marking Style** one can apply *Line thickness*, *Transparency* and a color to the grid as known from the *Format Markings*.
ON/OFF toggles the grid on/off;

Screen Markers



Instead of sticking pieces of Gaffa Tape on the Monitor ;-), one can define up to 8 arrowhead-markers, that can be placed in arbitrary sizes and positions onto the picture.
After enabling *Markers* by toggling *ON/OFF*, simply add Markers by pressing somewhere on the image. A simple press on Marker's number toggles it's display on/off. **Delete all** removes all Markers.
To remove and to "design" a specific Marker, press the corresponding number for >1s to open a sub-dialog. There you can **re-position** the selected marker as long as the dialog is opened by clicking somewhere on the image, or by utilizing the **arrow-buttons**. **Rotate** a Marker with the rotating-arrows-buttons. **Num** toggles the display of the Marker's number next to it. **Del** removes the Marker. With the sliders you can change color, size and transparency.

Remove Center Cross

To digitally remove the the *Center Cross* from the camera's ground glass, turn the setting to **ON**, then try to match and align the appearing red semi-transparent cross with the camera's cross by successively adjusting thickness, inner and outer lengths, and optionally the *Center Dot* size. The arrows move the red cross, + and - increase and decrease its size.
After leaving the dialog with *OK*, the removal gets applied to the image.

Hawk Anamorphic® Desqueezing, Cropping

If the *Desqueezing* is not set on the camera, the **Hawk Format Selector** allows fixed predefined desqueezing for current anamorphic formats, either 2x Squeeze or 1.3x Squeeze.

As usual, to actually turn on any of the settings, **toggle ON/OFF.**

As indicated on the 3 buttons, the *predefined* factors are:

- **2x Hawk 4:3 → 2.4** desqueezes (stretches) the image by a factor of 2 and crops the result to 2.40:1 (*Regular Scope*, for 4 perf 35mm or N 16mm film and **4:3 digital**.
- **1.3x Hawk 16:9 → 2.4** desqueezes a **16:9 image** by a factor of 1.3 to **2.40:1** (for 3 perf 35mm or S 16mm film and **16:9 digital**.
- **1.3x Hawk 4:3 → 16:9** desqueezes a **4:3 image** by a factor of 1.3 **to 16:9** (for 4 perf 35mm film or 4:3 digital)

As there is no existing digital HD 4:3 format (except SD formats, but **SD is not supported by the PSU-4** on the inputs), a 4:3 picture can only be wrapped in a 16:9 picture. To unwrap it, the left and right borders need to be cropped and the detected format has to be *overridden* to 4:3.

To accomplish this, press the *Sensor Override / Image Cropping* button:

The first row of options is for simply overriding the detected format and *defining* it to either 4:3 or 16:9.

The second row offers two special (de-) **letterboxing** cases:

- **Crop left and right borders** of a 16:9 image, that in fact carries a 4:3 image in the middle, as **produced by SD-to-HD-upscalers**. This results in a 4:3 picture.
- **Crop top and bottom borders** of (maybe imported) **4:3 SD-footage**, that in fact **carries a 16:9 image** in the middle. This results in a 16:9 picture.

The last row is intended to extract a *clean picture* from desqueezing happening on the camera, so that the PSU can maximize the area used for the picture by removing the borders:

- Crop top and bottom borders of a 16:9 signal carrying a desqueezed 2x picture. This results in a 2.40:1 image.
- Crop top and bottom borders of a 16:9 signal carrying a desqueezed 1.3x picture. This

results in a 2.40:1 image as well.

You can also **self-define** and apply **your own** desqueezing and cropping **factors:**

- First switch to ***Self-defined***, then you can set a horizontal factor between 0.5 and 2.5:

  The value can be reset to 1.0 by pressing the label for >1s.

- Optionally use ***Image Cropping*** to cut away up to four sides of the image:

Here you can define two sets of cropping values by "programming" the **Softkey**-Buttons: Press for >1s to enter edit mode, adjust the sliders as desired, then save the values by pressing the Softkey again to finish. Now you can quickly change between two setups with one press of a button... If at least one cropping value is changed after closing the sub-dialog, the LED on the Cropping-button will flash, and the current values are shown on the button as well.

The **Effective desqueeze** displays in both dialogs give you the combined factor resulting from the horizontal and cropping factors.

Chroma Keying

Chroma Keying (aka Color Keying, Greenscreen, Bluescreen) means "removing" parts of an image, that have a certain color and making those transparent, for example to put a different background there, instead. This probably only makes sense in an *Overlay* context.

> **Note on "Alpha"**
>
> The *Alpha Channel* of a picture is an additional channel (or layer) to the color values that indicates the **level of transparency for every pixel**. A value of "0" means "completely transparent", normally.

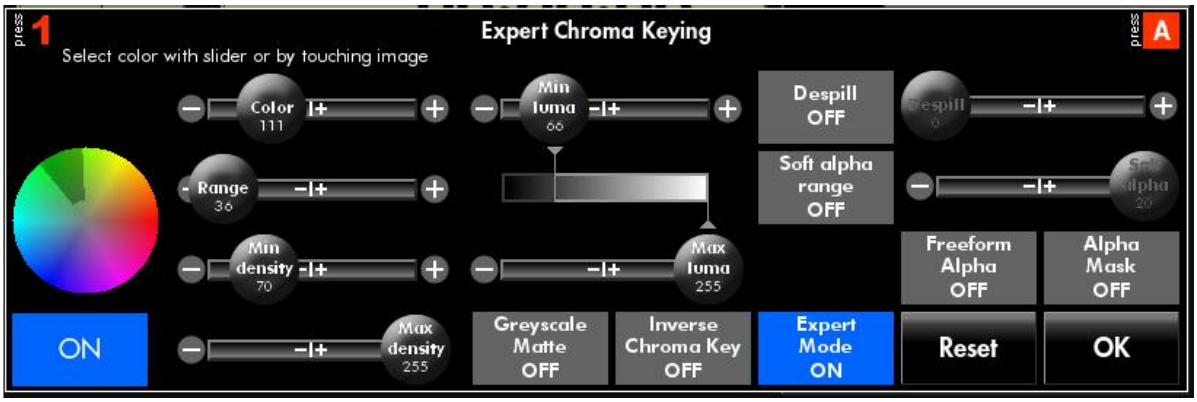
The Keying is based on the HSV color model, which means

- (**H**)ue: The "tone of the color"
- (**S**)aturation: The "intensity" or "density" of the color.
- (**V**)alue: The Light-Value means "luminosity" or "brightness" of the color

On the PSU we chose the terms **Color** for Hue, **Density** for Saturation, and **Luma** for Value.

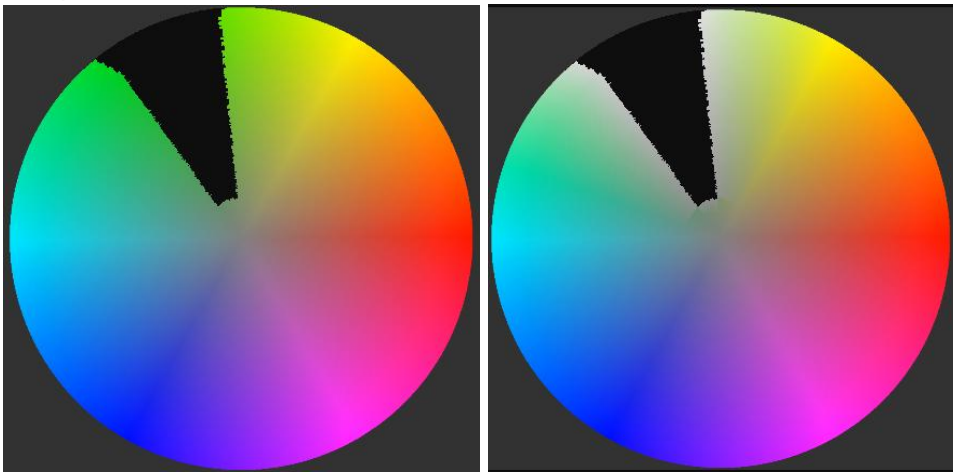
To use it, turn the effect **on** by toggling ON/OFF. For a quick setup, you can **press somewhere on the image** that has the color to be be keyed out. You can see immediately "where you are" looking at the darker segment on the Color Wheel, which represents Color-Tone and -Density at maximum Luma. The segment illustrates the color range (intervall) and density range for the Keying. With the fist slider in the dialog you can change the radial center of the color range, the second determines the width of the color range, and the third slider affects the density start-level.

If the results of these basic settings are not sufficient, for example if want to key out only "dark-green" and not also "bright-green", one can extend the dialog to **Expert Mode**:



Additionally to the three mentioned controls, you can now manipulate the upper density limit (the more-colorful-edge), as well as the Luma intervall (Min/Max Luma). The gray-scale between the latter two further illustrates the brightness range, where the Keying is happening.

Spilling is one of the problems in Keying: The Key-Color can for example get reflected on skin, clothes etc., especially close to the edges, hair and so on. **Despill** tries to improve the result by de-saturating (removing color) on color values close to the keying-range. (For example: Keying on green → *Green colors not keyed out* by the Keying-Range become "less green", like this (Despill ON on the right):

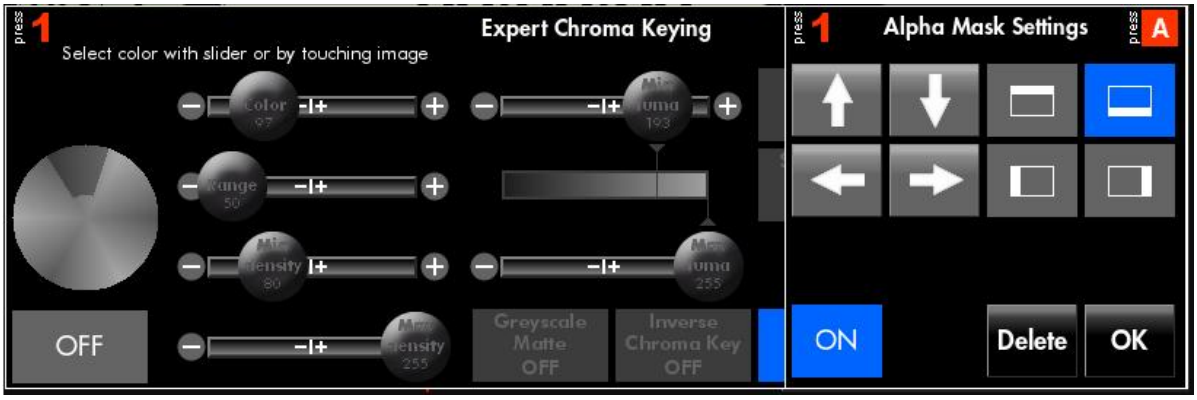


Soft alpha range avoids hard edges of the Keying by gradually changing the alpha channel (transparency level) slowly from transparent to opaque (instead of a "hard" transparent/ opaque decision) close to the ranges of the Keying-limits.
Example with soft alpha range ON:

As the name implies, ***Inverse Chroma Key*** keeps everything that would be keyed out normally by the current settings and vice versa. It's useful to evaluate and improve the settings further.

Grayscale Matte illustrates the current settings by painting everything white that doesn't get keyed out and painting black the keyed parts. It can, for example, be helpful in low contrast situations to precisely adjust the parameter intervals.

Available in both versions of the dialog are **Freeform Alpha** and **Alpha Mask**. Both functions "manually" **make transparent** parts of the image that can't be caught by the keying-parameters (which are based on color), like the black borders, camera information surrounding the picture or equipment *in* the picture that shouldn't be visible as well.



Settings up the transparent / "Alpha" Mask works exactly as the the "normal" Mask described above in Masking.

With **Freeform Alpha** you can freely edit or design an *additional* Alpha-Mask that is added to the effects of the Chroma Keying, but can also be applied with Chroma Keying itself turned off.

The dialog looks like this initially:

Here you can design/ paint 3 independent **system-wide** *Freeform Alpha Masks*. So, in contrast to most other Picture Settings == you can't have more than 3 different of these Masks activated **anywhere at the same time**==. Or differently: Every Camera Channel and every Overlay-Layer can have one of the 3 Freeform Masks active, but there are only those 3 different masks to choose from.

To design one, you first need to capture a still image from one of the camera inputs or playbacks **as a reference** to draw on. Press "Set Image" to capture or fetch an image from a mounted USB-drive or from the Grabbed Frames:

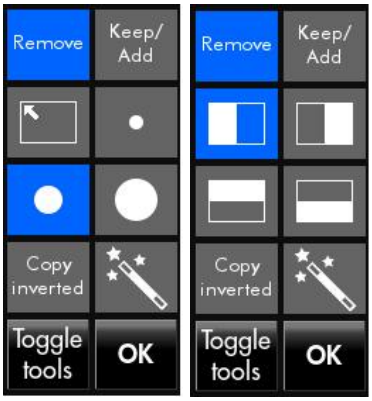
The set image won't be used as a visible layer anywhere, **only the Alpha Channel** you draw onto **is applied** to the result.

Now you can "paint" the pixels you would like to keep or remove.

> **Note:**
>
> You can't draw on the main view - only on the small preview images in the dialog! You can switch to the more convenient **Fullscreen-Editing** of the Mask, by pressing the *Edit Full Screen*-Button!

There are several editing tools available on the right side, you can switch them with Toggle

tools:



From Top to Down:

- **Remove / Keep**: Toggle the mode of operation - *Remove* means "make transparent", *Keep/Add* is the opposite.
- Draw a **rectangle** like known from Zooming and Masking
- Freely **draw** with small, middle and huge **dots**
- **Copy inverted** lets you copy the inverted mask from one mask to an other or to itself (invert the mask). The small yellow text at the top guides you through the steps. The copy will be transparent where the original was opaque, and vice versa.
- The "magic wand" (bottom right) is similar to the quick/auto Chroma Keying described above: It acts on all pixels that have the same color to where you press.
- The last 4 buttons remove/keep the left/right/top/bottom half of the image.

To assign one of the 3 masks to the current input channel or overlay layer, press **ON/OFF**.

To delete a mask before designing a new one, press **Clear**.

Side note: There is no way to *export* a *Freeform Alpha Mask* from the PSU, at the moment. You could design one as an Overlay Still Image, save it as a Frame Grab, and export that. Then you could re-import it (for example after editing it on a laptop) when you press "Set Image".

Waveforms & Scopes

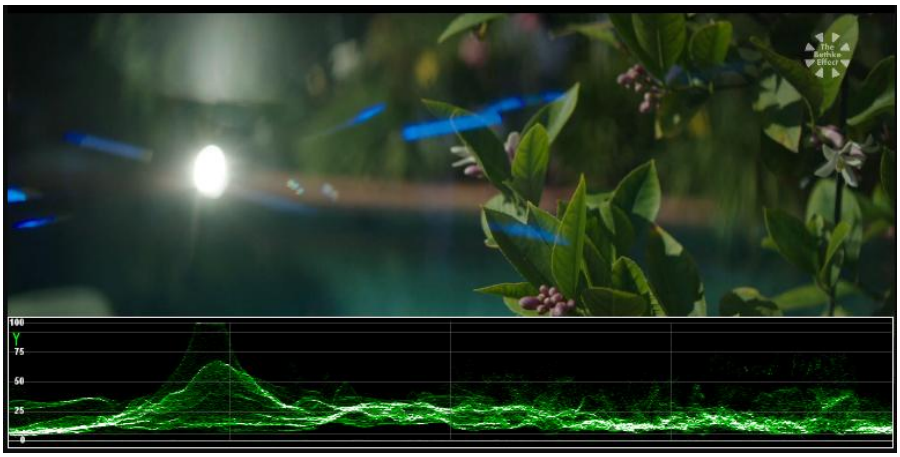
The eye can easily be betrayed - monitors can be un- or miscalibrated and the impression a monitor produces depends on the lighting conditions produced by the surrounding light etc.

To gain objective information regarding color and brightness, the PSU offers various scopes and

waveform displays which can be added to the image in the **Waveform/Scopes-Dialog**:

All scopes are in fact histograms, but they represent the information differently to "normal" histograms. Except for the *Vectorscope*, all the waveforms display frequency or occurrence of color values horizontally across the image. The brighter a point in the scope is, the higher the occurrence of pixels with that level a color value at a given horizontal position in the image.

Let's look at an example with an Y-scope stretched along the whole image at the bottom (select *Image Bottom* as the *Waveform Format* in the dialog):



The position of the bright light spot corresponds with the *peaks* in the graphs. The bright spot is overexposed because the highest peak is flat at the level of *100%*. The Fujiyama-like peak is from the brighter bokeh-area above the spot, and it's brightness level ("Y") tops roughly at 70%. The darker bokeh area looks more bright in the waveform because **more pixels** have a brightness of ~70% than those from the overexposed spot. You can increase the **intensity** of the scope with the left slider and change the **transparency** of the whole scope-display with the right slider.

You can either put single-scopes into the right corner of the image (**Image Corner**), stretch them

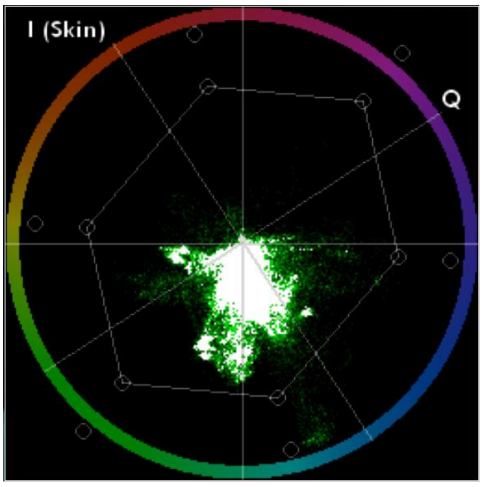
across the image at the bottom (**Image Bottom**) or make them fill the whole image (**Full Image**). This can be interesting when you put the waveform for example onto a *dedicated Video-Out-Monitor*. (*Settings → Picture Settings → Output*).

> **Note:**
>
> All scopes "measure" the picture as you have set it up in Picture Settings. That means that Chroma Keying, Chroma Masking, Zooming and Color Grading affects the scope's result! For example you can remove the artifacts originating from camera informations and frame lines etc by Zooming and Chroma Masking and do Color Correction or Color Grading and evaluate the results in the scopes.

The available Scopes are:

- **Y**: Brightness / Gray-level
- **YCbCr**: Three displays show Y (Brightness), Cb (Blue-Yellow Chrominance) and Cr (Red-Green Chrominance) values of the picture in the *color model* of the same name.
- **RGB Merged**: RGB means *Red, Green, Blue* - the levels and occurrence of these color portions are drawn into a single Waveform display.
- **RGB Parade**: Here the Red, Green and Blue levels and occurrences are drawn in 3 separate Waveform displays side-by-side.
- **Vectorscope**: This display illustrates the occurrence of colors and their saturations on a Color Wheel. The color is transformed into an angle in a coordinate system of Cb and Cr. The distance to the center represents the saturation of the color.

Vectorscope Example:



This shows that most of the colors here are weakly saturated blue and green tones, all well within the 75%-"box/hexagon". **Skin-Tones** should be close along the **I-Axis** to look "natural", this axis can serve as a reference for color correction or grading. The small circles outside the box mean 100% color saturation. The I and Q axis are from the YIQ color model of the NTSC system.

Vectorscope and Y-Scope can be combined by the "Y+Vector" option.

False Color is another tool for analysis: First the image is converted to gray, then certain levels if brightness are colored specifically (like known from the Alexa):

The meaning of the colors is:

Meaning	Level of Brightness	Color

Meaning	Level of Brightness	Color
White clipping	>= 99%	Red
Just below white clipping	99% - 97%	Yellow
One stop over medium gray	56% - 52%	Pink
18% medium gray	42% - 38%	Green
Just above black clipping	4% - 2.5%	Blue
Black clipping	2.5% - 0.0%	Purple

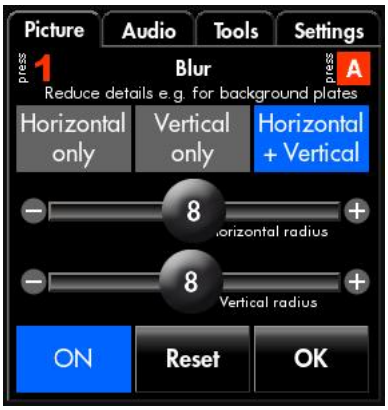
Unlike other Picture Settings, Scopes and Waveforms can be **limited to** be shown only in **Live (Rec)**, **Playback** or both modes (i.e. **always**) by cycling the **Visible on- Button** next to OK.

Special Effects: Blur, Focus Peaking, Screen Labeling

There are three special effects available, that don't fit into the other Picture-Settings-categories - **Blur**, **Focus Peaking** and **Screen Labeling**:

Blur

To **reduce details**, for example when using a take as a **Background Plate** in an **Overlay situation**, you can apply a Gaussian-Blur-Filter to the image:



One can blur either only horizontally, only vertically or both with a certain pixel-radius. This is made available because it may happen, that playback or live picture begins to stutter in situations when blurring is used on **many** pictures with big radius at the same time. (Blurring in only one direction needs less computing power.)

Focus Peaking

Focus Peaking is a tool to judge focus / sharpness **objectively** using an **edge detect filter**. In the following example one of the keys is in focus. This is indicated by the green border around sharp edges.

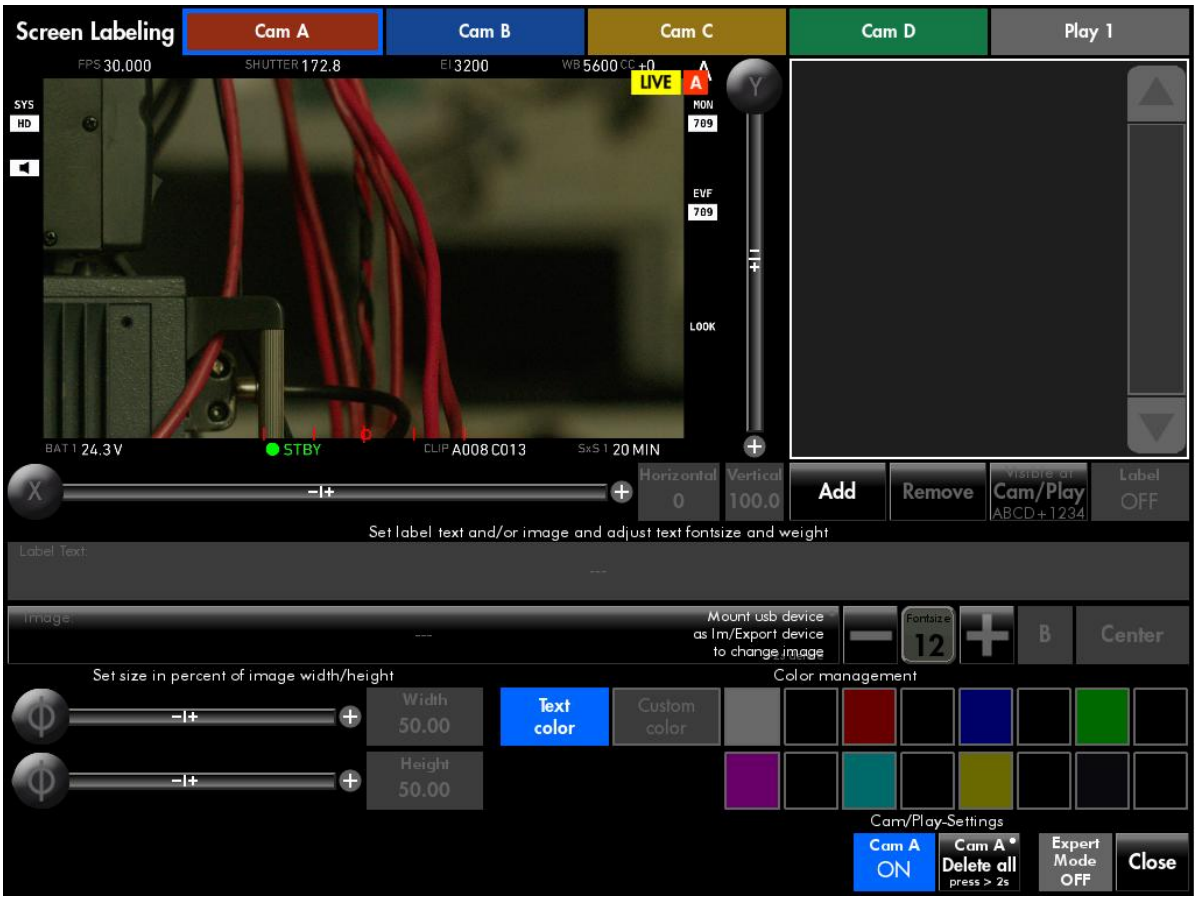
There are 4 mathematical algorithms available, each behaving slightly different. You need to

play around a little to find out which one suits most in a given situation. Then you can additionally adjust the *thickness* of the highlighted border with the **Threshold**-Parameter. The color can be red, green or blue:

Screen Labeling

The PSU allows **Screen Labels** as a means to display arbitrary information in the picture. They can be freely positioned, colored, sized, semi-transparent, can be camera- or playback-dependent, sourced from an (uploaded) image, and display variable or static metadata. There is no limit to the number of labels. It can be configured on which outputs (like Video-Outputs or Streams) they shall be visible (Expert Mode → **Output**-Button).

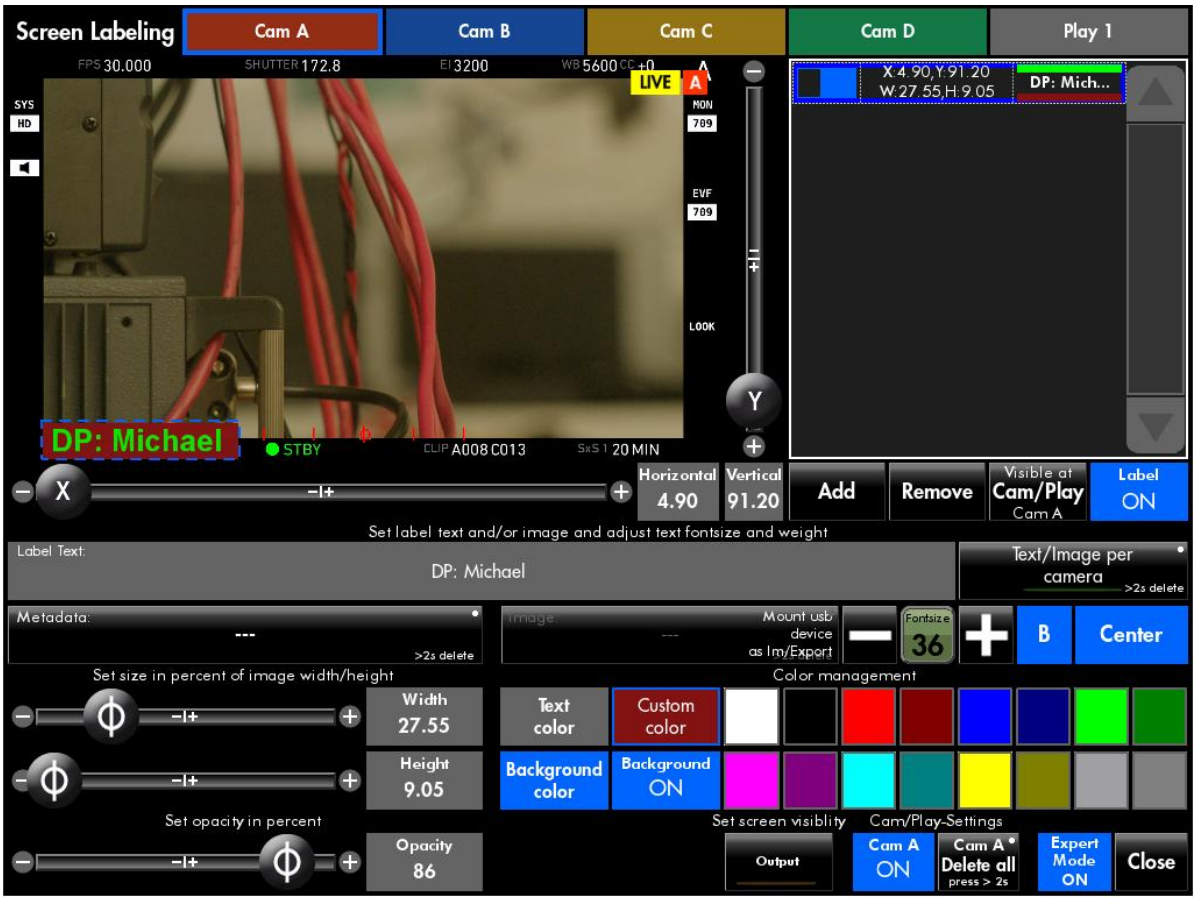
The Screen Labeling - Dialog is not only accessible via *Settings → Picture → Blur, Focus Pk., Sc. Label*, but also via the **Quick Set Menu** that you open by tapping the *picture*.



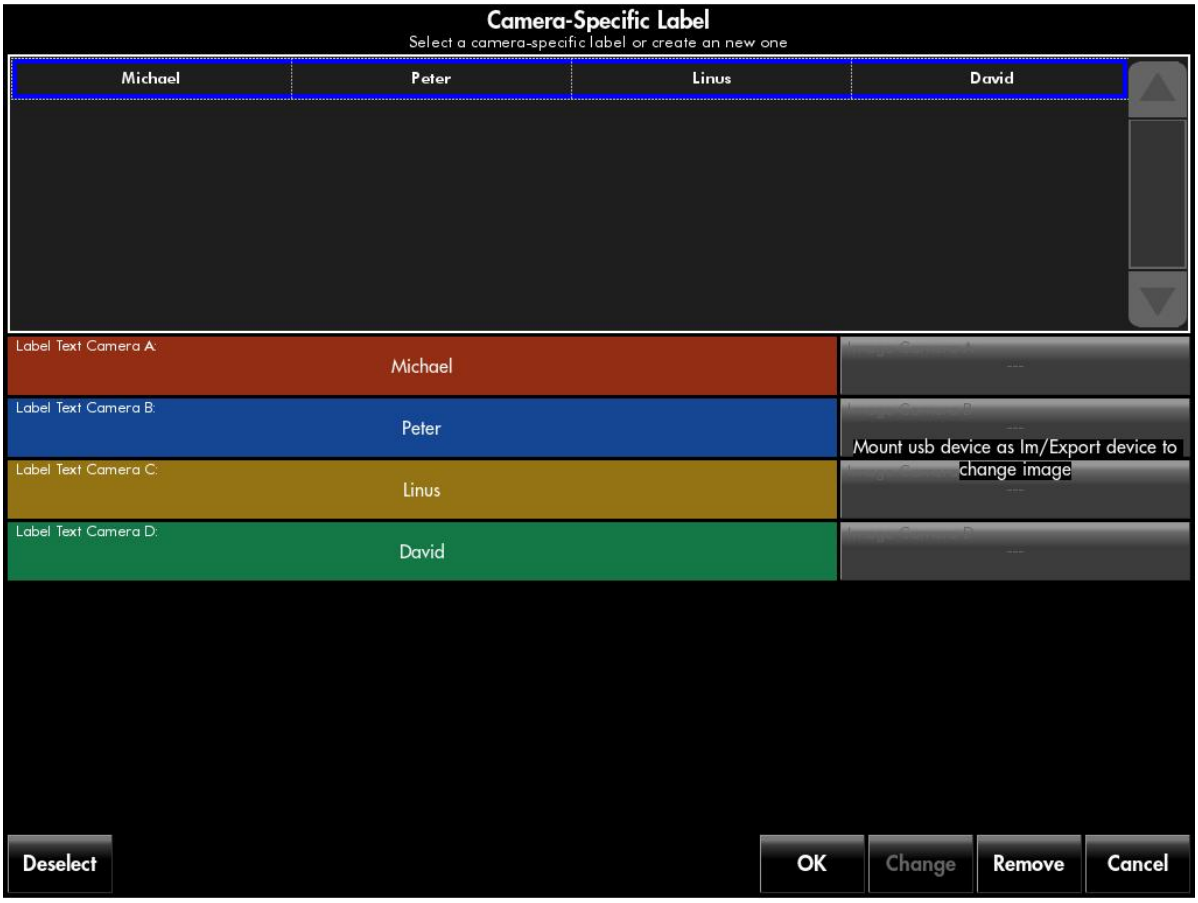
In the top line, select one of the activated cameras and playbacks. (If you're missing something, you can enable more cameras and playbacks in *Settings → Tools → Record Channels / Number Players*.) The selected source works as the **base** for you to design a label. Initially, you can set it up without being shown anywhere. Until you really activate to show labels at the bottom of the dialog, a message in the middle of the picture will say for example: "Warning: Labels for Cam A not visible. Toggle in Cam/Play-Settings below." In the above example, labels for Cam A are already set to ON.

To add a new label, tap **Add** underneath the list view on the right. For every label, you can determine on which cameras and playbacks it should appear: Press **Visible at Cam/Play** and select all desired destinations. (The currently visible channel is blocked and can't be deselected.)

Next, enter a text by tapping **Label Text**. In the example it's "DP: Michael". The initial size and position won't fit probably - adjust it with the **X** and **Y** sliders around the picture and **Width** and **Height** below. Choose the **Text color** on the right side. If you would like to have a (solid) **Background**, you need to switch on **Expert Mode**. This adds a slider to adjust **opacity** as well. You can change the **Fontsize**, make it bold with **B** and align the text in middle of the label with **Center**.

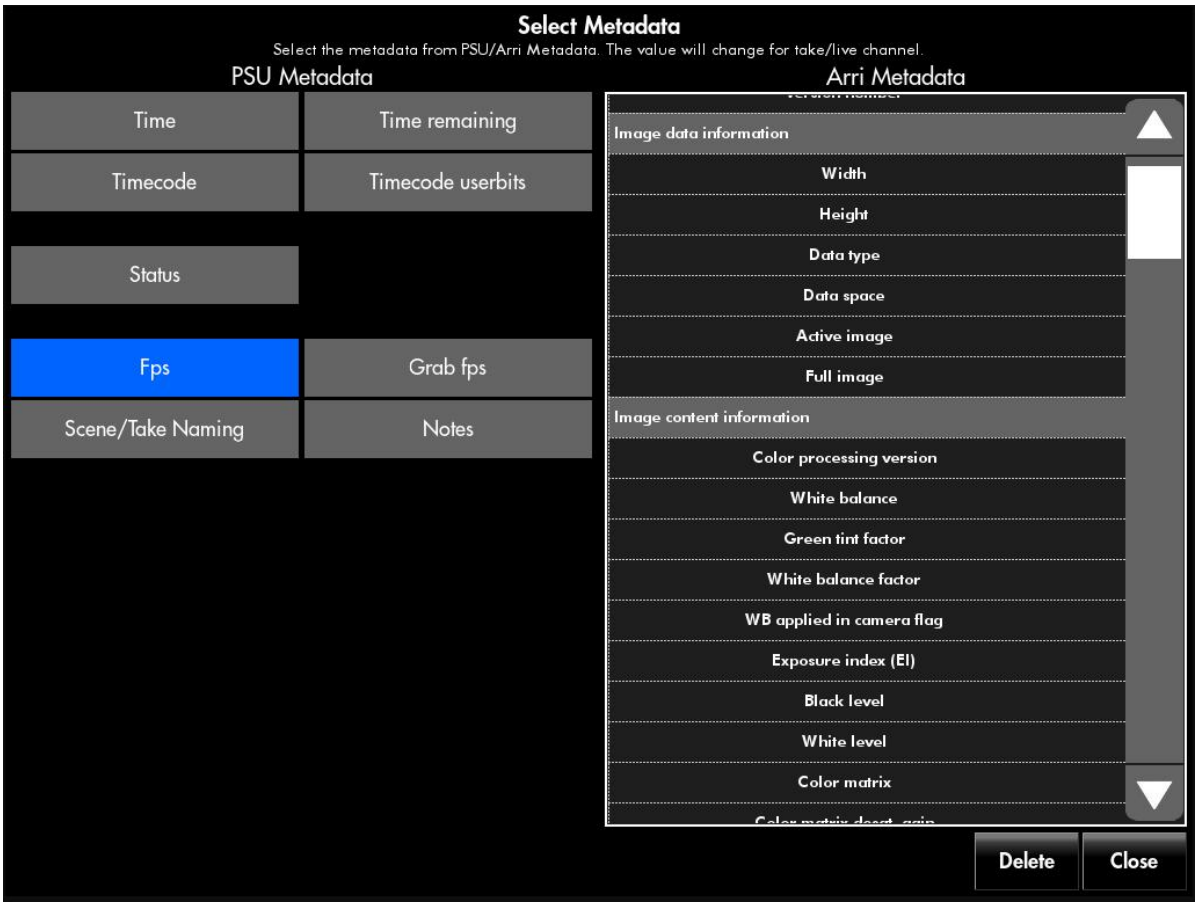


Now we have a static label that's only visible on Cam A (in Live-Mode). That might be sufficient for the case you need to know who's shooting "A". If you always want to see a certain label on all A-footage, i.e. also on all playbacks with A-takes, you can set a **Text or Image per camera** (you also need to activate labels on playbacks to see it):



This view shows all created **camera-specific** labels. Because you set the label's text(s) here, you can leave blank the static *Label Text* outside, or put the common part like "DP:" there. For camera-specific-labels you can set different texts (or images) for every camera within the same (one) "Screen Label"!

As another dynamic option you can add **frame- or take-specific metadata text** to a label. (Some people don't like the way the PSU displays status, camera and time information - with Screen Labels they could turn them off in *Settings* → *Settings* → *Channel Indicator* and design, choose and position them as desired...)
Tap the **Metadata** button to open the dialog to select one:



Note:

When you combine static and dynamic texts within the same label, you might want to add space character(s) in between.

Another Note:

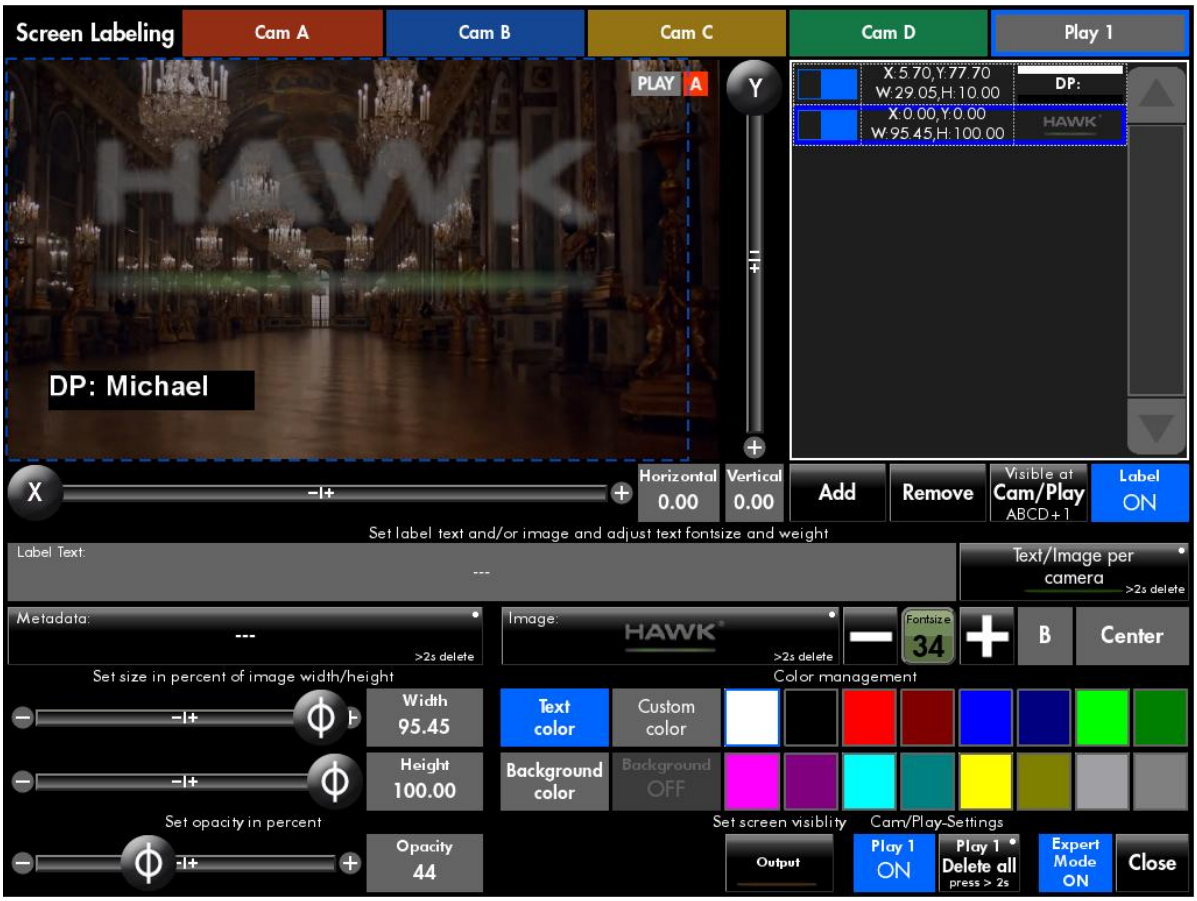
Showing "Live"- and frame-specific data originating from the **Arri/Alexa-Extended-Metadata** hasn't been implemented, yet. For now it's only take-specific and available during playback after recording.

As already mentioned, one can assign an image file (via USB) to a label, either additionally to the text or "standalone". The image is always scaled to fill width or height of the screen label (depending on the ratio). An **alpha channel** (recommended file format: 32-bit-PNG) is taken into account, that means that parts of the image can be fully transparent. This allows to add something like a **logo or watermark** to all outputs/pictures from the PSU. The opacity of the

non-transparent parts of a label-image can be adjusted the same way as for textual labels.

Furthermore, you can set different (camera-specific) images for a single screen label with ***Text/ Image per camera***.

Example: A semi-transparent Hawk-Logo, plus a camera-specific DP-Label...



LUTs (Look-Up-Tables)

The PSU supports LUTs in many different file formats, for example “Adobe After Effects”, “Codex3D”, “Lustre3D”, “Scratch”, “Shake”, “Nuke”, “Iridas”,... In fact our goal is to support every format that’s used commonly on sets, so if the PSU is not supporting a certain file type, one should contact for example techsupport@vantagefilm.com or anybody from our technical departments and tell us!

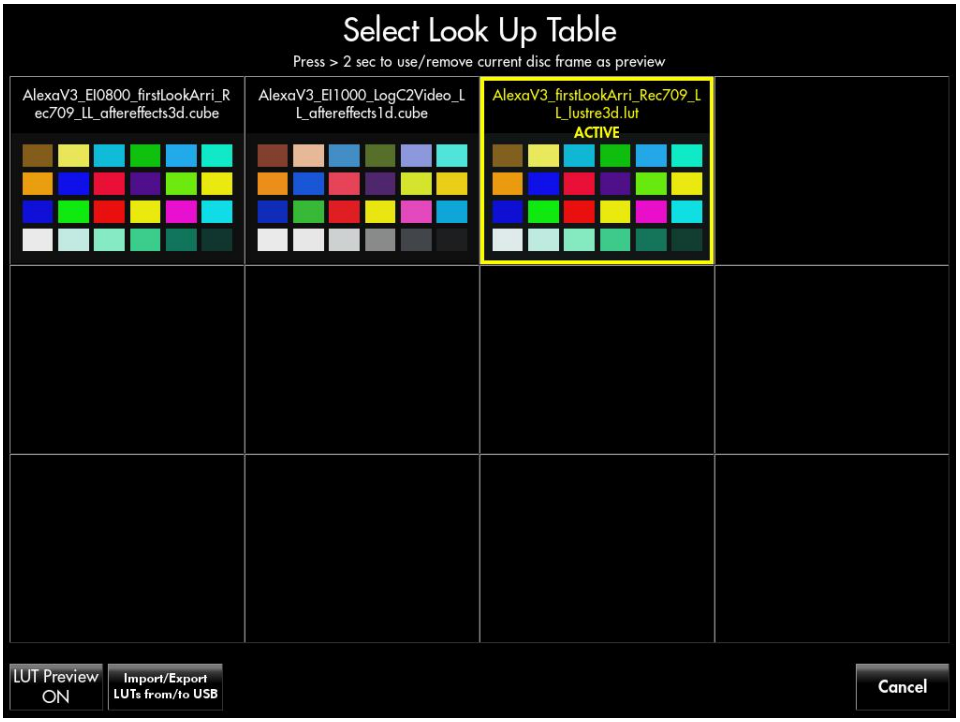
Generally speaking, LUTs *transform* or *map* colors from one value to an other in a certain way to produce color- “looks”, “moods”, “atmospheres” etc. They are also used to “simply” transform from one color system to another, like “LogC” to “Rec709”.

When there are no LUTs stored on the PSU, the *Picture Settings → LUT- Dialog* looks like this:

LUTs can be transferred onto the PSU by either its Network Interface or a USB-device (stick/ hard-disc). When a device is attached and *mounted*, press **Import/Export LUTs from/to USB** button, select the LUTs you want to copy and press *import*. Now you already should see the LUTs you selected, represented by standard color palettes with (maybe) some colors changed. When you press one of the palettes for >1s, a screenshot of the current playback's position with the respective LUT applied is used to illustrate the LUT. This dialog is also made to *export* LUTs to USB. Just select the ones you want, press *export* and navigate to the destination folder, then press *OK*. Quit the Import/Export dialog with *Close*.

When there are LUTs available on the PSU, either **press the green display** (initially showing just "——") or **Set LUT** to open the *LUT-Selection-Dialog* and choose the desired LUT (→ hilited

by a yellow frame and "Active"). Of course the "press >2s to get a preview" described above works here as well.



With a selected LUT the Settings-Dialog looks like this:

Now all that's left to do is to toggle ON/OFF on the bottom left to activate the LUT in all footage of the current Picture-Settings-Channel (or Overlay-Layer).

Color Grading

LUTs that change the *Look* (as opposed to the color system), normally originate from an external *Color Grading* device or software. But *grading* can also be done on the PSU itself.

Pressing **Color Grading** in the Picture Settings leads to this higher-level menu:

Before diving into "real" Grading, let's have a look at some elementary settings and shortcuts:

Brightness, Contrast, Gamma

These attributes could be realized in the "Grading Dialog" (see below) as well, but it's much simpler to only have one slider to adjust e.g. the Brightness a little, so this is kind of a "shortcut"-dialog. **As usual you first have to toggle ON/OFF to use any of the settings.**

Please see the general section about *Sliders* on the PSU, here.

Hue

This is a special effects setting that gradually changes *Hue*: It rotates the colors of all pixels "around" the color circle. It's also like swapping the color channels, e.g. red-becomes-blue and vice versa etc.
To get an idea what's happening, activate the *RGB-Merged*-Waveform, move the slider and and watch the scope ;-)

Inverse

One might have thought so: **Inverse** turns the image to its **(Film) Negative**!

Black + White

Removing all color from the image could be interesting to stop complaints from *some people* because of "wrong colors".

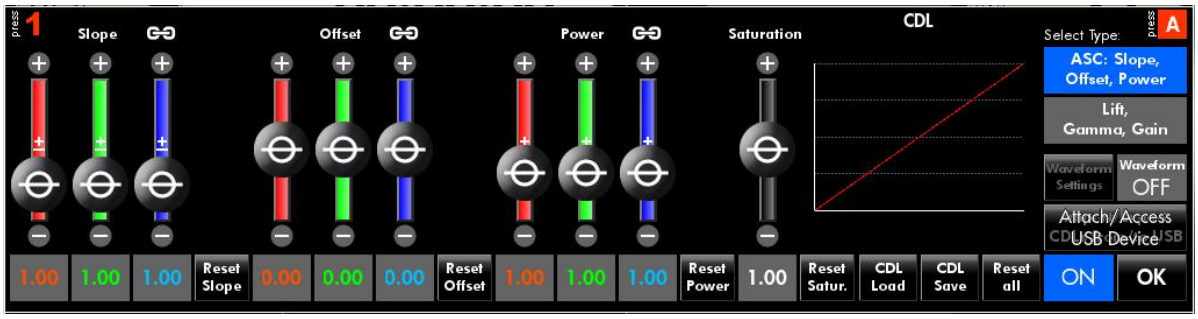
ASC-CDL / Lift-Gamma-Gain + Saturation

Now to the "real thing": The PSU supports two concepts for Color Grading:

1. **ASC-CDL: The American Society of Cinematographers Color Decision Lists**
2. **Lift/ Gamma/ Gain**

Both approaches can be accessed in the dialog linked to the

-Button:



After activating the feature toggling OFF/ON on the bottom right, select your preferred variant above.

As described in more detail for example here, ASC-CDL are basically a set of ten variables that mathematically transform color values based on the RGB color model. Fundamentally, one can apply three operations to numbers: **Add** a number, **multiply (scale)** with a factor and **raise to the power of some number (potentiate)**.
The three operations Offset, Slope, and Power do exactly this: First *Slope* is multiplied with the color (channel) value, then the *Offset* is added and the result is raised to the power of *Power*.

The Offset, Slope, and Power values can be different for the Red, Green and Blue components, which leads to nine variables. Finally, a single **Saturation** value is "applied" to the R, G, and B color channels in combination. ("Saturation" saturates / desaturates the colors (with color components weighted with values from the Rec.709 matrix).

Changing **Slope** results in a change to *Contrast*, but leaves the black level unaffected (the darkest value in the picture).

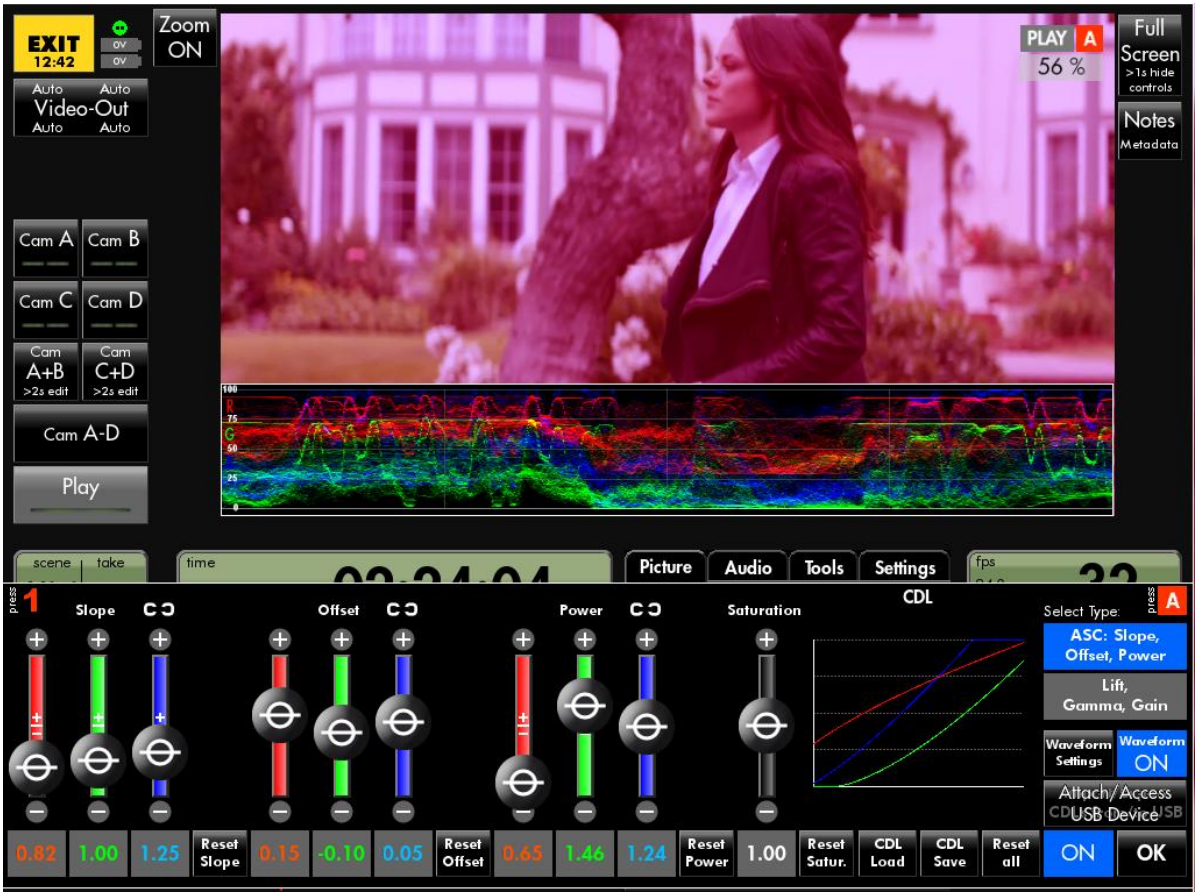
Changing **Offset** moves everything up or down in *Brightness*, affecting both, white level and black level.

Changing **Power** (=Gamma) expands or compresses the distribution of midtones without affecting white level or black level.

These ten described variables can be adjusted with the ten Sliders in the dialog. Initially the RGB color channels are *locked* together (indicated by the **chain-symbols** on top of the three operations), so that when you move one of them, the two other color channels move as well. Press the chain-symbol to allow / unlock the individual adjustment of values.

You can press the displayed number values at the bottom and enter their values manually, if needed. Slope, Offset, Power and Saturation can either be reset individually (e.g. **Reset Slope**) or altogether with **Reset all**.

The graph illustrates the current functions applied to R,G,B as shown in this example:



You can (and probably want to) activate a Waveform display like *RGB Merged* when grading colors. There is an option to automatically activate that when the Grading Dialog is opened (**Waveform ON/OFF**), and **Waveform Settings** opens the mentioned dialog to set it up.

Lift/ Gamma/ Gain is a slightly different approach, but mathematically equivalent:

Lift moves the black level (Shadows) without affecting the white level (Hilites), that means dark colors become brighter, midtones get compressed or expanded (→ contrast of midtones). This is like an inverted *Slope* in ASC-CDL.

Gamma does the same as above: It expands or compresses the distribution of midtones without affecting white level or black level.

Gain moves the white level (the Hilites) of the image without affecting the black level. This is exactly like *Slope*.

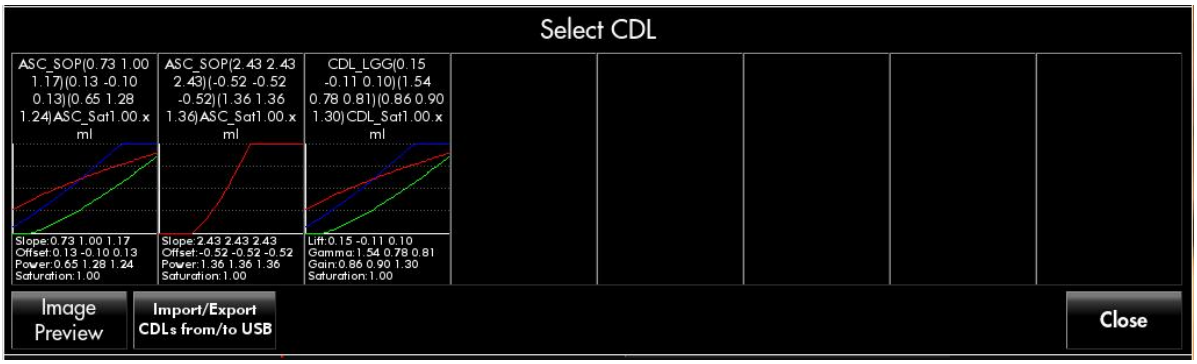
Both variants can be saved to (**CDL Save**) or loaded from (**CDL Load**) XML-formatted files that simply encode the above parameters like this:

```
<?xml version="1.0" encoding="UTF-8"?>
```

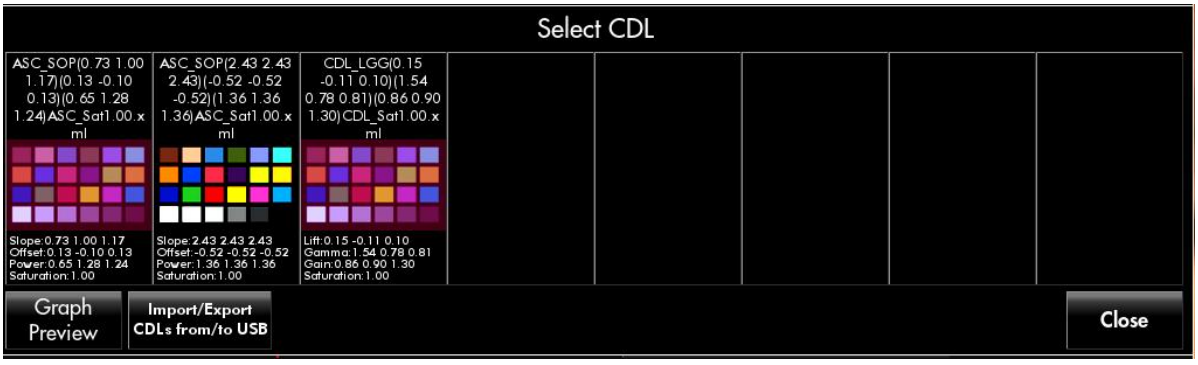
```
<ColorCorrectionCollection xmlns="urn:ASC:CDL:v1.2">
    <ColorCorrection id="uniqueID">
        <SOPNode>
            <Slope>2.43 2.43 2.43</Slope>
            <Offset>-0.52 -0.52 -0.52</Offset>
            <Power>1.36 1.36 1.36</Power>
        </SOPNode>
        <SATNode>
            <Saturation>1.00</Saturation>
        </SATNode>
    </ColorCorrection>
</ColorCorrectionCollection>
```

Loading CDLs:

The available CDLs can either be illustrated by **graphs**:

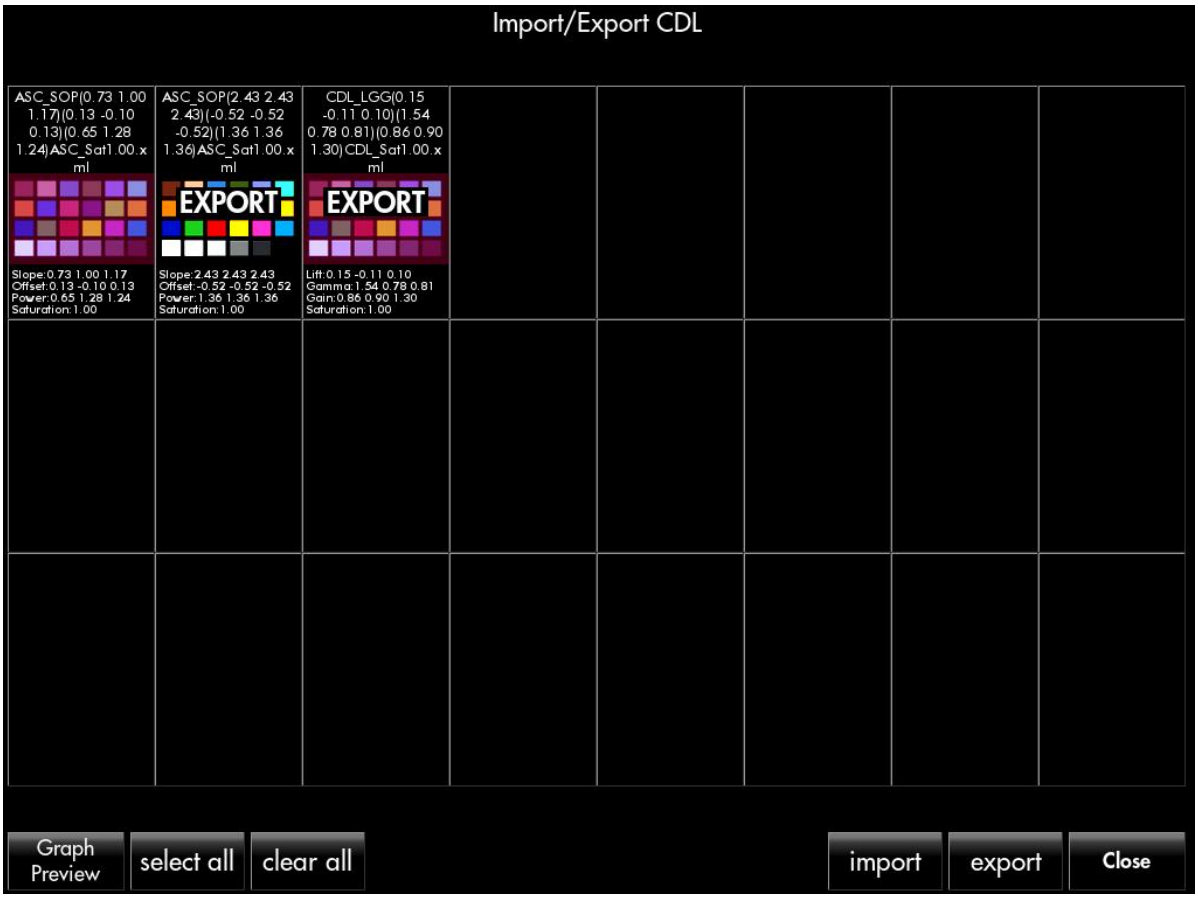


...or with a Testpattern that has the CDL applied (toggle **Image Preview / Graph Preview**-Button):



When saving a CDL, the proposed filename contains all 10 variables, but this can be arbitrarily renamed, of course:

With an attached and mounted USB device,
press ***Import/Export CDLs from/to USB*** to import or export CDLs:



Create LUT

All settings that you can apply in the top-level ***Color Grading- Dialog*** can be turned into a LUT by pressing ***Create LUT***. Of course you need to turn off all settings afterwards and ***only*** apply the LUT, otherwise the operations would be applied twice... There is a dedicated button in the main grading dialog to ***Turn off all Color Grading*** at once! But that's not a "toggle-button" -

you can't turn back on all settings this way, you need to go into all sub-dialogs and press ON/OFF, there.

Before the LUT is created, you can (de-)select which settings should be considered in the final result:

After pressing OK you need to enter a file name for the LUT and press Save. Now you can use the LUT as explained in the LUT section.

Color Space

The Video-Input-Board of the PSU always receives picture data in the YCbCr color model and needs to convert it to RGB (full range) for presentation. Unfortunately there were different transfer functions used over time for different scenarios. At the moment, most signals from digital cameras are Rec.709 in "legal range", that means color values are cut or compressed to a range smaller than necessary, to provide headroom for analog broadcast(!) etc. If the camera for example is configured to "extended range" instead, or if you are using an analog SD to HD-converter before feeding the signal into the PSU, you should change the Color Space to "Extended" or Rec.601 for SD footage (depending on the output of the converter box),

respectively, to make the picture look "right". The PSU can not determine the color space by looking at the data automatically.

Output

Imagine you don't need or want to have certain Picture Settings on certain Video-Outputs or Streams. In the Picture-Settings' Output-Dialog you can disable Chroma-Keying, Blur, Image Adjustments (=Color Grading), Ground Class Markings, Geometric Transformations (Zoom etc.), Masking, LUTs and Wavforms/Scopes for specific outputs. In the above example, Image Adjustments and Zooming is not applied/visible on Video-Out 1. (If you change anything other than *Waveform*, Waveforms get disabled as well on this output because of hardware limitations.) The right-most column of buttons changes the outputs to control: V-Out means the "normal" (SDI) Video-Outputs of the PSU, HDMI refers to the 4 additional Video-Outputs that become available when you activate HDMI-Out in Settings→ Settings → Video/HDMI-Out-Settings and S-Out refers to the 4 possible Wifi- or Internet-Streams (if they are activated).

If any change is done somewhere, the Output-Button itself is flashing slowly, as well as the affected V-Out-, HDMI- or S-Out- buttons.

Reset (all) Picture Settings

In case you like to reset **all** Picture Settings or specifically those of a certain camera back to standard values, **press the Settings-Button for more than 2s** and the *Customer Reset*-Dialog will be shown where you can do that:


Picture
Audio
Tools
Settings
Customer Reset
Reset the following image related settings to standard values:
Chroma Keying, Ground Glass Markings, Image Adjustments, Zoom, Move & Rotate, Mask, Mirror X/Y. Overlay will be switched off.
All other settings remain unaffected.
Reset All
Cancel
Reset the picture settings of a camera:
Cam A only
Cam B only
Cam C only
Cam D only

Audio Settings

The hardware options regarding audio are described in Tour around the PSU-4.

This chapter deals with setting up, monitoring and controlling audio.

Audio has its own section in the *Settings*:

Select Audio Source

Probably the most important setting is **Audio Source**: Here you assign audio-inputs to camera-inputs, like **"Audio-In 1 is used as the source for all Video-Inputs"** etc.

Pressing **Audio Source** opens a sub-menu to set up every channel individually, or all at once:

In the second (smaller) line of all Cam-Buttons one can see the current mapping - here all

cameras get their audio from (analog) Audio 1 (XLR-1).

To change the source for Cam A for example, press Cam A:

Then select one of the available possibilities, like HD-SDI-A to use the embedded audio fed into Cam A (the dialog will close immediatley).
AUX is disabled in the example and refers to the third pair of audio-connector's that can be connected to the second Headphone-jack by means of an adapter (also described in Tour around the PSU-4). To use this option, AUX has to be enabled in the "Expert Mode"-Settings of the Audio-Dialog.
Anoher "special input" is **Stereo**, which assigns both Audio-In-1 and 2 as Stereo Left/Right to the Video Input.
All HD-SDI-Audios are Stereo / 2-channel anyways. You can also switch Audio-In-1 to *digital (AES)* in the "Expert Mode"-Settings, then Audio-In-1 is 2-channel as well (see below).

But let's go back first to **Set All**: This opens exactly the same dialog as above, but assigns the choice made there to **all inputs**.

HD-SDI Sound from Camera assigns HD-SDI-A-Audio to Cam A, HD-SDI-B-Audio to Cam B, ...C to Cam C and so on for all inputs.

Speaker / Headphones Level

To set the volume of the built-in PSU-Speaker and/or Headphone connectors, press the left or right half of the green display at the bottom to select, then adjust with +/- buttons. (Dark-green means "active"...).

Sound Level Displays

The bigger sound level display in the *Audio-Settings-Dialog* and the smaller one above, that you can toggle with **Sound Level ON/OFF**, always visualize the audio that corresponds to what is visibible on the PSU-Screen. If more than one camera or playback is visible (needle is black), the color of the needles refer to the input channel or player number according to the PSU-Channels-Color-Scheme:

- Cam A / Playback 1: Red
- Cam B / Playback 2: Blue
- Cam C / Playback 3: Yellow
- Cam D / Playback 4: Green
- (Cam E-H match their channel-colors as well...)

> **Note:**
>
> As a shortcut, **press the sound level display on the main view to quickly open the *Audio-Settings-Dialog***, for example to immediately **Mute** all Audio-Outputs and Streams (except for headphones) by pressing **Mute** in the top-left-corner. *Pressing the sound level display for >1 sec will toggle **Mute all** as well (without opening the Audio-Settings).*

The meters' units are (-)dbFS, the red area starts exactly at -18dBFS (digital full-scale), matching studio- / line-level.

Variable Sound Speed

Normally (with this option turned off), you can only hear audio of playbacks within a range of ± 30% time-lapse or slow-motion factor (if sync-speed is 25, this means within the range of

18-32 fps). In this range the *tone-pitch is kept constant*, it sounds the same as originally, only faster or slower.

With **Variable Sound Speed** enabled, you can also hear audio beyond that range, but the tone-pitch goes down or up according to the current time-lapse or slow-motion factor of the playback, as known from an analog tape recorder.

When playing takes backwards/reverse, you always also get **backwards audio**, matching frame and speed!

Fan Control

With **Fan Control** enabled, the PSU **turns off** most of its cooling **fans** (or lowers the nois level close to inaudible) **while recording with sync sound recording**.
Because then all inside components start to heat up gradually, this state can't be kept forever, but it should last long enough for average length recordings (depending on the environment of course). Under "normal" conditions, like 23°C/74°F without direct sunlight, it should last for ~7-15 minutes. Above a certain temperature threshold (74°C/165°F), the PSU starts to control the fans dynamically with that target temperature. This keeps fan noise still low, but prevents damage to the PSU. If the inside temperature keeps on climbing, the PSU might switch into "Desert Mode" with all fans blowing at full speed. In extreme conditions this might not be sufficient: People have added external fans (to the PSU-3X) while shooting in the desert, that assist the main chassis fan to keep the PSU working. The PSU will shut off automatically when the processor goes beyond 100°C/212°F. Removing the ventilation grid roughly doubles air flow...

Between recordings, the fans are turned up much higher compared to *Fan-Control-OFF*, to quickly cool down the PSU again, as fast as possible.

When *Fan Control* is enabled, it's indicated on the right side above the fps-Display. An additional button is added to **turn off the fans manually**, without needing to

record. The temperature display is an additional option, that can be enabled in **Settings** → **Settings** → **Temp. Display**.

Manual Sync

When feeding audio directly to the PSU while the picture passes devices that introduce latency before entering the PSU, picture and audio might be out of sync already in the PSU. All monitors add latency as well, and there will be sync problems if audio is not delayed correctly in the monitor itself, too.
Manual Sync allows to delay or advance audio frame-wise relative to the image on the PSU (advance: playback only).

Auto Mute

During recordings, the speaker and (XLR-)Audio-Uutputs except for the headphones) will be muted automatically with **Rec-Mute** enabled.
You can adjust the Rec-Mute level from -60dB (=Off) to only -3dB damping for the internal speaker. (All other audio outputs will be just turned off completely.)

Especially to prevent feedbacks on the Video-Out-Monitors, **Live-Mute** only affects Audio-Out-1,

-2, and -AUX: It mutes the named outputs when the corresponding Video-Outs are *Live* or *Rec*. There are dedicated analogous Audio-Settings in the (Wifi-/Satellite-)Streaming-Settings to control what's happening in Live- and Recording-Modes on the Stream-Clients.

Mute All

 Mute turns off all audio on all Audio-Outputs and Streams, except for the headphones. This is indicated on the sound level displays as a red struck out speaker symbol.

Advanced Audio Settings

Back to the already mentioned **Expert Mode-Dialog**:

Analog Timecode

If you need to feed analog timecode into the PSU, you can do so by using Audio-In 2 (toggle to **Audio-In 2 ON**). This timecode will take precedence over the timecode that might come in via HD-SDI (if present). To display the TC of a take or while recording, press one of the *Time-Displays*.

Analog Timecode support on the PSU is relatively "basic": You can only put out timecode-audio or normal audio - not both at the same time on different audio outputs. To activate, toggle **Audio-Out 1 / 2 to ON**. (This also enables Timecode-Out on AUX-Out.)

> **Note:**
>
> As with normal audio, the TC-Audio-Outputs follow the states of Video-Out-1, 2 (and 3 with AUX). That means the playback with the desired Timecode that shall be put out, has to be visible on the Video-Out. (Audio-Out always follows Video-Out, e.g. Audio-Out-1 plays audio of Video-Out-1!)

So far it's only possible to play out timecode from playbacks (existing recordings), no Live-Timecode or Loop-Through.

AUX

Enabling this option turns Headphone 2 into an additional pair of mono Audio Input & Output. AUX-Out "follows" the picture of Video-Out-3!
You need an additional adapter for this.

AES In/Out

These two buttons toggle digital AES/EBU (stereo) support on Audio-In-1 and Audio-Out-1 (only). Audio-In/Out-2 and -AUX are always analog mono.

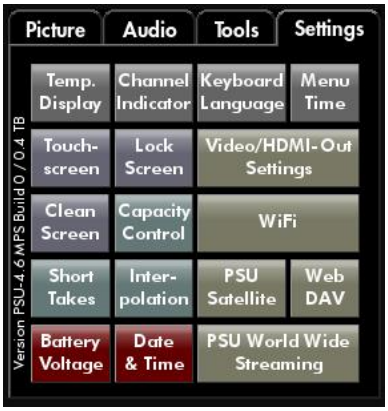
Gain Audio-In 1,2

Audio levels on the PSU-connectors are always based on studio/line-level (0dBu/775mV). If you nevertheless need to amplify the (analog) signal, you can increase Audio-In-1 and/or Audio-In-2 up to 30 dB. (Press left or right half of the green display to select 1 or 2, and adjust with +/- buttons. Dark-green means "active".)

Other Tools & User-Settings

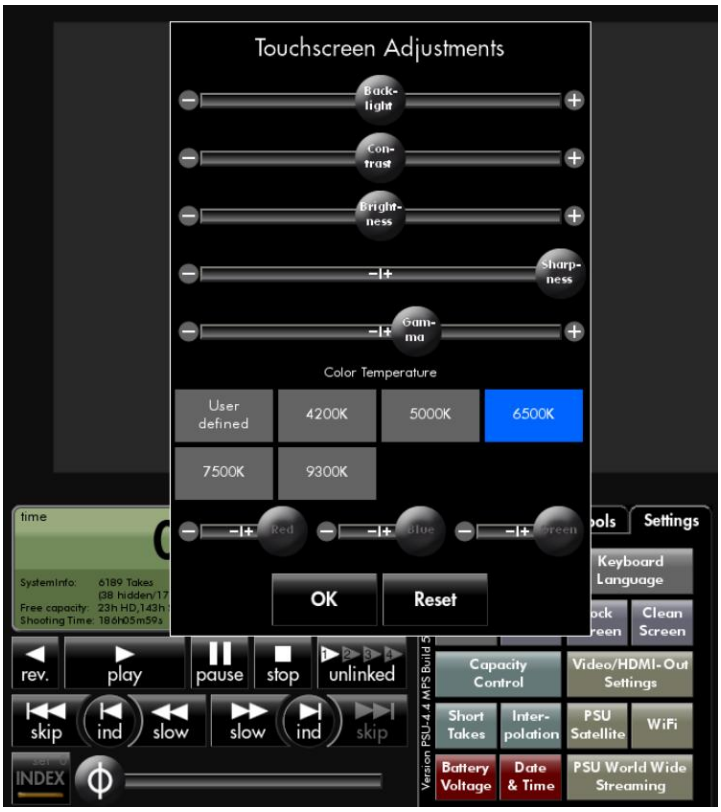
This chapter explains some *Tools* an *Settings* in full detail, that were already mentioned briefly or didn't fit elsewhere.

Most of the following applies to **Settings** → **Settings**:



Touchscreen

In **Settings** → **Settings** → **Touchscreen** you can adjust the PSU's screen settings. *None* of the Settings applied here change the image on the Video-Outs, Streams, or recorded footage, they just affect the visual appearance on the PSU's built-in screen! Because the communication with the built-in monitor controller is kind of slow, it's the best to gradually change the sliders or "single-step" through their range by single-touching left or right of a slider's *center*.

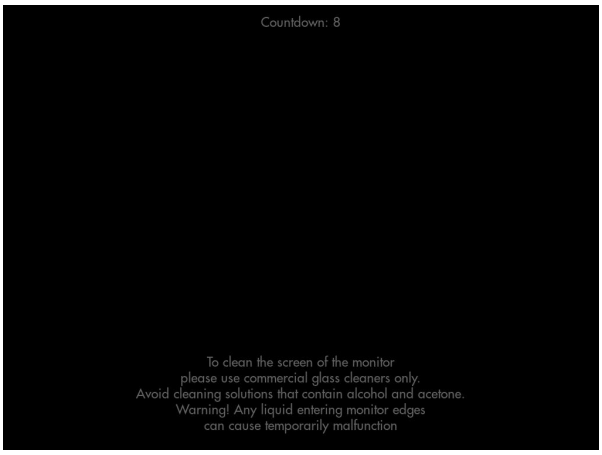


- The most important one is the first slider labeled **Backlight** - here you can tune the brightness of the screen without affecting (harming) the colors. Pulling it to the maximum right should allow the screen to be readable in sunlight. This will of course be too much for dark indoor situations...
- Increasing **Contrast** will add to visibility in bright sunlight, but you might lose details in the "lights" of the image itself. Same applies to decreasing contrast and details in the "shadows".
- **Brightness** increases the black-level of the PSU Screen, effectively turning black to gray...
- With **Sharpness** you can *blur* the image for whatever reason to soften hard edges and steps caused by digitization, but frankly, this option is from the analog times and left in for "completeness". The optimal and default setting is "pulled fully to the right", which presents the image as it really is (in the graphics processor). If you want to really blur the image, for example on a background plate, use the *Blur*-Picture-Setting.
- **Gamma** lets you change the Gamma value of the monitor. For details, have a look at for example Gamma Correction. If you don't know what you are doing, leave this setting as it is ;-)
- **Color Temperature**: Colors look differently depending on the lighting conditions of the current environment. (Wikipedia: Color Temperature). You can select a predefined

temperature or define your own (→ **"User defined"**) to make colors on the screen look the way you need or for example to match a certain Video-Out monitor. After selecting "User defined", The "Red", "Green" and "Blue" Sliders can be changed.

- Press **Reset** to go back to "Factory Settings".

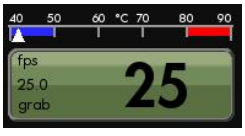
Clean Screen



After pressing *Settings* → *Settings* → *Clean Screen* all buttons and controls are hidden behind a dark screen counting down 10 seconds. When you press/touch the screen anywhere, the countdown restarts again. This is intended for cleaning the screen with a soft cloth and a commercial glass cleaner while the PSU is running, avoiding any unwanted key presses, etc.

> **Warning:**
>
> Avoid cleaning solutions that contain alcohol and acetone.
> Any liquid entering the monitor edges can cause temporarily malfunction.

Temperature Display



Use *Settings* → *Settings* → *Temp. Display* to enable a gauge above the FPS-Display, that displays the highest temperature of various sensors inside the PSU. Most of the time it will be the temperature of the first processor core. The display assists in estimating how long the PSU can

stay silent when recording with Fan control. If the temperature exceeds 80°C/175°F for longer (and you are not compressing takes for export in the background), **something might be wrong** - maybe the main fan is blocked, or the PSU is constantly exposed to direct sunlight on a hot day etc.

> **Warning:**
>
> If the processor (CPU) temperature reaches 100°C / 212°F, the PSU shuts off without warning and with the danger of losing/corrupting data (footage).

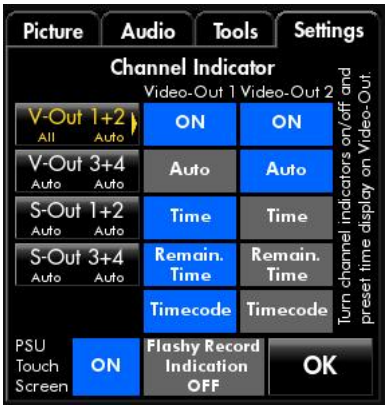
Menu Time

A lot of dialogs / menus get closed automatically after a certain time - by default after 20s. This time can be adjusted between 5s and 120s in steps of 5s, or the automatic hiding can be disabled by setting the time to **"Permanently"**.

Keyboard Language

To change the language of all (on-screen) keyboards where text can be entered, pick one of the available languages in **Settings → Settings → Keyboard Language**. The language will also apply to externally plugged (USB) keyboards. (See Keyboard Mapping if you are interested in controlling the PSU with an external keyboard, additionally).

Channel Indicator



In the top right corner of all images, the recording / input channel is shown (A-H), left of its *State* (PLAY, LIVE, REC, RUN*, OVERLAY if applicable, Zoom-Factor if applicable) and on Video- and Stream-Outputs the Scene/Take Number, various Time Displays and the Frame Rate.

(* *RUN* means: "Camera is recording but PSU is **not** recording".)

Example: Every display enabled on this output.

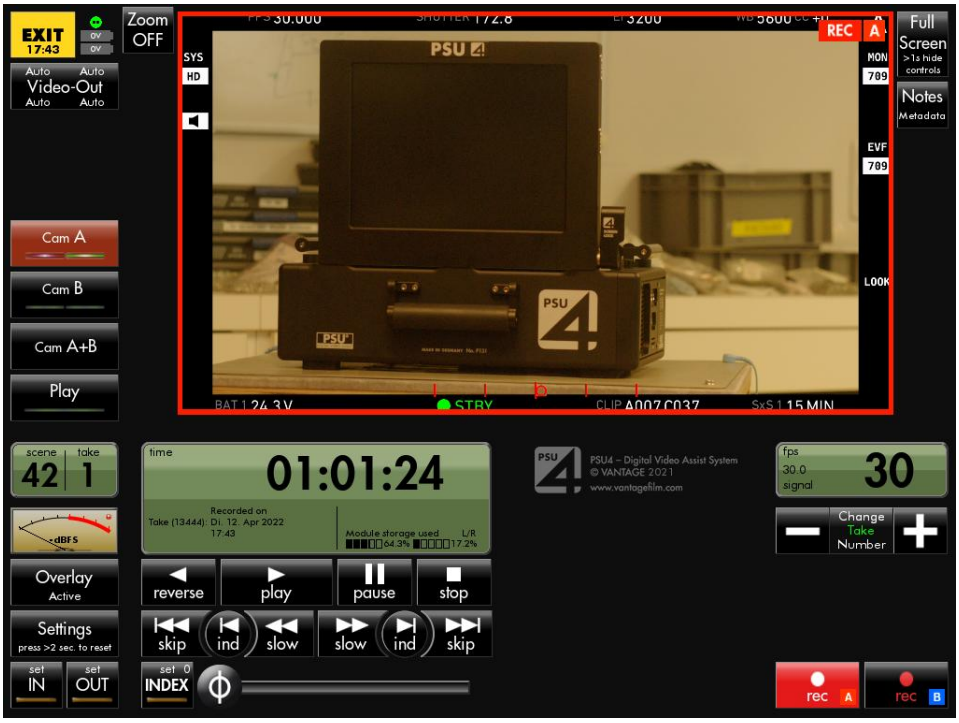
In the **Channel Indicator Dialog**, you can configure for all screens and outputs if they, and which of them shall be visible:

- **OFF:** Turns off all displays, you get a "clean" picture.
- **ON:** Displays Channel and State **plus one or more of the following Time-Labels:**
- **Auto:** Only normal playback / recording time
- **Time:** Normal playback / recording time
- **Remain. Time:** Time Remaining for playback
- **Timecode:** External/Recorded Timecode

As always, V-Out means Video-Out, S-Out means Stream-Out. The number of outputs depends

on Video-Out and Streaming-Settings.

- **Flashy Record Indication** draws a thick red blinking border around a running (PSU-)recording, like this:



Short-Takes-Length

As already mentioned here, every Take below a certain duration (initially 3 seconds) is marked as a *Short Take* automatically, and doesn't show up in the "normal" Takes. In **Settings** → **Settings** → **Short Takes** one can change the duration for what is to be considered as *short*, from 0 (→OFF) to 10 seconds. BTW, if you change to the Short Takes Level (as explained above), you can **delete** specifically, for example, **all short Takes at once**.

Tooltips

Tooltips provide On-Screen-Help for the PSU and can be enabled to allow an easy learning of the PSU usage. They explain certain non-self-explanatory concepts, e.g. press *play* "long" for *loop* and "double" for *continuous playback*, and they show up after certain functions were triggered a few times. The **Skill Level** affects the *frequency* Tooltips are presented.

If a Tooltip disturbs your productive work, simply press on the Tooltip area to remove it from the screen. If you press the same screen location again, the Tooltip last displayed reappears on the screen.

By default, Tooltips are **not enabled**. They are available in German, English, French or Spanish. It's also possible to cycle through all available Tooltips sequentially with the **Skip-Buttons** at the bottom.

Example:


EXIT
11:56
Zoom
ON
Auto Auto
Video-Out
Auto Auto
PLAY A
74 %
Full
Screen
>1s hide
controls
Notes
Metadata
Cam A
Cam B
Cam C
Cam D
Cam
A+B
>2s edit
Cam
C+D
>2s edit
Cam A-D
Play
Zoom
OFF
Mask
ON
Press one of these buttons longer than 1 second
to combine them with format markings.
Mask or zoom will be adjusted automatically by active format
markings.
scene
take
Mini Hawk
time
03:04:19
Action Master
02:52:00
Take Info:
Recorded on
Mo. 10. Apr 2017 16:37
Shooting Time: 08:48:03
Screen Time: 11:15:23
Module storage used
L/R
64.3%
17.2%
fps
24.0
grab
32
Picture
Audio
Tools
Settings
Tooltips
Select language
Deutsch
English
Français
Español
Overlay
OFF
reverse
play
pause
stop
Settings
press >2 sec. to reset
skip
ind
slow
slow
ind
skip
Indicate your skill level
Beginner
Advanced
OFF
Cycle through all Tooltips
set
IN
set
OUT
set 4
INDEX
OK
press
>1s
A+B
rec
A
rec
B
press
>1s
C+D
rec
C
rec
D

Battery Operation

The PSU can be operated with batteries. The two connectors on the back "expect" at least 24V nominal voltage batteries, otherwise the PSU treats them as "empty" and shuts down automatically. If two batteries are attached at once, operation time is **doubled.** Batteries can be **hot-plugged** i.e. if one battery is operational, you can remove the other one without shutting down the PSU first (or plugging in AC power).

The maximum voltage-type for batteries is 30V (their voltage can be above 30V when fully charged - that's ok).

Nowadays most batteries have built-in *Battery Managment Systems* (→ "BMS"), like the Anton Bauer Cine VCLX or Bebop CUBE. That means the batteries stabilize their output voltage to a fixed value themselves and they switch off to protect against *deep discharge* (which can destroy the battery).

When using "simple" batteries **without BMS**, the PSU **tries to deduce** the remaining capacity **based on the selected nominal voltage** in Settings → Settings → Battery and the **measured voltage** at the connector.

You can see the current battery's voltage right next to the EXIT-button, here 29.8V:

(By the way, the top/first battery symbol corresponds to "Battery 2" on the back, because it's

the first connector from left to right if you look at the PSU from the front (screen) side.)

If the PSU is running on AC power the circle symbolizing a wall outlet is green. AC power always takes precedence over battery power.

When two batteries of the same kind are connected with differing levels of charge (voltage), the "stronger" one is used until voltages are close. Then both will be powering the PSU together, thus discharging both with roughly the same load. If one gets empty, the other takes over seamlessly.

Upon the very first connection of a battery to the PSU, a message pops up, reminding you to select the correct voltage and battery type in **Settings** → **Settings** → **Battery Select**:

You can press **Select** on this message to directly access the Battery-Select-Dialog or acknowledge the current Setting (28V), which is probably wrong. In the following example, the BMS-option got selected:

WARNING!

The PSU won't ask again until it is reset to Factory Settings. **So don't forget to change the setting if you change to completely different batteries!**

Initially, only 28.8V and 30V can be selected. But the PSU also supports operation with 24V and 26.4V batteries. These can be enabled in a "hidden" settings-dialog, part of the *Owner Settings*. To access it enter code 13974 in one of the Delete-Code-Dialogs, and select **Battery Voltages**:

When working with "intelligent" (BMS) batteries, the PSU can't deduce the remaining capacity, and thus can't warn about batteries getting empty or safely shut down the PSU when the voltage is low, because the voltage will stay the same across time. The PSU-operator will have to keep an eye on the capacity display on the battery itself and perform a manual shutdown in time. The battery displays will always stay green, when "Bat. with built-in management" is selected.

With normal batteries, the PSU will warn about voltages getting low. The display will turn yellow and then red, before ultimately the PSU will perform a safety shutdown on its own.

Deep Discharge Protection

When operating on batteries and one of the batteries' voltage drops below 22V, the PSU shuts off the affected connector until the cable is pulled (and thus the voltage drops to 0V).

This is implemented by design to protect "normal" batteries against "Deep Discharge"!

It can cause the following weird situation:

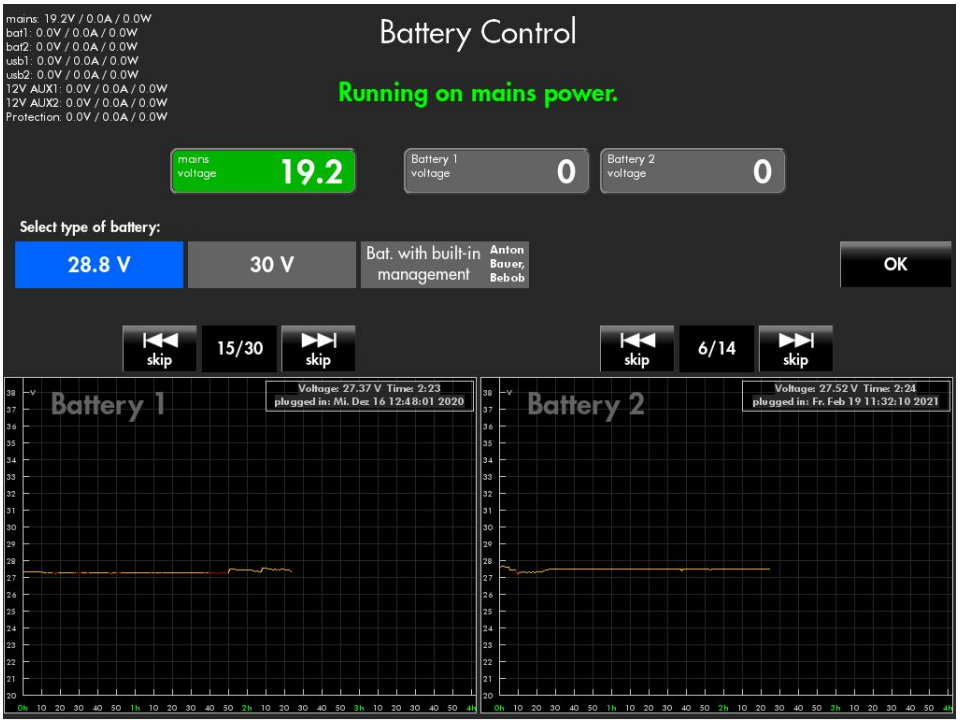
- For example, two VCLX are connected
- One of the batteries' ON/OFF button is pressed
- → Its voltage is slowly dropping below 22V.
- → The connector is shut off by the PSU (Deep Discharge Protection)
- → The battery is turned ON again (but PSU keeps it shut off!)
- → The other battery is pulled or empty

- → PSU loses power **although** a charged battery is connected.

To avoid such situations, simply don't switch off BMS batteries without pulling the cable afterwards...

Battery-History

There is "hidden" dialog where one can view and analyze the "Discharging-History" of the last couple of batteries that were connected to the PSU. It can assist in diagnosing the "health condition" of batteries by means of voltage/time diagrams. To access it, enter code "13795" in one of the Delete-Code-Dialogs.



Use Battery as an UPS

> **WARNING!**
>
> **Power-losses without clean shutdowns can cause corruption or loss of data** (i.e. footage). To avoid this, it is possible and **recommended to also attach a battery when operating on AC power!** Then the battery functions as an UPS (Uninterruptible Power Supply/Source) to keep the PSU running when AC power, for example from a generator, is lost.

Overlay

Basic Overlay / Concepts

Overlay means at least two or more **Layers** that shall be displayed stacked above each other, containing still pictures or moving footage. On the PSU, the limit is set to a maximum of **8 layers per Overlay** at the moment, to keep things "manageable". (This is a "decision of design" and could easily be extended in future versions, if there is a need for it...)

A **Layer** needs a **Source** - this can be:

- One of the availabe **Video-/Camera-Inputs**
- One of the available **Playbacks** (a.k.a. *Discs*)
- A **Still image**, for example a screenshot taken anytime when setting up the layer, a *Frame Grab*, an uploaded or imported picture.

The first two, of course, result in a **Running Layer**.

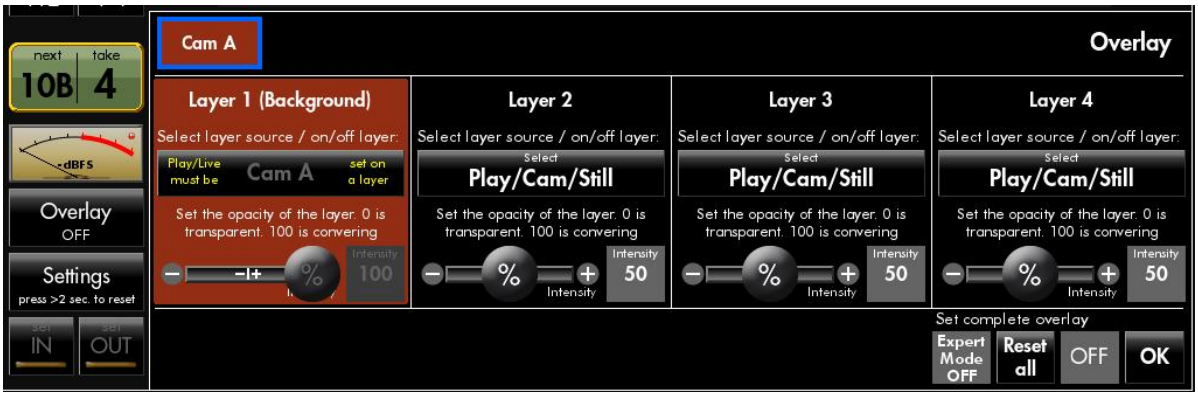
An Overlay can be set **on** any Input or Playback.

That means you can define up to 12 different **Overlay-Setups**, in theory (on 8 Inputs and 4 Playbacks).

To set up an Overlay, simply press the **Overlay-Button**.

Initially, most of the complexity is hidden: You can quickly set up an overlay with up to 4 layers without special settings on the layers. If any Picture Settings are applied to the layers' camera-sources, they stay effective.

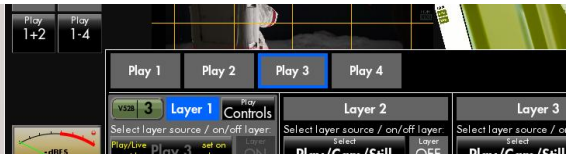
The (basic) **Overlay-Dialog** will look like this, if you are in Cam-A-Mode:



The first decision, one has always to make, is: Should the overlay be applied to a **"Live-Situation"** or should it rather be **based on a playback**. That means: Do you want to see the Overlay when you press one of the Cam-Buttons (some "Cam" is selected on Video-Out), or when you press one of the Play-Buttons (some "Play" is selected on Video-Out)? This decision leads to what is set up on the first layer of the overlay, initially. For example, if you press the **Overlay-Button** in Cam-A-Mode, Cam A will be set on the first layer (as above). The stacking order of the layers can be adjusted anytime (in "Expert Mode") - you can move Cam A here up to any other layer, but for a **Cam-A-Overlay** Cam A has to be present *somewhere* and thus can't be deleted or replaced by a different source! This is indicated on the **Source-Button** of *Layer 1*, telling you "Play/Live Cam A must be set on a layer!" The layer is always colored matching its source, if applicable. **Layer 1** is always the **Background**- or **Bottom-Layer**, the following layers will be "painted" above with an adjustable **Intensity** in percent. (You can't change the intensity of the Bottom-Layer.)

Note:

On the top-left of the Overlay-Dialog, you can see which **Overlay-Setup** you are controlling. In the above example it's the one for Cam A. You can change to an other simply by pressing on of the main Cam or Play-Buttons. In Multi-View-Modes, like Cam A-D, you can quickly change between the Overlay-Setup of, for example Cam B and C, by pressing those in the top line of the Overlay-Dialog, so that the outside view is not changed (stays in A-D mode). The active **Overlay-Setup** is also hi-lited by the blue frame:



To set up a layer's source, press its prominent **Select Play/Cam/Still**-Button:

On the right side, the Heading is explaining what's happening: *You are selecting the Overlay Source for the Cam-A-Overlay on Layer 2!*
If there is already a source selected, it would be shown in the green display on the top right corner.
Clear removes the current source from the layer and closes the sub-dialog, **Close** simply returns without changes.
On the left side, labeled **Running Live/Disc**, you would select one of Cam A-D and Play 1-4 as the (running) source for this layer.

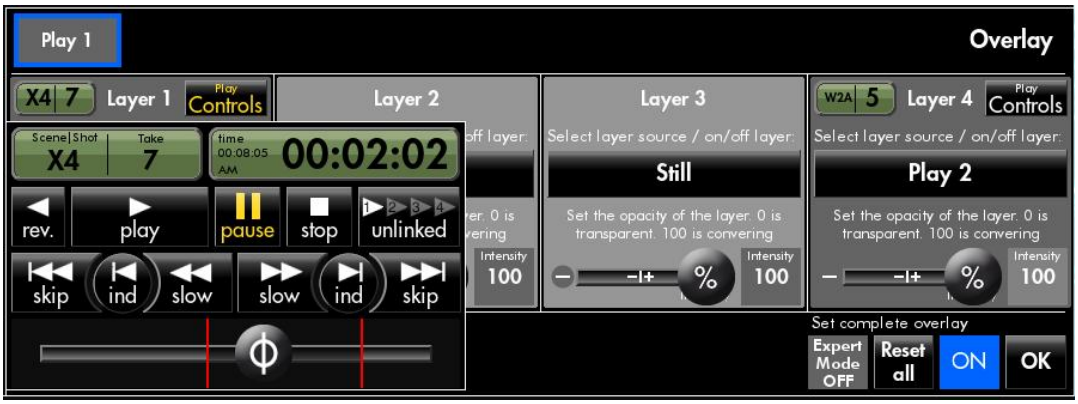
The bigger part of the dialog, with the darker background labeled "Still image", is to take a frame-grab/ screenshot from one of the Cam-Inputs or Playbacks **now**, and use this as the still image for the current layer. You can also select an existing **Grabbed Frame** or import a picture from an attached USB-device, if present.

The current still will show up on the little "canvas". Additionally, you can modify the Alpha-Channel of that image to make parts of the still partially transparent or opaque, exactly like described in the Freeform Alpha Mask chapter. The resulting still image including its Alpha Channel can be saved as another *Frame Grab* (and thus reused in other layers and overlay setups).

> **Note:**
>
> When importing images from "outside" the PSU (e.g. from USB), the expected/supported image ratio is 16:9 or 4:3. Other ratios will probably be stretched incorrectly.

The above is an example of what can be done *without* activating *Expert Mode*, although it might already be easier to accomplish this *with* Expert Mode:
All four layers are set up, the bottom layer is a playback of an underwater clip, Layer 2 is a still picture with Alpha Channel for the logo with about half the intensity to mix with the background, Layer 3 is another still with the green table fully opaque. In the foreground there is a second playback with active Chroma-Keying.

By using the **Play Controls** in layers with playbacks as source, one can easily control the playbacks without having to close the Overlay-Dialog first:



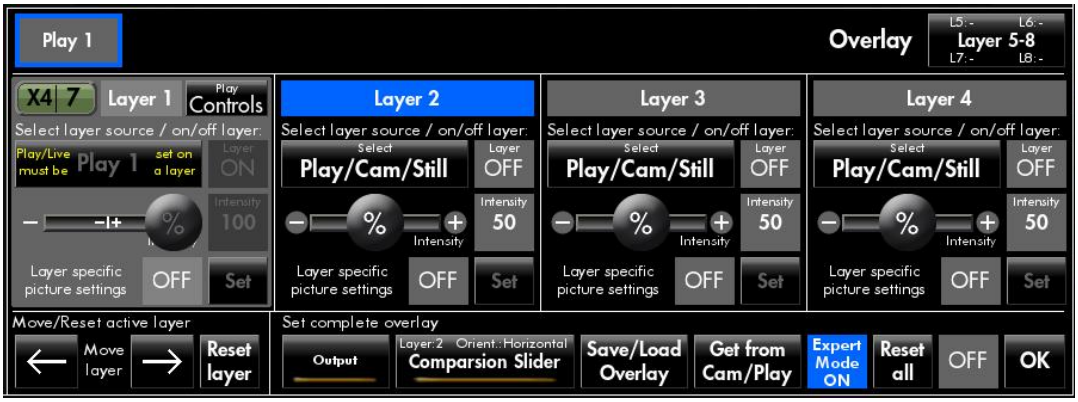
You can also search and load different takes “into” the layers by pressing the green Take-Number-Displays  in the top left corners of playback-layers without “leaving” Overlay.

To reset all layers of the **current** overlay, press **Reset all** at the bottom right for >1s . This does **not** affect overlays which are set up on other inputs (cameras) or playbacks! If you would close *Overlay* now (press **OK**), and there are still overlays active on other inputs or playbacks, the Overlay-Button would still read “Active”!

Next to *Reset all*, by toggling ON/OFF, you can turn off the current Overlay **temporarily**, without resetting everything.

Expert Mode

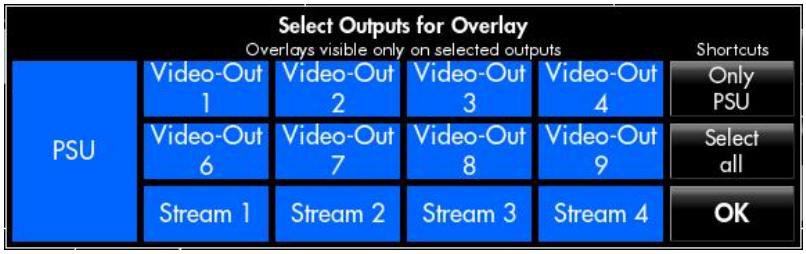
To unleash all overlay-possibilities, toggle **Expert Mode** to **ON**. Although it might look overwhelming, it makes a lot of things in fact easier to do!



The principle concepts as explained above stay the same. The following possibilities are added:

- The **Layer 5-8**- or **Layer 1-4**- Toggle-Button on the top right adds access to 4 more layers. On the button itself you can see which sources are set on these other layers.

- Every layer can be toggled ON/OFF *selectively* (next to *Play/Cam/Still*).
- You can **change the stacking order of the layers** by moving them up (right) or down (left). Before moving a layer, it must be selected first, by pressing the headline-label of each layer. In the above example "Layer 2" is selected at the moment, and could be moved by pressing the left or right **Arrow-Button** on the bottom left.
- Every layer can be reset individually by pressing **Reset Layer** on the bottom left.
- You can specify on which **Outputs** (Video-Outs, HDMI-Outs, Streams) Overlays should be visible by pressing the Output-Button. If you change anything here, the LED-Indicator on that button will blink slowly:



(There will only be that much buttons if Streaming and HDMI-Out is activated...)

- With **Save / Load Overlay**, 6 complete Overlay-Setups can be stored, labeled and reloaded:

If a slot contains a setup, it will be indicated by the small green LED on each button. Use **Load with takes** to restore all takes that were loaded in the players at the time the setup was saved. Otherwise only the layers' settings are restored, leaving the current playbacks untouched.

- **Get from Cam/Play** copies all (Picture-)Settings of a different *Overlay-Setup* to the currently opened Setup, for example if you earlier defined an overlay for Cam A and want to transfer all its settings to a (new) overlay on Play 1:

Layer Specific Picture Settings

Every layer can have its own **Layer Specific Picture Settings**, which are independent from the Input-Channel-based (main) Picture Settings and take precedence over them, if set. This allows to use for example Chroma-Keying only on the selected layer, which does not affect any other pictures anywhere else.

Not all Picture Settings are available, though. Supported are:

- Chroma-Keying
- LUT selection
- The geometric operations Mirror, Zoom, Move and Rotate
- Blur (which is intended primarily for background plates...)
- Focus Peaking
- Color Grading

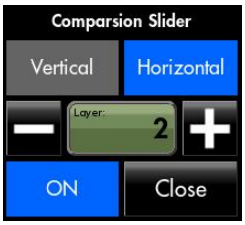
Additionally, the Picture Settings defined per Camera "outside", can be copied onto the current layer by using **Get from Cam X-Y**:

Note:

Because every layer can have its own Picture Settings, it's also possible to use the same Source (Play/Cam/Still) on different layers, each with different settings applied.

Comparison Slider

Finally, there is a special "tool" to *compare* layers vertically or horizontally by means of a slider:



To activate, press the **Comparison-Slider-Button**, toggle ON/OFF and choose *Vertical* or *Horizontal* mode of comparison. With -/+ you set the layer that shall be compared to the (overlay-)result of all layers "below". If there are only two layers, you're simply comparing layer 1 and 2.
In the above example, the sources for layers 1 and 2 are the same playback, but layer 2 has different Picture Settings applied (colors changed). It is probably reasonable, to set the intensity of layer 2 to 100%, unless you really want to blend the layers on the right, while comparing.

Editing

To enter the ***Editing-Level***, press any "Play" labeled button on the main view for more than 1 second and then ***Editing***:

For more information on the other available modes and functions, please see Basic Operation. In the Editing-Level or -Mode, you can only see and playback ***Cuts*** or ***Sequences of takes***.

You can easily distinguish the Editing-Mode by its red colored displays and the sequence-dialog labeled **PSU-4 Editing**" at the place of the Settings-Dialog:

To create a new sequence (or "cut" or "edit"...), press **New Sequence** in this dialog - this will open a "sibling" of the **Take-Selection-Dialog**, that is explained in detail in Finding and selecting Takes.

On the left side, there is the list of takes that make up the *sequence*. In this dialog you only select the takes you want to have in the cut and set the (temporal) order of them.

To add takes to the list, simply press takes on the thumbnail-matrix on the right, as long as **insert before** or **insert after** is the selected function on the left.

In the above example, the last take in the sequence is selected, indicated by the "hilite". Of course you can select any take in the list to specify before or after which the next take should be inserted. To move a take in the sequence up or down, select it and press **move up** or **move down**.

Out removes a selected take from the list, and **replace** exchanges with a take from the right.

Pressing **delete sequence** for more than 2s empties the complete list.

The **Navigate list** arrow-button can be used to **scroll the list** up or down by one, or **jump to the top or bottom** of it, if it contains **more than 7 takes.**

When you're done, press **Complete** to continue with setting IN- and OUT-Points on the main view:

Now, a **new Cut** ("c1") has been created, and you can set all the **In- and Out-Points** of the contained Sub-Takes.

To do this, press/select the In- and Out-Points in the dialog, and adjust them to the frame where a cut should occur.

You can use all the playback buttons and the slider. Play and reverse play behave a little different then usual: The sub-take **keeps playing as long as the buttons are pressed.** Index-Points for easy navigation within a long sub-take are available if they had been set on the active sub-take. Same applies for the Action Master In- and Out-Points, those will be used as initial In an Out for the cut, but can still be moved, of course. (For In/Out and Index Points, see Action Master.)

To fix a position as "in" or "out", press the Set-Button, and the next point will be selected automatically. When all points are done, **apply the cut** by pressing OK/Set Speed. Now the sequence is ready to be played. In this mode, one can adjust the speed (Time Lapse / Slow Motion, Ramps, Original Camera Speed) of every sub-take. It works just like you would do it in normal playback: Use the -/+-Buttons below the fps-Display, press the fps-Display itself to open the FPS-Keypad.

If you would like to exchange sub-takes of existing cuts, press Change Takes. Then select the sub-take you wish to replace. Then you can change it simply with the Skip-Buttons or press Change Takes a second time (in "Change-Takes-Mode") to open the Select-Take-Dialog-for-

Editing again (described above).

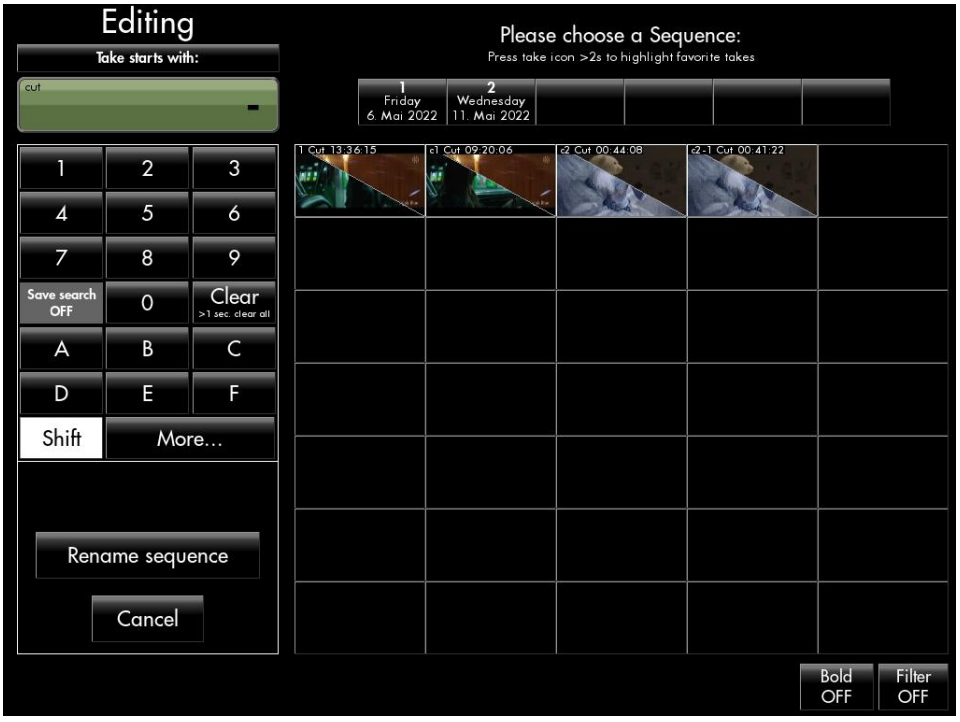
You can always switch back and forth between “Set Timing”, “OK/Set Speed”, and the third mode “Change Takes”.

The Up- and Down-Arrow-Buttons show up if the sequence has more than three elements to scroll through the list.

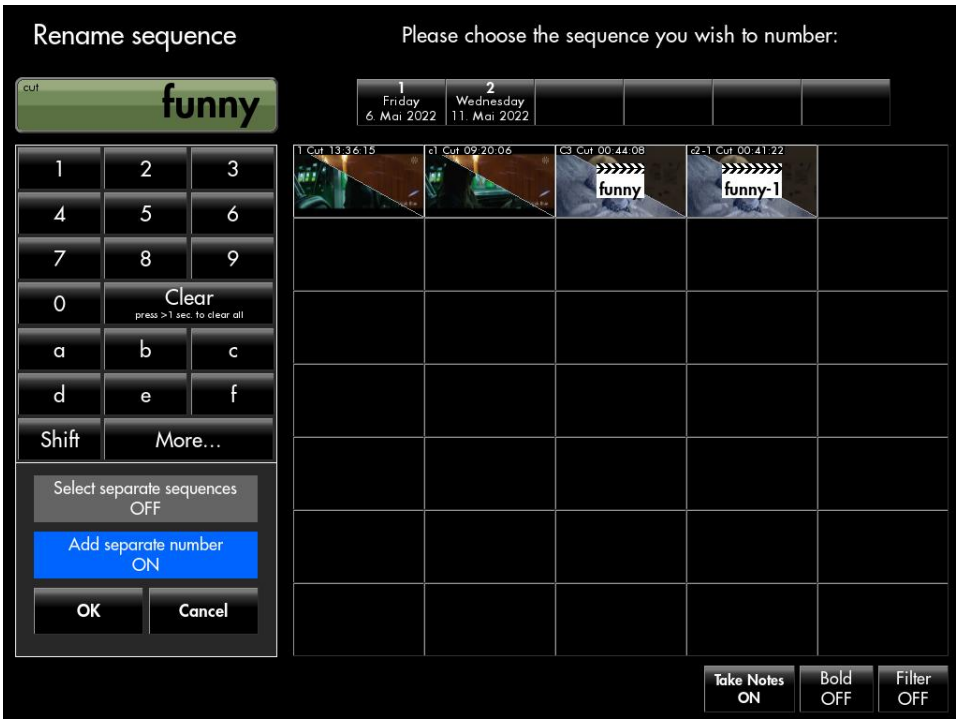
Conceptually there is a difference between editing a new sequence (for the first time) or going back to an existing one and changing it: The initial positions are set to the beginning and end of the take (or Action-Master-In/Out) and you “search” to the “inside”. When editing an existing cut, the positions are of course set to the already set up points and you “search” from there.

When you make in/out changes to an existing sequence, you can press **Store separate** to create a new (changed) cut based on the existing and leaving the original one as it was. (Like “Save as...” in known office software.) The new sequence based on an other will be labeled something like “c1-1” initially.

Like selecting / searching for “normal” takes, you can press the Take Number Display to select or rename existing sequences :



To change the name of existing sequences press **Rename sequence**:



As you can see, the "related" sequences or selected together. If you want to rename them individually, toggle **Select separate sequences** to ON. To get rid of the automatically added "-X" number, toggle **Add separate number** to OFF.

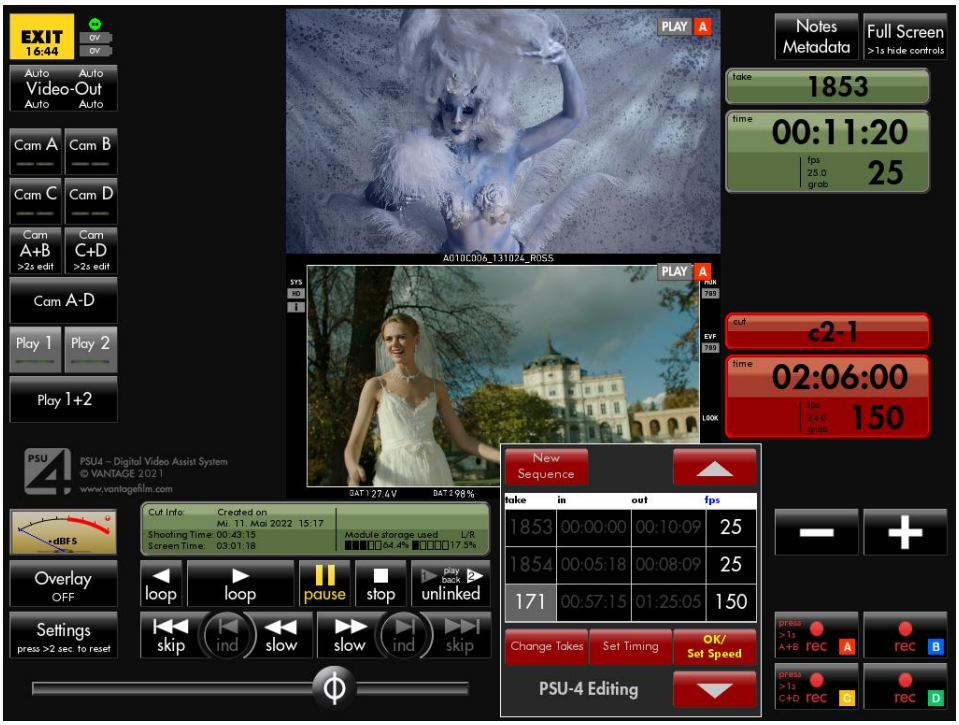
Deleting sequences works just like with "normal" takes (by pressing any "Play" labeled button for more than 1 second, then "Delete"...)

> **Note:**
>
> Sequences can be exported in various formats like normal takes.

Needless to say, you can also assign Favorite Labels and Take Notes to Cuts.

To protect sequences, the system displays "**part of cut**" on "normal takes" when you try to **delete** them. The whole cut must first be deleted before its single takes can be deleted. (This does not apply to "Delete Disc".)

It is possible to "mix" the playback of "normal" takes and cuts, and also do Overlays with cuts and takes that way:



Here “Play 2” is set to Editing-Mode whereas “Play 1” is in “normal” mode. The Editing-Dialog is hidden when you are controlling “Play 1”, and only shown when controlling “Play 2”.

Frame Grabs / Screenshots

A "Frame Grab" or "Screenshot" is a single frame taken from a Live-(Camera-)Input or Playback and stored separately on the PSU or on client devices accessing the PSU by network / WiFi.

On the PSU they can be used as **Overlay-Backdrops** and **Freeform Masks** (in the context of (Chroma) Keying). If you take a screenshot of a chroma-keyed picture, the transparency is preserved in the Alpha-Channel of the file. The file-format for Frame Grabs is "PNG" (Portable Network Graphics) with Alpha-Channel. PNG is a compressed but **lossless** file format, that means the quality does not degrade when "loading → changing → saving" the picture many times.

Outside the PSU they can be interesting for other departments like Script / Continuity, for example Frame Grabs can be used instead of taking photos of pictures on the Video-Out-Monitors... 😄

Frame Grabs Dialog

The "central" dialog for taking Frame Grabs and manage existing ones can be accessed by **Settings** → **Tools** → **Frame Grab**:

To take a screenshot, simply press one of the Source-Buttons (Here: Cam A-D, Play 1,2) where the desired image is visible at the moment. Normally, the original pictures are **captured without any Picture-Settings applied**. If **Effects** is toggled to ON, Frame Grabs are taken **with** Color Changes, Chroma Keying, Zoom/Move/Rotate, Blur & Focus Peaking.

The **green display** that shows the total number of stored Frame Grabs **can be tapped** to get

an overview of them in a Take-Selection-like Dialog:

Here you can browse through all, delete some or all of them and assign specific pictures to the three Freeform-Mask-Slots.

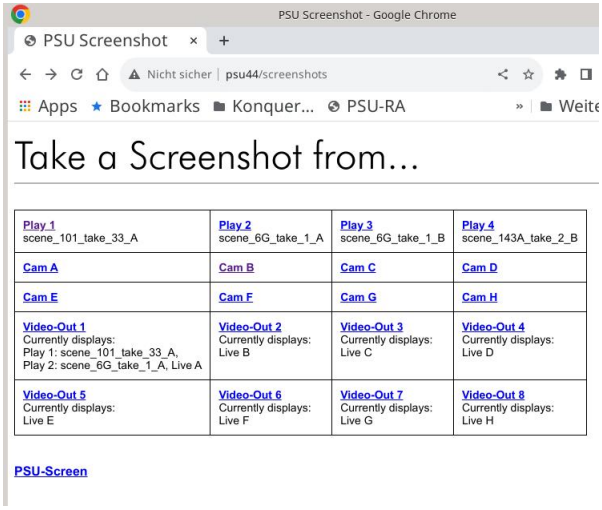
Quick Set Menu

Another way of taking Frame Grabs is via the Quick Set Menu. If the picture is visible on the PSU screen, tap the picture and press **Grab Image**. Screenshots taken via the Quick Set Menu are always **without** Effects, i.e. the **Effects ON/OFF**-Setting of the Frame Grabs Dialog will **not** be honored.

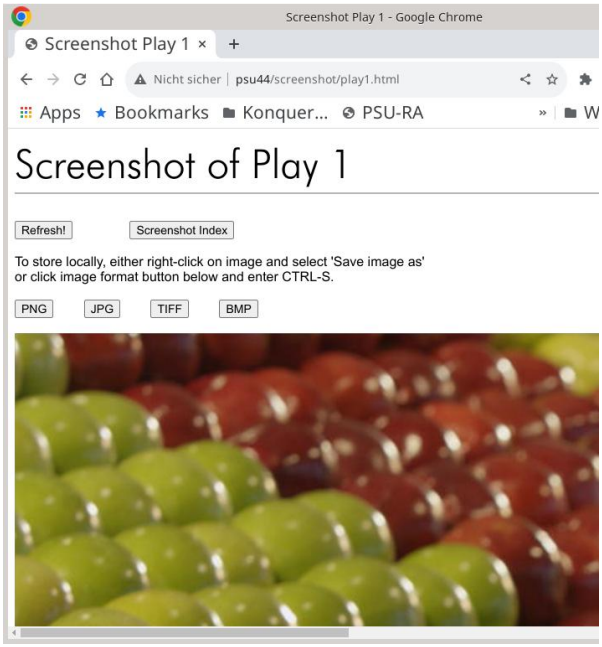
Screenshot-Web-Page

By opening http://psu+number/**screenshot** in a Web-Browser, Screenshots can be taken from all of the PSUs playbacks (Play1, Play2...), camera-inputs (Cam A, Cam B...) , Video-Outputs and the PSU-Screen itself. (Of course PSU and client device have to be in the same network to make this work. Please see chapter PSU-Network-Access for details.

The very "functional" page looks like this for example, depending on how many playbacks, inputs and outputs are set up:



Clicking on "Play 1" for example opens the page to take screenshots from Playback 1:



Pictures can be downloaded and saved as PNG, JPG, TIFF or BMP. To store locally, either right-click on the image and select 'Save image as' or click one of the 4 image format buttons and enter CTRL-S. A reasonable file name will be proposed, like scene_101_take_33_A_00_00_00.png

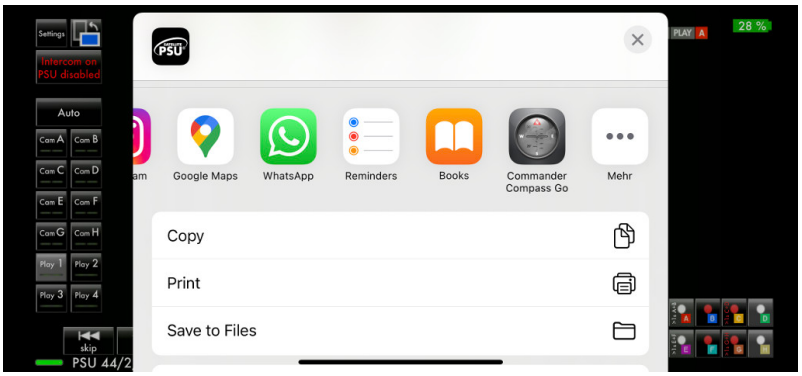
This feature is protected by **Authorization** that should be configured in *Settings* → *Settings* → *WebDAV*.

PSU-Satellite App

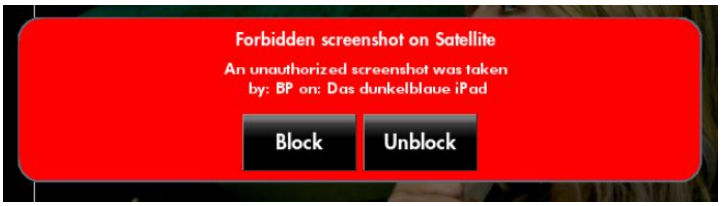
In the PSU-Satellite App, screenshots can be taken by tapping on the screen with **two fingers** (always with all effects applied). These will not be stored on the PSU! The Frame Grabs will always be stored in the local **Camera Roll** (i.e. the Photos App, and, if enabled, the iCloud). Additionally they can be shared / forwarded for a couple of seconds to another App on the iPhone/iPad/Mac that supports receiving JPEG-images. (For example iMessage, WhatsApp, Mail, Lightroom...). To do this, press Share Screeshot in top right corner of the App while it's visible.

Note:

You can change (extend / re-arrange) the list of Apps you get presented by iOS after pressing *Share Screenshot*: Scroll the list to the right as far as possible and select "More" ("Mehr") and then "Edit":



Taking Screenshots with two fingers can be suppressed in the PSU-Satellite-Settings. Because it can not be suppressed that someone grabs with "the operating-system" (Power-Button + Home-Button / Power-Button + Volume-Button), a warning will pop-up on the PSU, informing about a "forbidden" screenshot. The client-device will be blocked from that moment on, until the PSU-Operator unlocks it again:



As the Satellite-App supports "Split View" and "Slide Over" on iPads, it's possible to have the PSU-App running on the left half of the screen and use some "Script-App" for example on the right, that can immediately annotate the shared screenshots. (Use multitasking on your iPad).

World-Wide-Streaming:

If set up, of course everyone who is watching a PSU-Stream over PSU World Wide Streaming can take screenshots with tools provided by the operating system or third-party-tools.

Import / Export

There are two ways to import and export Frame Grabs or arbitrary (still) pictures onto the PSU, which will also show up as Frame Grabs:

1. USB-Device
   After attaching a USB-Stick or -Drive, open the Import / Export Manager and select **Import/Export other files**, then Import/Export Grab Frames.
2. WebDAV-Network-Interface
   Frame Grabs are accessible via the **capturedframes**- folder. You can download from or upload pictures to this folder. Please see chapter Network Interface for details on how to establish the network connection and access this folder.

Frame Grabs created on the PSU are named like the following examples:

- scene_24_take_2_B_00:06:21_20:03:55:18.png (The second time is the time-code)
- scene_24_shot_2_take_8_C_00:06:21_20:03:55:18.png
- 2019_09_17_B_18:33:50.png (from Live-Mode)

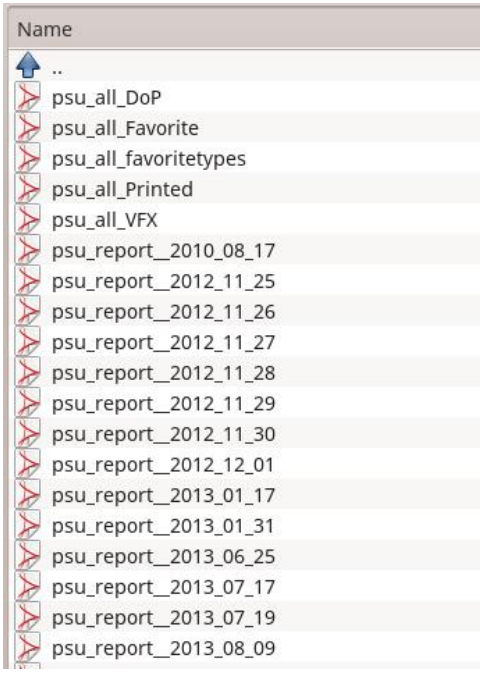
Job-/PDF-Reports

The PSU can produce "Job-Reports" or also called "Shooting-Day-Reports", which are documents in pdf-Format. They are created upon "request", and so are always up-to-date at the time of creation or download. They are not stored on the PSU permanently.

For every shooting day, one document is available, that lists **all takes of a dedicated date** grouped (=one table) **per camera.**

Additionally, there a special reports available that only contain **takes labeled with one** of the four possible **Favorite Types** and there is one variant that contains **all takes with any Favorite Type**.

Example of the reports-folder in a file-browser:



Report Structure

The documents look like this, initially:

PSU-Report 23 Oct, 2013

Camera: A

Scene	Take	PSU-ID	Rec. Start PSU-Time Cam-TC	Duration	Speed	Notes	Fav. Take
4 	1	7	07:57 00:53:31:09	00:46	24		
	2	8	08:00 00:58:23:18	00:52	24		
	3	9	08:02 01:02:04:14	00:41	24		
4a 	1	12	08:09 01:12:54:16	00:45	24		
	3	15	08:16 01:23:11:17	01:06	24		
4b 	1	18	08:19 01:26:53:11	01:26	24		
4c 	1	24	08:51 02:29:43:14	00:43	24		
	2	26	08:54 02:35:42:00	00:39	24		
	3	27	08:56 02:39:54:21	01:07	24		
	4	29	08:58 02:43:51:03	00:20	24		Favor
1 	2	44	09:34 03:56:45:23	00:53	24		
	3	46	09:36 04:00:11:22	00:46	24		
1a 	1	48	09:42 04:10:49:13	01:53	24		
1b 	1	50	09:49 04:25:53:01	00:41	24		
	2	52	09:52 04:31:50:21	00:46	24		
	3	54	09:54 04:34:12:09	00:34	24		
1c	3	61	10:07	00:38	24		

The tables contain the following columns and information:

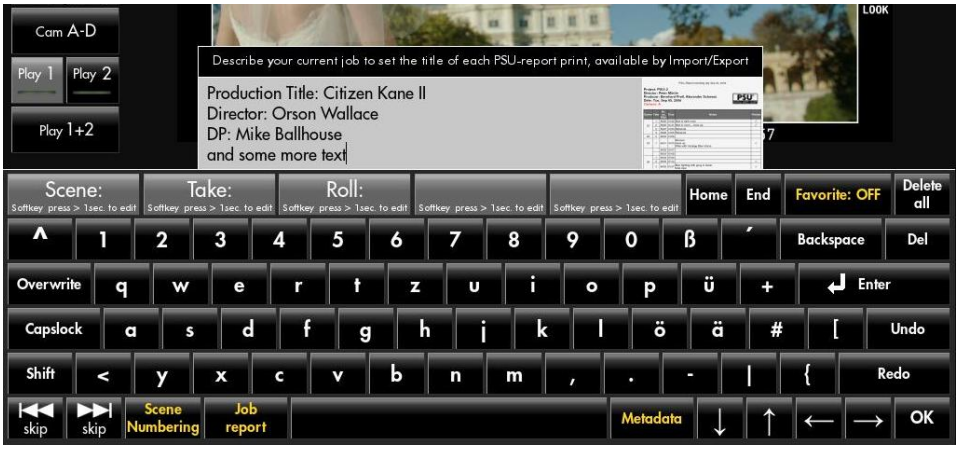
- The **Scene-Number** cell, including a thumbnail of the first take, spans across all takes of the same scene-number. If the Scene/Shot/Take-Scheme is selected, the Shot-Number is also shown here.The thumbnail pictures in the reports are stretched to anamorphic if Hawk-Desqueezing is activated and vice versa.
- **Take-Number**
- The **PSU-ID** is the internal continuous number given by the PSU, that is visible if Scene/Take-Labeling is turned off/not used.
- **Recording-Start** is time the recording of the take started, in real-time (PSU-clock) and

Camera-Timecode, if available.

- **Take-Duration** is the screen-time with time-lapse/slow-motion applied. If you change the simulated speed of the take on the PSU, this field will change accordingly.
- **Speed** means the signal-frequency also called and displayed as **grabFPS** in the FPS-Display.
- The **Notes** would show the text that was entered via the Notes-Keyboard. This cell can be filled automatically with selected fields of the Alexa Metadata.
- **Fav.Take** displays a colored square if the take is labeled with one of the Favorite Types.

Job Report Header

A **heading text** can be addded, that will be integrated at the beginning of every document: Pressing the **Job Report** button in the Take Notes Keyboard opens a special text/notes field for this purpose:

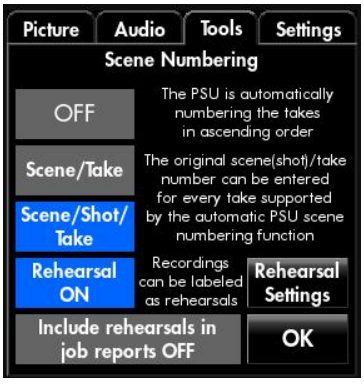


Add Metadata to Notes

You can automatically append Alexa-Metadata-fields to every Notes-Cell in the tables like this: Open the Notes-Keyboard, press the **Metadata-Button** and select the desired fields as described here:

Rehearsals

To control if **Rehearsals** shall be **included** in the reports toggle ***Include rehearsals in job reports*** in *Settings → Tools → Scene Numbering*:

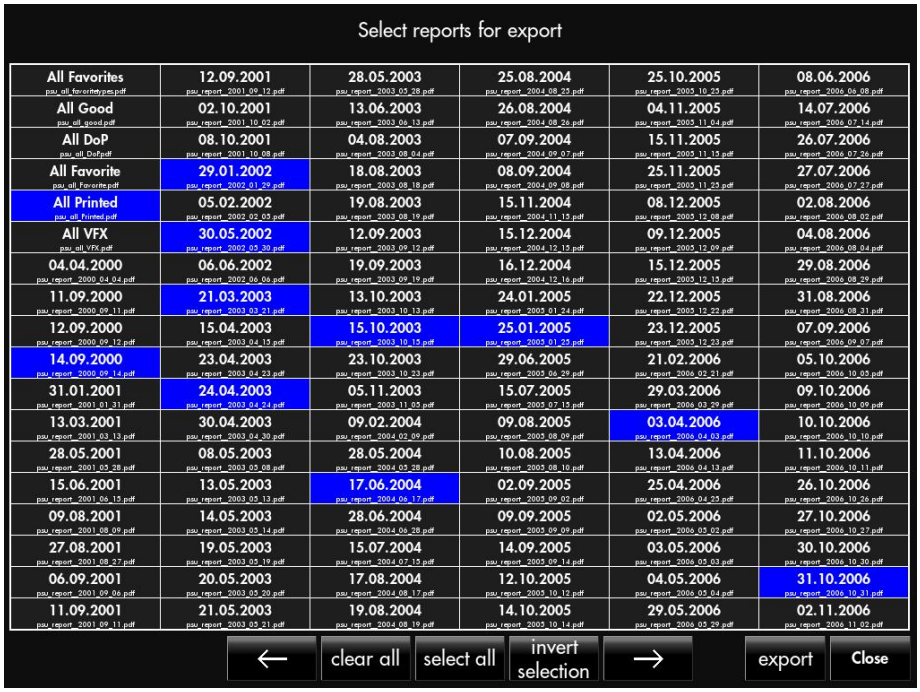


Accessing Reports

There are two ways to access/export the Job-reports:

1. **USB-Device**
   After attaching and mounting a USB-Stick or -Drive, open the Import / Export Manager and

select *Import/Export other files*, then *Export Reports*:



Here you need to select which dates and kinds of reports to export, then press **export** and select (create) the destination folder to store them.

2. **WebDAV-Network-Interface**

   The Job-Reports are accessible via the **reports**- folder (the folder is "download-only").

   Please see chapter Network Interface for details on how to establish the network connection and access this folder.

Wifi-Streaming

The PSU can stream Camera-Inputs and playbacks or any combination thereof to **Apple devices** via "WiFi" (a.k.a WLAN = Wireless LAN), most importantly to **iPads**, but of course also to **iPhones and Macs**. The App to receive, show and optionally control a stream is named **"PSU-Satellite"** and can be installed for free from the *Apple App Store*. (There is no App for other operating systems, like Android, yet. As a workaround, you could consider using "PSU World Wide Streaming").

> **Note:**
>
> In fact the PSU doesn't care about the network infrastructure - it is completely "transparent" to the PSU if the network is only wireless, partly cable-based or, for example, a WiFi-Mesh-Network available in the Studio.

The PSU-4 offers up to **4 different streams**, that can transport independent contents – think of it as of 4 additional (Network-)Video-Outputs.
There is no limitation on the number of clients PER stream other than bandwidth. As **the nature of Wifi is NOT "Broadcast"** (like TV) but rather a **"Shared Medium"**, every client takes away its slice of the available bandwidth! That means: If all of the bandwidth has been "used up" ("the channel is full"), the only way to add more clients is to lower the amount of bandwidth needed per client. This can be done by **lowering** either the **quality of video-compression** (= increasing compression factor) or **lowering the image resolution.** Both of these factors can be controlled PER stream on the PSU. This allows for example to reserve a good/best quality stream for the Director and a lower quality version for less important viewers. (It doesn't make a huge difference to watch a stream in Full-HD or Half-HD (960x540) on an *iPhone!*)

> **Note:**
>
> The WiFi/Satellite-Streams and the "Internet-Streams" are the same! Conceptually you can send the WiFi-Streams ***additionally*** "over the Internet". That means, if you change for example the quality of Wifi-Stream 1, it will affect the quality of Internet-Stream 1 the same way and vice versa.

WiFi-Routers

For *WiFi* one needs a *WiFi-Router*, a device that can distribute the single network connection coming from the PSU to multiple (WiFi-)connections.

You can use

- your own WiFi-router
- the **built-in router of the PSU-4**
- our (rental) router, called "Houston". The latter provides you with everything you need to set up a WiFi-Network on the set: The router itself in a rugged housing, cables and a **Stand** to position it close to and above the people needing WiFi:

We also provide very robust and nicely housed iPads, named "Satellites" including a power-bank concept to allow a day of work without needing to recharge.

Steven Spielberg using the PSU-Satellite on set of *Bridge of Spies*.

WiFi-Range

It is very important to understand, that WiFi is kind of a "consumer" standard, developed for home/private use. **That means that "range" is a problem**, because it's heavily regulated and enforced by law to only transmit with low power, and only a few channels are available for private use (→ "crowded" channels!). The situation in the US seems to be a bit more relaxed than in Europe, because the allowed transmit power is roughly doubled in the 2.4GHz band.

One of the consequences is, that most decent routers you can buy, provide roughly the same range *without* huge differences.

Under ideal conditions, we streamed accross 100m (~yards) with "Houston". If other networks are "around", a range somewhere between 20m to 50m is more realistic. In situations like Trade Shows with hundreds of WiFis around, it can happen that it's not working **at all**.

Although 2.4 GHz should have a higher range by the laws of physics compared to 5 GHz (and nowadays 6 GHz), the channels are in most cases "overcrowded", and you get **much** better results with 5 GHz. (We have no experience with 6 GHz, yet...)

PSU-4 built-in Router

The PSU-4's built-in router is intended for "mobile" situations where there is no place or time to set up "Houston" or something else, and where the **PSU can also be close (enough) to the people using the Streaming**. The built-in router is of good quality but it can't compete with stand-alone devices, let alone Mesh-Setups.

The antennas are build into the PSU-Monitor. Because they are placed behind the TFT, the full WiFi-Range can only be realized “behind” the PSU: That means, when you look on the PSU-screen, the best reception will be experienced by the people you can see looking in that direction.

> **WARNING!**
>
> As also mentioned here, it’s a bad idea to put the PSU’s screen-cover on the back of the PSU-monitor: The cover is made of carbon fiber and **weakens significantly the WiFi-signal** of the built-in antennas!

The router supports 2.4GHz and 5GHz operation **in parallel**, that means that there are two WiFi-Networks with different frequencies present (if enabled).

The second Ethernet-Port “GbE2” of the PSU is a Switch-Port of the built-in Router. Devices connected to this port will become a part of the same network (LAN) as the Satellites connected to the built-in router. There is a **DHCP-Server** running on it, providing IP-addresses for the clients. GbE2 is ideal for directly attaching, for example, a laptop to the PSU to access its (WebDAV)-Network Interface.

The network of the built-in Router is configured to 192.168.16.0/8, the router itself can be reached under 192.168.16.1, DHCP-Range is 192.168.16.10 - 192.168.16.250.

WiFi-Settings (built-in Router)

Normally, you don’t need to access the router’s web-interface, because you can control the

most important settings from within the PSU-software:
Open *Settings* → *Settings* → *WiFi* to configure the built-in router:

At the top, the **current status** is displayed: When the "Waves" are blue, the Wifi-Network is up and people should see it in iOS-Settings → Wi-Fi.
When the built-in Wifi is set to *ON*, this status-display is also visible below the *Exit-Button*:

In the WiFi-Settings' next line one can **separately toggle** the 2.4GHz and 5GHz networks **ON/OFF.**

In **non-Expert-Mode** (see below), the *WiFi-Network-Name* (SSID: "Service Set Identifier") and **password** to access it, are used for **both networks** - for 5GHz "_5G" is automatically appended to the name.

By law, you're not allowed to operate a WiFi-Device with a wrong Country-Setting. (It internally defines which exact frequencies are available to use and which maximum transmit-powers per frequency.)

Unlike other settings of the PSU, if you make any changes to the WiFi-Settings, you have to apply them by pressing *"OK Changes*, because the communication and status-exchange can take quite a long time:

If you need more control over the WiFi-Settings, toggle to **Expert Mode**:

Then you can set **different WiFi-Network-Names and -Passwords** for 2.4 and 5GHz networks, and you can also try to set the networks to **fixed channels** instead of letting the router decide in **"Auto"**-Mode. This *might* help, if for example other (like Video-) transmitters are used on set with fixed channels. But depending on the channel and the selected country, the router can switch to an other channel on its own. Because on certain channels the router has to detect if other (commercial/military etc) transmitters are present, it can take a log time to switch the channel. (see DFS).

Here are tables of the available and working 5GHz channels for Germany and the US.

Houston (External Router)

As already mentioned above, we offer our own router you can rent, called "Houston". It provides you with everything you need, to set up a WiFi-Network on the set:

- The router itself in a rugged housing
- cables, power supply and
- an (optianl) **Stand** to position it close to and above the people needing WiFi.

Because Houston has a DHCP-Server running to provide IP-addresses for all its clients, you need to **connect it to GbE1 on the PSU.** (On GbE1 the PSU expects to receive an IP-address from an attached DHCP-Server.)

> **Important:**
>
> Until now, it is not possible to use Houston **in parallel** with the PSU's built-in router! (For example as a kind of Range Extender.) **If you would like to use an external router, the recommended setup is to disable the internal router and connect the external to GbE1.** A possible way to use the built-in and *your* external router, is to configure your router to "Bridge Mode", connect it to GbE2 and make sure both routers ***don't*** transmit on the same WiFi-channels or are placed far away from each other to not interfere.

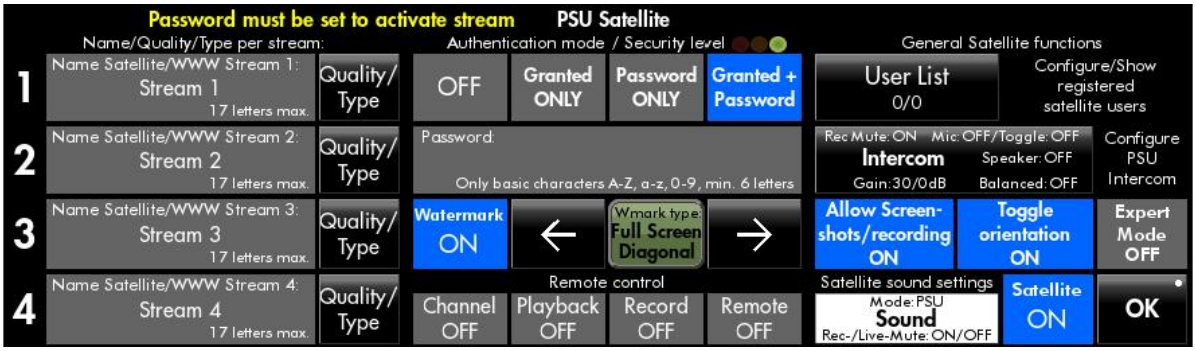
Houston is configured to the 192.168.10.0/8 IP-network.
It's own IP-address is 192.168.10.**5**.
DHCP-Range is 192.168.10.51 - 192.168.10.99

Houston is always configured to **PSU-WLAN** (2.4GHz) and **PSU-WLAN_5G** as the WiFi-Network-Names (SSIDs).

Streaming-Settings (PSU-Side)

After you have set up the WiFi network, you need to activate Streaming on the PSU:

Open ***Settings*** → ***Settings*** → ***PSU-Satellite,*** and toggle ***Satellite ON ***. The dialog will look like this initially:



Note:

When "PSU-Satellite"-Streaming or "PSU World Wide Streaming" is turned on, the Video-Out-Matrix is extended with four additional columns to control the contents of the streams in exactly the same way as the "normal" Video-Outputs!

Security Levels

The "first level" of security is of course the WiFi-password (see above in "WiFi-Settings"), but you can't change it easily on "Houston".

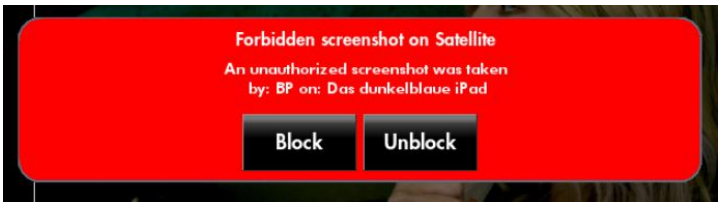
On the PSU-Side you can set up different levels of security / authentication modes:

- ***OFF:*** No additional security: Everyone who gets into the WiFi-Network can join one of the streams.
- ***Granted ONLY:*** Every device that connects to the PSU needs to provide a username, and the PSU-Operator has to consciously grant access to Streaming, but ***no additional password*** is needed. Device-/User-specific restrictions and settings **can be applied** in this mode.
- ***Password ONLY:*** To access the Streaming, only a password has to be entered upon first connection (additional to the WiFI-password). **In this mode, no device or user-specific stream-settings are possible.**
- ***Granted + Password:*** As the name implies, this option combines password and username access.
- ***Different Security Levels PER Stream*** can be set up in **Expert Mode** (see below).

> **Note:**
>
> Username and/or password only have to be entered once in the Satellite-App. If the App is closed and reopened, joining a stream will work immediately, unless the password has been changed, the user has been blocked or deleted on the PSU-Side, or if the App has been deleted and re-installed.

Additional Security Features:

- **Watermark:** To protect for example against people simply taking pictures / recording clips of client devices with another device, a watermark can be drawn accross the stream, displaying the user-name (if available) and the device's ID (can and should be set on the device in *(iOS-)Settings → General → Name*). You can specify the position of the watermark with the left/right-arrows ("Full Screen Diagonal", "Full Screen Straight", "Left Corner", "Right Corner").
- **Allow Screen-shots / Screen-recording:** Screenshots and Screen-Recordings can be blocked by toggling "Allow Screen-shots / Screen-recording" to OFF. Because it can not be suppressed that someone grabs via "the operating-system" (Power-Button + Home-Button / Power-Button + Volume-Button), a warning will pop-up on the PSU, informing about a "forbidden" screenshot. The client-device will be blocked from that moment on, until the PSU-Operator unlocks it again:



> **Note:**
>
> The possibility to take *iOS-"Screen Recordings"* needs to be added/enabled in *Settings → Control Center* by tapping the *Add button* next to *Screen Recording* on the iPhone/iPad. Audio is recorded as well, but you need to un-mute sound on the iPhone/iPad when playing back the clip, because it's muted by default by iOS... By tapping and holding the Screen Recording-Button in the Control Center, you get more functions like adding a voice over or sending the resulting clip to a different app on your device!

Remote Control

At the bottom of the "PSU Satellite"-Dialog, one can **specify what can be controlled from the client-side**, i.e. what buttons will by available in the PSU-Satellite-App. In non-Expert-Mode, this applies to all 4 Streams ("Stream-Settings"), unless the capabilities get removed/ adjusted per user (→ User List).

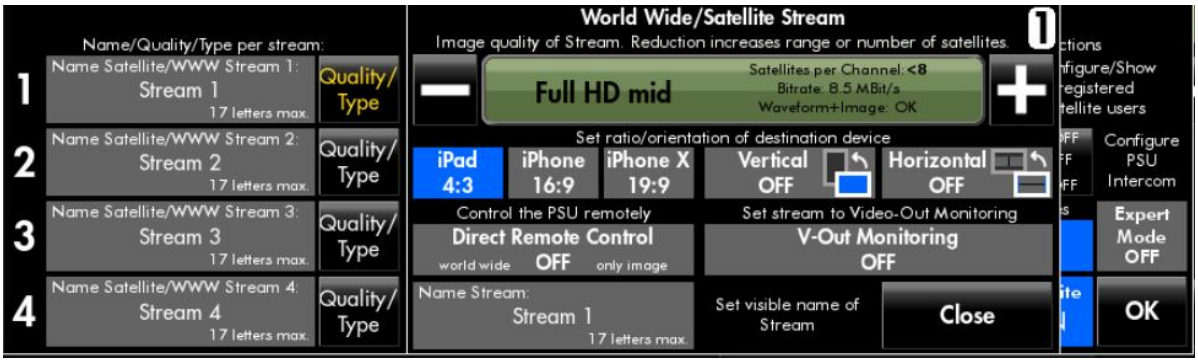
- **Channel**: Adds camera- and playback-buttons and allows to control which cameras and playbacks are shown on the connected stream. **If somebody switches from Cam A to Cam B on Stream 1 for example, all clients on Stream 1 will see this!**
- **Playback**: Adds play, pause, skip, slow, Action & Index Master buttons and the position slider to control the currently visible playbacks on the stream. If more than 1 playback is visible, you can toggle between playbacks with the "linked"-Buttons as known from the PSU. The Playback-Buttons are Remote-Control-Buttons for the PSU - that means, the playback on the PSU will start as well, **it's not an independent playback on the client!** But of course you can "define" for example Play 4 as a playback for a certain stream, that doesn't affect anything on the PSU, if it's not shown anywhere except for the stream.
- **Record**: Adds Record- and Rehearsal-Buttons to start and stop recordings on the PSU. This is probably most interesting for the PSU-Operator.
- **Remote**: Allows to activate the Full-Remote-Control-Mode on clients (Press there: "Settings → PSU Remote ON/OFF").

Next to "Allow Screenshots":

- **Toggle orientation**: Controls the availability of the *Vertical/Horizontal-Orientation-Button*  on the App-/client-side. When disabled only the PSU-operator can change a stream's *orientation*.

Stream-Quality/Type

As explained at the beginning of this chapter, one can increase the number of possible clients by lowering quality/resolution and thus bandwidth of a stream. This can be done separately for every stream by tapping the **Quality/Type**-button next to a stream's name:



In the top right corner of the sub-dialog, the number tells the stream number. With the **-/+-Buttons**, quality and resolution can be changed up or down in 12 steps – 4 resolutions, each in Low, Mid and High Quality:

Name	Resolution (16:9)	Resolution (4:3)	Note
SD	360x304	640x480	Old TV
"960"	960x540	720x456	Quarter-HD
HD-ready	1280x720	960x608	Half-HD
Full-HD	1920x1080	1440x912	HD

With lowest quality, ~100 clients could be possible hypothetically (untested), Full-HD-mid should allow up to 7 clients under *good WiFi-conditions*.

The display between "-" and "+" also estimates the number of clients, the bitrate and it informs if Waveforms & Scopes will look OK in this mode.

In the next line you can fine-tune the **stream-ratio** to match exactly the most used devices on the stream, like iPads (4:3), iPhones(16:9) or even iPhone X,12,13... (19:9).

> **Note:**
>
> When the stream is intended for Internet-Streaming ("PSU World Wide Streaming"), a ratio of 16:9 is the best choice.

Vertical ON/OFF and **Horizontal ON/OFF** work exactly like the Video-Out-Options described

here.

All streams can be switched to *special modes*:

- **Direct Remote Control** doubles/mirrors the PSU-Touchscreen onto the Stream, including a Touch-Return-Channel, effectively turning all devices on it into **full-blown wireless Remote-Controls for the PSU.** This feature is probably most interesting for the PSU-Operator, and maybe should only be allowed on a dedicated "Operator-Stream". (Note: This does *not* work "over the internet" i.e. "PSU World Wide Streaming").

* **V(ideo)-Out Monitoring:** Like the On-PSU-Monitoring of the Video-Outs, you can put a *Monitoring* of Video-Out 1-4 onto a Stream as well. This is intended as a kind of a screen-extension to the PSU's screen, to always see what's on the Video-Outs.

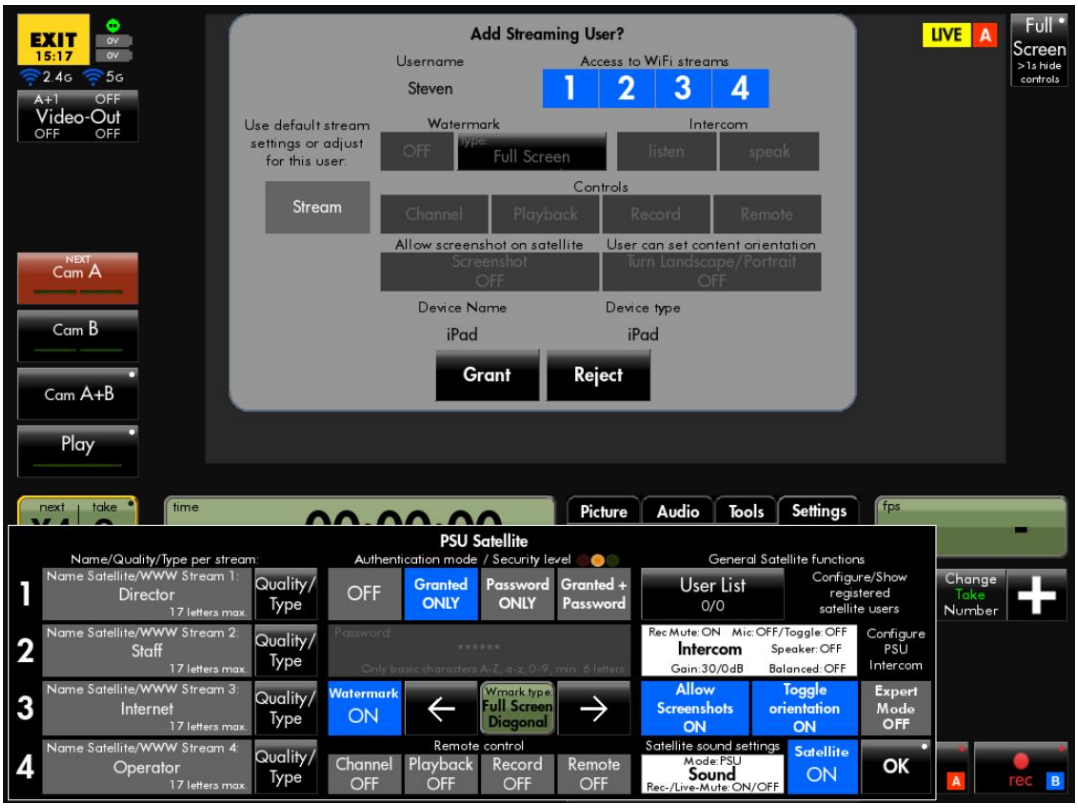
Finally, you can (should!) **label the streams with a name** to make it easy for people to select the right stream when connecting to the PSU and of course to make it easier to control the right one from the PSU: Tap the **Name Stream**-label in the sub-dialog or in the main PSU-Satellite-Dialog to open a keybord. (You can also edit the name in the Video-Out-"Matrix" with "Configure Stream".

User-specific-Setup & User-Control

If the security level is set to "Granted ONLY" or "Granted + Password", the following settings can be fine-tuned **for every User:**

- Which streams are allowed to access
- Intercom-Listen
- Intercom-Speak
- Watermark (incl. position)
- Remote Control Capabilities (Channel-Selection, Playback, Record, Full-Remote-Control
- Screenshot

The following message will appear on the PSU when someone (here: "Steven") tries to connect for the first time:



At this point, the operator should either know who is trying to connect, or find out ;-) **Grant** will accept the request, **Reject** will deny it.

You can immediately decide if the current Stream-Settings are “ok” for the user, or if you want to adjust them specifically. Tap “Stream” to enable individual settings (Turns blue and displays “User”).

Alternatively, to adjust a user’s individual settings anytime later, press the **User List**-Button to open the **Satellite Users Management**-Dialog:

Every line represents a *Satellite-User*, all the individual settings mentioned above can as well be set here. Each line can be expanded or collapsed by pressing the **more**- or **less**-Buttons on the right side. **Ind. Settings** means and toggles "Individual-Settings" for each client. When a line is expanded, additionally the device's name and type are displayed, as well as its current battery-level. **The green LED** left of more/less indicates that **the client is connected at the moment**. Single devices can be quickly **blocked** temporarily (by tapping "BLOCKED"). One can also **Block All** users at once by tapping the button at the bottom of the dialog.

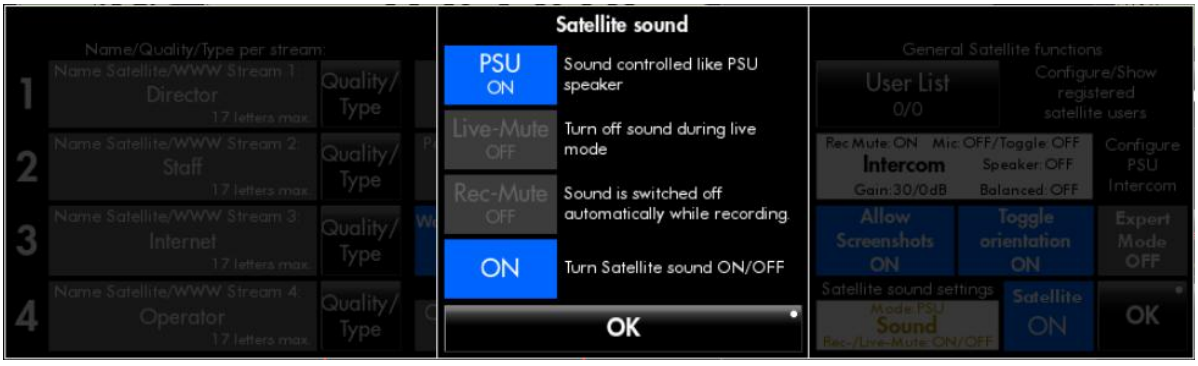
There are **three modes of operation** for this dialog, which can be selected at the bottom:

- **Change Settings:** Fine-tune the settings for each client.
- **Accept/Reject:** Select specific users, that shall be rejected or hidden (for now). They won't be visible when you're back in *Change-Settings-Mode* until they get *accepted* again, and they won't be able to see any stream. You can quickly select *all* or *none* as a shortcut.
- **Delete:** Remove Streaming-Clients from the list, either one-by-one, select multiple with **DELETE more** or simply **Delete all** at once. To be deleted only means that the affected user has to request again to be "let in" again.

If certain devices should be kept out "forever", they should be rejected and not deleted, so that they can't log in again as long as they are "known" by the system.

Sound

To activate sound/audio for Streaming press the Sound-Button and toggle ON/OFF in the sub-dialog that opens in the middle:



Initially, **audio-muting** for Streaming is behaving like the PSU's built-in speaker is set up at the moment. But Streaming clients can be treated differently: For example if everyone is using headphones on the clients, sound doesn't need to be turned off while recording. To enable an independent setup, set PSU to **OFF** and adjust **Live- and Rec-Mute** for Streaming as needed.

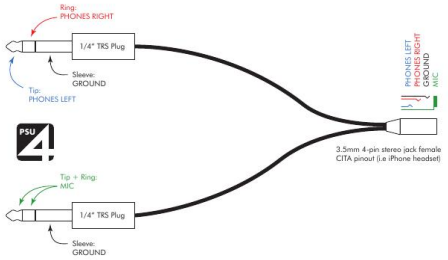
Intercom

In combination with a microphone (like headsets have), the PSU can be operated as a 2-way Intercom system for the set: The PSU-Operator can talk to all or specific Satellite clients, and clients can talk back to the PSU (but not in between Satellites).

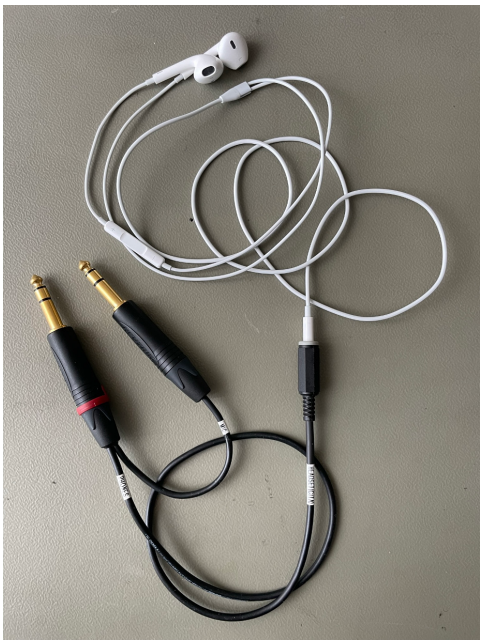
On the right side of the PSU is the microphone jack:

It can be configured to support balanced and unbalanced microphones.

Here is a schematic that also contains the wiring of the microphone jack:



We offer a 3.5mm to 2x 6,5mm **headset adapter** as a **PSU-Accessory** (for headphone and Mic in one plug with four contacts). It is compatible to the original analog iPhone-Headsets which offer relatively good speech quality and are still commonly available:



To enable Intercom on the PSU, press the big **Intercom-Button** and toggle ON/OFF in the sub-dialog that opens in the middle:

Intercom is always audible on headphones connected to the PSU – **Speaker ON/OFF** adds it to

the PSU's built-in speaker. As long as someone talks on a Satellite i.e. the Mic is opened, other audio (from playback or live) is silenced on the PSU-Speaker and Headphones, and one can only hear the Intercom **exclusively**. On the Satellites, Intercom- and Stream-audio *can* be mixed. **Rec Mute ON** turns off Intercom on the PSU-Speaker while recording.

> **Note**
>
> The Rec-Mute-Settings in Audio-Settings affects Intercom as well. If you really want to hear Intercom while recording, Rec Mute has to be OFF in Audio-Settings **and** Intercom-Settings!

If you have attached a microphone to the PSU and want to use the PSU-to-Satellites-Intercom, switch **PSU Mic to ON**. This brings up a round **Mic-Button** next to the EXIT-Button.

There are two modes of operation: **Toggle Mic** and **Push-to-Talk** (=Toggle Mic OFF):
With Toggle Mic ON, the microphone stays on or off until you press the Mic-Button **again**:

Press it to open the Mic.

You can speak until you press it again.

In Push-to-Talk-Mode, you can only speak **as long as** you press the Mic-Button:

You can adjust the gains for both Intercom directions from 0 dB to 60 dB (be careful!). It's best to first adjust the volume for normal audio (like playbacks) on the PSU and Satellites to the desired level, and then fine-tune the microphone gains until "understanding" is good.

The PSU supports **Balanced** and **Unbalanced microphones**. Set **Balanced ON/OFF** accordingly. Normal (cheap) headsets, like the mentioned *Earpods* above, are probably unbalanced (which is the default setting).

See Wikipedia: Balanced Audio or
The difference between balanced and unbalanced cables

Finally, the **Prev. talk**- Label at the bottom displays the IP-address of the last device that sent Intercom to the PSU.

> **Note:**
>
> If you select one of the security levels that supports User-Specific-Setup and Control, you can determine for every Satellite if it can **listen** to the Intercom and/or **speak** to the PSU.

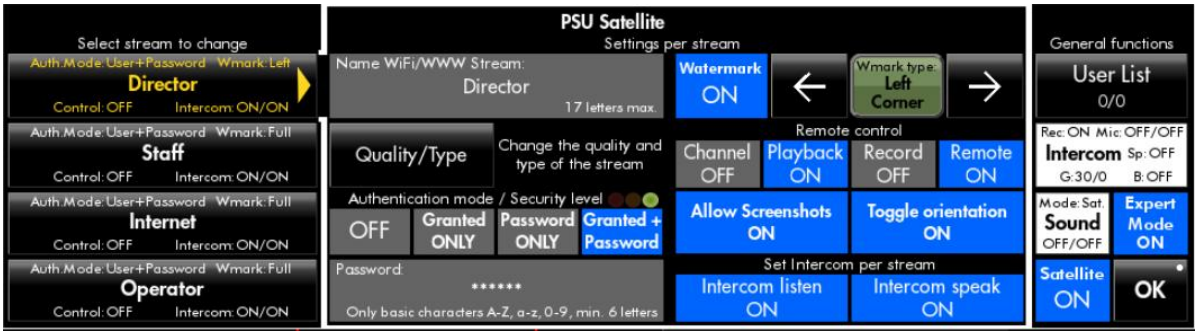
Expert Mode

In "normal" i.e. Non-Expert-Mode

- the Security Level,
- Streaming Password,
- Watermark-Settings,
- Remote Control Capabilities (Channel-Selection, Playback, Record, Full-Remote-Control),
- and permission to take Screenshots

are applied to all 4 Streams as Stream-Settings.

In Expert Mode, these settings, and additionally Intercom-Listen and -Speak can be **set up for each Stream individually.** (The white frame around those settings tries to illustrate this.)

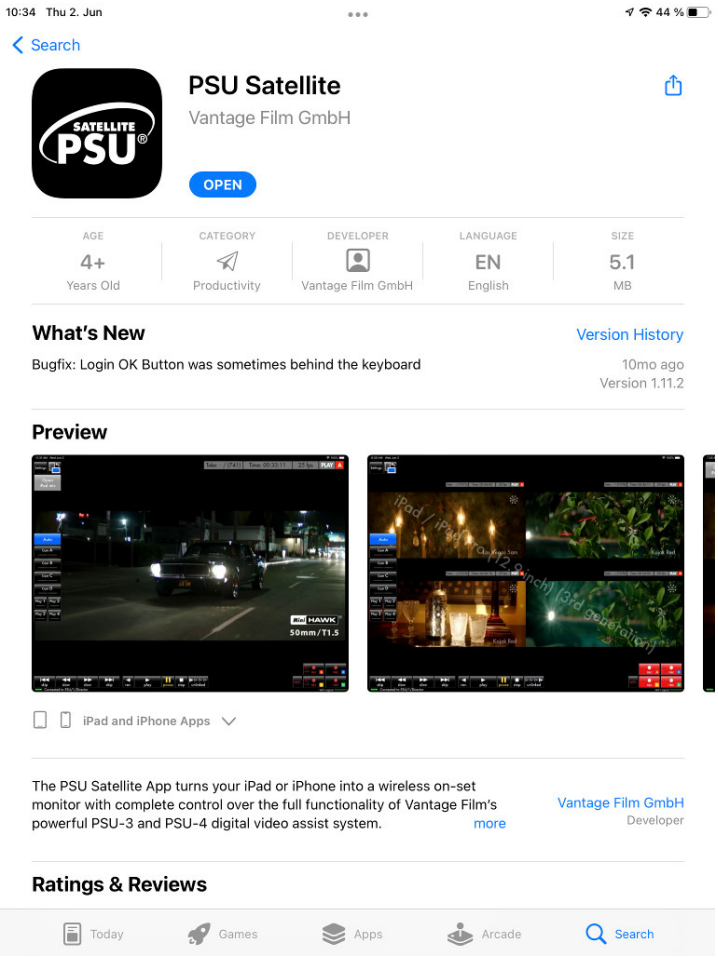


This would allow for example do make the Director's Stream only accessible by a password without watermark and the ability to take screenshots, while leaving the Stream for "Staff" openly accessible, but disallowing screenshots and always showing a watermark and keeping Intercom away.

Of course it is still possible to use User-Specific-Setup and Control in combination with Expert Mode. The small yellow text at the top right, saying *"Some User Ind.(ividual) Settiongs for W(ater)mark/Controls/Screenshot/Intercom ON"* indicates that there are some clients with user-specific setup.

PSU-Satellite-App

The App to receive, show and optionally control a stream is named **"PSU-Satellite"** and can be installed for free from the *Apple App Store*.



It runs

- on all iPads and iPhones which are not older than maybe 8 years
- and Macs running on MacOS 10.15 (Catalina) or newer.

In 2022 for example, the App is still compatible with iPad Air Gen2, but this might change in the future if we are forced to (by Apple).

(There is no App for other operating systems, like Android, yet. As a workaround, you could consider using "PSU World Wide Streaming") if a decent Internet-Upload-Rate is available on set.

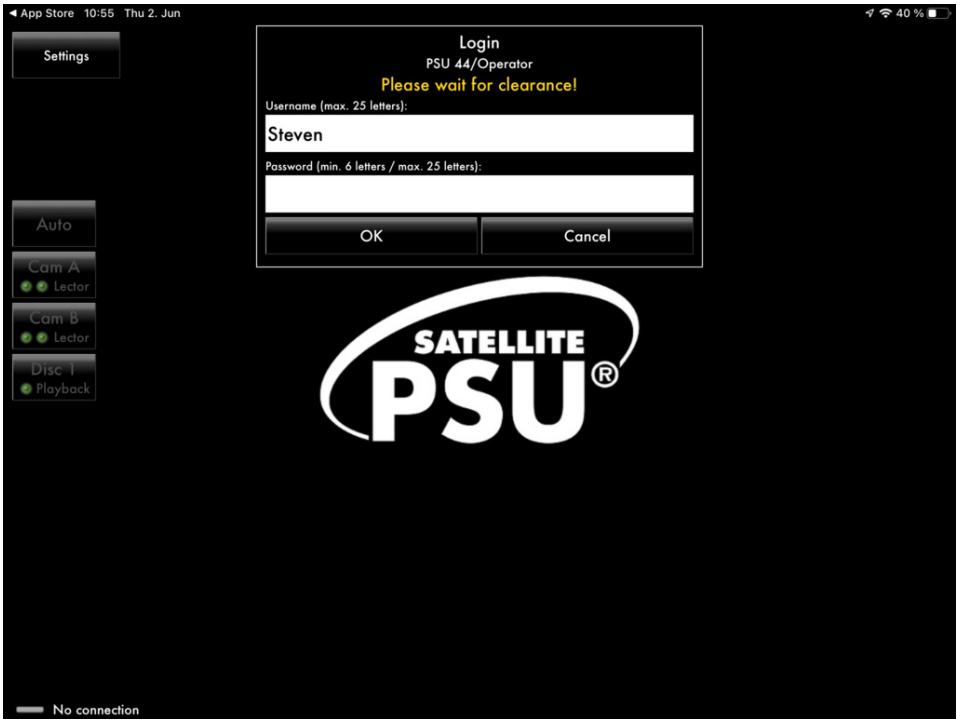
Accessing a Stream

After installing (probably switching Wifi to the PSU-Wifi-Network) and starting the App, you need to allow *"..to find and connect to devices on your local network"*, otherwise the App can't find and list available PSUs. (Unfortunately, this question from iOS will not be shown again, until the app gets deleted and re-installed. But you can also enable the capability "Local Network" in iOS-Settings in the PSU-Satellite-App-Settings, if you missed it.)

Here PSU44 is found:

Select it and the Stream-Selection-Buttons will display the Stream-Names:

After selecting one of the Streams (here: Operator), you will be prompted to enter the user-name and password for the Operator's Stream (because it is set up with User + password):



... and finally we are logged in and immediately see the stream as it is set up at the moment:

Working with the App

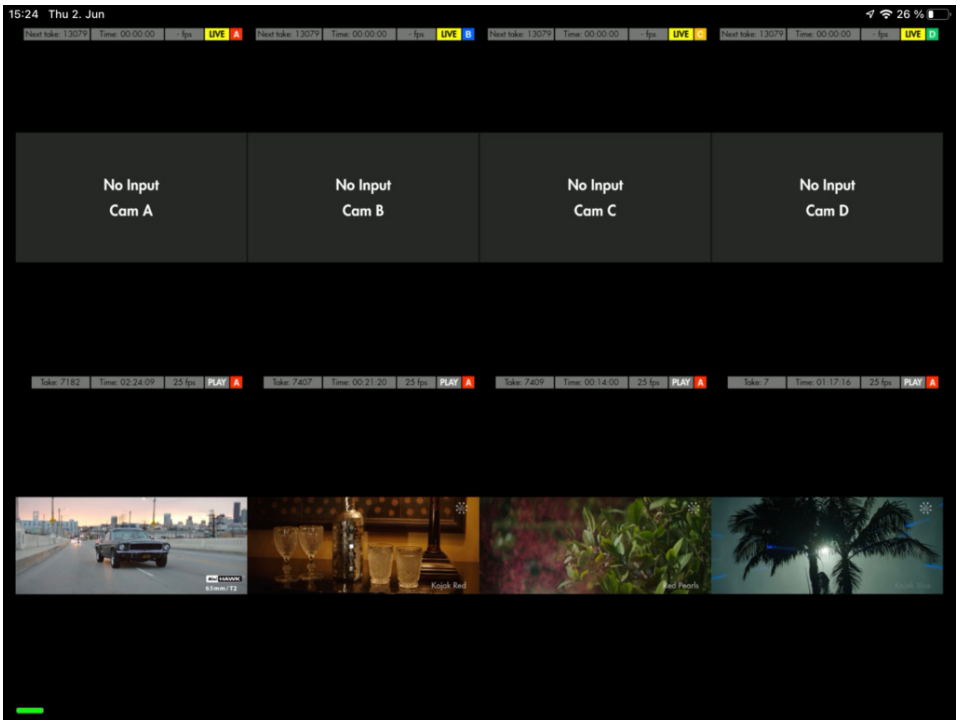
Because all *Remote Control Capabilities* are enabled for this Stream, you get Camera- and Playback-Channel-Buttons, Playback-Controls and Recording-Controls. **Remember: If a button is pressed, all clients on the same stream will see it!**

Single-Tap on the screen to **hide** and un-hide **the buttons** and get a full-screen-view of the picture. To get rid of the **watermark**, it has to be switched off on the PSU by the operator.

By **pinching with two fingers** one can **zoom** the image and **move** it around with **one finger**. To **unzoom**, simply **double-tap** the image. If **screenshots** are allowed, **tap once with two fingers**. (Upon first use, you have to grant the App access to "Photos" on the device.)

> **Note:**
>
> People don't necessarily need to control what's visible on the screen themselves, the PSU-operator can always control that as well in the Video-Out-Matrix.

As on every Video-Output, up to **8 views** with different cameras and/or playbacks can be enabled on each stream:

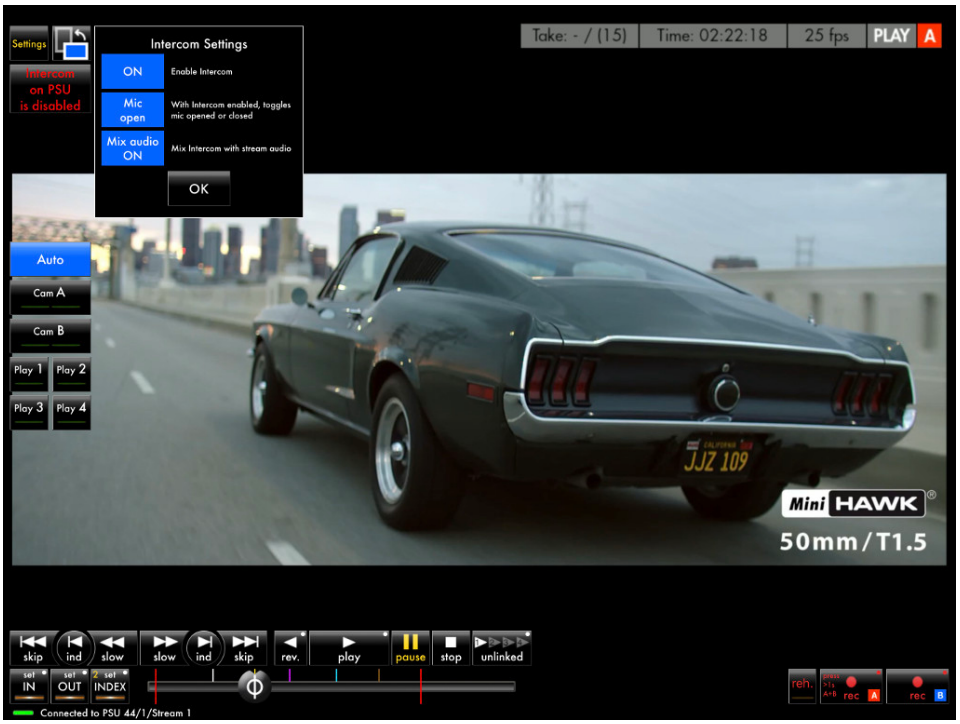


Pressing the **Settings-Button** in the top left corner let's you

- Connect to a different PSU in the same network or a different Stream of the same PSU like explained above.

- Enable Intercom on the client device
- Switch to Full-Remote-Control of the PSU

Intercom Settings:



Toggling **Mic open** switches between **Toggle Mic** and **Push-to-Talk** (=Toggle Mic OFF) modes like on the PSU (see above).
With "Mic open", the microphone stays on or off until you press the Mic-Button ("**Open iPad mic**") **again**. In Push-to-Talk-Mode, you can only speak **as long as** you press the Mic-Button.

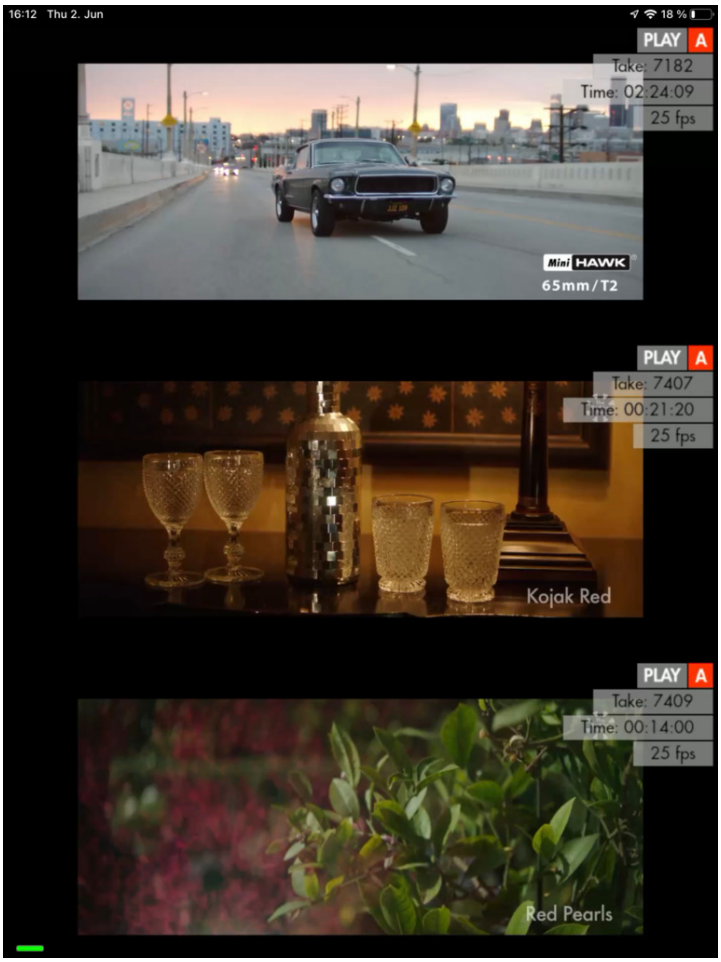
Mix audio overlays Intercom- and Stream-Audio so that both are audible at the same time.

> **Note:**
>
> The PSU-Satellite-App supports the use of wireless headsets like Apple Airpods!

When you switch **PSU Remote** to ON, the current stream switches to a copy/mirror of the PSU-Screen, including a "Touch-Return-Channel", giving you full interactive remote control over the PSU:

(To return to “normal” mode, you have to open the Settings and press **PSU Remote** again.)

The -Button toggles between **horizontal** and **vertical** mode of the App to make better use of screen space in multiview scenarios, for example:



This affects the current stream, meaning **everyone on the stream** will be switched to that mode. The -Button can be "removed" from clients by setting *Toggle orientation* to OFF in PSU-Streaming-Settings.

Satellite-HDMI-Output

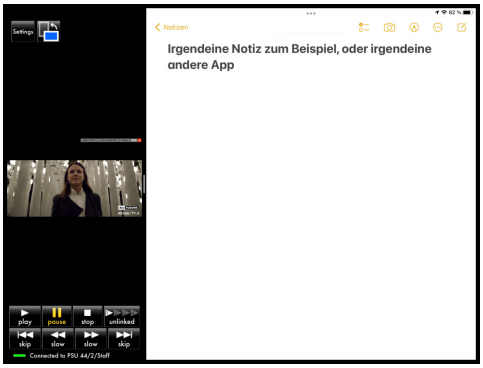
Every iPhone and iPad provides an *HDMI-Output* via its *Lightning*-connector by means of an optional *Lightnig-to-HDMI-Adapter*. And not enough: This HDMI-Out can be independent from the actual device's screen providing a second monitor! The PSU-Satellite-App supports this fully by putting out a clean Full-HD-Picture without buttons etc. This effectively turns any iPhone or iPad in combination with the adapter and a monitor into an additional *wireless monitor* including sound, Remote-Controls, Screenshots and Intercom...!

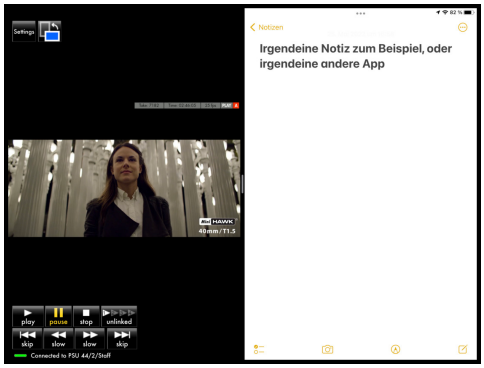
(The setup should work with the newer iPad-Pros as well (which use USB-C), but hasn't been tested, yet.)

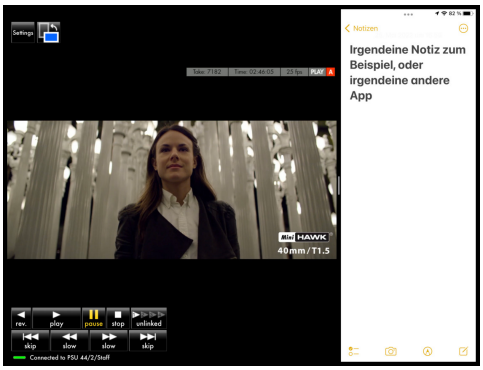
Side-note: the adapter doubles the lightning connector, so that the iPhone/iPad can be charged/ constantly powered at the same time.

Split View & Slide Over

The PSU-Satellite-App on iPads supports *Split View* and *Slide Over* a.k.a. *Multitasking*. That means you can work with two Apps at the same time, e.g. the Satellite-App on the left and some Editor on the right side, or the Editor in full-size and the Satellite-App hovering in in small above:







To create a Split View:

- Interact with the App somehow → On the top side three dots will appear in the middle.
- Tap, hold and move the three dots for example to the left of the screen
- Start the other app → you will get both Apps half and half.
- Now you can move the border in the middle to the left or right
- For Slide Over, tap the three dots again until it looks the way you want it.

There's a little **drawback** to this feature: Originally and intentionally, the App did never rotate the App-Screen when the device was rotated (because no monitor does...). This had to be given up, because it's not possible in combination with Split View & Slide Over. **This makes working with vertical mode a little confusing, because the App doesn't "show" you anymore how to hold the device in your hands.** Simply rotate the device by 90° after switching to vertical, and everything will be ok...

> **Note:**
>
> To get a running picture in Split View on the Satellite-HDMI-Out (see above), the Satellite-App has to be "the main App" on the left-side. So if the HDMI-Out-picture is not "moving", try to put the Satellite-App on the other side of the screen.

Advanced WiFi-Topics

The following two paragraphs are intended for PSU-Owners and Operators who bring their own routers, because it's not officially supported by us, to change the settings of *Houston* and the built-in router in an other way than through the WiFi-Settings dialog. Nevertheless it's of course *possible* if it's *your* gear.

Parallel use of built-in and external router

Normally or *"out-of-the-box"*, it's not possible for example to attach an external router to GbE1 and span two Wifi-networks together with the built-in router, because there will be internal routing problems. If both routers are in the same network it can work, if only one of them has the DHCP-Server running, or if the external router is in "Bridge Mode".

So two approaches would be:

1. Disable DHCP on the external router

- (It is assumed that Wifi is already set up on the external router, and everything is working when attached to GbE1)
- Before attaching the router to the PSU, configure the external router into same network as the built-in router, which is 192.168.16.0/8 and give him an IP-address outside of the DHCP-Range of the internal router, i.e. one of 192.168.16.2 to 192.168.16.9.
- Disable DHCP on the external router. (Now you can't access its setup anymore by WiFi without the PSU...)
- Attach the external router to **GbE2**

2. External router in Bridge Mode

- Configure your external router to Bride Mode.
- Attach the external router to **GbE2**

In both cases all clients on the external router's network should receive IP addresses from the built-in router, and the external router's setup pages can still be reached from either WiFis. You have to make sure that the used WiFi channels on both device are different, or both have to be placed so far apart from each other that they don't interfere.

"Join-WiFi"-Operation

The following is still more "Research and Development", meaning that you likely run into problems for which we don't have solutions, yet... It is on the road-map to support this via the WiFi-Dialog in a future PSU-software-version.

If there is a WiFi-Network present on-set that also provides internet, the built-in router can join the Wifi on its 2.4 GHz channel and forward internet access to clients that connect over the 5GHz network as well. (Yes, people can still use the 2.4GHz network for streaming in parallel!) Another great benefit would be, that one can use "PSU World Wide Streaming") without an additional LTE/Mobile-Router, enough bandwidth provided.

To join an other WiFi with the built-on router:

- Turn off the PSU with AC-Power plugged in - the router is running in that mode, but the PSU-Software is not talking constantly to the router, then.
- Connect to its network, either through WiFi or direct cable connection on GbE2.
- Open its setup page in a browser (192.168.16.1) and log in.
- Go to Network → Wireless
- There are two lines, radio0 (2.4GHz Radio) and radio1 (5GHz Radio), that have a green "Add" button at the end. Press "SCAN" to get a list of the available WiFis in vicinity. Every line there has a "Join Network" button. It's best to use the 2.4GHz network to join, because streaming and joining seems not to be possible in 5GHz radio in parallel, only with 2.4GHz(?).
- "Join Network" opens a window to configure that connection. It seems to be important to exactly find out the security/cipher mode to make it work. If the joined "Client" connection shows up at the bottom of the "Wireless Overview" under "Associated Stations", it should work as far as the router is concerned.

This has also successfully been tested with an iPhone-Hotspot...

If you are doing this with a PSU rented from us, please remove your joined networks at the end of the project or kindly leave a note that we have to clean the setup.

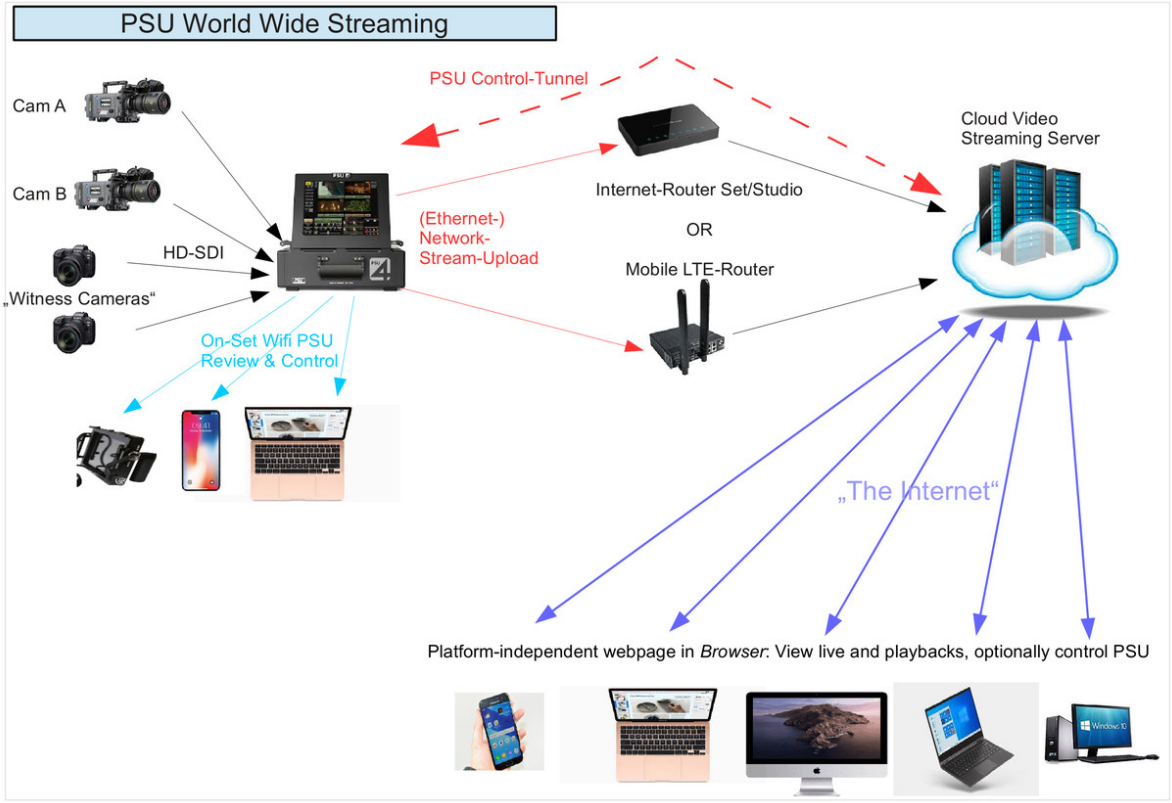
Internet Streaming

> **Note:**
>
> To be able to use and set up *Internet Streaming*, it is very important to **familiarize yourself with Wifi-Streaming**, first!

Concept

The worldwide Covid-19 pandemic introduced the requirement for **remote production** and even **remote directing** on a wide scale. To meet this need, the PSU can additionally **forward the existing four network-streams to an Internet-Server** (also called a Cloud Server) from which any number of clients can access and view them.

The following diagram explains the concept:



On the left side there is the well known setup with cameras attached to the PSU and on-set wireless streaming. Additional *"Witness Cameras"* are placed to capture what's going on behind the scene, for example to allow visual contact with people on location from remote. Because the PSU can handle up to 8 cameras, a wide coverage is possible. Then on the PSU you can define which of the streams shall be uploaded "into the internet" (up to four streams). Of course you need a solution for internet access - either an available on-set (studio) router can be used or you need an additional mobile LTE-Router of some kind. To get a stable uplink with high bandwidth, a cabled connection (connected to GbE1) should be used. Furthermore, the Streaming Server must be up and running. It has to be rented per day - please contact your preferred Vantage/Hawk Branch Office to book it.

When everything is set up, clients only need an Internet-Browser, like Google Chrome, Firefox, Safari, Microsoft Explorer or Edge etc on any platform (iOS, Android, Mac, Windows, Linux...). No additional client software or plugins need to be installed - it should work right "out-of-the-box" by opening an address similar to e.g. *frankfurt.psustream.com*.

Our servers can immediately be started in Frankfurt, Paris and Los Angeles. A lot of other locations world-wide are possible, but this needs some time for preparation.

Benefits of using our servers and gear

You can also configure your own Streaming Server in the PSU-Settings if you have one, but then you lose the **following benefits** and are on your own security-wise:

- User/Stream-**Authentication and User-Management**
- **Control** what's visible on **the stream from the client's side**, like selecting cameras and playbacks! (Remote Control)
- **Playback-Controls** on client's side! (Remote Control)
- **Ultra-Low-Latency** (for Internet Streaming): ~0.8 seconds
- Choose from different streaming technologies (RTC/HLS)
- Watermarking
- Streaming-Server-Restart directly on-site
- Cost-Control: Streaming Flat-Rate
- Complete solution: We can also provide you with a prepared LTE-Router (data-plan included) for Germany and France (limited availability). Other countries on request.

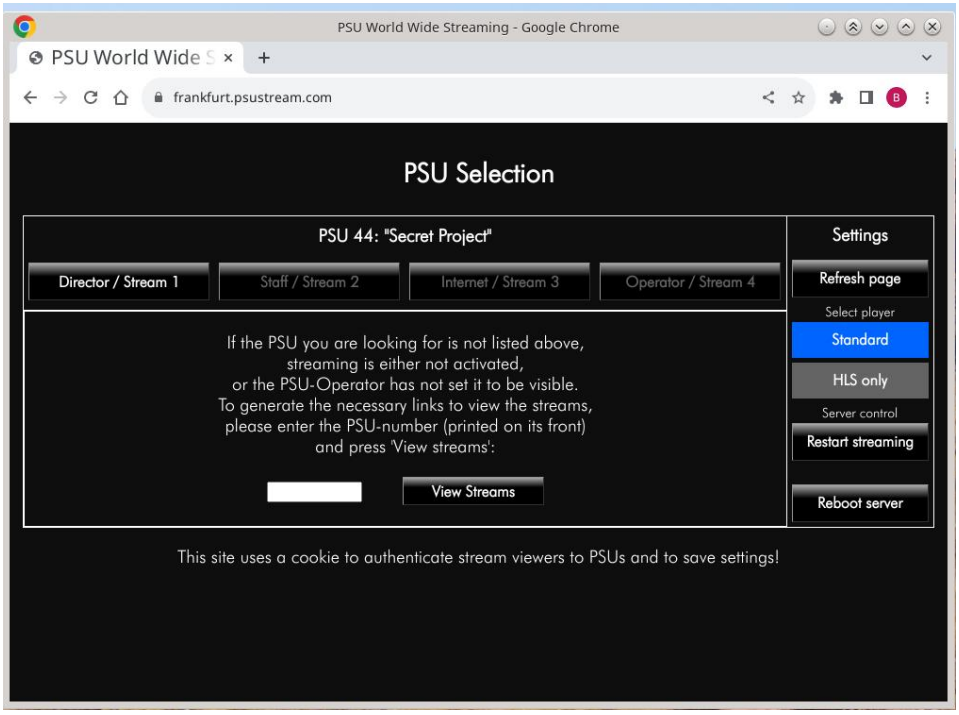
Setup

To configure Internet Streaming on the PSU open *Settings* → *Settings* → *PSU World Wide Streaming* and switch *Streaming* (above "OK") to ON:

The first thing you need to enter is the is the actual **Streaming Server's address**. When you use our servers, you only need to enter the **first part of the address**, like **"frankfurt"**. The rest of the address, which is *frankfurt.psustream.com* plus a lot more, is added internally. (The complete address syntax for third-party servers is explained in Expert Mode.)

Below the entry field for the address, the slim green display shows the resulting address **frankfurt.psustream.com**. This is the address to be entered in a browser to **view** (access) the streams on the client side:

For example in Chrome, this will look similarly to this:



If *Visible on server* is set to ON (as above), a line with the PSU-number will show up on the initial page *automatically*, with four buttons underneath to select one of the four possible streams. If provided, the *Project Name* will be displayed next to the PSU-number (here "Secret Project"). If you don't want your project to be visible on the starting page, set *Visible on server* to OFF. Then all participants need to know and enter the number of the PSU themselves in the input field left of *View Streams* to get the Stream-Selection-Buttons.

In the above example, only Stream 1 is activated for Internet Streaming at *"Activate Streams"*. Because of this, only the first button labeled "Director / Stream 1" can be clicked.

As explained in-depth in the **WiFi-Streaming Chapter**, you can adjust the quality, type, aspect ratio, orientation and label of each stream with the *Quality/Type-Buttons*.

> **Note:**
>
> In fact you are controlling the exact same settings here: If you change anything in the Quality/ Type menu for a certain internet stream , it will equally affect the WiFi stream and vice versa!

Unlike those Quality- and Type-Settings, the **Security-Settings** (including Watermark) are *independent* of the corresponding WiFi-Streaming-Settings. For example, you could turn off any authentication for the local WiFI-Streaming on-set but activate *Granted + Password* for Internet Streaming.

An exceptional feature when using our streaming infrastructure is the possibility to **remote-control** the contents of streams (visible cameras and playbacks) and have **playback control from the client's browser!** With *Channel ON/OFF* and *Playback ON/OFF* this can be controlled.

> **Note:**
>
> There are "only" four different streams available altogether. If someone changes for example the shown camera(s) on Stream 1, everyone watching Stream 1 will see this! Of course one can control *who* is allowed to do this (see below).

If everything is set up correctly, the "LED" next to *Server available* turns to bright green :

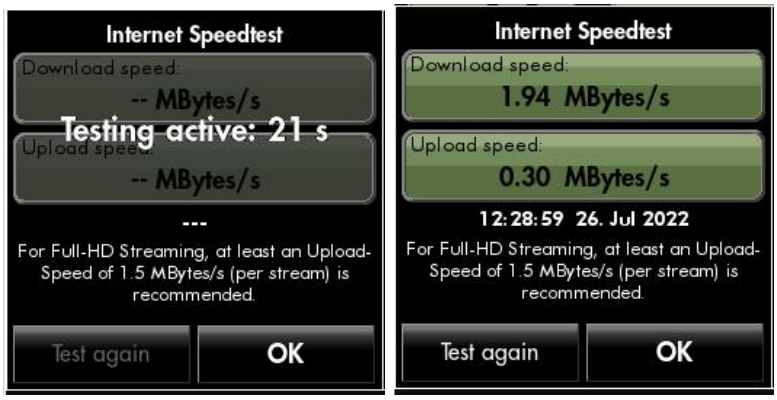
To constantly **remind the PSU-Operator that Internet-Streaming is active**, the Video-Out-Button is extended by three LEDs:

LED-State	Meaning
	Streaming is activated but not set up and working
	Streaming is active, Security is *Off*
	Streaming is active, Security Level is *Medium*: Password or Granted *only*
	Streaming is active, Security Level is *Highest*: Granted + Password

Adjust A/V Sync allows you to advance or delay the audio by a maximum of 1 second in 20ms increments:

By pressing the slim green display containing the address for client access

one can initiate an **Internet-Speedtest:**



Here the *upload speed* is crucial for assessing whether the Internet connection is suitable for streaming. For Full-HD-Streaming, at least an upload speed of 1.5 Megabytes/s is recommended (~12 Megabits/s).

User-specific-Setup & User-Control

This has already been explained in-depth in the **WiFi-Streaming Chapter** - **User-specific-Setup and User-Control is also available for Internet Streaming:**
If the security level is set to "Granted ONLY" or "Granted + Password", the following settings can be fine-tuned **for every User**:

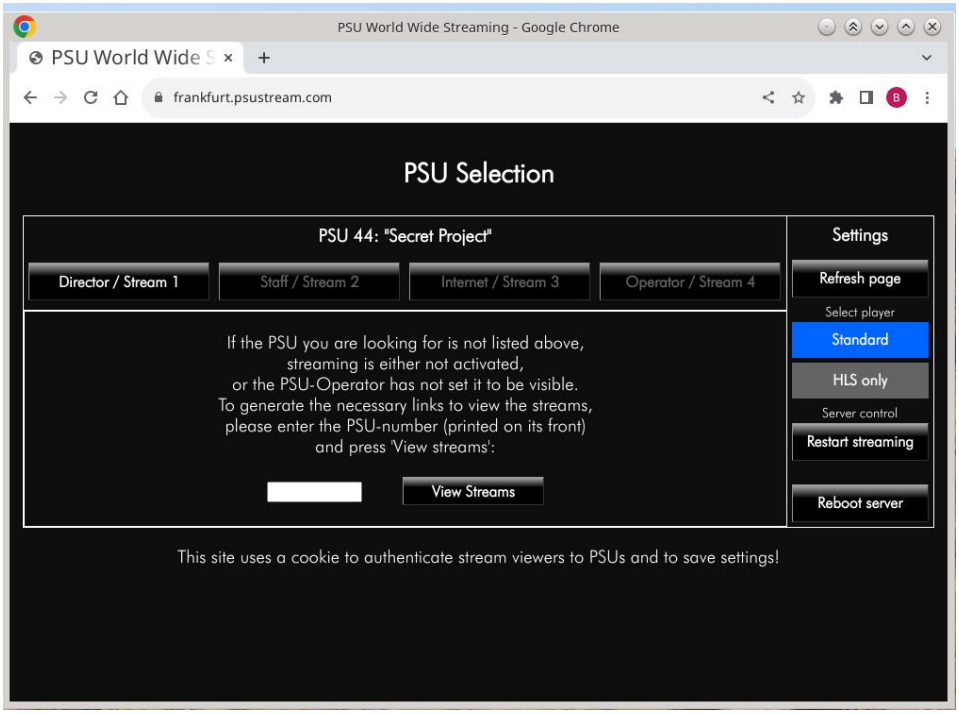
- Which streams are allowed to access
- Watermark (incl. position)
- Remote Control Capabilities (Channel-Selection, Playback)

Press *User-List* to access the *World Wide Streaming Users Management Dialog*, which works similar to the WiFi-Streaming-Equivalent:

Browser-/Web-Client

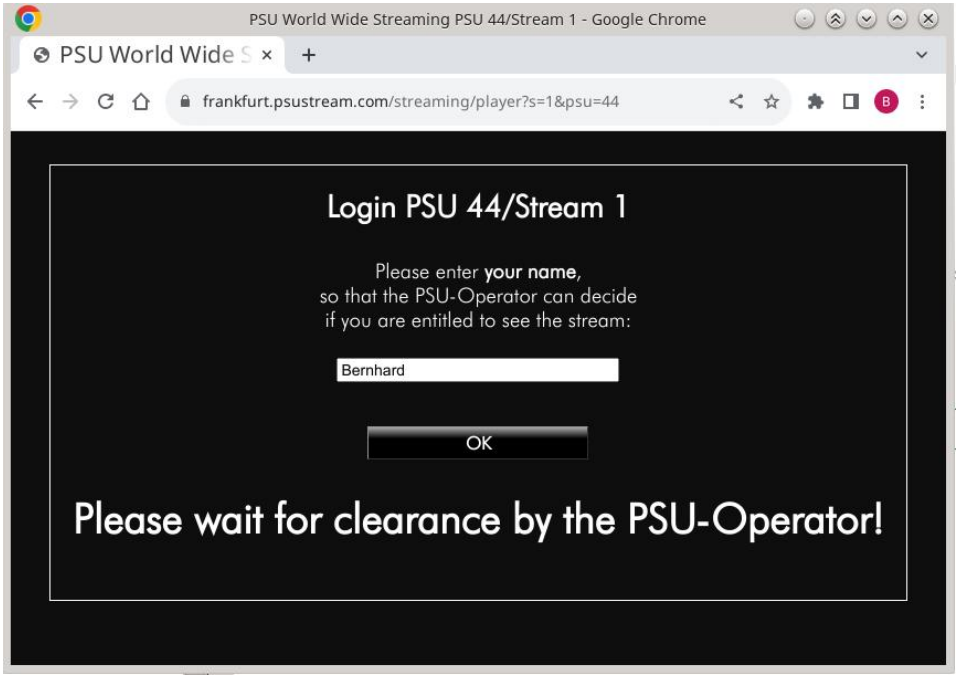
The counterpart of the Satellite App for Internet Streaming is a client-application that is hosted on the Streaming Server and running in the environment of a Web-Browser, like Safari, Chrome, Firefox, Edge etc. No additional software needs to be installed on the client device. Every browser is behaving a little differently - Chrome seems to be the one to offer the “smoothest” experience right now, but that doesn’t really mean you can’t use others.

The entry point after opening a Vantage Streaming Server, like `frankfurt.psustream.com`, looks like this:

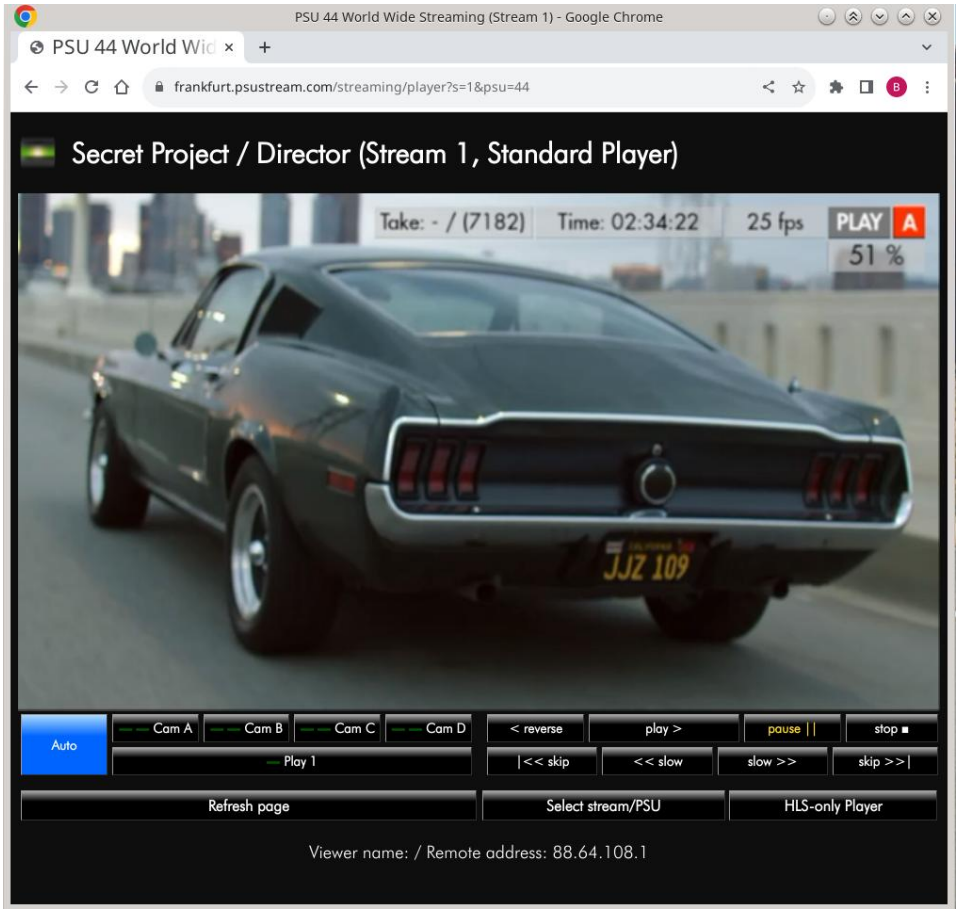


For every PSU connected to the server, there is one line of buttons to open a stream. After selecting one of the streams (see browser-screenshot above), one gets either presented the web-player directly (Security: OFF) or an intermediate page to enter a user name, password or both.

For example with “Granted ONLY”, you need to enter your name in the browser, before you can access the stream:



After access has been granted by the PSU-Operator, the stream-player is loaded. On some browsers, you need to enter your credentials again. Logging in is only necessary once per device, normally, because the information is stored locally for future convenience.



Also depending on the browser, you may have to start the playback of the stream yourself. With Chrome for example, it starts automatically. In this example, Channel-Selection and Playback-Controls are enabled: On the left bottom half you find the buttons to select the camera inputs and playbacks to be shown on the stream, on the right you get basic playback control for the active playback.
Select stream/PSU gets you back to the entry page to select an other PSU or stream.

Our Web-Client offers two different technologies that can be toggled with **HLS-only Player** and from there back with **Standard Player**. The "Standard Player" is based on *WebRTC* which offers an extremely low latency (at least for "Internet Streaming") of about 0.8s.
HLS stands for "HTTP-Live-Streaming" that has a latency of 5s because of larger buffering. On the other hand you can get through higher resolution streams when you are close to your bandwidth limit. HLS is also the older and more compatible technology - on some browsers the "Standard Player" might not work at all and so HLS is simply another option to make streaming

work at all... If you know in advance, that one of the techniques is not working on your platform, you can select that already on the entry page with "Select Player".

Double-Tapping/Clicking on the streaming image toggles between a **Full-Screen-Mode** without any controls and the above "Buttons-Mode" (not on iPhone).

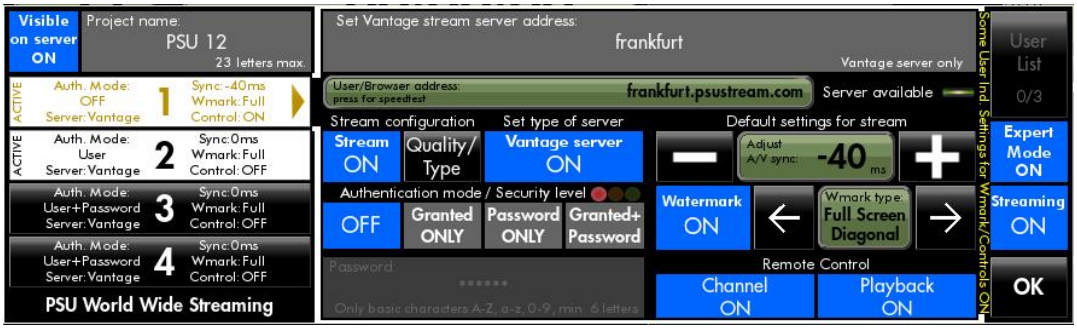
Expert Mode

In "normal" i.e. Non-Expert-Mode

- Security Level,
- Streaming Password,
- Watermark-Settings,
- Remote Control Capabilities (Channel-Selection, Playback),
- Server-Address
- "Using-a-Vantage-Server" and
- Audio/Video-Sync Adjustment

are applied to all 4 Streams as *Stream-Settings*.

In ***Expert Mode***, these settings can be **set up for each Stream individually.** (The white or orange frame around those settings tries to illustrate this.)



On the left side you select the stream you want to set up. If the button's background is white, the stream is actively being transmitted to a server. When "***Vantage server***" is set to OFF, you can use a third-party server as the destination. The syntax for the address line is the following in many cases:

```
rtmp(s)://login:password@subdomain.domain.tld:port/app/stream_key
```

The stream format the PSU is sending out is always RTMP or RTMPS which is **h.264** for video

and **aac** for audio formatted into the **flv** ("flash video") transport format.

We have successfully tried streaming to third-party servers from Wowza, Facebook-Live, Streamshark and Youtube-Live. Here are some **examples** how the addresses looked like (with scrambled credentials):

- Wowza: `rtmp://client83803:2f14a2d2@e1a757.entrypoint.cloud.wowza.com:1935/app-1897/850659b1` `rtmp://psuStream1:aqPlosdWtr8pw@18.156.194.252:1935/PSU_test/stream1`
- Facebook: `rtmps://live-api-s.facebook.com:443/rtmp/2097463180547632?s_bl=1&s_sc=41954731031667254&s_sw=0&s_vt=api-s&a=Wbt_f52TowRcYdXE`
- StreamShark: `rtmp://gce-k-eu-west-2.streamshark.io/live/psulive-efa6q5_main?v=p&p=pt&u=jejbxhriyz&k=FYzgguuF76`
- Streamshark-Player: `https://play.streamshark.io/t/x/arljrzhk/psulive-hmijke/embedComment`
- YouTube-Live: `rtmp://x.rtmp.youtube.com/live2/qsov-7f3p-h37y-94b1-bj8x`

Troubleshooting

Bandwidth related problems

- Execute the Speedtest and asses if the upload speed should be sufficient
- If the speed is low, and you are using a mobile 4G/LTE-Router: Try to place it somewhere where you get full/good signal, maybe according to status-LEDs on the device itself or displayed on a router-internal configuration page. You could also use your mobile phone to find a spot with good coverage.
- Activate only those streams, you want to stream "into the Internet".
- Lower the quality of all used streams to the lowest possible ("SD low"), then, if you get a smooth running stream, gradually increase its quality until it's **not** running smooth on the client anymore, then go back one or two steps.

Blocked port on the server

If you, for example, already had a working streaming setup with local cable based network (LAN on set or studio) and then pulled the network cable and plugged in a (different) mobile router without shutting down the PSU first, there might be a stale, still opened port on the server that utilizes the old network path. In this case you either have to wait for quite some time, or

restart the server itself by the provided "Reboot server"-Button on the entry page.

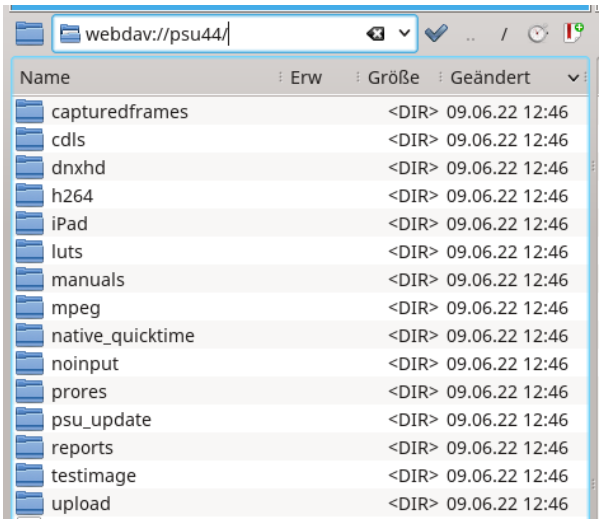
The recommended procedure when you change the network setup is as follows:

- Shutdown the PSU (port on the server will be closed cleanly)
- Re-Attach/Swap network cables
- Start the PSU
- Check if streaming is active ("Server available LED")
- If streaming is not working on the clients, reboot the server.

Server Freeze

There haven't been *any* reports that this has happened so far, but there is the possibility to quickly restart the *server software* within seconds (as opposed to reboot the whole server) by pressing "Restart streaming" on the entry page.

PSU-Network-Access

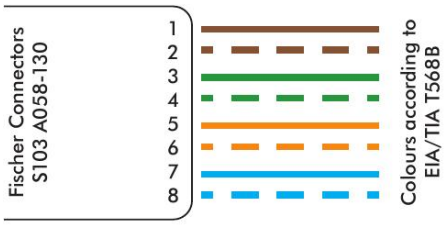


The PSU offers network access in the form of **folders / directories** to **all recorded takes**, compressed takes in various formats, cuts, frame-grabs, LUTs, CDLs, (Shooting-Day-)Reports, camera-("No-Input"-)logos, User-Testpattern and more. It's is also possible to upload takes/clips and images onto the PSU using this interface.

Ethernet-Network

On the main connectors' side, the two Fischer sockets **GbE1 and GbE2** are Gigabit-Ethernet (network) connectors. There is one (red) cable in every PSU-Shipping-Case that fits, additional cables are provided with the *PSU-Satellite-Set*.

Pinout of GbE1 / 2:



Difference between GbE1 & GbE2

- On **GbE1** the PSU expects/tries to receive an IP-address from a DHCP-Server on the other side.
- **GbE2** is a socket of the **built-in WiFi-router** of the PSU, that has a DHCP-server running by default. That means GbE2 always provides an IP-address to clients connected to GbE2.

In other words: **GbE1** should be used if the **PSU is a client-device** in the network (LAN), and **GbE2** if the **PSU should become** *The Server* of the network.

Use Cases:

- Attach PSU on GbE1 to another router, like a company or stage LAN, or a LTE/Mobile-Router to get the PSU "into" the internet. (For example to use *World Wide Streaming* or receive *Remote Diagnosis, Maintenance, Updates*.
- Use GbE2 to *directly attach a laptop* etc. to the PSU, for example to upload/download files.
- Attach an external WiFi-router like Vantage Film's "Houston" to GbE1. Note: Houston is not configured to "extend" the built-in WiFi of PSU-4 - when using Houston, the internal WiFi should be turned off!
- It's also possible to connect an external WiFi-Router configured in *"Bridge Mode"* to GbE1 on one side to the PSU and on the other side to an available ("Stage-Router") LAN. Then Internet-Streaming and WiFi-Streaming on the external router can be used in combination.
- A second WiFi-router in *"Bridge Mode"* can also be used on GbE2 to extend the WiFi-Network of the built-in router, but you should pay attention to the used WiFi-channels on each of them, so that they don't transmit on the same frequencies.

Wireless-Network

To connect to the PSU wirelessly and access the Network-Interface, you can either use an external WiFi-Router (on GbE1) or the built-in WiFi-Router.

WebDAV-Clients

In any case, all PSUs in the same network should be reachable by **"psu"** *plus* its **number** as "Hostname" or "Servername". The number is written on the front (without leading zero). For example: **psu72, psu120,** ...

The underlying network technology (protocol) is *WebDAV*, which is an *extension* to the ubiquitous http-("www")- protocol. Among others, it adds folders and file-control to http. To access the structures and resources on the PSU, you need some WebDAV-Software-Client. Encryption ("https") is **not supported**, yet, but (optional) **Authorization** by Username + Password is.

By default, WebDAV-Authorization is activated, the initial pair of credentials (login+password) is psuwebdav/psuwebdav. Both can and should be changed, if WebDAV-Authorization is desired. To set it up, open Settings → Settings → WebDAV:

To disable WebDAV- and HTTP-Authorization, toggle *Security* to OFF.

You can also configure if the network interface is usable while the PSU is locked via *Exit → Lock Screen*, by setting **Lock with PSU** accordingdly.

> **Note:**
>
> **Windows** (Explorer) and **MacOS** (Finder) have **built-in support for WebDAV-Shares**, but both are **not really usable** in combination with the PSU: Some resources, like native-quicktimes and reports, are generated just-in-time upon request - so their file-sizes are not known when they get *listed*. Both WebDAV-implementations can't cope with 0-sized files, although the true size is known before downloading, later.

Windows

- **WinSCP:** A great client for Windows - it's completely free, shows the correct download progress and is easy to install. New Session → Protocol: "WebDAV" → Encryption: None → Server: e.g. psu123 → Save, maybe even create shortcut on Desktop → Done!
- **Cyberduck** (freeware): Works good, but nags about "Incomplete Transmission" although files download correctly. Use "anonymous" login; has "download synchronization" feature! Benefit: **Same user-interface as on Mac.**
- **Mountain Duck** (not free): Untested, but probably same base as Cyberduck - installable file-system-driver for WebDAV.
- **TotalCommander** (Shareware): Needs the WebDAV-Filesystem-Plugin available on same site. Runs under all Windows versions but has a little "dated", yet powerful interface. For friends of the Norton Commander ;-) Disable the so called "Multi-Step-Upload".

MacOS

- **Cyberduck** (freeware): Works good, but nags about "Incomplete Transmission" although files download correctly. Use "anonymous" login; has "download synchronization" feature! Benefit: **Same user-interface as on Windows.**
- **Mountain Duck** (not free): Untested, but probably same base as Cyberduck - installable file-system-driver for WebDAV.
- **FE FileExplorer:**: Actually, this is a great client originally developed for mobile devices like smartphones and tablets. If you use it there anyways, why don't use it on the Desktop as well? The free-/test-version only supports **one connection** and does not allow to manage (like "copy") multiple files *at once*. One should definitely consider to upgrade to the "Pro"-Version!
- **Transmit:** (not tested)
- **Commander One:** (not tested)

iOS & Android

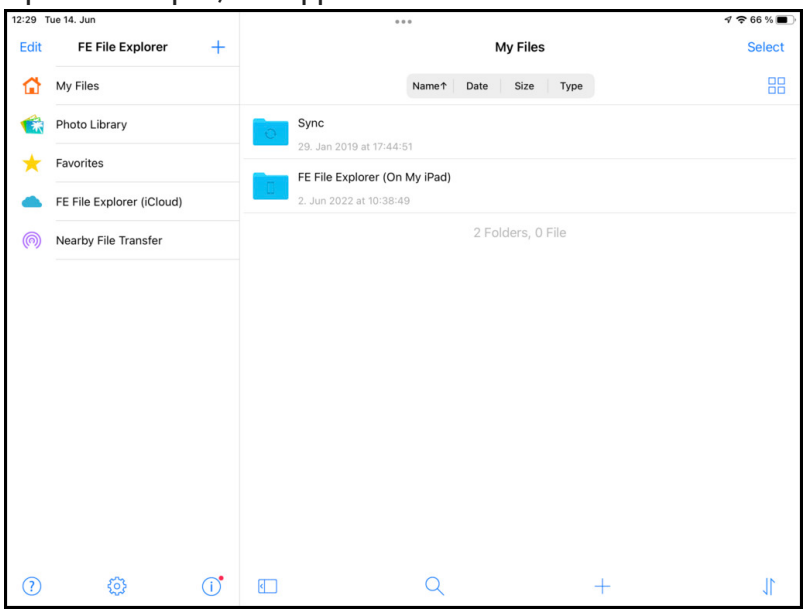
- **FE FileExplorer:** (See also above!) Great WebDAV-Client and powerful arbitrary-file-manager for iOS. There is also a version for Android (not tested). It is the recommended App to download takes/clips locally on the device to support Script/Continuity.

Linux/Unix

- KDE: Konqueror/Dolphin/Krusader: Nativly suppports webdav://psuXX in address lines.
- GNOME: Nautilus
- command line: cadaver (also works under every other operating system)

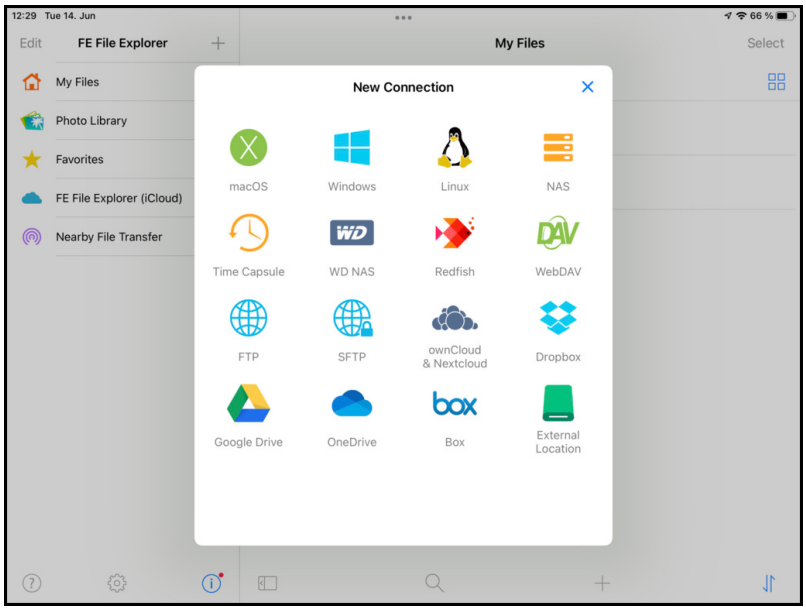
Example-Connection with FE FileExplorer

1. Get FE File Explorer from App-Store or Play-Store (needs Internet connection)
2. You probably need to change your WiFi-connection to the PSU-Network.
3. Upon initial open, the App looks like this:

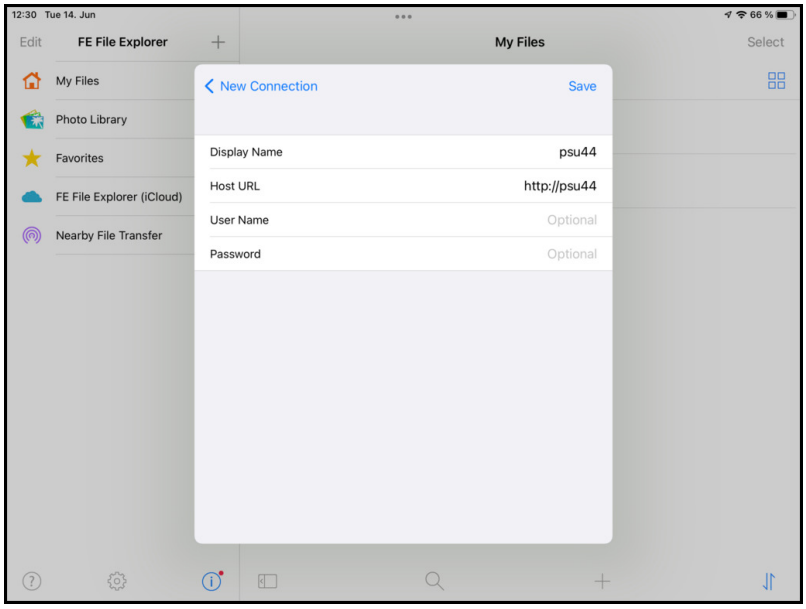


On the left side are on- and offline "places" and connections, like the App-local file-storage **"My Files"**, the device's **Photo Library** (can be interesting to upload existing clips and stills to the PSU) and more.

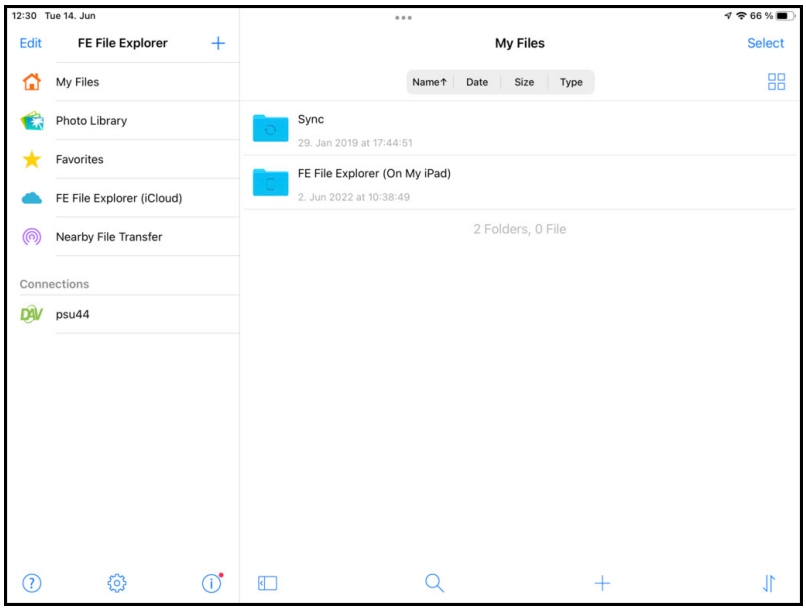
4. To create a **new connection to a PSU**, tap the **"+"** on the right to "FE File Explorer" to open the "New Connection"-Dialog. There, **select "WebDAV":**



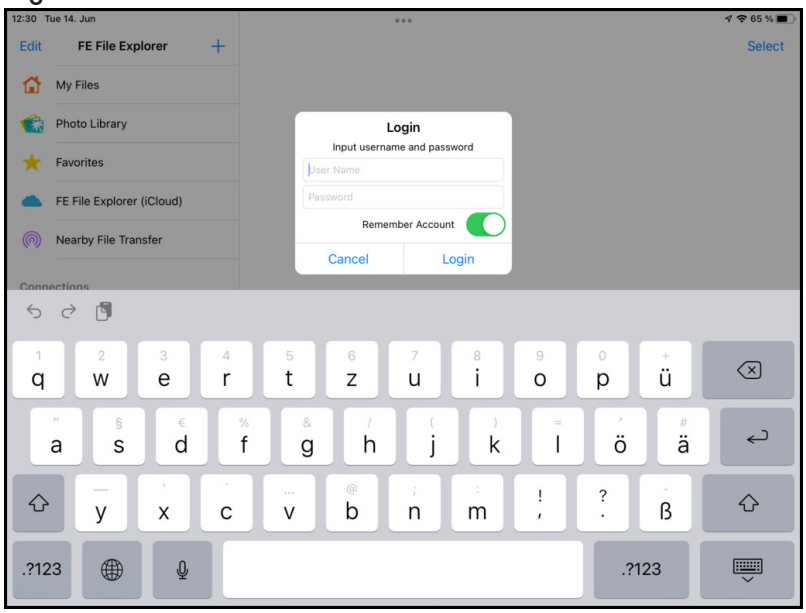
5. You **only need to enter the** Host-Address of the PSU, like http://psu44 (change "44" to the number engraved on the front of the PSU!). If "Display Name" is left *blank*, the Hostname will be used for that:



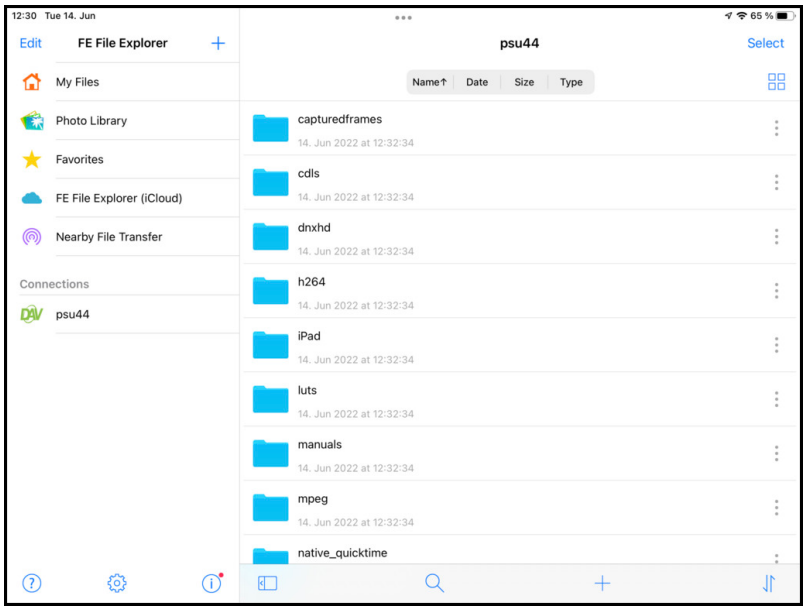
6. Now you can **see the newly created conection "psu44"** on the left panel:



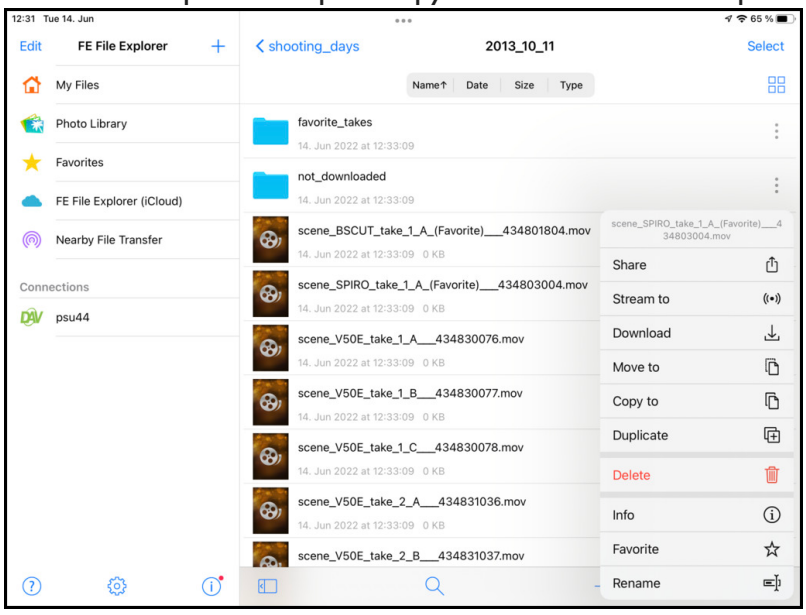
7. Simply tap the connection to open it. You will prompted for username + password - just **leave them blank and press login.** From now on, you will not be asked again for the login credentials:



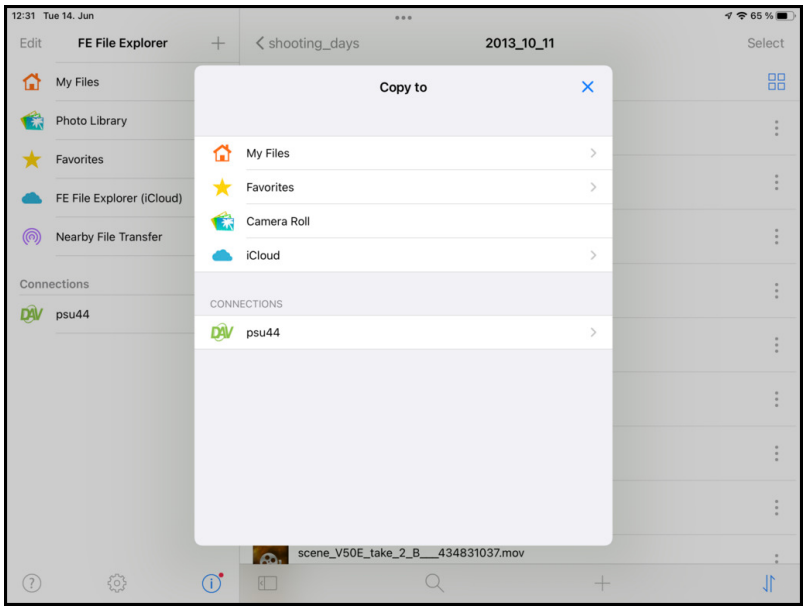
8. This is the top folder structure of the PSU - they are discussed in detail below:



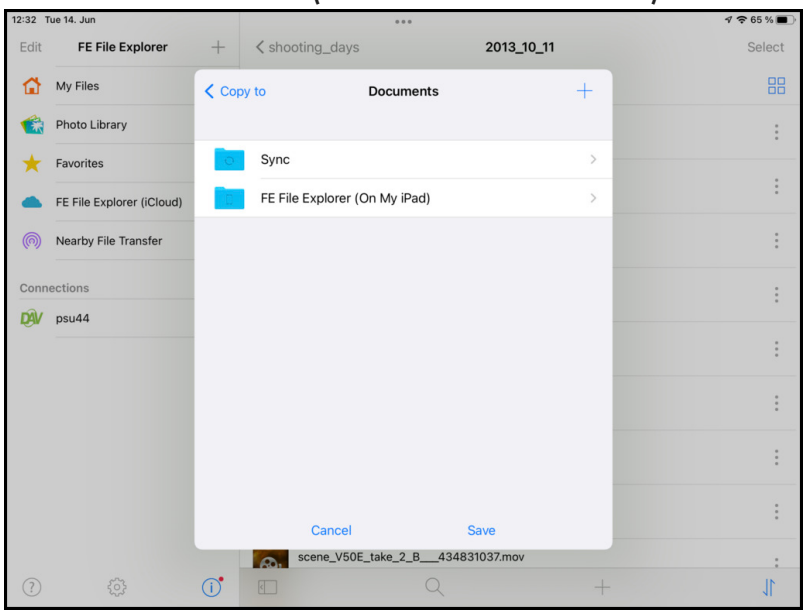
9. For illustration, we descended here to *native_quicktime* → *shooting_days* → *2013_10_11*, and pressed the **three vertical dots*** at the end of a clip-entry, which opens the action menu for it: Tap for example "Copy to" to download the clip...



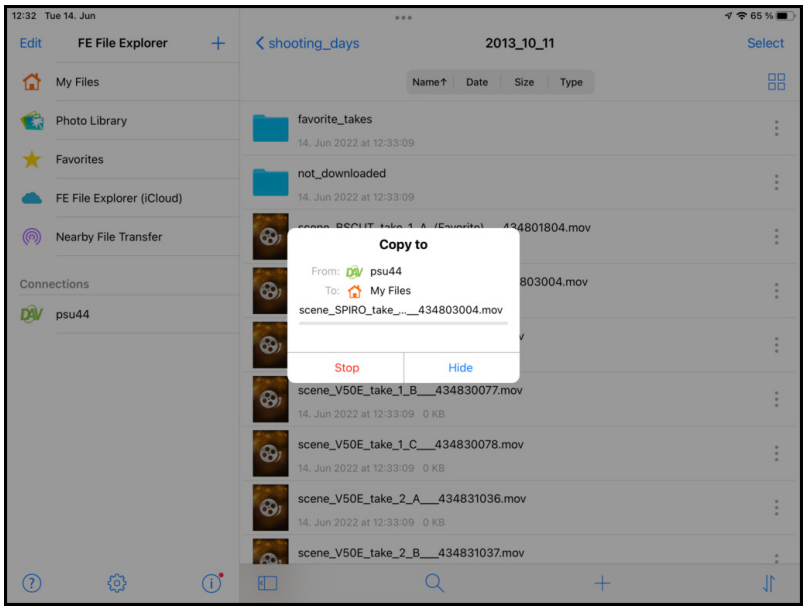
10. ...select a destination like "My Files"...



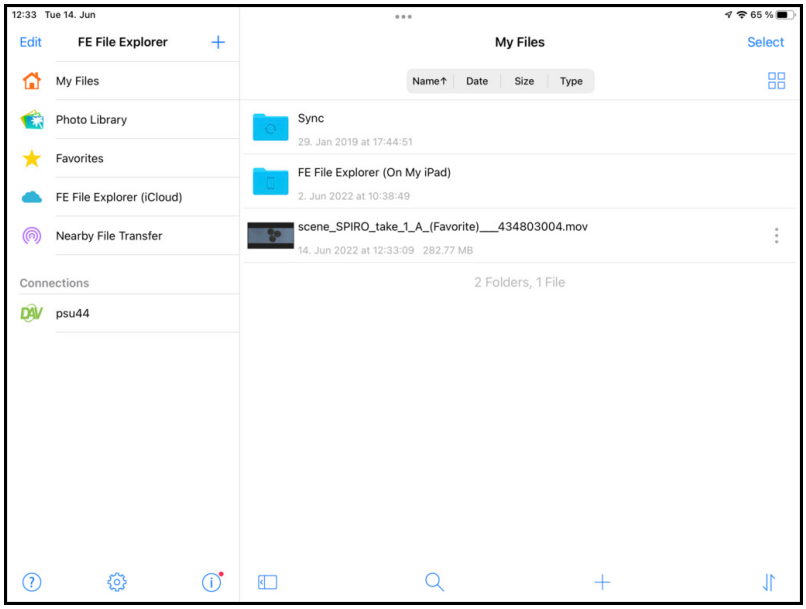
11. ...and some folder there (create a new one with “+”)...



12. ...wait for the download to complete...



13. That's it! The take/clip is on the iPad: You can immediately press it to play it back. Double-tapping on the picture in playback mode toggles different de-squeezing and zoom-in modes.



It would work exactly the same the other way around to upload a take onto the PSU. (Use the **"upload"-folder** as the destination.)

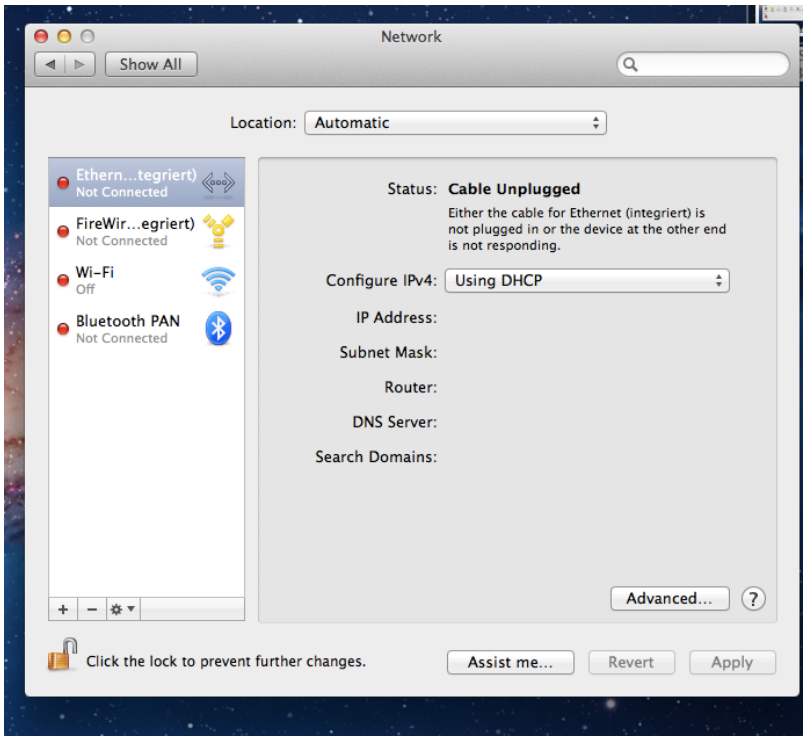
Furthermore: The App allows folders to be "dragged out" and placed next to the original app as a second window (supporting "MultiView"). So one could open the PSU on the left side and the destination folder on the right for example.

> **Note:**
>
> A lot of the PSU's folders contain virtual subfolders which can contain the same takes again like the parent-folder, for example "favorite_takes" and "not_downloaded" - to avoid multiple downloads, don't select the complete shooting_days-folders - either only select the individual files you really need, or for example "not_downloaded" to copy all not-yet-downloaded-files...

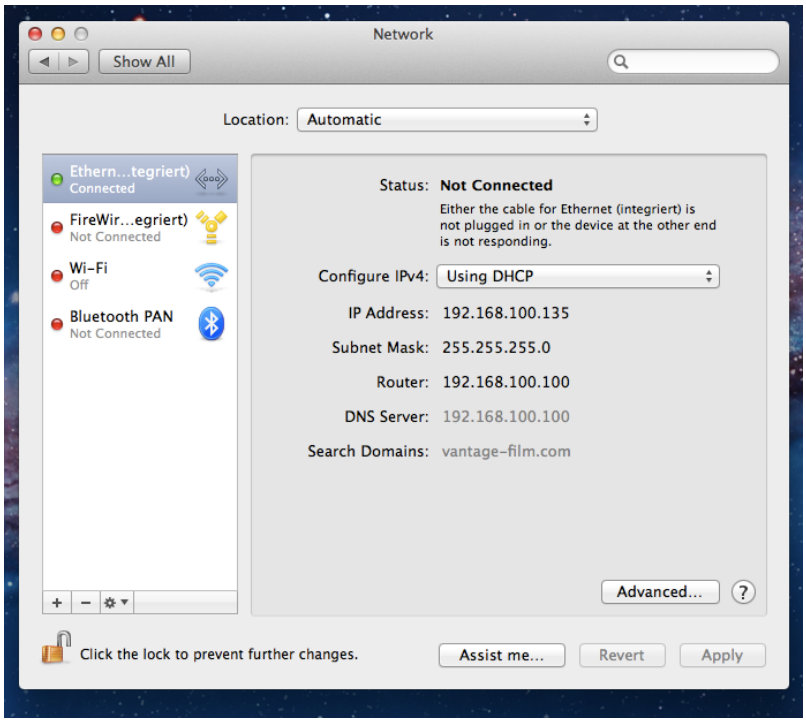
Example-Connection with Cyberduck

1. Get Cyberduck - all versions can be found at:
   https://cyberduck.io/changelog/
2. Open **Network** settings in **System Preferences:**

3. It will look like this when the network cable is unplugged. In the **Configure Ipv4** setting of the built-in Ethernet interface, select **Using DHCP.**

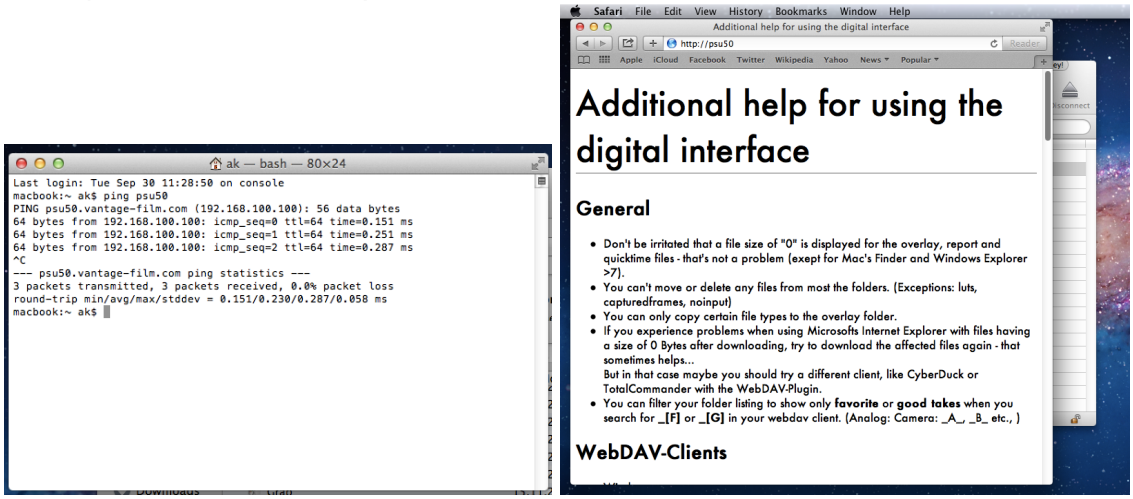


4. After plugging in the cable, please wait until it looks similar to this. This may take some time (≈30 seconds). The IP-Address may be different. Notice the green light left to the Ethernet interface:

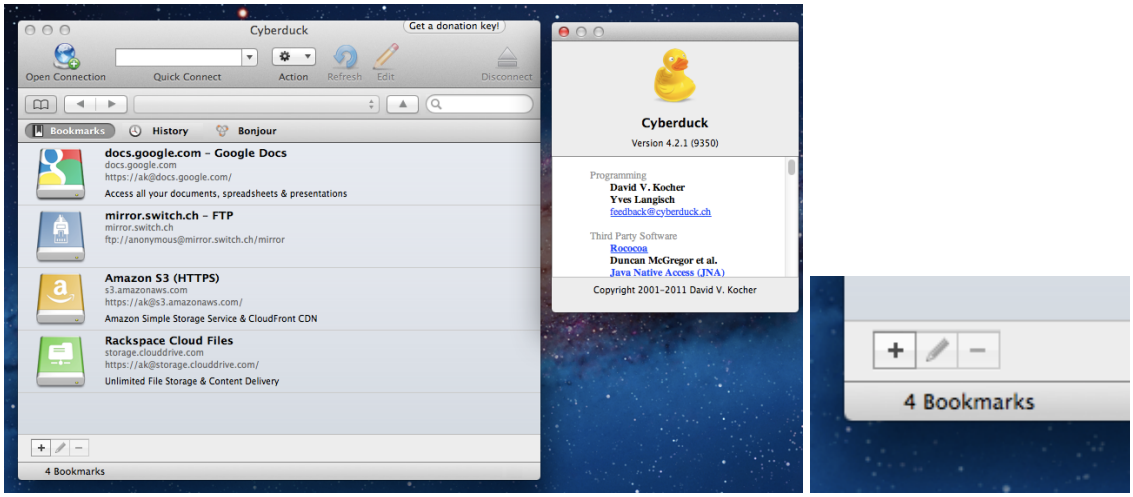


5. It is not necessary, but you can check the connection by entering either *ping psu50* into a **console window** or **http://psu50** in a web browser (e.g. Safari). Change the number

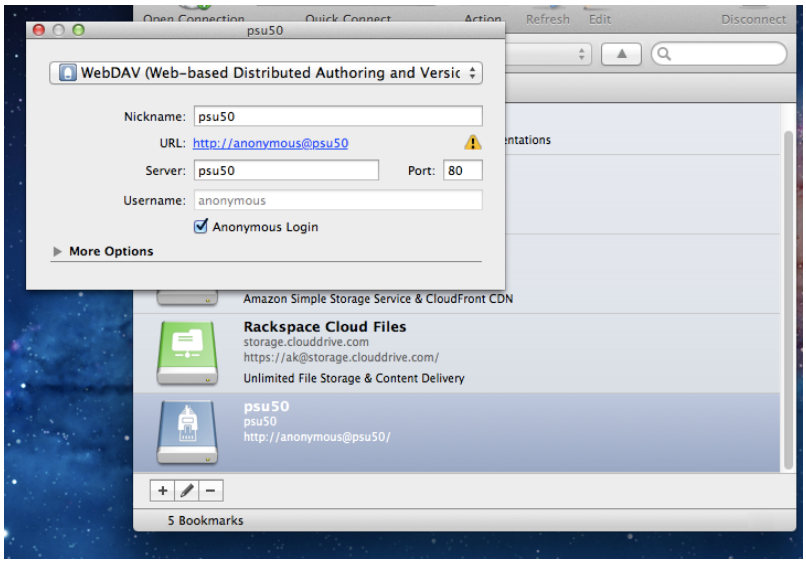
after “psu” to the number of your unit!



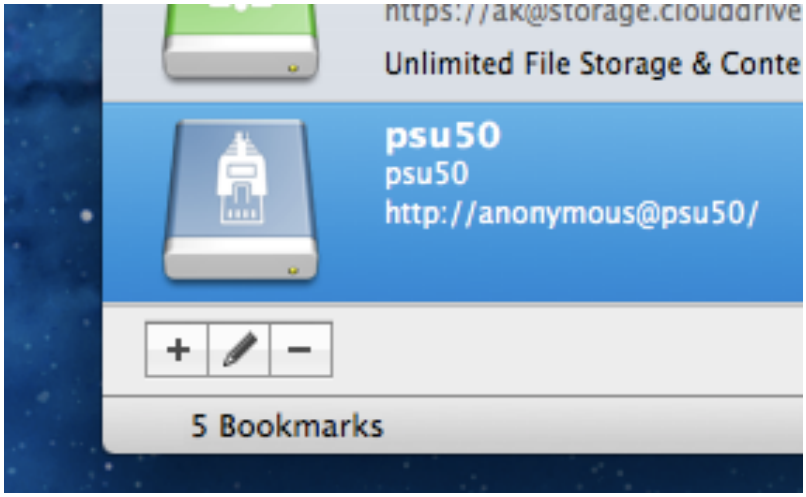
6. **Open Cyberduck.** A freshly installed version will look like this. It starts by displaying the bookmarks. To connect to the PSU, **create a new bookmark by pressing “+” in the lower left corner:**



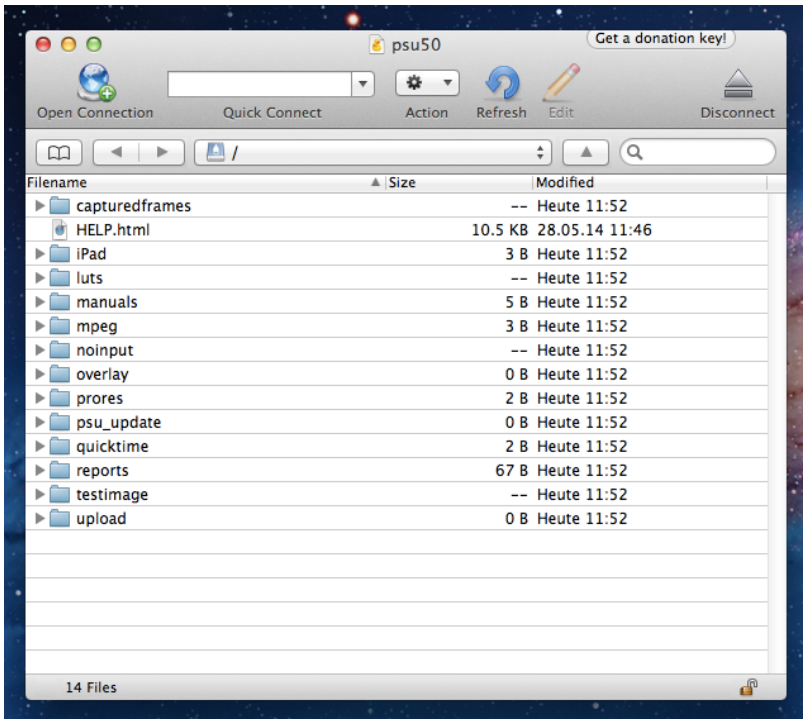
7. In the dialog box, select the connection type **WebDAV (Web-based Distributed Authoring and Versioning)**, (Do Not Use: WebDAV (HTTP/SSL))
   For **Nickname**, you can enter whatever you want, but something like “psuXX” seems reasonable.
   For **Server**, enter the PSU name, such as “psu50.” Set the mark left to “Anonymous Login.”
   Close the dialog.



8. A new bookmark will be created in the list. Double click it:



9. Finally, all folders off the PSU's network interface are now visible. From now on, all you have to do, is to plug in the cable, start Cyberduck, and open the PSU bookmark.



Folders of the Network-Interface

General information

- Don't be irritated if a file size of "0" is displayed for certain files like *reports* and *native-quicktime* files - that's not a problem. Those are created dynamically when downloaded.
- You can't move or delete any files from most of the folders. (Exceptions: luts, cdls capturedframes, noinput, testimage, psu_update)
- You can only copy certain file types to the capturedframes folder.
- You can filter your folder listing to show only favorite takes when you search for _(F in your WebDAV client. (Analog: Camera: _A_, _B_, etc.,)

native_quicktime > PSU-Backup / Native Takes

- The files are created dynamically on demand (i.e. on download), that's why they have a size of "0".
- Because of this, you have to wait a short period of time before the download starts
- At the moment, you can only download these takes, if all playbacks on the PSU are

stopped ("paused" is not enough).

- You can browse through the quicktime files **grouped by shooting days** or see **all** existing takes in one directory.
- **Backup:** The files contain all additional information a PSU-take has, like original camera speed, take notes, timecode, sound, arri-metadata and more. They are suitable for backing up some or all takes of the PSU
- If enabled, you can also download **XML-metadata-files for Final Cut Pro** from the quicktime-sub-folders
- You **can not upload to this folder** - use the "upload"-directory for this.
- The native_quicktime-folder contains all takes in one **ALL-folder**, and the **shooting_days-folder** that has a sub-folder for every shooting day. If any of the takes of a folder are "Favorite-Takes", an additional folder called "favorite_takes" exists, that only contains those. Furthermore: The PSU keeps track of downloaded takes - if applicable, there is a **"not_downloaded"-folder** that contains those takes that haven't been downloaded in some format (or backed-up), yet!

MPEG-, iPad-, h264-, DNxHD- and ProRes-Files

- You can only see files in the **"mpeg", "ipad", "h264", "dnxhd" and "prores" - folders**, if you already compressed (aka "rendered") them in the Import-/Export-Manager. These formats can't be generated *on-the-fly* from here.
- If you think that certain files are missing, maybe they aren't compressed yet. There is only a progress display on the PSU when you initiate a compression.
- ...Or maybe you have to **refresh the view** in your client software.
- By activating *Auto Compression* all already recorded takes will be compressed automatically in the background and will be available in the folder of the selected format.
- You can view the compressed files grouped by shooting days, a "not_downloaded" folder or see all existing files in one directory.
- All these folders contain all takes in one **ALL-folder**, and the **shooting_days-folder** that has a sub-folder for every shooting day. If any of the takes of a folder are "Favorite-Takes", an additional folder called "favorite_takes" exists, that only contains those. Furthermore: The PSU keeps track of downloaded takes - if applicable, there is a **"not_downloaded"-folder** that contains those takes that haven't been downloaded in some format (or backed-up), yet!

upload > Upload / Import Takes into the PSU

- If you copy Quicktime-Files into this directory, they will be imported into the PSU as new takes.
- If you upload the takes that were downloaded originally from the “native_quicktime” folder, they will show up exactly at their original timely position, and all additional information is preserved as well. *Currently only some basic codecs in quicktime-containers are supported, especially ProRes, h264, yuvs, jpeg, mjpeg, mpeg1, yuv, indeo, cinepak. Others might work as well, like DNxHD in a quicktime-container.
- You can copy whole directory/file-structures at once into “upload”.
- There are special virtual directories in “upload”, like “16_9_letterbox”, that allow to rotate and “letterbox” uploaded clips to 16:9 or 4:3 by adding black rectangles. Rotating and letterboxing requires the uploaded footage to be re-encoded, which needs a lot more time than decoding alone!

reports > PSU-Reports

- The reports are created dynamically on download. The initial list just displays which days and collections are available.
- Please see the Job-/PDF-Reports Chapter!
- You can select fields from the extended ARRI-Metadata that should be included in the reports.
- There are special reports that contain that contain for example all favorite takes.
- In the “Scene Numbering”-Dialogue you can include/ exclude the rehearsal-takes from the reports.

capturedframes > Frame Grabs/ Overlay Stills

- Here you can download Frame Grabs, upload stills for example for Overlay-Backgrounds and Freeform Masks, and delete existing files.
- All pictures here are provided in 4-channel PNG-Format (RGB+Alpha)
- To upload images to this folder, they must meet the following criteria:
  - The file-format must be true-color BMP, GIF, JPEG, MNG, PBM, PNG, PPM, or XPM. (Apple’s “HEIF” is not supported, yet!)
  - The general recommendation is to use *PNG* because it’s a **lossless compression** with **Alpha-Channel support**.
- If the original resolution is higher, uploaded files get scaled down to the resolution the PSU

needs (1920x1080), and compressed to PNG. Otherwise only the aspect ratio is adjusted to 16:9.

- The width to height ratio must either be 4:3 or 16:9, otherwise the picture will look squeezed on the PSU.
- If you want to upload a picture that looks right in anamorphic mode, the original ratio must be 8:3 or 16:9 x 4:3=2.37 (because it gets automatically squeezed to 4:3 or 16:9)

luts > LUTs (Look-Up-Tables)

- If you copy 1D or 3D luts into the "luts"-folder, you can select and apply them in the Picture-Settings LUT-Dialog.

cdls > CDLs (Color-Decision-Lists)

- Upload, download and delete SOP (Slope, Offset, Power) and LGG (Lift, Gamma, Gain) Color-Decision-Lists in XML-Format)

noinput > "No-Input"-Logos

- In the "noinput" folder one can upload a **Custom (Live) Logo**, that will be displayed in Live-Mode **instead of "No Input Cam X"**, as long as no signal is connected/detected at the Camera-Input.
- The filename must start with a,b,c...g,h followed by an underscore "" *for example "b_noinput.png". Even "a"* alone is possible...

testimage > User-supplied Test Image

- In the Video-Out selector you can activate a test image that gets displayed on all screens. You can upload one yourself to the PSU by copying it into the testimage-folder. Press the button in the dialog for >1s repeatedly, to select it.

psu_update > PSU-software update

- In special cases where internet access for the PSU can't be provided, but an update-package is existing, it can be uploaded to the "psu_update"-folder and then installed. At the moment, there is no package available that could be installed this way.

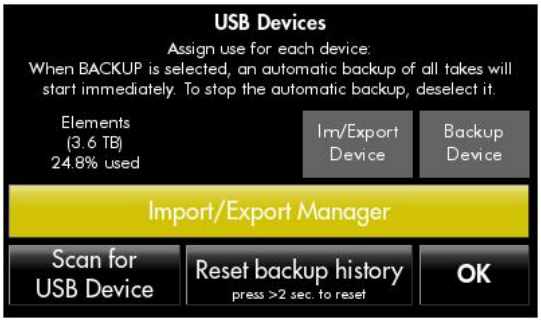
Importing & Exporting

The center for importing and exporting takes, cuts, still images, logos, LUTs, CDLs and job reports is the ***Import/Export-Manager***. It is a sibling of the ***Take-Selection-Dialogs***, that means on the left side you control what you want to do with the takes which you selected on the right side (thumbnails). The Import/Export-Manager is mainly intended for working with external USB-storage media, like hard discs, SSDs or USB-sticks. *Most* of the things that can be done here, can also be accomplished through the Network-Interface of the PSU (except for initiating take compressions).

Attaching USB devices

So let's assume there is an USB-disc plugged into one of the USB-connectors on the back of the PSU. As soon as the device is recognized, the ***Access USB***- Button appears in the top left corner of the screen:

Press *Access USB* to open the USB-Devices-List.



For illustration: It can contain multiple lines for every attached device or found partition on the devices:

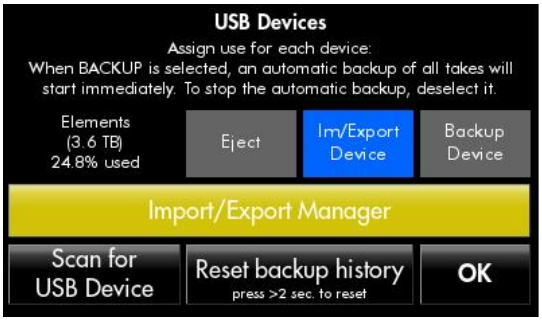
Here you can see by the way, which file systems are supported by the PSU: All FAT-flavours (DOS/Windows), NTFS (Windows), HFS (Mac), BTRFS, Ext (Linux).

If for some reason an attached device is not showing up in the list, try **Scan for USB Device**.

Before a device can be used, it has to be **mounted**. This *could* be done automatically, but you can use a device for **different tasks:**

- If you just want to import or export some clips for example, select **Im/Export Device**.
- Choosing **Backup Device** activates the **Automatic Backup-Mode:** Immediately after selection, the PSU starts to export all already recorded takes to the selected drive, and every newly recorded take gets exported as soon as recording stops! (Format: "Native" - see below.) Not all filesystem-types are usable for the Automatic Backup, because the type needs to be able to handle big files (more than 4GB). Older filesystems like fat16, vfat and others don't have this capability. This is indicated by *"Filesystem not suitable for backup."* The **PSU keeps track** of the automatically backed-up takes **across multiple devices,** that means you can use different devices for backup, but every take will only be exported *once*. If you want the PSU to "forget" that, press **"Reset backup history"** for >2s.

To unmount a device, press **Eject**:



> **Note:**
>
> If devices don't get unmounted before shutting down by pressing "Eject", they will be mounted automatically the next time the PSU is started and the device is already plugged in at power-on.

Import/Export-Manager

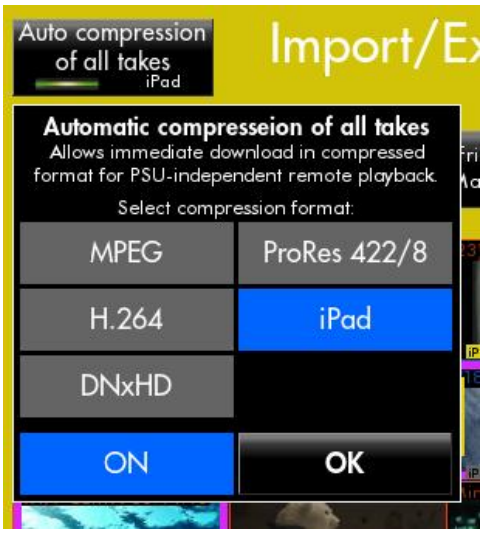
There are two ways to access the Import/Export-Manager:

1. As described here, by **pressing any "Play" labeled button for > 1 second**, you can switch to special Takes-related "levels" or operation modes. One of them is *Import/Export*:

2. Press the prominent yellow button labeled Import/Export-Manager in the USB-Devices-Dialog (see above).

In the top left corner there is a green status display with multiple informational progress bars which illustrate the current state of compressors and copy tasks running in parallel “in the background”. Before software version 4.6, all import/export-tasks are paused as long as a playback or recording is running (or a playback is paused!). This has bee changed starting version 4.6, which allows parallel operation **until** 4 channels are “running”, like 2 recordings plus two playbacks at the same time. All import/export activity can also be paused manually if needed with the **pause compression/copy** button underneath.

Auto Compression

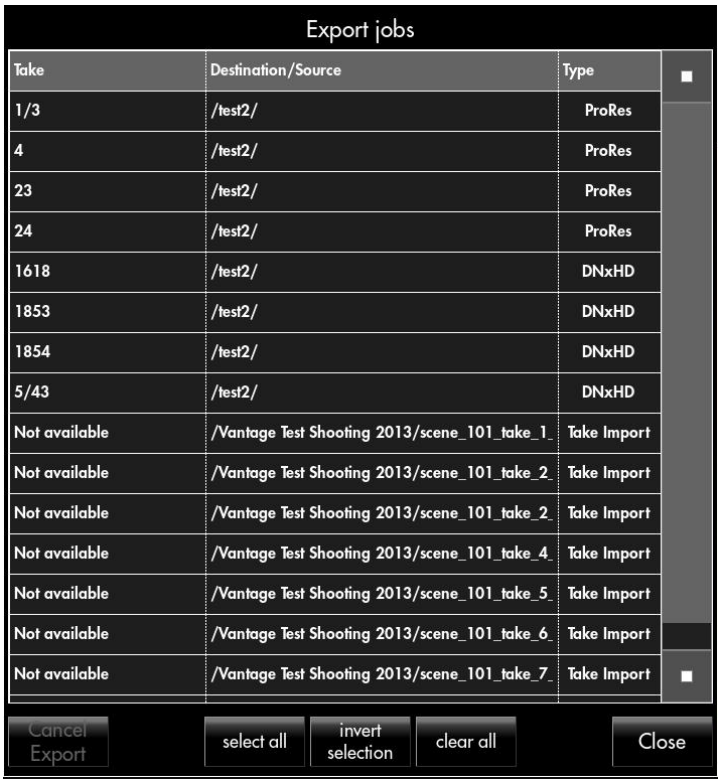


Before we move downwards, let's first point out the **Auto Compression** function the can be activated with the button right next to the status display: In it's associated menu you can choose a format in which **all** already recorded **takes** and all future recordings **will be automatically compressed in the background**, so that all takes are available for **immediate download** in this format. This is intended for independent use (i.e. playback) on **network clients** of any kind. All you need is some WebDAV-capable client software to download them. Please see chapter Network Interface for details.

Down the left panel follows the selection of the type of operation you would like to perform:

- **Export takes** to the external device
- **Import takes** from the external device
- **Delete compressed files** that are stored on the PSU
- **Import/Export other files,** like still images, LUTs, reports, grabbed Frames and Color Decision Lists (CDLs)

All operations are queued: You can assign different tasks to the queue and leave the Import/Export-Manager to continue working "outside" in parallel. **To inspect and optinally control the queue, press the green progress/status display itself:**



In the above example, you can see three queued jobs: The first four takes will be exported to folder "test2" (on the external drive) in ProRes-Format, another four takes will be exported as DNxHD, and finally a couple of takes will be imported from folder "Vantage Test Shooting 2013" (on the external drive as well).

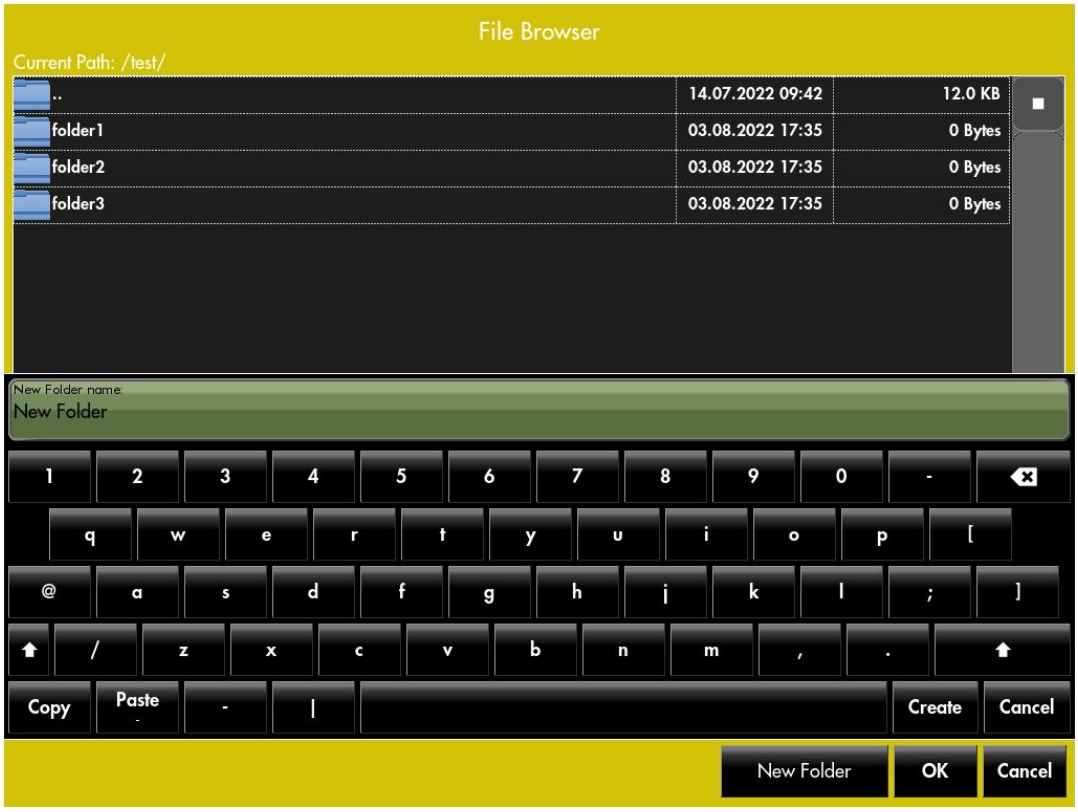
You can edit the list and cancel jobs: Select the entries to remove either selectively or with the ***select all***, ***invert selection*** and ***clear all*** shortcuts. Then press ***Cancel Export***.

To export takes and delete compressed files, first select the operation and then mark all desired takes in the thumbnail view on the right. There are also tools to mark all files of a certain day (select a date and press ***selected day***) or ***select all***. To remove all selection marks press ***clear selection***. To search takes by number, scene, shot, or take press ***search take***, this will bring up the Search-Keypad of the Select-Take-Dialog explained here.

Export Takes

Additionally to selecting the takes you wish to export, you need to determine a destination. This can either be on the ***PSU*** for later download via the Network Interface (WebDAV) or a folder on the ***USB***-device.

The folder can be selected or created by pressing the green display labeled ***Destination path***:



Here **New Folder** was pressed before, which brought up the keyboard to enter a name for another folder. Press **Create** on the keyboard to confirm and close the keyboard. To actually **use** a newly created directory as the current export destination path, one has to select it from the folder list **before closing the File Browser with OK.**

Finally, you need to select one of the available file formats before adding the export job to the task queue by hitting **"Start"**:

- **Native:** This is the native format of the PSU that **needs no time for re-encoding or compressing.** It preserves all meta-data and, when re-imported, restores the original take as it was on the PSU. It's MJPEG (compressed) or "YUV" (uncompressed) stored in a Quicktime container. Unlike all other export formats, no picture information is lost in respect to the PSU.
- **H.264:** Also known as **mp4**, keeps the resolution as stored on the PSU but is compressing rather strongly (resulting in small file sizes).
- **DNxHD:** Citing the Wikipedia-Article: "Avid DNxHD ("Digital Nonlinear Extensible High Definition") is a lossy high-definition video post-production codec developed by Avid for multi-generation compositing with reduced storage and bandwidth requirements. It is an implementation of SMPTE VC-3 standard. DNxHD is a video codec intended to be usable as

both an intermediate format suitable for use while editing and as a presentation format. DNxHD data is typically stored in an MXF container, although it can also be stored in a QuickTime container."

- **ProRes 422/8**: Citing the Wikipedia-Article: "Apple ProRes is a high quality, lossy video compression format developed by Apple Inc. for use in post-production (...)" As the PSU is currently based on 422 chroma subsampling and 8 Bit sample depth, it makes no sense to export ProRes in an other configuration.
- **iPad**: Same a H.264 but resolution is reduced to 960x540 ("Half-HD"), to still look reasonably good on iPads for example for PSU-offline viewing of takes.
- **MPEG**: This is the little dated MPEG2 format, that was used for DVDs.

> **Note:**
>
> Except for *Native*, all file formats need time for re-compression. Non-*Native* files can only be downloaded via the Network-Interface if they have been created in advance on the PSU! *Native* takes can be downloaded just-in-time as needed.

If takes have already been compressed, the format is indicated with little yellow labels around the thumbnails:

Import Takes

To import takes from an external USB-device, press **Import takes**. An extended version of the File Browser already shown above will come up:

Navigate to the folder containing the files to be imported onto the PSU. Then select the files by marking them one-by-one or activate “Drag select” to mark by moving accross the file list. If the clips to import have a different format ratio or rotation other than 16:9 or 4:3, you can let them be resized and rotated while importing by means of the **Letterbox import** settings. Confirm, close and add your import-task to the work queue by pressing **“OK”**. You can also close the Import/Export-Manger and continue working “outside”. There is also a progress bar in the main Time/System-Info-Display indicating the progress.

Before software version 4.6 only some basic quicktime flavours were supported for importing, especially ProRes, h264, yuvs, jpeg, mjpeg, mpeg1, yuv, indeo, cinepak. The import capabilities have been extended significantly starting with version 4.6 to so many, that we don’t try to list them here anymore. Please tell us if a needed format is NOT supported...

If you re-import *Native* takes, they will show up exactly at their original position, and all additional information is preserved as well.

Delete compressed files

All non-**Native** compressed clips **will be kept on the PSU** until they get deleted here specifically, or by “Delete Disc” implicitly.

For example to free up space by removing no longer needed exports, press **Delete compressed files** in the Import/Export-Manager:

Mark the takes whose compressed versions you would like to delete and additionally select the desired file-formats. So you can - for example - only delete the iPad-versions of takes but keep their ProRes files on the PSU. You can use the same helper functions like “Selected day” as explained above for marking and finding the the compressed takes to delete.

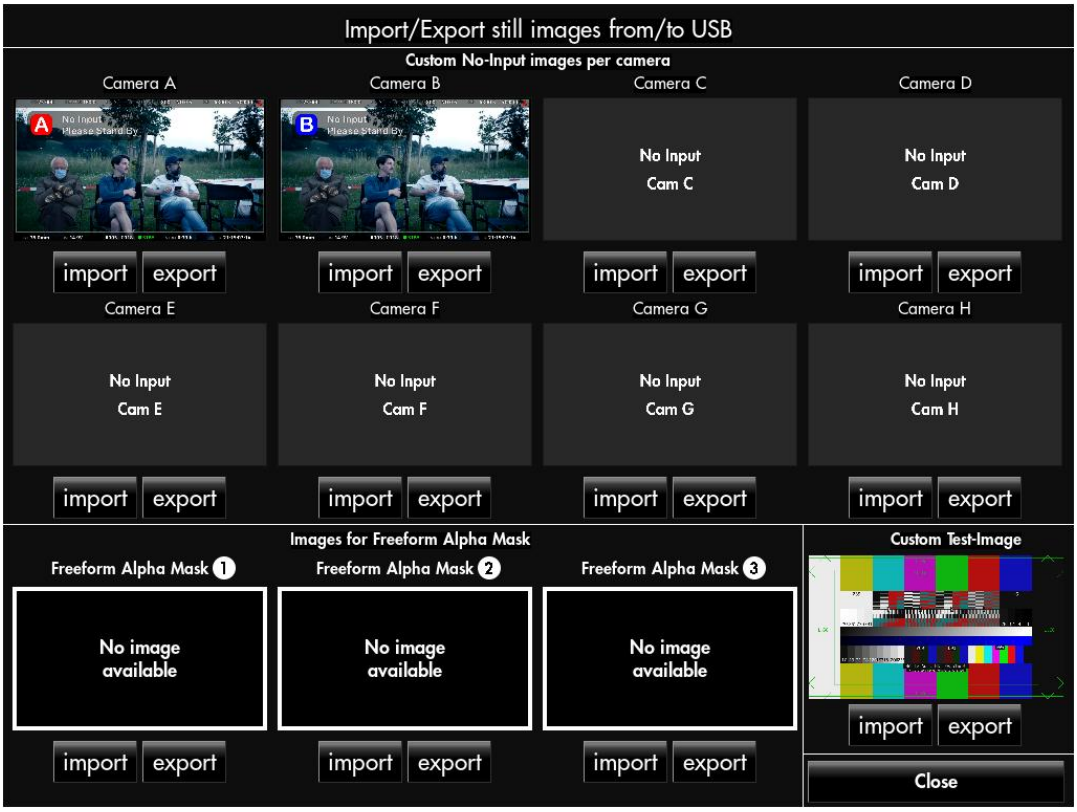
The original takes won't be affected (i.e. deleted) here!

Import/Export Other Files

Selecting ***Import/Export other files*** turns the left panel into a menu for handling all other kinds of data:

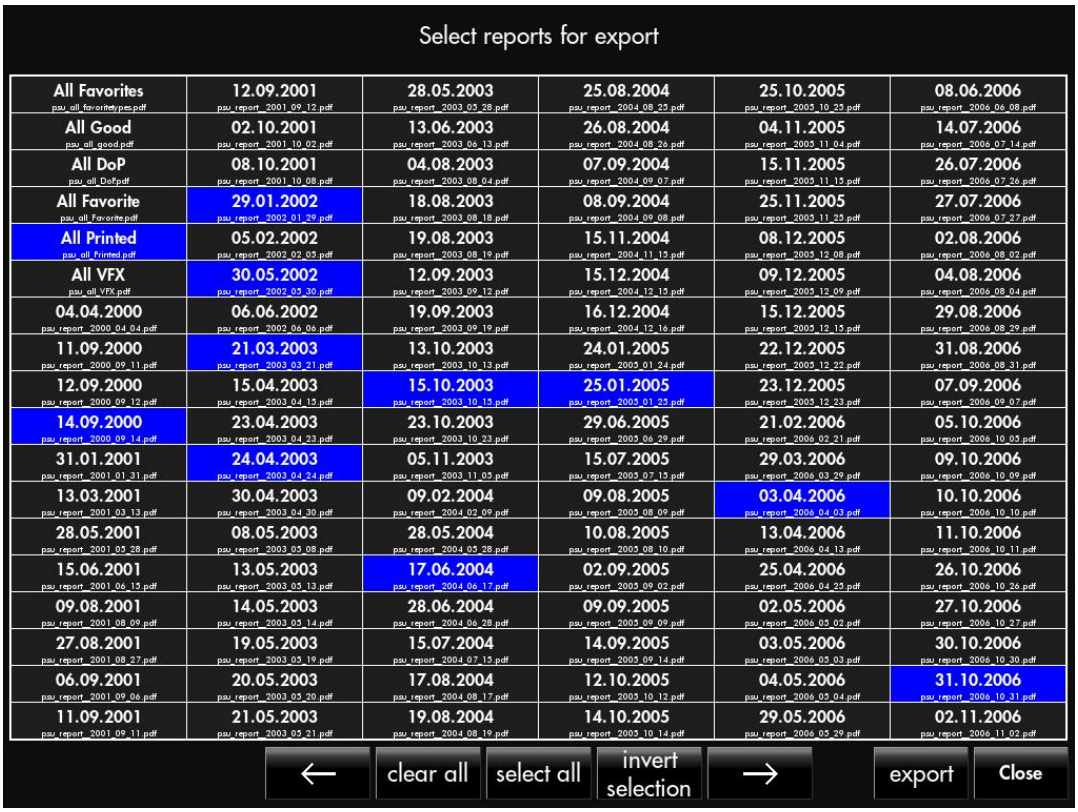
Import/Export still images lets you transfer and change

- the ***Custom (Live) Logos***, that will be displayed in Live-Mode instead of "No Input Cam X", as long as no signal is connected/detected at the Camera-Input,
- the three possible Freeform Alpha Masks that can be applied in Chroma-Keying-Setups,
- and the ***User-supplied Test Image***, that can be activated in the Video-Out-Dialog by pressing the ***Test***-Button there for >1s.



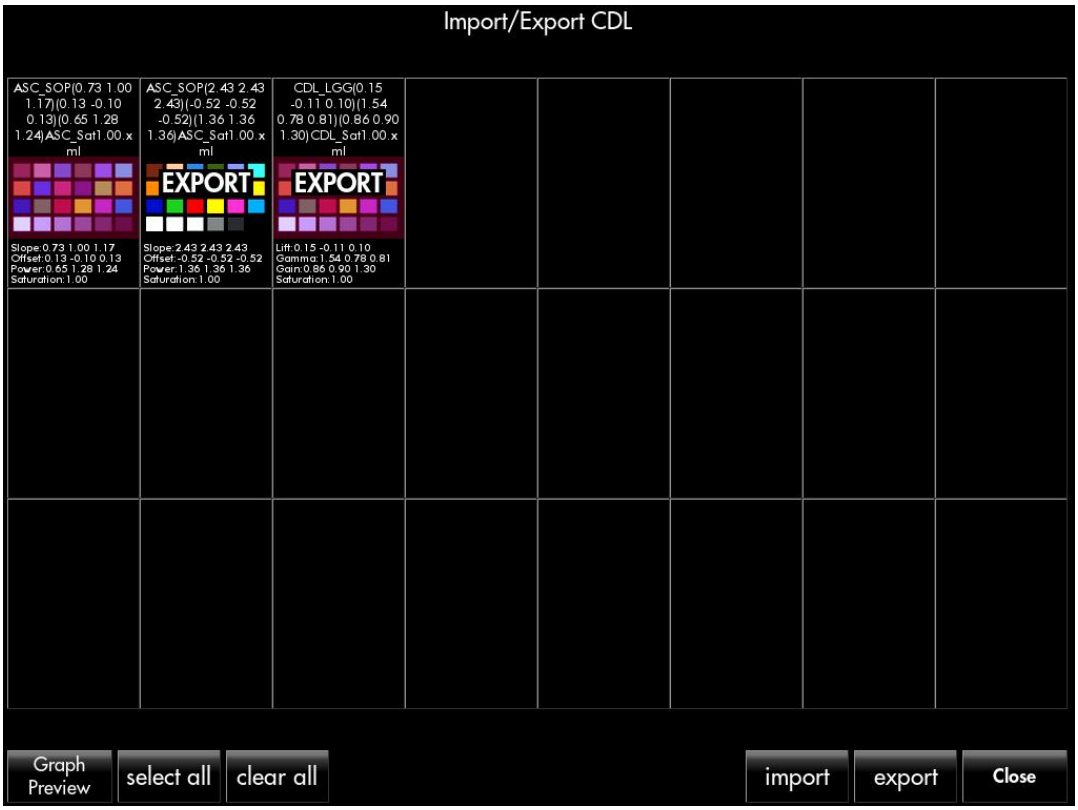
You can handle LUTs here with *Import/Export LUTs* or in the respective Picture-Settings sub-menu:

With **Export reports** you can select the shooting days that you want to have Job-Reports to be generated of. Confirm your selection with **export**.



Use **Import/Export** *Grab Frames* to exchange screenshots or import for example backdrops for Overlays:

And finally you can handle Color Decision Lists (CDLs) here with **Import/Export CDLs**, as well as in the respective Picture-Settings sub-menu:


Import/Export CDL
ASC_SOP(0.73 1.00 1.17)(0.13 -0.10 0.13)(0.65 1.28 1.24)ASC_Sat1.00.xml
EXPORT
Slope:0.73 1.00 1.17
Offset:0.13 -0.10 0.13
Power:0.65 1.28 1.24
Saturation:1.00
ASC_SOP(2.43 2.43 2.43)(-0.52 -0.52 -0.52)(1.36 1.36 1.36)ASC_Sat1.00.xml
EXPORT
Slope:2.43 2.43 2.43
Offset:-0.52 -0.52 -0.52
Power:1.36 1.36 1.36
Saturation:1.00
CDL_LGG(0.15 -0.11 0.10)(1.54 0.78 0.81)(0.86 0.90 1.30)CDL_Sat1.00.xml
EXPORT
Lift:0.15 -0.11 0.10
Gamma:1.54 0.78 0.81
Gain:0.86 0.90 1.30
Saturation:1.00
Graph Preview
select all
clear all
import
export
Close

Frame Rate Basics

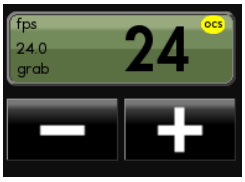
Frame Rates in the PSU

While working with the PSU, you will encounter multiple Frame Rates that should be adjusted to avoid confusion and image stuttering.

> **Note:**
>
> Speed, Frequency, and Rate are used interchangeably - and all have the same meaning.

Grab-Speed

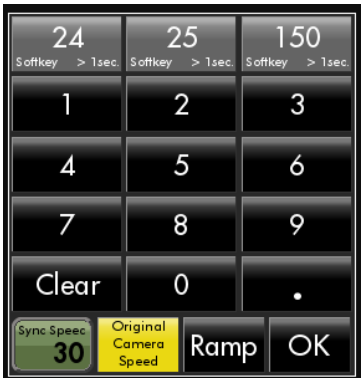
This is the Frame Rate of the signal that is received via the PSU's BNC socket. A Take is recorded using this Frame Rate. This information is always displayed on the FPS Display, no matter which mode is being used: Play=Playback, Live, or Rec. It is the basis Frame Rate for showing images on monitors and the PSU.

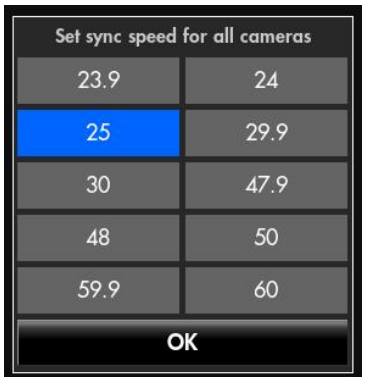


The Video-Out-Frequency has to be either the same or an integer that is a multiple thereof; otherwise, there will be image stuttering on the Video-Out Monitor(s).
The image is synchronized with the Video-Outs in order to prevent regular-interval image stuttering as long at the frequencies are correctly set.

Sync-Speed

This is the speed that the project will be shown at in theaters or on television. In cinema, that is 24fps (excluding High-Frame Rate Productions), 25fps for most European television, and 30 fps for United States television.





Sim(ulated)-Speed

Since the PSU does not receive the raw-data directly from the camera, but from its monitoring output or when considering analog film productions, other speeds (slow motion/ time lapse) can only be simulated and interpolated. **This function can be set using the fps-Displays (±) on the PSU.**

The Sim-Speed and the Sync-Speed reference each other in order to calculate the slow motion/ time lapse factor. For example, the Sim-Speed settings should be set to 48fps for a 24 fps Project with a two-times time lapse. The Grab-Speed will be multiplied by this factor (Sim-Speed divided Sync-Speed).

Why are there different standard frame rates? Historically, IVS (Integrated Video System) was always either 25fps or 30fps because there was no television standard with 24fps. The camera worked with 24fps, and IVS worked with 25fps. Both of these frame rates can still be used with

HD. Moreover, Rec-Out-, Sensor-, and Mon-Out can also be individually set.

In principal, it doesn't matter what Sync- and Sim-Speed settings are used for normal playback as long as they are same (Factor = 1). It could be problematic if the Shutter/Sensor-fps-Information is recorded with Lector or Metadata (OCS = Original Camera Speed). In this case, the Sync-Speed should be set accordingly. Naturally, you could correct this after the fact if Takes have already been recorded. If the Sim-Speed has not been manually changed, Sync- and Sim-Speed will be automatically corrected. The Sync-Speed is saved on every Take. Thus far, Takes can only be altered altogether.

If input signals and/or takes in (multi-)playbacks have different Grab-Speeds, the highest one will be used. That means that the lower frame rates cannot be viewed without image stuttering. Likewise, it is possible to set the Video-out ports differently (Expert Mode). In this case, this will cause one output to stutter. Again the higher frame rate will take priority.

In Summary:

- The Video-out-Frequency should be the same to or a multiple of the Grab-Speed to avoid image stuttering.
- If possible, Sync-Speed should be set to the Grab-Speed to avoid confusion.

Keyboard Mapping

General

Optionally, one can control basic functions of the PSU by attaching an USB-Keyboard. To keep the high-speed USB-3 connectors "free" for more important devices, there is an optional USB-Hub available for the 14-pin Lemo connector labeled Calpad USB 2.0 on the left side of the PSU.

Because the system can not determine the the keyboard's language, you should configure the correct language in *Settings → Settings → Keyboard Language!*

> **Note:**
>
> The keyboard is supported everywhere, where you can enter numbers or letters.

Main-Screen

- **1, 2, 3, 4, 5, 6, 7, 8:** Start/Stop Recording A,B,C,D,E,F,G,H
- **F1, F2, F3, F4:** Single-Live A,B,C,D;
- **Press Twice F1, F2, F3, F4:** Single-Live E,F,G,H;
- **F5:** Live-All Channels 1 (=First Multi-Cam-Live-Button)
- **F6:** Live-All Channels 2 (=Second Multi-Cam-Live-Button)
- **F7, D:** Playback-Mode (aka Disc-Mode / aka Live-Off). If >1 Playbacks: Cycle through all Single-Playbacks (Play 1, 2, 3, 4)
- **F8:** Play 1+2
- **F9:** Play 1-4
- **F10:** Action-Master-In
- **F11:** Action-Master-Out
- **F12:** Action-Master-Index
- **F:** Fullscreen (Long: Pure-Fullscreen)

- **P, Space:** Play / Pause / Loop (Long-Press) / Continous Play (Double-Press)
- **R, Alt:** Reverse Play
- **S:** Play-Stop
- **PageDown/-Up:** Backward/Forward- Skip
- **Cursor-Down/-Up:** Backward/Forward- Index-Skip
- **Cursor-Left/Right:** Slow/Single-Frame Backward/Forward
- **M:** Dual/Multi-Playback ON/OFF
- **L:** Dual/Multi-Playback: Toggle Player/Link auf Longpress
- **N, C:** Open Notes- (aka Comments-) Dialog
- **Delete, Backspace:** Delete current Take (after entering Pin)
- **Print:** Make a Frame Grab of all images that are currently displayed on the PSU-screen. (Honors „Effects On/Off" Setting in Frame Grab Tools-Dialog.)
- **T:** Open the Select-Take- („Thumbnails"-)Dialog.

Select-Take-Dialog

Reduce the list by entering as much of the Scene-/Take-Number as necessary, so that the desired Take is visible on the first thumbnail.

- **Tab:** Switch between Scene/Shot/Take-Entry
- **Enter:** Select the Take that is visible on first thumbnail.

New-Scene-Dialog

- **Insert:** Open the New-Scene-Dialog analogous to pressing long on Take Number Display
- **F1, F2, F3, F4:** Select Next-Rec. A,B,C,D
- **Tab:** Switch between Scene/Shot/Take-Entry
- **Esc:** Close Dialog

Notes-Dialog

- **Shift+Enter or Ctrl+Enter:** Close Notes-Dialog and save current note.

PSU-4 SPECIFICATIONS

General	
Battery power requirements	consumption 24 to 30 V / 100 W
AC-Adapter power requirements	INPUT 100 to 240 V AC, 50/60 Hz, about 3 A max
Operating temperature / humidity	0°C to 40°C (41° F to 105°F) / 20 % to 80 %
Dimensions (w/h/d) / mass	417 x 145 x 290 mm / 10.5 Kg
Built in speaker	Ø 32 mm
Disc capacity	up to 200 h 1080p30 @ 4TB
Max. playback speed	2000 fps
Noise level at recording	0 dB

Input connectors	
CAM A / B / C / D	3G SDI, BNC 75 Ohm terminated 1 Vpp
CAM E / F	SFP-slot (different modules can be fitted)
CAM G / H	SFP-slot (different modules can be fitted)
AUDIO IN 1 / 2	XLR female 3-pin balanced 0 dBu at -18dBFS (pin 2 = hot, 20Hz-20kHz ±0,5dB, THD+N < 0,008%)
AUDIO IN 1	switchable to AES/EBU (32-96kHz Samplerate, > 0,5Vpp)

Input connectors	
AUDIO IN 2	switchable to receive analog timecode
MIC IN	6.3mm TRS (balanced/unbalanced switchable, gain 60dB max)

Output Connectors	
VIDEO OUT 1 / 2 / 3 / 4	3G SDI, BNC 75 Ohm
VIDEO OUT 5	4K HDMI (may be splitted to 4 separate FHD pictures e.g. via AJA - HA5-4K)
AUDIO OUT 1 / 2	XLR male 3-pin balanced 0 dBu at -18dBFS (pin 2 = hot, 20Hz-20kHz ±0,5dB, THD+N < 0,008%)
AUDIO OUT 1	switchable to AES/EBU (48kHz Samplerate, 2,7Vpp ±0,4V) or output analog timecode
AUDIO OUT 2	switchable to output analog timecode
HEADPHONES 1 / 2	6.3mm TRS (load 8 ohms min, output power 1W max, TRS-Ring = right channel)
HEADPHONES 2	switchable to AUX IN/OUT 0dBu at -18dBFS (TRS-Ring = INPUT to PSU, TRS Tip = OUTPUT from PSU)

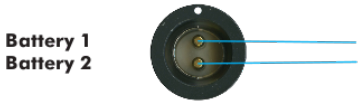
Digital Interface	
USB 1 / 2	USB 3.0 Type A (charging power 12W max with special cable)
USB 3	USB 2.0 part of Lemo 14-pin
GbE 1 / 2	Fischer 8-pin

Power Connectors	
BATTERY IN 1 / 2	Fischer 2-pin hot swappable (24-30V)
AC-ADAPTER IN	Fischer 2-pin (20-30V)
2 x 12V OUT	Lemo 2-pin (max. total power 20W)

Accessories	
AC Adapter	Input: 100-240V AC 50/60Hz Output: 24V/10A DC
Cables	Battery cable 1.8m, Update/data cable, iPhone charging cable, Extension cable 10m for remote control
Protection	Screen Protector, Sunshade, Rain Cover
Extension	8 Channel Module (4 x BNC-HD to 4 x BNC), External Storage Module, Director’s Control, Remote control
Cases	Location Case, Cargo Case
Others	CaLpad, PSU Trolley

Pinout overview

Pinout overview



Battery 1
Battery 2

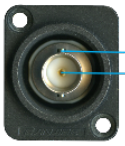
1 = Battery minus(-), chassis ground
2 = Battery plus(+)

Power Supply

1 = Power Supply minus(-), chassis ground
2 = Power Supply plus(+)

12V Acc

1 = 12V OUTPUT minus(-)
(isolated from chassis ground)
2 = 12V OUTPUT plus(+)



CAM A-D VIDEO OUT

1 = shell, chassis ground
2 = SDI video signal

AUDIO IN

1 = audio ground (isolated from chassis ground)
2 = audio signal positiv
3 = audio signal negative

Info: Audio ground with all its components is electrically completely isolated from the chassis ground which greatly reduces potential ground loops and therefore inducted noise and other problems!

AUDIO OUT

1 = audio ground (isolated from chassis ground)
2 = audio signal positiv
3 = audio signal negative

HEADPHONES

T = audio signal left channel
R = audio signal right channel
S = audio ground (isolated from chassis ground)

AUX IN/OUT

T = audio signal out of PSU-4 (send)
R = audio signal into PSU-4 (return)
S = audio ground (isolated from chassis ground)

MIC

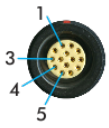
Switched to balanced (no phantom power):
T = audio signal positive
R = audio signal negative
S = audio ground (isolated from chassis ground)

Switched to unbalanced (mic bias provided):
T+ R = audio signal
S = audio ground (isolated from chassis ground)

GbE 1
GbE 2

Colours according to EIA/TIA T568B

1 = brown	5 = orange
2 = brown/white	6 = orange/white
3 = green	7 = blue
4 = green/white	8 = blue/white



Calpad USB 2.0

1 = chassis ground
3 = USB 2.0 Data+
4 = USB 2.0 Data -
5 = +5V(500mA max)

Troubleshooting

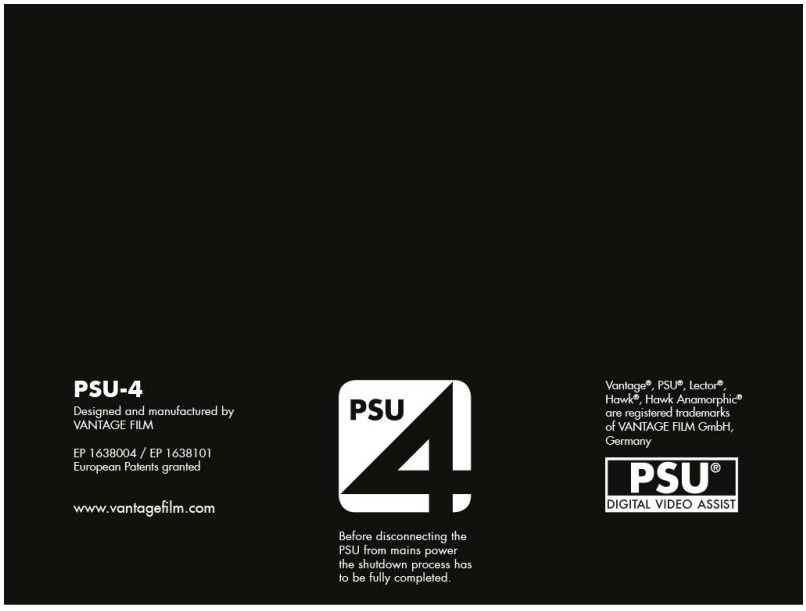
General rule: Note down time and date and ideally operating conditions like “shooting on battery”, “active WiFi streaming with internal or external router”, “Video-Inputs connected to Video-Transmitters” etc. Take a picture or a short clip of the problem and send it to techsupport@vantagefilm.com or a contact person at Vantage/Hawk you know. It is most of the time useless and impossible to find and fix problems like “Occasionally bad touch function” or “Image Freeze” etc. after the unit was already returned to us and the project is finished.

Blue Color Flip

Get a PSU-software update > 4.4.5

Only Boot-Logo, no PSU software

- Wait at least a couple of minutes: Every now and then, the PSU is executing a file-system check that might take longer than normal startups without test.
- If a Calpad is in the transport case, attach it and restart the PSU to monitor the boot-up process. If there is problem, take a picture or clip with your phone and send it.
- If you see this logo for more than 2-5 minutes:



attach a Keyboard, press Ctrl-Alt-F1 and take a picture or describe what’s written there on

the phone.

- Maybe the Storage modules have become corrupted because of a power-outage/loss without shutting down the PSU. Procedure: Shut down PSU, take out the Storage module(s), switch on PSU, put Storage module back in while PSU is running, open Disc-Managment via pin 55001, press “Try to repair”,(if there is another module: put second Storage Module back in while PSU is running, open Disc-Managment via pin 55001, press “Try to repair”).

Software-Restart-Loop

- If the PSU constantly tries to load the software, crashes, tries again and so on, it might also be related to a corrupted file-system on the/a Storage Module. Procedure: Shut down PSU, take out the Storage module(s), switch on PSU, put (one) Storage module back in while PSU is running, open Disc-Managment via pin 55001, press “Try to repair”, (if there is another module: put second Storage Module back in while PSU is running, open Disc-Managment via pin 55001, press “Try to repair”).

Touchscreen not working smoothly

Please remove the PSU Screen Protector before powering on the device - otherwise, the *touch function* of the screen could be calibrated incorrectly! In case you forgot to remove the cover and the screen is already not working as expected, simply power-cycle (shutdown & restart) the unit one more time.

Other things to try in case you did not start up with the screen protector still in place:

- Turn around the AC-power-plug 180° in the power outlet.
- Is it better/working when you touch the metal frame while touching the screen?
- Is the touchscreen working better / flawless when powered with battery alone?

→ Maybe the protective earth of AC-power is missing on set! (Power generator not set up correctly?)

Stutter

- Image is stuttering although Input-Framerate (see “grabFPS”) and Video-Out-Framerate are matching or are a multiple of 2 (like 24/48fps): Maybe there is also a Video-Transmitter attached, that outputs 60 fps by default when not receiving a signal? Don’t mix/attach different frame rates to avoid stutter.

Occasional Live/Playback Image Freeze

- Most likely cause: Bad SDI-cables (lose contacts) and video transmitters losing signal can affect the other inputs connected to the PSU, resulting in short image freezes.
- A faulty network cable (like from GbE1 to external router) can cause stutter/freezes when the “network carrier” is lost and reconnected. To find out, wag the cable and watch if it is related.

WiFi-Range of built-in Router

- Did you place the PSU Screen Protector on the back of the monitor?
  → Remove it, it reduces transmitting power/range!
- The WiFi-Range of the built-in router is best in the direction in which the back of the PSU-monitor points to. For more information, please see chapter WiFi-Streaming

Imprint