epiphan video

User Guide

Epiphan Pearl-2
Pearl-2 Rackmount
Pearl-2 Rackmount Twin

Release 4.19

June 21, 2023

UG115-25

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Thank you for choosing Epiphan!

At Epiphan Video (“Epiphan”), building reliable video systems with pro features that perform above your expectations is our mission.

We value your feedback! Email us your suggestions and let us know how you think we're doing and where you'd like to see our products improve: info@epiphan.com

Warranty

All Epiphan Video systems have a 100% return to depot warranty for one year from the date of purchase.

Technical support

Epiphan’s products are backed by our professional support team. You can reach our team several ways:

- Email support@epiphan.com
- Live chat from our support site https://www.epiphan.com/support/
- Phone toll free at 1-877-599-6581 or call +1-613-599-6581

Gather as much information about your problem as you can before you contact us so we can help you better, including:

- A description of the problem
- Details about your video or audio source (type, connection, resolution, refresh rate, etc.)
- Product serial number
- Product firmware version (using the admin interface)
- Product LED lights

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Start here

Welcome, and thank you for buying Epiphan Pearl-2™. The **Start here** section is where you'll find important information and specifications for your device, as well as a quick start to help first-time users set up a single video source with audio and record that video right away.

Product overview

Pearl-2 overview, front and rear-panel descriptions, connecting audio, 4K support, and more.

Quick start

Step-by-step procedures to quickly connect a video source, audio, and start recording.

Specifications

Detailed technical specifications, AV inputs, optimizing performance, and international character support.

Release notes

Release 4.20.0

- Added ability to apply a Pearl Configuration preset from an attached USB drive.
- Re-branded Epiphan Cloud to Epiphan Edge on web admin interface and touch screen.
- Made enhancements to Pearl-2 to allow the inclusion of video files of size up to 100 MB in configuration preset.
- To improve the user experience and readability configuration presets, icons representing sections of the preset are no longer shown on the touch screen.
- Resolved an issue in which Pearl times out when attempting to discover NDI sources on the network.
- Resolved an issue that leads to loss of input video signal when the name of a video source on Pearl web UI is changed to reserved key words.
- Provided better handling of HTTP error code 401 from YuJa Enterprise Video Platform.

Previous releases and features

This section lists features and updates introduced in previous product releases.

Release 4.19.0

- Added support for media playback enabling you to add an MP4 video file to a layout within a channel.
- Added support for web URL as input for use with graphics solutions such as Singular.live, Uno, and Flowics. This can be used for use cases such as lower-thirds and bugs.
- Increased number of simultaneous sources that can streamed to Panopto from 4 to 6.
- Implemented a fix for an issue that prevented the upload of recorded files to Panopto. This problem is encountered when Pearl is rebooted while in the middle of uploading a recorded file to Panopto.
- Implemented a solution to identify and restore the XLR analog audio input capture when it fails due to grounding and/or external environmental issues.
- Resolved an issue that prevented Pearl from uploading files to existing subdirectories in an S3 bucket using AFU.
- Resolved an issue that caused video signals from the SDI input on Pearl-2 to not de-interlace properly.

Release 4.18.0

- Performance improvements to NDI|HX functionality
- Pearl-2 can register itself with an NDI discovery server if one is set up on the network, this functionality can be enabled in the Network section
- Added support for quickly connecting SRT inputs to Epiphan Connect
- Enhanced SRT inputs and outputs with buttons to quickly copy information to clipboard
- Enhancements made to Panopto integration; Pearls configured to record webcast events will now begin recording to local storage if Panopto cannot be reached at the scheduled start time.
- Improved discoverability of the Epiphan Live dashboard
- Resolved an issue in which some scheduled back to back events with Panopto, Kaltura, or YuJa CMS may not get recorded
- Bug fixes
- MPEG-DASH is no longer supported on Pearl devices
- UPnP is no longer supported on Pearl devices

Release 4.17.3

- Added support for closed loop fan speed control on thermal load of Pearl-2. As thermal load increases fan RPM increases, and as thermal load decreases fan RPM decreases

- An issue has been resolved wherein configuration presets that contained Epiphan Cloud data from one Pearl were applied to another Pearl which then caused a hard lock of that Pearl upon reboot. A better handling of this information has been implemented in this release to prevent the hard locking of these Pearls on reboot.
- An issue has been resolved wherein occasionally Epiphan Cloud team members were not able to access the Admin interface of a paired Pearl unit
- Bug fixes
- All Pearl-2 units manufactured after November 2022 will have a new LCD screen and a new fan that require firmware version 4.17.3 or higher. These Pearl-2 devices cannot be downgraded to previous versions. Similarly, old Pearl-2s whose fans require repair, will have the new model of fan installed. These Pearl-2s also require firmware release 4.17.3 and cannot be downgraded to older firmware versions.

Release 4.17.2

- Bug fix for the full frame rate preview in Epiphan Cloud Pro. HLS preview stream from Pearl to Cloud was not closing properly when preview was stopped, this has been resolved

Release 4.17

- Firmware version 4.17 is the last version to support connections to UPnP enabled devices
- Support for Kuando BusyLight Alpha and Omega model 2
- Support for starting and stopping scheduled YuJa events early using Pearl
- Support for pausing and resuming YuJa events in progress using Pearl
- Support for extending a YuJa event in progress using Pearl management interface
- Addition of brute force password attack prevention. If the same IP address tries and fails to log in to Pearl 50 times in a row within 60 seconds, Pearl will block further attempts to log in from that IP address for 60 seconds
- Security vulnerability fixes
- Bug fixes

Release 4.15

- Direct integration with the YuJa content management system lets you streamline your YuJa workflows for even more efficiency. Pearl can automatically start recording or streaming based on your schedule in YuJa and push files to the right folder on the platform
- Kaltura updates including Improved ad hoc events and My Dashboard integration
- MultiViewer onscreen options including on-air status, audio meters, channel status, and CMS event status
- SRT support upgraded to version 1.4.3 (better stability, more accurate statistics, and other improvements)

- Support for automatic file uploading via secure SMB2 and SMB3, improving compatibility with Windows-based systems
- Preset optimizations allow you to select which aspects of a created preset to apply to a Pearl device

Release 4.14.2

- MultiViewer displays a custom mix of up to six video sources including channels on the HDMI output port in a convenient grid for confidence monitoring with minimal impact to the system's processor.
- Pause and extend CMS events
- Panopto device templates
- Live channel RTSP stream transport option
- NDI version 4.6.2 support
- Keyboard shortcuts
- Pearl as FTP server functionality removed.

Release 4.14.1

- Upload local webcast recordings to Panopto
- Locking the CMS start screen
- Pre-configured stream URLs for Kaltura webcasts
- Schedule CMS event uploads
- Adjustable fan speed

Release 4.13.0

- Epiphan Edge support replacing AV Studio
- Diagnostic tools added to the touch screen and Admin panel
- Scheduled Automatic File Upload (AFU)
- DHCP option 81 (FQDN) support
- Dynamic DNS (DDNS) support
- Configure Pearl-2 to not send low storage alerts to Panopto
- NDI resource discovery across subnets and external networks
- SHA hashing algorithm support

Release 4.12.1

- External keyboard control for the touch screen
- Status light indicator support for select models of Kuando BusyLight and Delcom Product's USB HID status indicators
- Email address lookup for Kaltura ad hoc events

Release 4.12

- Secure Reliable Transport (SRT) streaming protocol support
- HTTP Live Streaming (HLS) streaming protocol support
- MPEG-DASH streaming protocol support
- Additional HLS (pull) options to configure the segment size and playlist duration
- Multiple multicast publishers support in the same Pearl-2 channel and the ability to start and stop the publishers
- Adding pre-existing recordings to an Automatic File Upload (AFU) queue
- Changed some status fields on the Admin Panel's Info page and changed the bitrate status to now show the total combined bitrate of the video plus audio.
- Enhanced streaming error messages

Release 4.11

- Extend certain admin privileges to operators
- NDI 4.1 support on Pearl-2
- Monitor status of file transfers using touch screen and cancel file transfers using the Admin panel
- Added support for Kaltura's lecture capture plus live event type

Release 4.10

- Local Admin panel access using a USB keyboard, mouse, and monitor connected directly to Pearl-2 plus a built-in virtual keyboard, multiple keyboard language layouts, and support for touch screen monitors
- NDI Alpha channel support on Pearl-2 plus the option to ignore timecodes
- Assigning Pearl-2 a unique device name, description, and location
- Using a Kaltura application token to register Pearl-2 as a remote recorder
- Selecting a video output source using the touch screen

Release 4.9.1

- Kaltura ad hoc event details and configurable event schedule refresh interval
- Panopto support for ad hoc event authentication from Pearl-2's touch screen using credentials for external identity providers
- Panopto ad hoc event folder selection from the Pearl-2's touch screen
- Automatic user logout when an ad hoc event ends
- International character support in channel names, layout names, video and audio input names, text overlays, and recorded file names. For a list, see Release notes
- Epiphan Discovery Utility support deprecation

Releases 4.9.0 and 4.9.0h

- Full Panopto integration
- Kaltura ad hoc event creation using the touch screen
- Toggle Temperature/CPU load on the touch screen
- Automatic EDID verification of connected sources upon start up
- USB tethering removed
- Confirmation before AFU queue file deletion
- Kaltura users who are only defined in MediaSpace are allowed to start unsheduled ad hoc events using both the touch screen and the Admin panel (4.9.0h)

Release 4.8.1

- Traffic shaping to improve video output quality when streaming over a Gibabit Ethernet network to 10/100 Mbps set-top boxes. If the API is used for traffic shaping, see the Technical Notes for your Pearl-2 model for instructions. They're available from the product resources page on the Epiphan.com website.
- Improved video smoothness of the HDMI outputs
- We improved the smoothness and quality of interlaced video from SDI inputs

Release 4.8.0

- NDI and NDI|HX support
- Hardware acceleration
- Live switching improvement
- Audio inputs as playback audio sources for HDMI outputs
- Product registration changes

- Pairing to AV Studio changes
- Original Livestream and Wowza Cloud streaming presets removed

Release 4.7.1

- AFU to SFTP server stability improvement
- BIOS update to resume status after a power cycle

Release 4.7.0

- Integration with Kaltura CMS
- International character support in text overlays
- Chroma key color selection update
- RTMPS certificate update
- EAP-TLS user name field update

Release 4.6.0

- 802.1x network security compliance
- RTMPS AV encryption
- HTTPS
- Discovery utility port disabled

Release 4.5.1

- Constant volume for layouts with multiple audio sources
- Stereo and mono analog audio selection
- Assign XLR B/RCA audio sources to an input
- Mute audio
- Remote login
- Channel as a source
- Mirror the video output
- Some important UI terminology changes

Release 4.4.1

- AV synchronization improvements of RTSP streams and loopbacks.
- Improved synchronization and performance of 4K sources on SDI and 4K HDMI port.
- Fixed the Wowza custom streaming option.
- Improved the recognition of AV.io SDI capture cards when they are first plugged in.
- Fixed a hot plug issue affecting the detection of interlaced 1080i signals from certain camera models (for example, Sony HDR-CX180, HDRCX190, and Panasonic HC-VX980M).

Release 4.4.0

- Constant frame rate
- Audio VU meter
- Epiphan Live preview on HTTPS networks
- AFU to an SCP server remote directory creation

Release 4.3.0

- Chroma keying
- Text overlay and custom layout editor enhancements
- Clone channels and custom layouts
- Clone recorders and recorder metadata
- AFU enhancements
- Start and stop individual streams using Epiphan Live
- Logitech BRIO 4K camera support

Release 4.2.0

- USB 3.0 support for web cameras and AV.io UVC video capture cards
- Fully integrated multi-publishing
- Enhanced video cropping
- Audio delay control
- Epiphan Live recordings management

Release 4.0.1

- Launch of Pearl-2 Rackmount models
- 4K add-on

Release 4.0.0

- Inaugural release of Pearl-2 with the following features
    - Capture 6 video sources at once
    - Epiphan Live
    - Switch video sources live
    - Pro video inputs and outputs
    - Pro audio inputs
    - 512 GB data storage (SSD)
    - Touchscreen

Product overview

Learn about your Pearl device and get familiar with the various connectors and features.

Topics include:

- What is Pearl-2?
- Front and back view of Pearl-2
- What's in the Box?
- Live video mixing / switching
- Monitoring audio
- Selecting an audio source for Pearl-2
- Connecting microphones to the XLR line level inputs
- About 4K on Pearl devices

What is Pearl-2?

Pearl-2 is a versatile live video production device that's a video encoder, video streamer, live switcher, and video recorder all in one. Pearl-2 comes in three models.

Pearl-2	Pearl-2 Rackmount	Pearl-2 Rackmount Twin

A small, silent, portable system that comes with a hard-shell carry case.

A 2U rackmount system with all the same functionality as the portable Pearl-2, but designed for installation and operation in a rack.

A high density 2U rack mount variation that contains two complete (and independent) Pearl-2 systems.

With Pearl-2, you can capture, record, and stream from computer monitors, radar displays, or almost or anything with a wide variety of supported video input signals, including:

- SDI (up to 12G)
- HDMI™
- HDMI 4K[4K]
- DVI-I (single link)
- USB
- SRT and RTSP
- NDI® and NDI|HX (Alpha channel supported)

Capture audio from XLR, RCA, USB, SDI, HDMI, and network sources (SRT, NDI, and RTSP).

Simultaneously capture up to six full HD video sources or up to four 4K sources if you have the 4K feature add on installed. You can create up to five simultaneous channels for live switching, or a single 4K channel. Have separate ISOs or create custom layouts with multiple video sources and picture in picture. You can do all that with Pearl-2.

Streaming

Stream to Content Distribution Networks (CDNs) worldwide using modern protocols like SRT and HLS. At the same time, you can stream to other destinations using RTMP/RTMPS, RSTP, or NDI. Even multicast directly to viewers on your LAN so they can watch the live channel broadcast using a web browser or media player on smart devices connected to the same private network as the Pearl device.

Recordings and CMS

Download recordings using your web browser, or set the Pearl device to automatically upload recorded files directly to a network server using FTP, RSYNC, CIFS, WebDav, and more. Pearl devices are also fully integrated with Kaltura, Panopto, and YuJa Content Management Systems (CMSs) and can be registered as a video remote recorder resource for seamless lecture capture plus user authentication directly from the touch screen.

Networking

Network security compliance with 802.1x protocols, passwords, and certificate authentication means an easier setup for IT friendly live streaming over enterprise networks. Pearl-2 is HTTPS enabled for secure administration and control over the LAN, and supports secure live streaming protocols like SRT with AES encryption and RTMPS.

Pearl-2 does not capture from HDCP encrypted sources.

Front and back view of Pearl-2

Table 1 Pearl-2 front panel descriptions

Label	Name	Description
1	Touch screen front panel display	Used for confidence monitoring and simple configuration, obtaining system information, and starting/stopping recordings and streams. Users can also authenticate with one of the integrated Content Management Systems (CMSs) to create unscheduled ad hoc recordings and webcasts.
2	USB 3.0 port	For connection of external hard drives, flash drives, USB keyboards, and supported USB status light indicators. Can be used to connect a USB mouse or keyboard when the local

Label	Name	Description
		console feature is enabled. A web camera or USB microphone cannot be connected to this port, only to the ports on the rear panel.
3	3.5 mm audio jack	For audio confidence monitoring. Plays the audio for the currently visible channel.
4	Power button	Press once to power on. Double-press to initiate a graceful system shutdown.

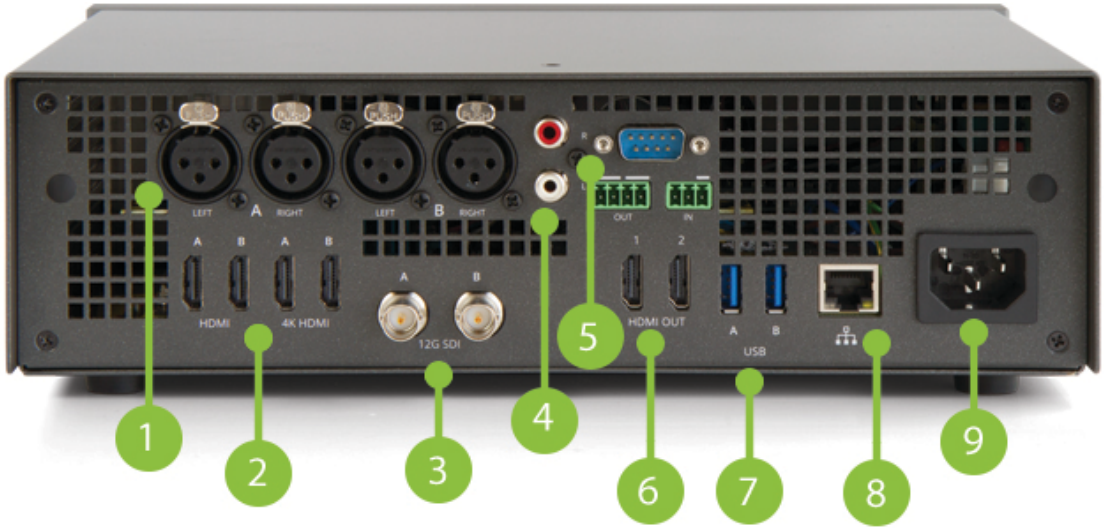


Table 2 Pearl-2 back panel descriptions

Label	Name	Description
1	XLR audio in	The four XLR ports can function as two, professional line level left/right stereo pairs (XLR A pair and XLR B pair) or as four mono inputs, see Pearl-2 AV inputs. The XLR ports are professional line-level inputs and are calibrated for + 4.0 dBu signals.
2	HDMI in	Four HDMI 1.4 ports that connect HDMI and DVI signals to Pearl-2. The first two ports allow for any signal up to full HD, and the second two inputs allow for any input resolution up to 4K[4K] .
3	12G SDI in	Connects SDI signals to Pearl-2, including 3G-SDI; 6G-SDI; 12G-SDI; 4K-SDI; HD-SDI; SD-SDI
4	RCA audio in	The RCA ports are consumer line level, left/right stereo pair and are calibrated for - 10 dBV signals.

Label	Name	Description
5	RS-232 port	For connection to a control computer terminal.
6	HDMI output ports	HDMI output for connection to a display or projector (up to 4K[1]). Port 1 is HDMI 2.0, and Port 2 is HDMI 1.4, see Video output ports.
7	USB 3.0 ports	For connection of external hard drives, flash drives, USB web cameras, USB microphones, keyboards, or supported USB status light indicators. Can be used to connect a USB mouse or keyboard when the local console feature is enabled.
8	RJ-45 Ethernet	Auto-sensing gigabit Ethernet 10/100/1000 Base-T network port with support for RTSP, SRT, NDI and NDI|HX (Tx/Rx) networked video inputs. See Configure network settings for setup instructions.
9	Power jack	Plug the supplied 120/240 V AC power cable in here.

[1]Requires 4K feature add on

The SDI ports on the back of Pearl-2 can be delicate. Be careful to avoid sharp impacts or pressure such as balancing the system on its back with the SDI ports against a hard surface. Rough treatment of the SDI ports could result in loss of functionality for that port.

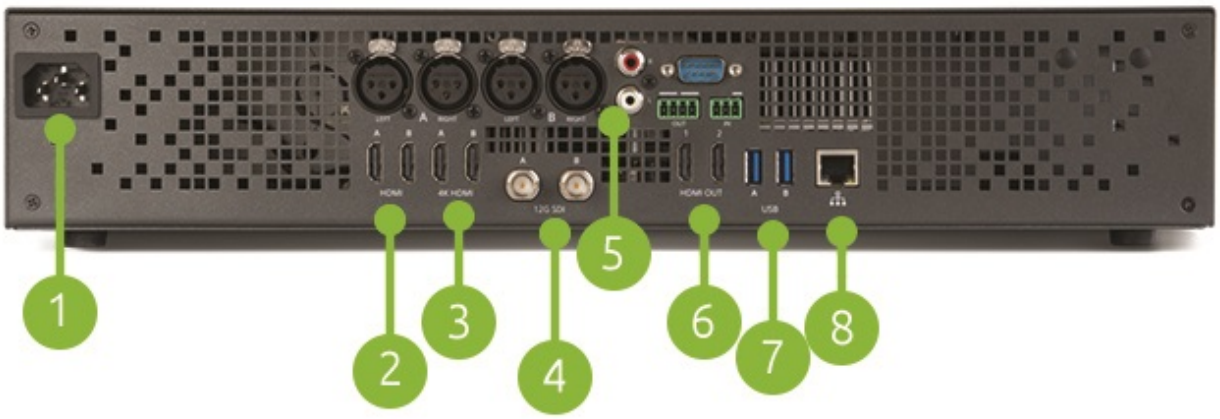
Pearl-2 Rackmount and Pearl-2 Rackmount Twin

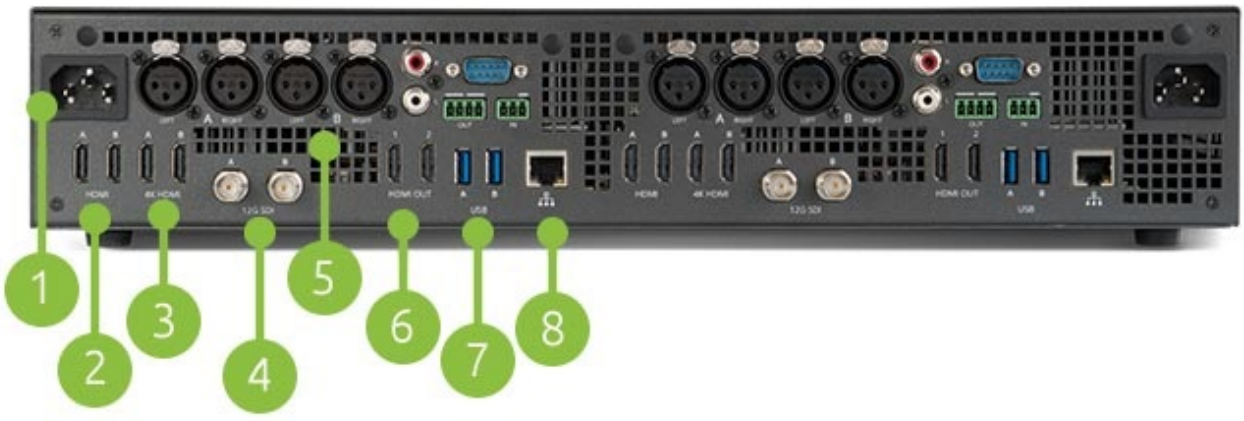
Pearl-2 Rackmount Twin consists of two completely independent Pearl-2 systems, each with identical sets of controls and ports.

Table 3 Pearl-2 Rackmount front panel descriptions

Label	Name	Description
1	Touch screen front panel display	Used for confidence monitoring and simple configuration, obtaining system information, and starting/stopping recordings and streams. User can also authenticate with one of the integrated Content Management Systems (CMSs) to create unscheduled ad hoc recordings and webcasts.
2	USB 3.0 port	For connection of external hard drives, flash drives, keyboards, or supported USB status light indicators. Can be used to connect a USB mouse or keyboard when the local console feature is enabled.

Label	Name	Description
		A web camera or USB microphone cannot be connected to this port, only to the ports on the rear panel.
3	3.5 mm audio jack	For audio confidence monitoring. Plays the audio for the currently visible channel.
4	Power button and LED	Press once to power on. Double-press to initiate a graceful system shutdown.





Pearl-2 Rackmount Twin consists of two completely independent Pearl-2 systems, each with identical sets of controls and ports.

Table 4 Pearl-2 Rackmount and Pearl-2 Rackmount Twin back panel descriptions

Label	Name	Description
1	Power jack	Plug the power supply in here. Always use the provided power supply.
2	HDMI in	Connect HDMI and DVI signals.
3	4K HDMI in	Connect up to 4K[1] HDMI signals.
4	SDI in	Connect SDI signals.
5	XLR audio in	The four XLR ports can function as two, professional line level left/right stereo pairs (XLR A pair and XLR B pair) or as four mono inputs, see AV inputs. The XLR ports are professional line-level inputs and are calibrated for + 4.0 dBu signals.
	RCA audio in	The RCA ports are consumer line level, left/right stereo pair and are calibrated for - 10 dBV signals.
6	HDMI Out	For displaying a source or channel on an external display (up to 4K[1]).
7	USB 3.0 ports	For connection of external hard drives, flash drives, USB web cameras, USB microphones, keyboards, or supported USB status light indicators. Can be used to connect a USB mouse or keyboard when the local console feature is enabled.
8	RJ-45 Ethernet	Auto-sensing gigabit Ethernet 10/100/1000 Base-T network port with support for RTSP, SRT, NDI and NDI|HX (Tx/Rx) networked video inputs. See Configure network settings for setup instructions.

[1]Requires 4K feature add on

The SDI ports on the back of Pearl-2 can be delicate. Be careful to avoid sharp impacts or pressure such as balancing the system on its back with the SDI ports against a hard surface. Rough treatment of the SDI ports could result in loss of functionality for that port.

What's in the Box?

Pearl-2

Pearl-2 Rackmount

Pearl-2 Rackmount Twin

The standalone Pearl-2 model is shipped in a hard shell case that you can re-use for storing or moving the system between jobs. Cable storage is located under the custom foam tray that holds Pearl-2 in the case.

Inside the box with your Pearl-2 system, you'll find the power cable and the following items. Pearl-2 Rackmount Twin comes with two sets of cables:

1. One SDI cable (3 feet / 1 meter in length)
2. One HDMI cable (3 feet / 1 meter in length)
3. One HDMI to DVI adapter
4. One Ethernet cable
5. One region-specific power supply cable (6 feet / 1.8 meters in length)

Table 5 Cables (power cable not shown)

Image	Name	Description
	SDI cable	Connect SDI sources to the SDI ports (12G-SDI capable).

Image	Name	Description
	HDMI cable	Connect HDMI or DVI (using adapter) sources to the HDMI ports.
	DVI (female) to HDMI (male) adapter	Connect DVI sources to the HDMI port.
	RJ-45 Ethernet cable	Connect Pearl-2 to your network.

Monitoring audio

The front panel includes a 3.5 mm headphones audio jack for monitoring audio. To monitor the audio for a channel, just select the channel using the device screen. The audio you hear depends on the audio source configured in the live channel layout.On Pearl Mini and Pearl-2, different layouts can have different audio sources configured.

Increasing the volume to 100% may cause you to hear distortion that is not actually present in the audio signal being recorded and streamed.

Adjust the volume on Pearl-2 or Pearl Mini

Tap the headphones icon on the touch screen to adjust the volume. Each tap increases the volume by 25% to a maximum volume of 100%. Tapping the headphones icon when the volume is at 100% mutes the volume. You can also long press the headphones icon to mute and unmute the volume.

At 75% volume, what you hear corresponds to the nominal audio level in the VU meter at approximately where the green bars change to yellow.

Volume is muted.

25% volume.

50% volume.

75% volume.

100% volume.

Audio VU meter

A VU meter on the device screen shows the audio levels for the channel you are monitoring. The value is displayed in dBFS (decibels relative to full scale). Colored bars represent the audio level.

Channels that have stereo audio display two bars. The top bar is the left audio channel and the bottom bar is the right audio channel.

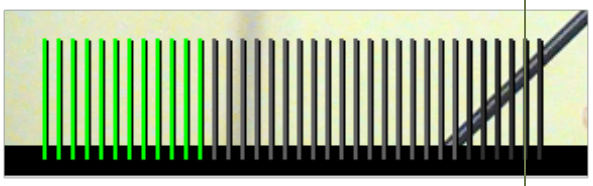
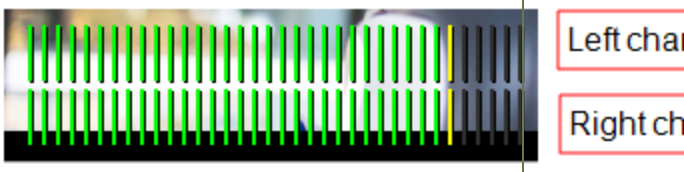
Pearl Mini and Pearl-2	VU meter (mono)	
	VU meter (stereo)	

Table 6 Audio VU meter levels

Color	Decibel range
Red	0 to -9 dBFS
Yellow	-9 to -18 dBFS
Green	-18 dBFS and lower

The VU meter appears in several different places so you can visually check audio levels:

- **Touch screen**: On the individual channel view and the grid view. If the audio meter isn't showing, tap anywhere on the touch screen to turn on the control icons.
- **Admin Panel**: On the audio input source's configuration page when you select the input source from the Inputs menu. You can also add the VU meter to appear on the video output ports, see Disable or enable audio and output port volume.
- **Epiphan Live**: See Monitor video and audio input sources using Epiphan Live

Live video mixing / switching

Create dynamic content for your viewers to watch while you record and stream your program. Using the custom layout editor, you can create different layouts, like picture in picture or side-by-side views of a camera and slides, then easily switch between layouts with either a tap on the touch screen, using Epiphan Live on a mobile device, or from the Admin panel.

Your program stream with switched layouts could look like this:

To create a program channel with custom layouts using the custom layout editor that you can switch, see What is a channel?

For instructions on how to live switch, see:

- Switching and mixing using the touch screen
- Switching / mixing using Epiphan Live
- Switching / mixing using the Admin panel

About 4K on Pearl devices

Pearl-2 and Pearl Nano support resolutions from low-res SD to 4K, which means that you can use them to capture DCI 4K (Pearl-2 only) and 4K UHD digital signals. You need the 4K feature add-on to access this feature, see Add-ons overview.

4K feature add-on

The 4K feature provides Pearl-2 or Pearl Nano with the following 4K features:

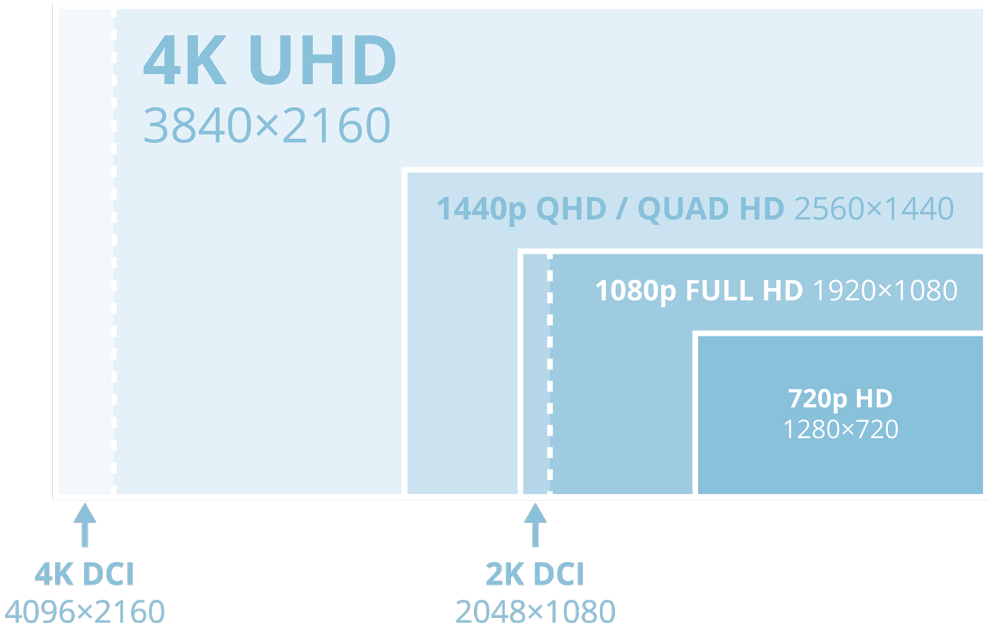
Specification	Pearl-2	Pearl Nano
4K video inputs	4 (2 HDMI and 2 SDI)	2 (1 HDMI and 1 SDI)
4K Hardware scaling (4K down to full HD)	4	2
4K video outputs (HDMI)	2	1 pass through port
4K video encoding	1	1

You can find more details on the add-on, along with installation instructions and the add-on itself, at www.epiphan.com/add-ons.

Activating your 4K add-on might not be necessary with older versions of Pearl-2. As the first Feature Add-on, the 4K add-on was included automatically in some systems. If you purchased the full version of Pearl-2 or an early copy with firmware 4.0.0, the 4K add-on was included with your purchase and is automatically activated, so in those cases no action is required.

4K UHD vs. DCI 4K

DCI 4K and 4K UHD are just different definitions of a 4K resolution. 4K UHD (3840×2160) is the standard 4K resolution available on televisions and other common display screens. The 4K resolution of 4096×2160 (Pearl-2 only) referred to as Digital Cinema Initiatives (DCI) 4K, and is the resolution used almost exclusively for cinema-scale film production. It is rare to find this resolution outside of a cinematic context. Pearl-2 and Pearl Nano capable of supporting input and output at either definition with the Feature add-ons.



Quick start

After you've unpacked your Pearl device, you're ready to get started. This quick start uses the default settings where possible so you can quickly start using your Pearl device.

Before you begin, make sure you have:

- A video source such as a camera or computer and cables to connect them to Pearl device. For HDMI, the video source must not be HDCP protected.
- An audio source coming from either your SDI or HDMI video source (must not be encrypted). Optionally, audio from a different source such as an audio mixer that you connect to the audio input ports can be used.
    - The Pearl Mini and Pearl 2 can use USB for video input.
    - The Pearl Nano can use the USB input for audio input.
- Local area network that uses Dynamic Host Configuration Protocol (DHCP) is preferable.
- Computer with a web browser connected to the same network. We'll call it the “admin” computer.
- Ethernet cables to connect Pearl device and the admin computer to the network.
- To record video using Pearl Nano or Pearl Mini, you need to install a storage medium. Pearl Nano and Pearl Mini have a standard SD card slot on the front panel that you can use.
    - We recommend an SD card that is at least a class 10 with up to 512 GB of capacity.
    - Pearl Nano also has a SATA M.2 2280 SSD storage expansion slot that's accessible from the underside.

Your Pearl device comes shipped with an AC/DC power adapter and a registration card that contains brief instructions to connect the Pearl device to the network, login to the Admin panel, and format an SD card. The instructions in this quick start provide more details.

Start up the Pearl device for the first time

1. Turn on your camera or video source and connect the output to the back panel of Pearl device.

2. Connect the Ethernet cable to the Pearl device and to your network. Pearl Nano can power up using the power from the Ethernet cable if your network supports PoE+ power. If you are using PoE+ power with a Pearl Nano, you can skip the next step.

3. Attach the power cable and plug it into a power source.

4. Turn on the system:
    - **Pearl 2** - power button is on the front of the unit. Wait for the power-up cycle to complete. The Grid view showing both channels appears on the touch screen. The video source you connected to the "A" row appears in the Auto A channel, and the video source connected to the "B" row appears in the Auto B channel.
5. .
6. (Optional) Plug headphones into the 3.5 mm headphone jack at the front of the Pearl device to monitor the video signal's embedded audio. For more about monitoring audio, see Monitoring audio.
7. (Optional) Start recording:
    a. **Pearl Mini or Pearl-2** - tap the red dot that appears in the top right corner of the screen to start and stop recording the channel. The dot flashes while recording.

Selecting an audio source for Pearl-2

You can choose the audio source for a channel using the Admin panel and can have a mix of several different audio sources. Select your audio sources from connected video sources (SDI, HDMI, USB videoUVC, SRT, NDI, and RTSP), as well as from the dedicated analog audio input ports. The USB (UVC/UAC) ports on the rear panel of Pearl-2 will accept a USB microphone (UAC).

Dedicated analog audio inputs ports are:

- Four XLR professional line-level inputs + 4.0 dBu up to 12.3 V RMS, (+24 dBu) that support balanced and unbalanced signals.
- One stereo pair RCA consumer line-level input (-10 dBV)
- Two USB video/audio ports

The four XLR audio inputs are configured as two stereo pairs by default: XLR A (left/right) and XLR B (left/right), see Configure audio ports for stereo or mono. The XLR B audio ports and the RCA audio ports are linked. You can configure Pearl-2 to use both or just one of the audio sources using the Admin panel, see Assign audio sources to an input.

Audio for Auto channels are selected automatically.

This table offers some guidelines for adjusting the gain of the XLR and RCA analog audio input ports, as well as the USB ports. Add the suggested gain to the audio input to get an average signal to register at a nominal level in the VU meter (i.e. where the green bars change to yellow). The actual amount of gain needed depends on the strength of the original audio signal. See Adjust audio gain and delay for details.

Table 7 Audio input port gain guidelines

Audio source	Input port	Gain
Mobile phone or other consumer line level device	XLR	Add +6 to +12 dB gain to the audio input port.
	RCA[1]	Nominal

Audio source	Input port	Gain
Professional mixer	XLR	Nominal
	RCA[1]	Not recommended.
USB microphone	USB	Nominal
Dynamic, condenser, or electret microphones	XLR	Not recommended. To connect microphones to the pro line level XLR inputs, you must use an external preamp to boost the microphone signal enough to provide the proper line level signal at the XLR input port, see Connecting microphones to the XLR line level inputs.

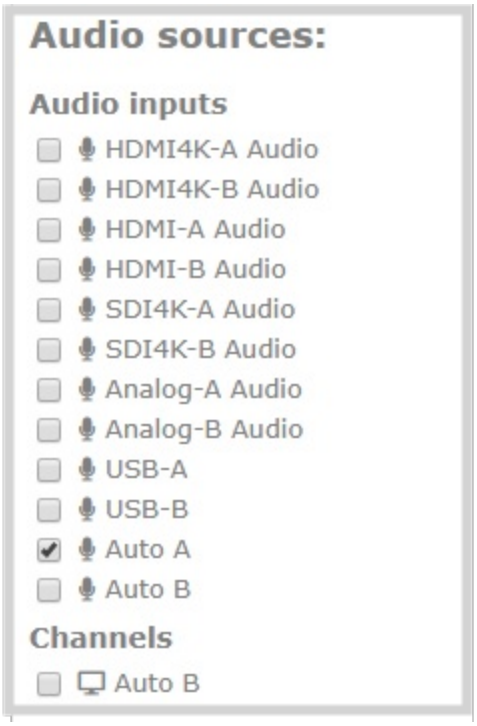
[1]To avoid unwanted signal noise on the RCA ports, we recommend adding no more than 12dB of gain to the RCA port or when XLR B/RCA is used.

To choose a different audio device for the channel:

1. Using a web browser on the admin computer, go to the IP address of your Pearl-2 and log in, see Connect to the Admin panel.
2. From the Channels menu, select your channel (i.e. Auto A or Auto B) and click **Layouts**. The custom channel layout editor page opens.

   Audio for Auto channels are selected automatically.

3. Check the audio source that you want to use for the layout and click **Save**.



4. (Optional) Adjust the gain for an audio input source. Select the input port from the Inputs menu and adjust the amount of gain on the configuration page for the audio input port. Click **Save** when you're done. For more details, see Adjust audio gain and delay.

Connecting microphones to the XLR line level inputs

The XLR analog audio input ports on Pearl-2 and Pearl Nano are professional line level inputs rated at + 4.0 dBu up to 12.3 V RMS, (+24 dBu). You can't connect microphones directly to the XLR ports because the microphone signal is too low.

If you want to connect microphones to the line-level XLR ports on the Pearl-2 or Pearl Nano, you must use an external preamp and boost the mic level signal to the appropriate line level before connecting it to the XLR port.

Specifications

Topics include:

Pearl-2

- Pearl-2 AV inputs
- Pearl-2 tech specs
- Optimum System Load
- International character support

Pearl-2 AV inputs

For best performance, we recommend using a maximum of six 1920×1080@30 fps sources in up to six full HD channels simultaneously. Up to three of those 1080@30 inputs can be from NDI 4.6 sources. Or you can have up to four 4K sources[4K] simultaneously in a single channel. One of those 4K inputs can be from a networked source (SRT, RTSP, or NDI).

Only content that is not HDCP-protected is captured from HDMI and USB video sources.

Pearl-2 supports the following AV inputs. It also supports common signal converters and input adapters.

Pearl-2 Rackmount Twin has two complete sets of these inputs.

Table 8 Inputs for Pearl-2

Input port	Qty	Details
SDI[1]	2	Linear PCM audio/video input. Supports up to 12G-SDI signals.
HDMI™	2	Linear PMC audio/video input, non-HDCP protected. DVI-I (using an adapter) is single link.
4K HDMI[2]	2	Linear PMC audio/video input, non-HDCP protected. DVI-I (using an adapter) is single link.
USB 3.0	2	Linear PCM audio/video input accepts non-HDCP protected content. Use to connect UAC or UVC devices, such as USB microphones and web cameras. Can also connect to external hard drives, flash drives, and control interfaces.
RJ-45[3]	1	Up to six SRT sources over Ethernet at 1920×1080@30 fps or one 4K[4K] SRT input.
		Up to six RTSP sources over Ethernet at 1920×1080@30 fps or one 4K[4K] RTSP input.
		Up to three NDI sources over Ethernet at 1920×1080@30 fps or one 4K[4K] NDI input. Up to six NDI|HX sources over Ethernet at 1920×1080@30 fps or one 4K[4K] NDI input.
RCA[4]	2	RCA consumer line-level audio inputs function as a stereo pair (-10 dBV). • White = left • Red = right
XLR[4]	4	The XLR inputs accept balanced and unbalanced, pro line level signals (+4.0 dBu) up to to 12.3 V_{RMS}, +24 dBu.

Input port	Qty	Details
		By default, the four XLR ports operate as two stereo left/right audio pairs (XLR A pair and XLR B pair). You can configure the ports to operate as independent mono inputs using the Admin panel, see Configure audio ports for stereo or mono.

[1] SD-SDI audio is not supported
[2] Requires 4K feature add on
[3] A mix of video over Ethernet sources are supported. Just ensure that total system loading is within acceptable levels, see Optimum System Load.
[4] In the Admin panel, Analog audio B includes audio signals from the XLR B audio pair and the RCA audio pair by default. You can disable one or the other using the Admin panel, see Assign audio sources to an input.

If you are using DVI2PCIe cards with your Pearl-2, DVI2PCIe cards do not support audio over HDMI.

Pearl-2 tech specs

The input and output connectors are listed for Pearl-2 and Pearl-2 Rackmount. Pearl-2 Rackmount Twin is made up of two completely independent Pearl-2 systems, therefore it has double the number of inputs and outputs that are listed in this table.

For the most up-to-date product specifications and information, go to www.epiphan.com/pearl-2.

Table 9 Specifications for Pearl-2

Video Inputs	Local video inputs	(2) 12G SDI (2) HDMI™ 1.4a[1] / DVI[2] (2) 4K HDMI 1.4a (UHD/DCI)[3] / DVI[2] (2) USB 3.0 (UVC) - rear panel
	Video over Ethernet[5]	RTSP[4] NDI® 5 (with Alpha channel support) and NDI HX[6] SRT (push)[6]
	Connectors	(4) HDMI type A (female) (2) BNC (female) (2) USB-A (female) - rear panel (1) RJ-45
	Aspect ratios	3:2, 4:3, 16:9, 16:10, and custom aspect ratios

	Standard resolutions	PAL, PAL wide, NTSC, NTSC wide
	Input resolution range	640×480 to 4096×2160
	Frame rate	Up to 60 fps[7]
	Video input color spaces	HDMI: RGB 4:4:4, YC_RC_B 4:2:2, YC_RC_B 4:4:4 SDI: RGB 4:4:4, YC_RC_B 4:2:2
	Deinterlacing	Yes
	Maximum cable length for SDI	300 ft
	Maximum cable length for USB 3.0	6 ft
Audio Inputs	Analog audio inputs	(4) XLR pro line level (+ 4.0 dBu) up to 12.3 V_{RMS}, +24 dBu (balanced/unbalanced, mono or two L/R stereo pairs) (1) RCA consumer line level - 10 dBV (L/R stereo pair)
	Connectors	(4) XLR (female) (2) RCA (female)
	Digital audio inputs[9]	(2) SDI[8] (4) HDMI (3) USB (rear panel) (6) RTSP (embedded from RTSP input over Ethernet) (3) NDI (embedded from NDI input over Ethernet) (6) SRT (embedded from SRT input over Ethernet)
	Connectors	(2) SDI (female) (4) HDMI (female) (2) USB (female) - rear panel (1) RJ-45 (female)
	Audio gain control	0 dB to +30 dB
	Audio mute	Yes
	Configurable audio delay	-300 ms to +300 ms
Video processing	Video output color	4:2:0, 8 bits per color

	space	
	Video codec	H.264/AVC (ITU H.264, ISO/IEC 14496-10) 4:2:0, 8 bit color • **Encoding profile**: High, Main, Baseline • **Profile levels**: 3.0, 3.1,3.2,4.0,4.1, 5.1 Motion JPEG NDI, NDI|HX
	Bitrate	1 to 50 Mbps (selectable)
	Bitrate control	Constant
	Hardware accelerated video encoding	Optional
	Video scaling	Software and hardware
	Chroma keying	Upstream/downstream keying
	Key frames	1/2 s, and 1 s up to 5 s in 1 second intervals
Audio processing	Compression	MP3, AAC, and PCM
	Sampling rate	MP3: 22 kHz, 44 kHz, 48 kHz AAC: 16 kHz, 22 kHz, 44 kHz, 48 kHz PCM: 22 kHz, 44 kHz, 48 kHz
	Bitrate	64 to 320 kbps (MP3 and AAC)
Video output	Signal types	(2) HDMI (port 1 HDMI 2.0, port 2 HDMI 1.4a) (3) H.264/AVC digital video over Ethernet (2) NDI (unicast) (6) RTSP (6) SRT (push) (6) HLS (push)
	Connectors	(2) HDMI (1) RJ-45 (female)
	Encoded channels	Up to six 1080p channels at 30 fps or one 4K channel at 30 fps (recommended)
	Streaming protocols	MPEG-TS and FLV

		RTSP over TCP/UDP SRT (push) over UDP HLS (push) over HTTP/HTTPS Multi-Publish to Streaming Server / CDN (SRT, RTSP, RTMP, RTMPS) HLS (pull) - Native Apple HTTP/HTTPS stream for iPad, iPhone and iPod Touch
	Multicast streams	RTP/UDP, MPEG-TS & RTP, and MPEG-TS over UDP SAP
	Stream encryption and authentication	SRT: 128 bits, 192 bits, or 256 bits AES encryption (negotiated) and configurable passphrase HLS (push): MD5, SHA-256, and SHA-512 RTMPS: encryption plus CA certificate negotiation
	Resolution ranges	Recorded: 480p to 2160p Streamed H.264: 480p to 2160p NDI streamed: 480p to 1080p HDMI output ports: 480p to 2160p
	Frame rate	Up to 60 fps
	Formats	H.264/AVC (ITU H.264, ISO/IEC 14496-10) 4:2:0, 8 bit color • **Encoding profile**: High, Main, Baseline • **Profile levels**: 3.0, 3.1,3.2,4.0,4.1 Motion JPEG NDI
	Network traffic shaping (multicast streams)	4 Mbps to 95 Mbps (configurable)
Audio output	Analog audio output	(1) 3.5 mm stereo headphone jack - front panel
	Digital audio outputs	RTSP, SRT, and NDI audio over Ethernet HLS over HTTP/HTTPS HDMI audio (embedded)

Monitor and control	Touch screen	4.3 inch touch screen monitor (built in) resolution: 800x480
	USB keyboard	Connect a standard USB keyboard (optional)
	USB status light	Connect a single USB status light (optional), supported models: -Kuando BusyLight models: UC Alpha and UC Omega -Delcom Products USB HID single color and multi-color signal indicators
Recording and storage	Record formats	AVI, MOV, MP4, and MPEG-TS
	Upload image formats	JPEG, PNG
	Internal hard drive	512 GB SSD[10]
	File transfer protocols	FTP, SFTP, SCP, AWS S3 client, and WebDAV client RSync
	Network file share protocols	CIFS/SMB2+
	File system for USB storage	FAT16, FAT32, XFS, EXT2, EXT3, EXT4, NTFS
	External USB ports	(1) USB 3.0 - front panel (2) USB 3.0 (UAV/UAC) - rear panel
	Bitrate	Up to 50 Mbps
Communication	USB standards	USB 1.1, USB 2.0, and USB 3.0 HDCP compliant. Only content that is not HDCP-protected is captured
	Serial port	(1) Bidirectional RS-232 (female)
	Serial port protocols	**Data bits**: 7 or 8 (default) **Stop bits**: 1 **Parity**: None **Flow control**: None, Hardware or Software
	Serial port baud rate	19200 bps
	Ethernet host port	(1) RJ-45 (female)
	Ethernet data rate	10/100/1000 Base-T, half/full duplex with autodetect
	Maximum	68 to 1500 MTU, configurable

	Transmission Unit	
	Protocols	DHCP Option 81, TLS 1.2, LDAP, mDNS, DDNS, SAP, RTP, MPEG-TS & RTP and MPEG-TS/UDP, 802.1x, EAPOL, EAP-TTLS, EAP-TLS, PEAP, HTTP, HTTPS, NTP, PTP, FTP, SFTP, SCP AWS S3
	Network discovery / Announce	SAP
Network security	802.1x EAP methods	PEAP, EAP-TLS, EAP-TTLS
Administration and control	Admin panel	Local web UI for full administration. On-screen display and mobile UI for confidence monitoring, administration, and control. Local Admin panel access using a USB mouse, keyboard, and monitor connected directly to Pearl-2 with built-in virtual keyboard and touch-screen monitor support.
	Epiphan Live	Local web-based UI to easily control streaming, recording, and switching.
	Epiphan Edge	Cloud-based platform to remotely manage and control Pearl-2 devices. Start and stop recording/streaming, monitor channels and alert dashboard, remotely login to Admin panel for rescue troubleshooting, update firmware and more from the Internet.
	Secure access	Multiple user accounts and passwords. HTTPS for secure Admin panel and Epiphan Live access, as well as local network access to the live channel broadcast.
	Remote access:	Remote login[11] to cloud versions of the Admin panel and Epiphan Live.
	API	Yes (HTTP/HTTPS or RS-232)
	Crestron driver	Yes See https://applicationmarket.crestron.com/epiphan/
Integrations	Content Management Systems	Kaltura Panopto YuJa
	Cloud access and management	Epiphan Edge

General	Power supply	Internal: 100-240 VAC, 50-60 Hz
	Power use	0.8 A, 100-240 VAC
	Operating temperature	32° to 122° F (0° to 50° Celsius)
	Cooling	Fan air flow: Bottom front to back
	Enclosure	Metal
	Form factor	Portable desktop model 19" rack mountable model 19" Rackmount Twin model
	Dimensions (W x D x H)	**Pearl-2**: 11.81″ × 9.45″ × 3.54″ (300mm × 240mm × 90mm) **Pearl-2 Rackmount**: 19 ⅛" × 3½" × 10 ⅞" (485 mm × 89 mm × 276 mm) - dimensions include mounting tabs **Pearl-2 Rackmount Twin**: 19 ⅛" × 3½" × 10 ⅞" (485 mm × 89 mm × 276 mm) - dimensions include mounting tabs
	Weight	**Pearl-2**: 8.38 lbs (3.8 kg) **Pearl-2 Rackmount**: 12.1 lbs (5.5 kg) **Pearl-2 Rackmount Twin**: 14.6 lbs (6.6 kg)
Regulatory compliance	**FCC compliance**: Part 15	
	CE compliance: Directive 2014/30/EU - Electromagnetic Compatibility Directive 2014/35/EU - Low Voltage Directive Directive 2011/65/EU - RoHS	
Time Synchronization	NTP, TIME (RFC 868), PTP v1 (IEEE-1588-2002 V1)	
Country of Origin	Made in Taiwan	

[1] HDCP compliant. Only content that is not HDCP-protected is captured from HDMI
[2]Using HDMI port with adapter.
[3]Requires 4K feature add on.
[4]Up to six 1080@30 inputs can be from RTSP sources or up to one 4K source[4K] can be from an RTSP source.
[5]A mix of video over Ethernet sources are supported. Just ensure that total system loading is within acceptable levels, see Optimum System Load.
[6]Up to three 1080@30 inputs or up to one 4K input source[4K] .
[7]Except the HDMI 4K input ports, which support up to 30 fps.
[8]Digital audio is de-embedded from the digital source.
[9]SD-SDI audio is not supported.

[10]Approximately 100 MB of the hard drive space is reserved for system use. Recording space can be virtually unlimited with offload to networked storage.
[11]Requires an Epiphan Edge Pro account.

Optimum System Load

While Pearl-2 is powerful, there is a limit to the number of concurrent tasks the onboard CPU can perform efficiently.

The number of concurrent tasks depends on many factors, such as:

- the number of video sources
- what frame rate and bitrate is used for a channel
- if the video output ports are used
- if a live monitor is connected to the HDMI output port (about the equivalent of an encoded 1920×1080@30 fps channel)

Other limiting factors

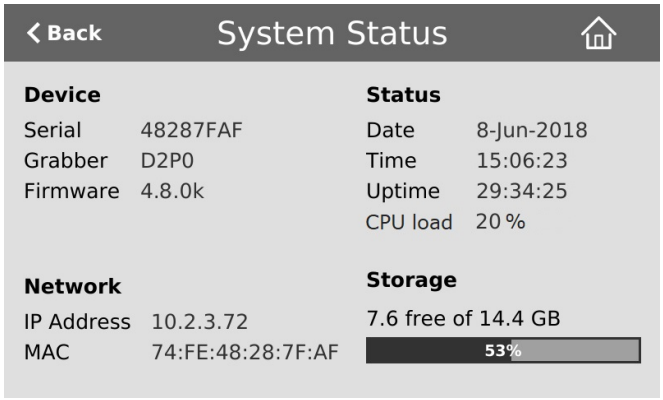
- how many channels you have
- how many layouts you have per channel
- how often you switch layouts
- if the system is resizing (scaling) video sources

Streaming an NDI output with Pearl-2 consumes about the equivalent of an encoded 1920×1080@30 fps channel .

For best results, we recommend keeping System load usage under 70%.

Check CPU usage on the touch screen of Pearl Mini and Pearl-2

To check the CPU usage from the touch screen, tap the gear icon and select **System Status**.



Recommendations

If the system load is higher than recommended, you can:

- Disable the video output port (if unused).
- Remove unused channels or layouts.
- Reduce the number of channels created.
- Stop channel(s) that are streaming or recording.
- Ensure video sources come in at the right resolution so that Pearl-2 doesn't have to up scale or down scale the video source.

International character support

You can include certain international characters in the channel name, layout name, video and audio input names, text overlays, and in the name of recorded files. Common character sets for the following languages are approved:

- **Western European/Nordic languages**: Danish, Dutch, English, French, German, Icelandic, Italian, Norwegian, Portuguese, Spanish, and Swedish.
- **Central/Eastern European languages**: Bosnian, Croatian, Czech, Hungarian, Polish, Romanian, Slovak, and Russian.

Important considerations

- Use only alphanumeric and diacritic characters in metadata descriptions. The whole metadata string is refused if any special currency or mathematical symbol appears in the description. You must remove the offending characters before Pearl-2 will accept the description, see Add or remove channel metadata.
- Do not include any special currency, mathematical symbols, and other special characters such as slashes or spaces in the channel name. Pearl-2 replaces special characters with an underscore.

User interfaces and remote access

Pearl devices have several user interfaces:

- **Touch screen**: Easily accessible on the front panel of Pearl, Pearl-2, and Pearl Mini, the touch screen is primarily used for confidence monitoring, live switching, and Single Touch streaming and recording control, see About the touch screen. For instructions to use the touch screen to start/stop scheduled events or to authenticate with a Content Management System (CMS) and create unscheduled ad hoc recordings and webcasts, see CMS event controls using the touch screen.
- **Admin Panel**: A web-based user interface that's primarily used to perform system set up and administrative tasks for your Pearl device. You can access the Admin Panel using an internet browser on a computer or tablet that's connected to the same local Ethernet network as your Pearl device, or locally using a USB mouse, keyboard, and monitor connected directly to the Pearl device. See About the Admin panel.
- **Epiphan Live**: A web-based user interface that's primarily used for confidence monitoring, statistics, live switching, and recording control, see Epiphan Live.

Start and stop recording/streaming, monitor video sources, view status and alerts, remote rescue troubleshooting and more over the Internet using Epiphan Edge, see Cloud-based device management. For remote login access to your Pearl device, see Remote login to the Admin panel and Epiphan Live.

The touch screen - Pearl-2 and Pearl Mini

Use the touch screen to switch layouts, start and stop recording and streaming, configure network settings, load configuration presets, and to view configured channels, audio meters, and system information.

Topics include:

- About the touch screen
- Record a channel using the touch screen
- Stream a channel using the touch screen
- Switching and mixing using the touch screen
- Single Touch streaming and recording control
- CMS event controls using the touch screen
- Configure the touch screen

To view system information using the touch screen, see View system information using the touch screen

To select the video source for the output port using the touch screen when local console is enabled, see Select the video output source using the device screen.

About the touch screen

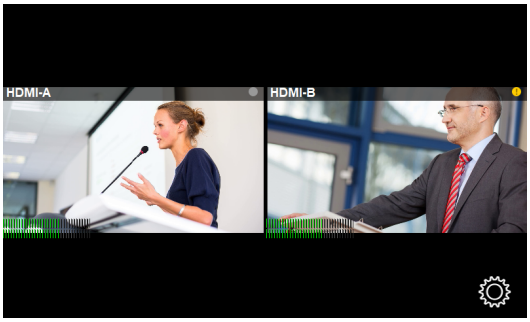
The touch screen has many uses, including confidence monitoring, basic configuration and diagnostics, one-touch streaming and recording control, easy start/stop of scheduled events, and authentication with a Content Management System (CMS) to create unscheduled ad hoc recordings and webcasts.

The touch screen is capacitive. Use your finger or a specially designed soft-tipped capacitive stylus with firm but gentle pressure. Pressing too hard or using something other than a fingertip or capacitive stylus can result in damage to the screen.

When you power on the Pearl device, a grid view appears. The grid view displays all channels that are configured for your system. If you haven't created any channels yet, the grid view shows the two HDMI input ports by default (Auto-A and Auto-B on Pearl-2).

See **About automatic channels** for more details about auto channels.

In this example, the grid view shows two video sources, which are plugged into HDMI video input ports A and B on the Pearl device.



If no video sources are connected, or your sources aren't sending a signal, the grid view shows no signal images.

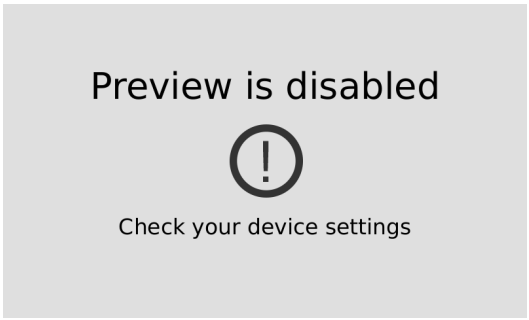
Tap a channel on the grid view to select it and go to that channel's view. You can tap the **Grid icon** to return to the grid view. Tap the **gear** icon at any time to go to system settings.

The No Channels screen

The **No Channels** screen appears if there are no channels configured on your Pearl-2 and the automatic channels **Auto A** and **Auto B** have been deleted. Tap anywhere on this screen to go to the system settings screen.

Enabling and disabling touch screen features

By default, the touch screen and all features except viewing the CMS Events screen are enabled. You can disable the touch screen and define which features are enabled on the touch screen. If the touch screen is configured to not show channel previews, tap anywhere on the screen to go to the system settings screen. See Configure the touch screen for details. For information about the CMS Events screen and icon, see CMS event controls using the touch screen.



When setting some features, a pop-up virtual keyboard appears. To enable using an external keyboard that you connect to one of the Pearl device's USB ports instead, see Connect an external keyboard.

The touchscreen channel view

Each channel you configure on Pearl device can be monitored and controlled using the touch screen. After you power on the Pearl device and the grid view opens, you can select a channel and open the channel view. Just tap the channel you want in the grid view and the channel view opens.

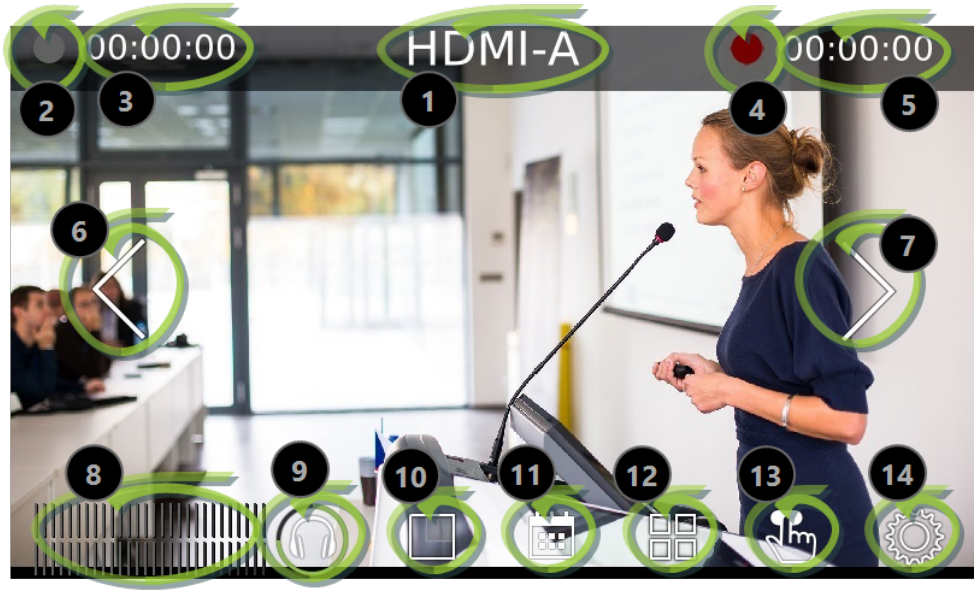


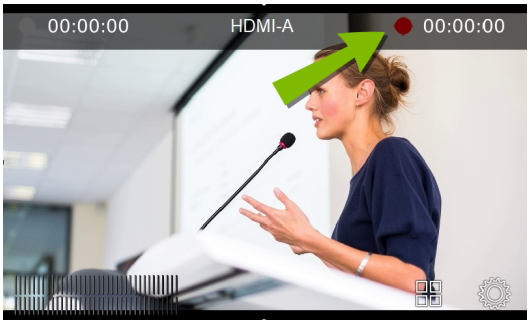
Table 10 Parts of the touch screen for the individual channel view

Item	Description
1	Channel name.
2	Streaming status. Gray means streaming is stopped, flashing blue means streaming is in progress.
3	The streaming timer shows the length of time that streaming has been in progress.
4	Recording status. Bright red and flashing means recording is in progress.
5	The recording timer shows the length of time that recording has been in progress.
6 and 7	Controls to switch between channels. Tap the arrow to view the next (or previous) channel. The arrow icons fade when the touch screen is idle (i.e. untouched) for several seconds. Tap the touch screen and the icons reappear.
8	Audio VU meter uses quasi-peak ballistics with samples averaged every 10 ms. The maximum average audio level in

Item	Description
	each 100 ms period is displayed using colored bars. • RED = 0 to -9 dBFS • Yellow = -9 to -18 dBFS • Green = -18 dBFS and lower
9	Audio monitoring volume control icon. Tap to change volume level. See Monitoring audio for more information.
10	Live Switcher view icon. Tap to view the live switcher, which lets you live switch between different custom layouts that are configured for the channel.
11	CMS Events screen icon. Tap to view the status of scheduled Kaltura or Panopto CMS events or to authenticate with your CMS and create an unscheduled ad hoc event, see Create ad hoc events using the Admin panel.
12	Grid view icon. Tap to view all the configured channels in a grid.
13	Single touch streaming and recording control icon. See Single Touch streaming and recording control
14	System settings icon. See View system information using the touch screen.

Record a channel using the touch screen

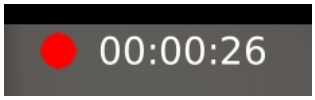
Use the touch screen to easily start and stop recording of a channel. Simply tap the recording control button that appears in the channel view.



If the red Record icon doesn't appear in the top right corner of the screen, recording is disabled. See **Disable or enable recording, streaming, and switching from the touch screen** to enable recording.

Start and stop recording a channel using the touch screen

1. From the grid view, select the channel you want to record. The channel view opens. If necessary, tap the screen once to display the controls.
2. Tap the red Record icon at the top right of the screen to start recording. The red dot flashes and the record timer increments when recording is in progress.

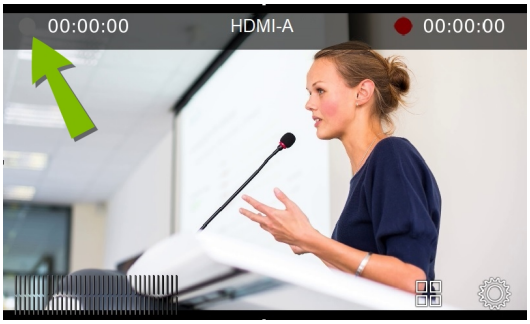


3. Tap the red Record icon again to stop recording. The dot stops flashing and the record timer resets to 00:00:00.

Pearl devices also feature **One Touch**, which lets you control recording and streaming of multiple channels and recorders at the same time with the touch of a button. See **Single Touch streaming and recording control** for more information.

Stream a channel using the touch screen

Use the touch screen to easily start and stop streaming a channel. Simply tap the streaming control button that appears in the channel view.

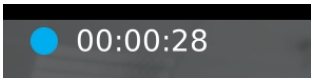


If the gray (or blue) Stream icon doesn't appear in the top left corner of the screen, streaming is disabled. See **Disable or enable recording, streaming, and switching from the touch screen** to enable streaming.

Start and stop streaming a channel using the touch screen

1. From the grid view, select the channel you want to record. The channel view opens. If necessary, tap the screen once to display the controls.

2. Tap the gray Stream icon at the top left of the screen to start streaming. The Stream icon turns blue and the timer increments when streaming is in progress.



3. Tap the Stream icon again to stop streaming. The dot turns gray and the timer resets to 00:00:00.

If an error occurs when you start streaming, a yellow circle with an exclamation mark appears in the left top corner of the touch screen. Check your networking and streaming settings.

Pearl devices also feature **One Touch**, which lets you control recording and streaming of multiple channels and recorders at the same time with the touch of a button. See **Single Touch streaming and recording control** for more information.

Switching and mixing using the touch screen

Switching live video inputs, or video mixing, is simple and intuitive using the Pearl device's touch screen.

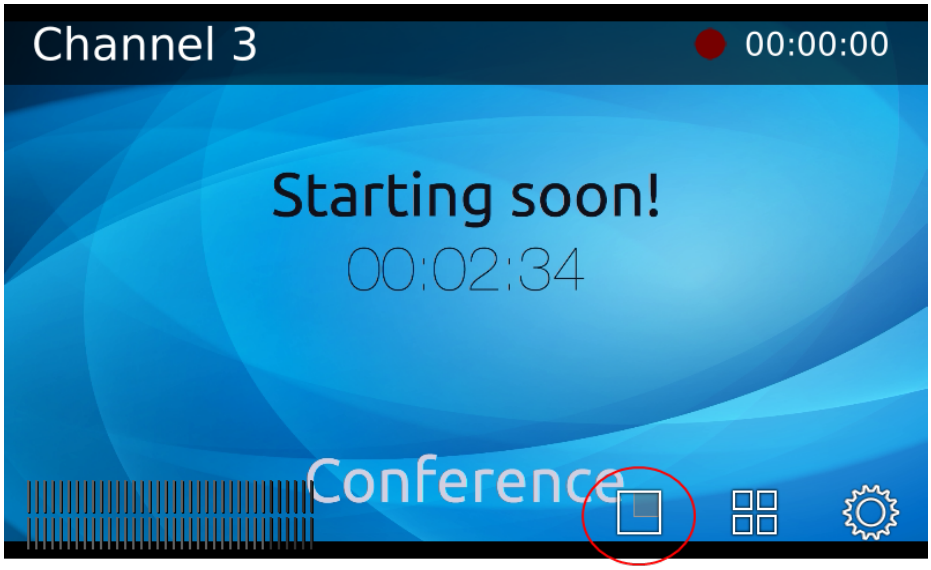
After you select the channel you want to live switch, tap the Live Switcher icon along the bottom of the touch screen to open the live switcher. All custom layouts that are configured for the channel display in the carousel. Simply tap a layout to load it in to the standby panel and you're ready to start live switching.

Performing live switching using one interface, like the touch screen, does not dynamically update the visuals in the other interfaces (e.g. the Admin panel and Epiphan Live). The other interfaces must be manually refreshed to accurately reflect the current live switching layout information.

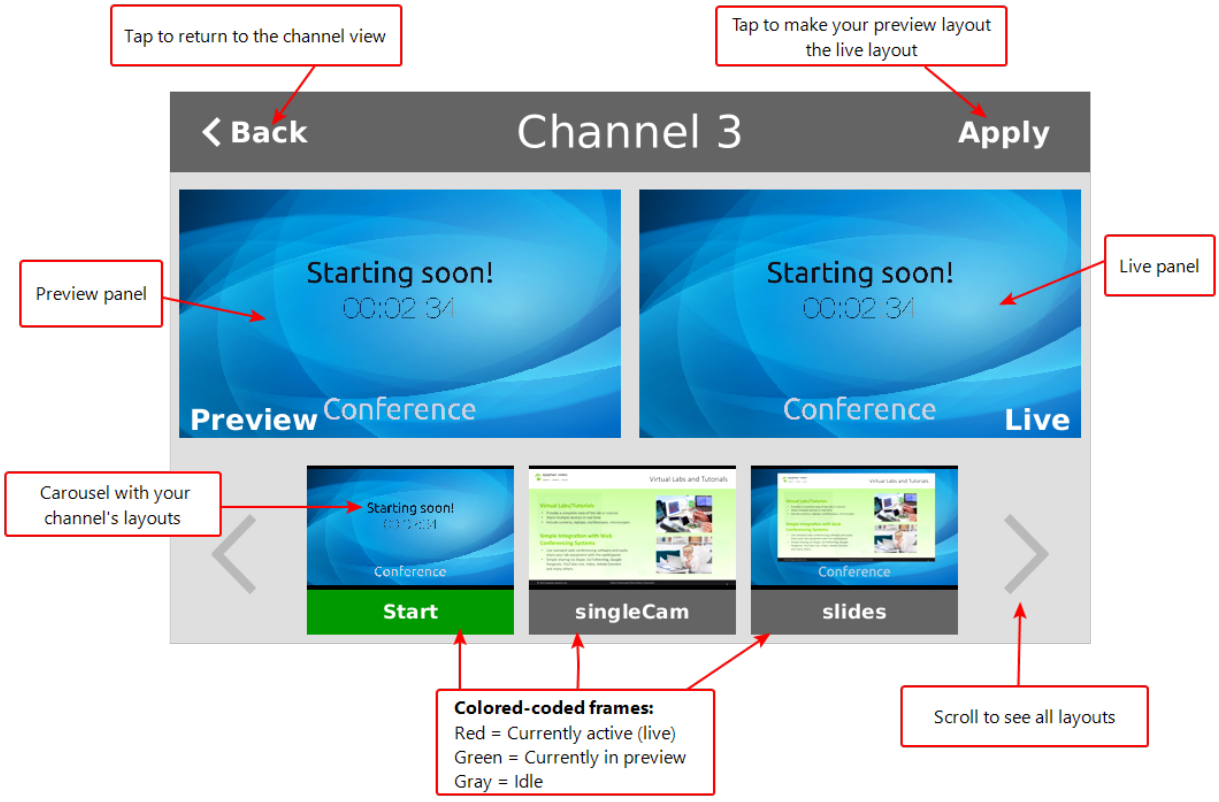
If the live switching controls don't appear on the touch screen, they may have been disabled. see Disable or enable recording, streaming, and switching from the touch screen.

Switch custom layouts for a channel using the touch screen

1. Tap the Live Switcher icon to open the live switcher view for the channel. If the control icons aren't showing, tap anywhere on the touch screen.



2. The Live Switcher view opens.



3. Tap any layout that appears in the carousel to load it in to the Preview panel.

4. Tap **Apply** or double tap inside the Preview panel to switch that layout to the Live panel. The layout that was in the Live panel moves to the Preview panel so that it's ready for the next time you switch.
5. To load a different layout into the Preview panel, tap another layout in the carousel.
6. Tap **Back** to exit the Live Switcher view.

Single Touch streaming and recording control

You can easily control streaming and recording from the touch screen on Pearl-2 and Pearl Mini with just one touch of a button.

Topics include:

- About Single Touch streaming and recording
- Specify channels and recorders for Single Touch recording
- Specify channels for Single Touch streaming
- Customize the Single Touch control display

About Single Touch streaming and recording

The Single Touch feature lets you control the recording and streaming of multiple channels and recorders with one touch of a button on the touch screen. Specify which channels and recorders to include for Single Touch control using the Admin panel.

To open the Single Touch control screen from the touch screen on the Pearl-2 or Pearl Mini, tap the **Single Touch control** icon.

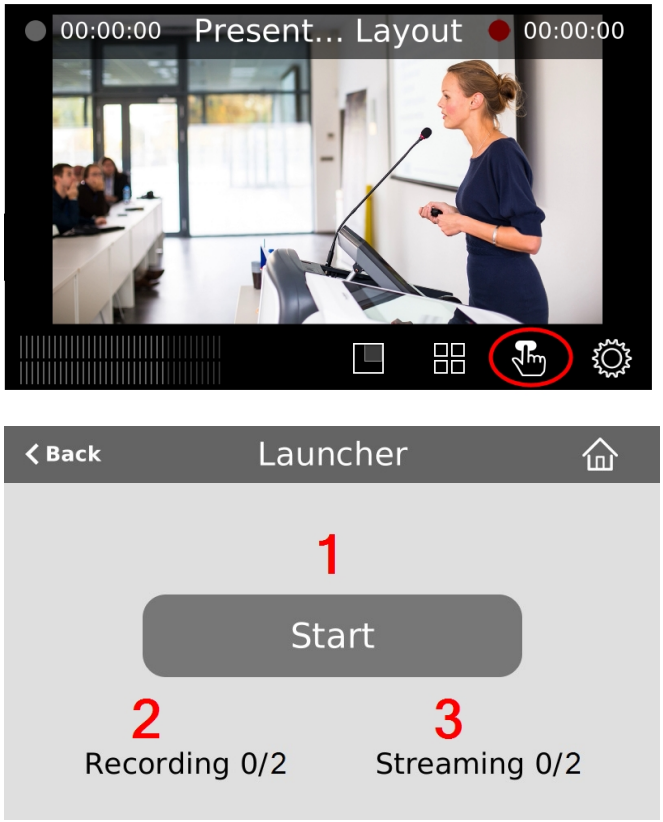
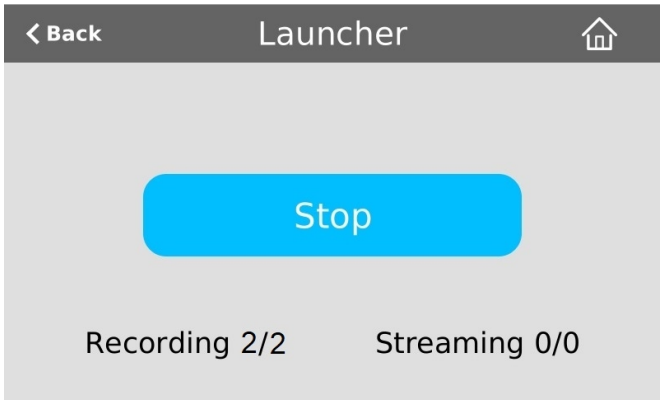


Table 11 One Touch control screen components

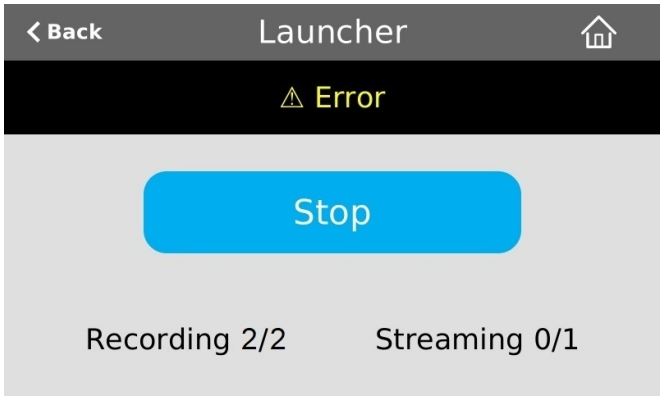
Label	Description
1	**Start/stop button**: Press the Single Touch control button to start or stop streaming and recording for all specified channels and recorders.
2	The number of recorders and/or channels that are actively recording (the first number) over the total number of channels that are configured for one touch recording (the second number).
3	The number of channels that are actively streaming (the first number) over the total number of channels that are configured for one touch streaming (the second number).

When you press the start button to activate Single Touch recording and streaming, a blue **Stop** button appears, the Recording values update to show the number of channels and recorders that are actively recording, and the Streaming values update to show the number of channels that are actively streaming.



In the example above, Single Touch control has been activated and both channels out of the two total channels and/or recorders are recording successfully. There is no streaming activity because there are no channels configured for Single Touch streaming.

An error icon displays if there's a problem with the streaming and/or recording settings for one or more of the channels and recorders. All other channels and recorders that are working correctly continue to stream and record normally.



In this example, after pressing **Start**, both recorders/channels are recording properly but the one channel configured for streaming is not streaming correctly.

To troubleshoot, investigate each channel's streaming configuration page using the Admin panel and identify which channel isn't streaming. Then correct any streaming configuration errors.

See Specify channels for Single Touch streaming and Specify channels and recorders for Single Touch recording for more information about configuring channels and recorders for Single Touch control.

Customize the Single Touch control display

You can use the Admin panel to customize how Single Touch control is displayed on the touch screen. The start screen options for Single Touch control are:

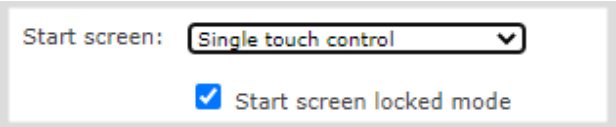
- **Default**: The Single Touch control screen is accessed by tapping the **One Touch control icon** at the bottom of the touch screen.
- **Single touch control**: The Single Touch control start screen displays automatically on the touch screen when you power on the Pearl device. Operators can still navigate to other screens from the Single Touch control screen by tapping the Home icon in the top right corner of the screen.
- **Start screen locked mode**: The Single Touch control start screen is the only screen that displays on the touch screen. Operators cannot navigate to other screens from the Single Touch control screen.

If no 4-digit PIN set when the start screen is in locked mode, you can access the Single Touch control start screen right away to start/stop streaming and recording. However, you cannot access any other screens using the touch screen.

If you set a 4-digit PIN when the start screen is in locked mode, a lock appears in the top right of the start screen. You must enter the PIN to unlock the Single Touch control start screen and access the other screens using the touch screen. When you return to the Single Touch control start screen, the Pearl device automatically locks itself and you must re-enter the 4-digit PIN to unlock the touch screen.

Configure how the Single Touch control screen displays on the touch screen using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Touch Screen**. The Touch screen configuration page opens.
3. From the **Start screen** drop-down menu, select **Single Touch control**.
4. (Optional) Check **Start screen locked mode** and set a 4-digit PIN. For more information about setting a PIN, see Set a PIN security code.



5. Click **Apply**.

If you chose **Single Touch control**, the touch screen automatically refreshes to display the Single Touch control screen.

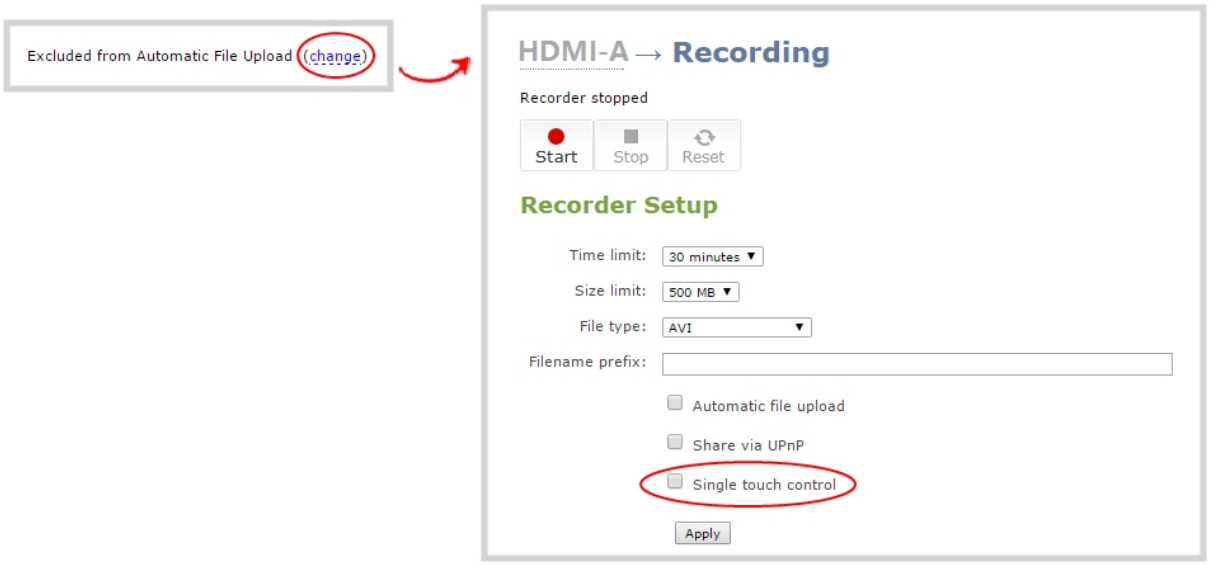
Specify channels and recorders for Single Touch recording

All channels and recorders are enabled for Single Touch recording control by default. You can enable and disable one touch recording for individual channels and recorders using the Admin panel.

To learn how to configure your channels for recording, see **Record** . To learn how to configure recorders, see **Recorders**

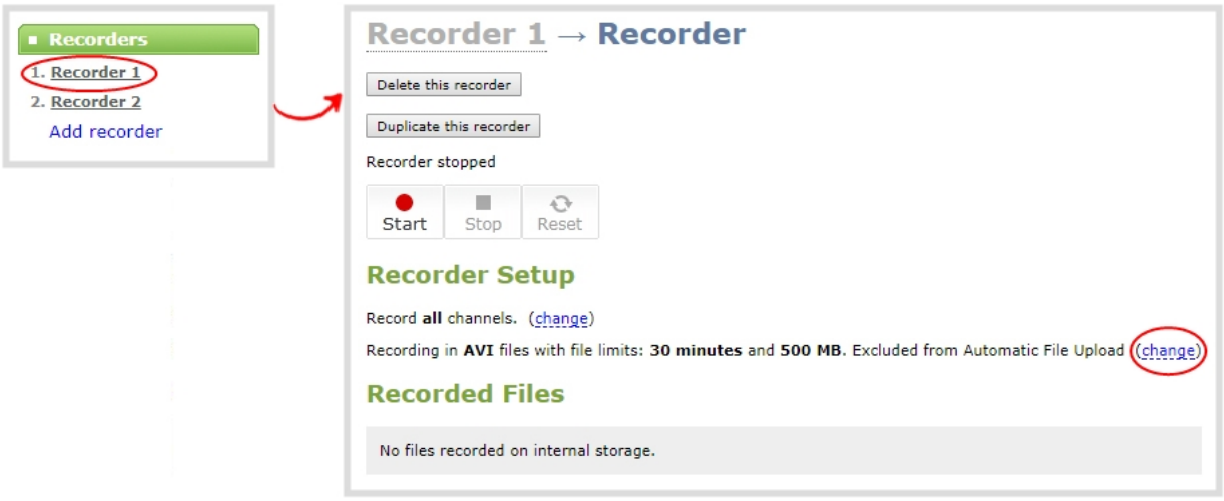
Enable or disable Single Touch control for a channel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select the channel you want and click **Recording**. The Recording page opens.
3. Select **change**, and then check **Single touch control** on the options page to enable the channel for One Touch control. Uncheck the check box if you don't want to include that channel for One Touch control. Then click **Apply** when you're done.

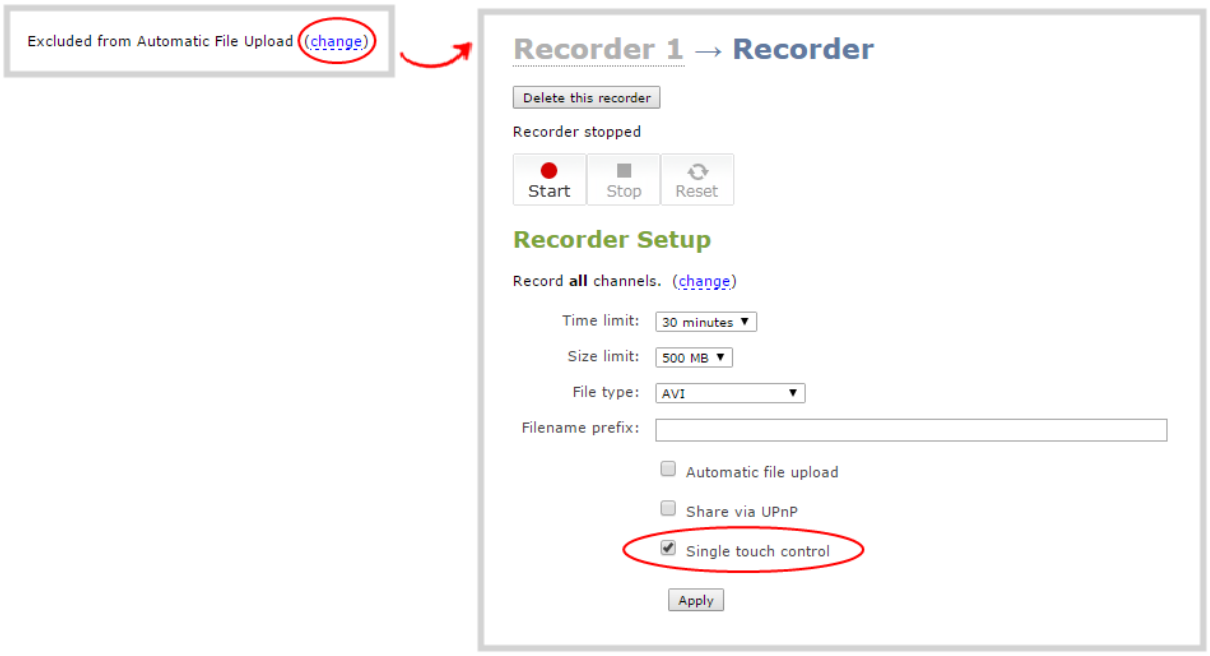


Enable Single Touch control for a recorder using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. To enable or disable **Single touch control** for a recorder.
3. From the Recorders menu, select the recorder you want. The Recorder Setup page opens.



4. Select **change**, and then check **Single touch control** on the options page to enable the recorder for Single Touch control. Uncheck **Single touch control** if you don't want to include that recorder for Single Touch control. Then click **Apply** when you're done.



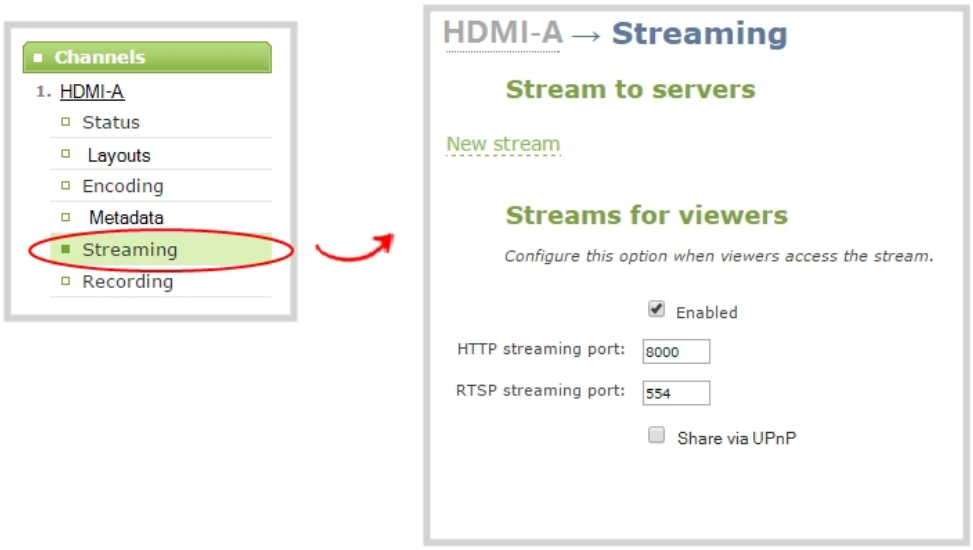
Specify channels for Single Touch streaming

Channels are not enabled for Single Touch streaming by default. You can enable and disable one touch streaming control for individual channels using the Admin panel.

To learn how to configure your channels for streaming, see **Stream**.

Specify channels for Single Touch streaming using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Streaming**. The Streaming page opens.



3. Click **New stream** and select a publishing method, for example, RTMP push.
4. Check **Single touch control** to enable this channel's stream for Single Touch control. Uncheck **Single touch control** if you don't want to include this channel's stream for Single Touch control. Then click **Apply**.

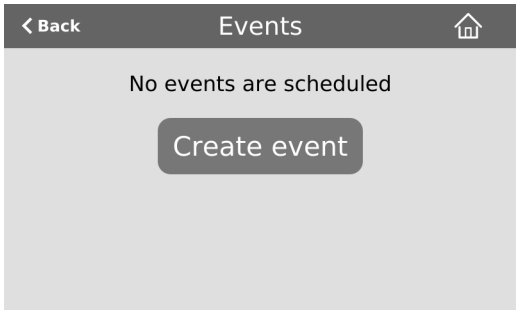
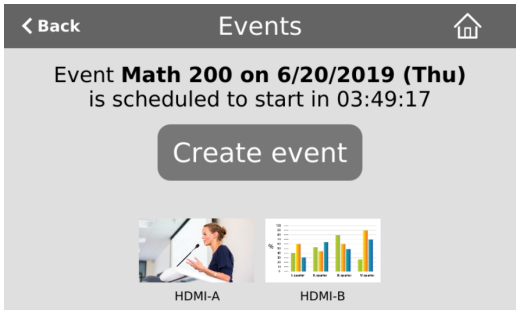
CMS event controls using the touch screen

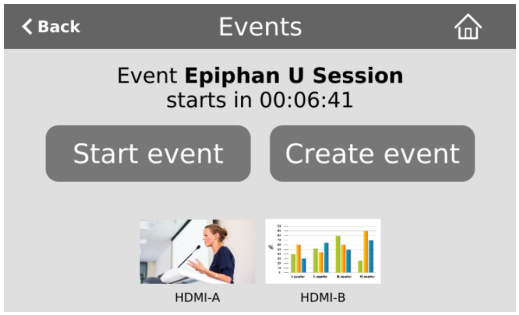
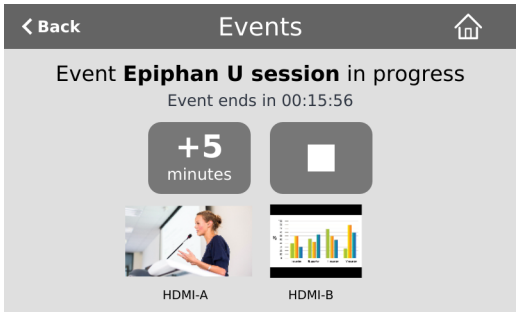
Pearl devices start recording scheduled events automatically; however, you can use the touch screen to start and stop scheduled events sooner. The touch screen can also be used to authenticate with your Content Management System (CMS) to create unscheduled ad hoc recordings and webcasts. For detailed instructions, see:

- Stop/start scheduled CMS events using the touch screen
- Extend or pause CMS recordings and webcasts
- Create ad hoc events using the touch screen
- Set up a CMS start screen

For important considerations before recording or webcasting to a CMS, see Integration.

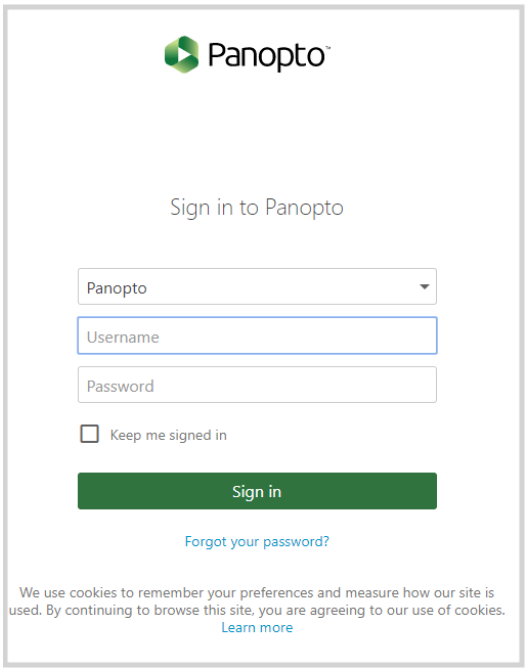
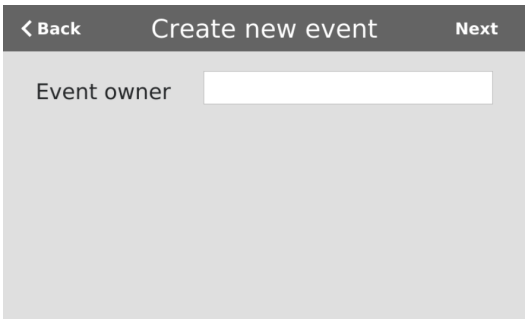
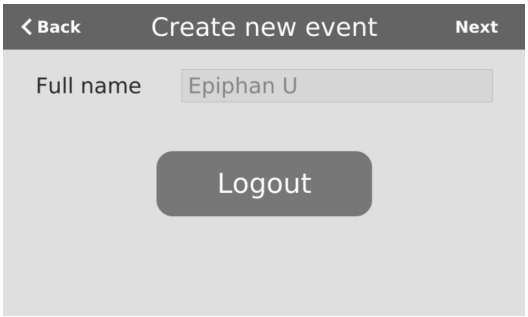
Table 12 Events screens for scheduled Kaltura, Panopto, and YuJa events

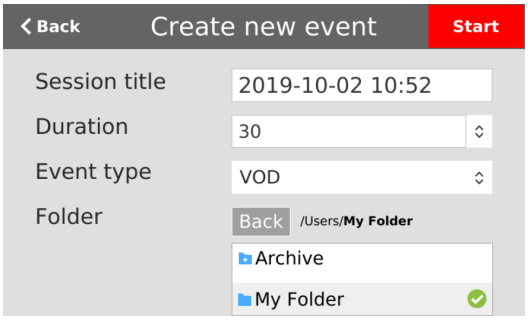
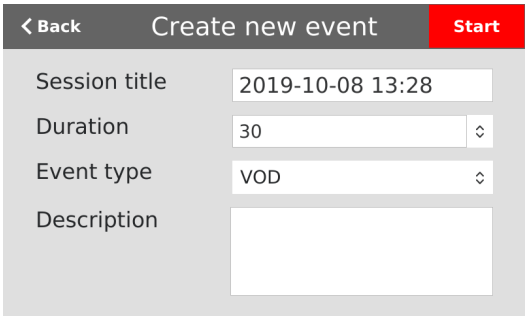
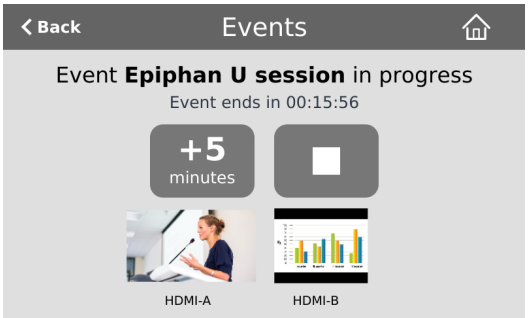
Events screens	Description
	The Calendar icon appears on the touch screen when CMS is setup using the Admin panel.
	Tap the calendar icon to display the Events screen. For example: From the Channel view, the calendar icon appears along the bottom of the screen.
	This Events screen displays when no scheduled events are configured. To create an ad hoc recording or webcast, tap **Create event** and authenticate using your CMS credentials. **Note:** Pearl devices must be registered with the CMS to create ad hoc events.
	This Events screen displays when a scheduled event is configured and it's 30 minutes or more before the event start time. Notice that this is a recurring event with the date appended to the event name. To create an ad hoc recording or webcast, tap **Create event** and authenticate using your CMS credentials. Tap the channel thumbnail to go to the Channel view and see a live preview of that channel with an audio VU meter for confidence monitoring.

Events screens	Description
	This Events screen displays when a scheduled event is set to start within 30 minutes. To start the scheduled event early, tap **Start event**. To create an ad hoc recording or webcast, tap **Create event** and authenticate using your CMS credentials. **Note:** Scheduled events override ad hoc events. The Pearl device stops the ad hoc event and starts the scheduled event when it's time for the scheduled event to start.
	This Events screen displays when a scheduled event is set to start in five minutes or less. To start the scheduled event early, tap **Start event**. **Note:** For Panopto, the video quality you select for the session overrides the channel encoding settings in the Pearl device. Notice the lower resolution of HDMI-B for the slides with the inserted black bars. Video quality encoding settings applied to the channel by Panopto persist for that channel after the scheduled event ends.
	This Events screen displays while a scheduled or an ad hoc session is in progress. For Panopto, and YuJa, events an additional pause button lets you pause and resume active recordings and webcasts. To stop the event early, tap the **square** stop button. To extend the event, tap **+5 minutes**. The extend event button can be setup to add 5, 10, or 15 minutes each time it is selected. See your Pearl device administrator.
	If configured, the Pearl device mutes the audio and displays an event paused image when a Panopto CMS recording or webcasting event is paused. For more information about pausing Panopto events, see Extend or pause CMS recordings and webcasts. If **mute on pause** and the on-screen **pause illustration** are not enabled on the Pearl device, your viewers watching the stream can see and hear the live webcast while the event is paused, as well as in the recording in Panopto.

Authenticating using the touch screen lets you create unscheduled ad hoc recordings and webcasts.

Table 13 Unscheduled ad hoc event screens

Unscheduled ad hoc event screens	Description
	**Panopto login screen**: When Pearl-2 is registered with Panopto, this authentication screen appears when you tap **Create event** from the Events screen. Tap in a field and enter your credentials, then tap **Sign in**. **TIP:** To check the **Keep me signed in** check box using the built-in keyboard or an externally connected keyboard, press the space bar.
	**Kaltura login screen**: When Pearl-2 is registered with Kaltura, this authentication screen appears when you tap **Create event** from the Events screen. Tap in the Event owner field and enter your Kaltura user ID or a valid Kaltura email address as your login credentials, then tap **Next**.
	This screen displays after a successful authentication. To create an ad hoc event, tap **Next** to go to the next screen and set the event title and details. Tapping **Logout** logs you out of your CMS session and you return to the Events screen.

Unscheduled ad hoc event screens	Description
	Now enter your event details. For **Panopto**, you can change the ad hoc session title, duration, choose the type of event (VOD or Live Stream), and select the folder in Panopto to upload the file. **My Folder** is the default. Swipe to scroll down the list. Double tap and use the Back button to navigate nested folders. Tap **Start** when you're ready to start the ad hoc event.
	For **Kaltura,** you can change the ad hoc session title, duration, choose the type of event (VOD, Live Stream, or VOD + Live Stream), and add a description. Swipe to scroll down to add Kaltura categories and tags. Tap **Start** when you're ready to start the ad hoc event.
	This Events screen displays after you have started the ad hoc event. To stop the ad hoc event, tap the **square** stop button. To extend the event, tap **+5 minutes**. The extend event button can be setup to add 5, 10, or 15 minutes each time it is selected. Events cannot be extended beyond the start of the next scheduled event. For Panopto events, an additional pause button lets you pause and resume active recordings and webcasts. **Note:** To log out after stopping an ad hoc event, tap **Create event** from the Events screen and re-enter your User ID to return to this logout screen.

Configure the touch screen

The touch screen on Pearl-2 and Pearl Mini is enabled by default and all its features are available. You can disable the entire screen or some of its features using the Admin panel. For information about how to connect to and use the Admin panel, see The Admin panel.

- **Enable display** - Enable or disable the Pearl device from displaying anything on the touch screen.
- **Show preview** - Hide or show the channel previews on the touch screen.

- **Show system status** - Disable or enable the system status screen. If disabled, system information like device IP address will not be available from the touch screen.
- **Allow control for network settings, configuration presets, Epiphan Edge, output port and SD card** - Enable or disable the ability to:
  - modify network settings
  - modify configuration presets
  - Enable/disable Epiphan Edge access
  - format output port and SD card.
  - If this check box is cleared and **Show System Status** is selected, users see an ***i*** icon instead of the configuration gears icon in the lower right corner of the touch screen.
- **Allow control for recording, streaming, and layout switching** - Enable or disable control for recording, streaming and layout switching. **Show preview** must be enabled for the touch screen for recording, streaming and live switching control to work.
- **Single touch control** - Select from the following:
  - **Default** - The Single Touch control screen is accessed by tapping the One Touch control icon at the bottom of the touch screen.
  - **Start screen** - The Single Touch control start screen displays automatically on the touch screen when you power on the Pearl device. Operators can still navigate to other screens from the Single Touch control screen by tapping the Home icon in the top right corner of the screen.
  - **Locked** - The Single Touch control start screen is the only screen that displays on the touch screen of the Pearl device. Operators cannot navigate to other screens from the Single Touch control screen.
- **Timeout** - Set the touch screen to shut off after a given amount of time. To re-enable the touch screen after it times out and shuts off, simply tap anywhere on the screen.
- **PIN** - Enable a 4-digit pin to lock the screen of the Pearl device.

Topics include:

- Disable or enable the touch screen
- Hide or show channel previews on the touch screen
- Disable or enable the system status screen
- Disable or enable configuration using the touch screen
- Disable or enable recording, streaming, and switching from the touch screen
- Set the Pearl device screen timeout
- Set a PIN security code

Disable or enable the touch screen

You can enable or disable Pearl devices from displaying anything on the touch screen. The touch screen remains touch-sensitive even when the display is disabled.

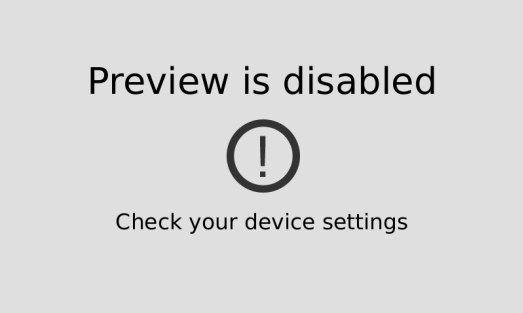
Disable or enable the touch screen display using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Touch Screen**. The touch screen configuration page opens.
3. Uncheck **Enable display** to disable the touch screen display. Check **Enable display** if you want the touch screen display enabled.
4. Click **Apply**.

Hide or show channel previews on the touch screen

Previews of your configured channels display on the touch screen by default. You can disable channel previews using the Admin panel.

A message displays on the touch screen when channel previews are disabled. If you have configured **system status** or **settings and configuration preset changes** to be allowed, then tapping anywhere on the touch screen opens the settings page.



Hide or show the channel previews on the touch screen using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Touch Screen**. The touch screen configuration page opens.
3. Uncheck **Show preview** to disable channel previews from displaying on the touch screen. Check **Show preview** if you want to enable channel previews on the touch screen.
4. Click **Apply**.

Disable or enable the system status screen

The system status screen displays network and system related information, such as the IP address needed to access the Pearl device. You may not want this information visible on the touch screen after you've configured the Pearl device. You can use the Admin panel to disable the system status screen from displaying on the touch screen.

Disable or enable the system status screen from displaying on the touch screen

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Touch Screen**. The touch screen configuration page opens.
3. Uncheck **Show system status** to prevent the system status screen from opening on the touch screen. Check **Show system status** if you want to enable the system status screen to open on the touch screen.
4. Click **Apply**.

Disable or enable configuration using the touch screen

You can apply configuration presets and configure network settings using the touch screen by default. You can disable this ability using the Admin panel.

If configuration is blocked and system status is permitted, touch screen users see an *i* icon instead of the configuration gears icon in the lower right corner of the touch screen.

Disable or enable configuration using the touch screen

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. Select the **Touch Screen** link in the Configuration menu. The touch screen configuration page opens.
3. Uncheck **Allow settings and configuration preset changes** to disable configuration from the touch screen. Check the check box if you want to enable configuration from the touch screen.
4. Click **Apply**.

Disable or enable recording, streaming, and switching from the touch screen

Recording, streaming, and live switching control using the touch screen is enabled by default. You can disable this function using the Admin panel to stop users from switching layouts and from starting or stopping live streams and recordings.

Channel preview must be enabled for the touch screen for recording, streaming, and live switching control to work. See **Hide or show channel previews on the touch screen**

Disable or enable recording, streaming, and switching control using the touch screen

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Touch Screen**. The touch screen configuration page opens.
3. Uncheck **Allow start/stop recording and streaming** to disable recording, streaming, and live switching control from the touch screen. Check the check box to enable recording, streaming, and live switching control.
4. Click **Apply**.

Set the Pearl device screen timeout

Initially, the Pearl device screen is always on for easy monitoring. However, you can set the screen to shut off after a given amount of time. To re-enable the screen after it times out and shuts off:

- Tap anywhere on the screen for Pearl-2 or Pearl Mini.
    - If the start screen is not set to locked mode and a screen timeout occurs, tapping the touch screen returns you to the last screen you were on before the timeout occurred.
    - If you set a 4-digit PIN when the start screen is in locked mode, a lock appears in the top right of the start screen after a timeout. You must enter the PIN to unlock the start screen for access to the touch screen.
- .

Set the screen timeout using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select Touch Screen (Front Screen for Pearl Nano). The Touch screen/Front screen configuration page opens.
3. Enter the number of seconds before the screen automatically shuts off in the **Timeout** field. A value of 0 keeps the screen on at all times when the system is on.
4. Click **Apply**.

Set a PIN security code

You can set a PIN code to protect the Pearl device screen from unauthorized access. By default, the PIN is not set.

If a PIN is configured, users are prompted to enter the PIN code whenever:

- You power on or restart the Pearl device.
- The Pearl device recovers from timeout mode, see Set the Pearl device screen timeout.

If you set a PIN when the start screen is in locked mode, a lock appears in the top right of the start screen. You must enter the PIN to unlock the start screen, access other screens, and use the Record and Stream Control keys to start and/or stop recording or streaming. When you return to the Single Touch control or CMS start screen, the Pearl device automatically locks itself and you must re-enter the PIN to unlock the screen.

If no PIN is set when the start screen is in locked mode, you can access the configured start screen right away. Anyone can quickly start/stop streaming and recording if the Single Touch control start screen is configured, or start/stop an event if the start screen is configured for Content Management System (CMS). However, no other screens are accessible using the Pearl device screen.

Set a device screen PIN security code using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Touch Screen** (**Front screen** for Pearl Nano) . The **Touch screen/Front screen configuration** page opens.
3. Enter a 4 to 12-digit PIN code in the **PIN** field, then click **Apply**. The Pearl Nano can only accept 4 digits.

Record the PIN code in a safe location for future reference. You need this PIN to access the Pearl device screen.

The Admin panel

The Admin panel is used primarily to set up Pearl-2 and perform administrative tasks. Most tasks in this user guide are performed using the Admin panel. This section contains what you need to get started using the Admin panel.

Topics include:

- About the Admin panel
- Connect to the Admin panel
- Enable local console access to the Admin panel
- Connect using a DNS-based service discovery
- Connect using persistent static IP address
- Switching / mixing using the Admin panel

For information about remote access to the cloud version of the Admin panel, see Remote login to the Admin panel and Epiphan Live.

For information about integrating Pearl-2 with Content Management Systems (CMSs) and related administrator tasks, see Integration.

About the Admin panel

The Admin panel is a web-based user interface that's used primarily to set up your Pearl device and perform administrative tasks.

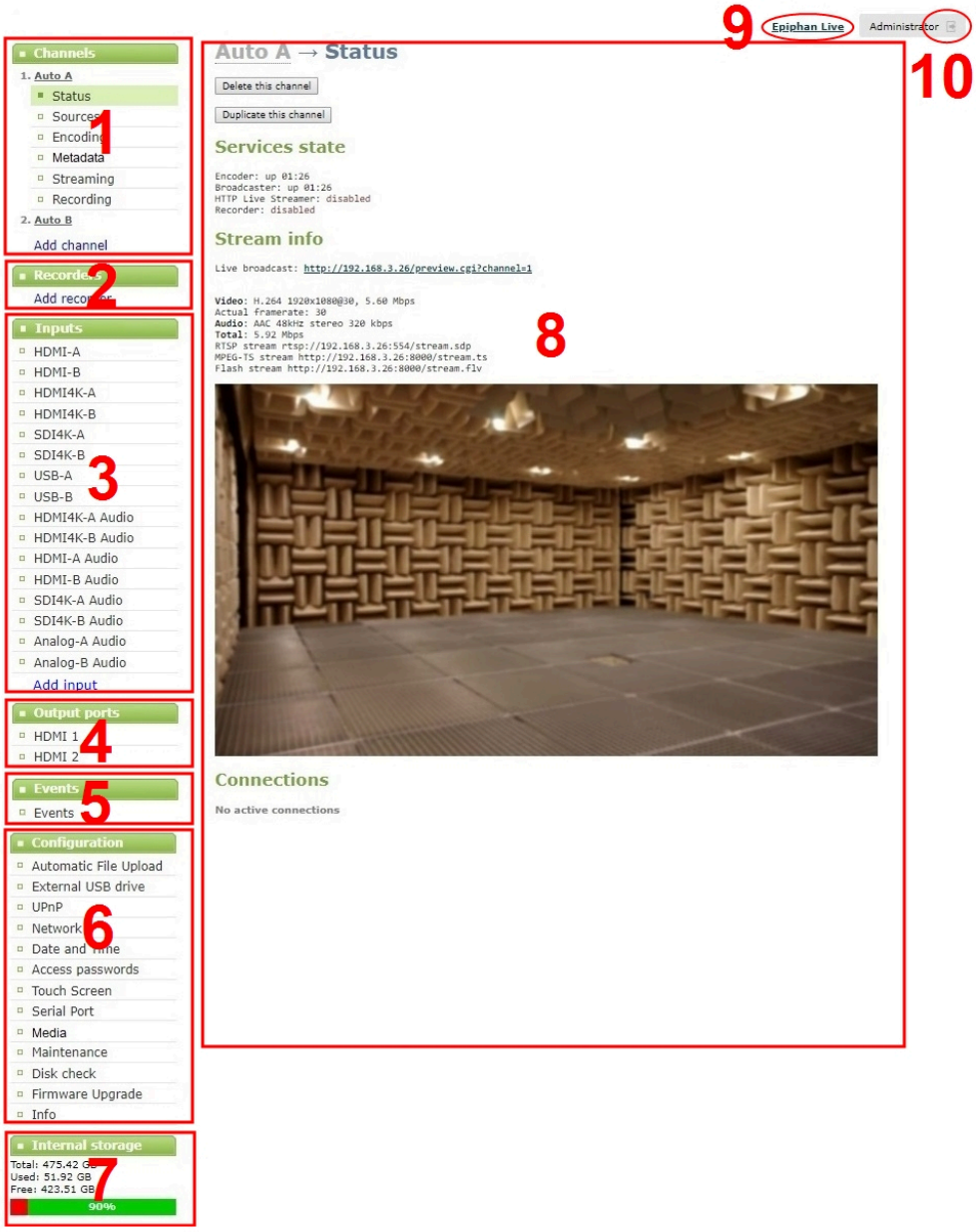


Table 14 The Admin panel

Label	Name	Description
1	**Channels** menu (**Channel** menu on Pearl Nano)	The channels that are available for the current configuration of your Pearl device are listed. Select a channel to access the drop down list of options that are available to configure channel encoding, add video and audio sources, create layouts, perform confidence monitoring, record the channel, and more.

Label	Name	Description
		The Pearl Nano has a single channel.
2	**Recorders menu**(Pearl Mini and Pearl-2 only)	Recorders you add to your Pearl device are listed. Select a recorder to open the status page and list of related recordings for that recorder. You can start and stop recording, as well as configure the recorder settings from this page.
3	**Inputs menu**	The available video and audio input ports on your Pearl device are listed. Select a port to open the configuration and status page for that port.
4	**Output ports menu**	The output ports available on your Pearl device are listed. Select a port to open the configuration and status page for that port.
5	**Events menu**	Access the Content Management System (CMS) events list containing up to three months of scheduled CMS events, in progress events, and completed ah hoc and scheduled events.
6	**Configuration menu**	A list of all the available configuration options.
7	**Internal storage and system information menu**	System details are displayed in this area, such as the total amount of internal storage, how much space is currently used, and how much free space is available.
8	**Main panel**	The main panel is where the selected menu information displays. What's displayed depends on which menu item you select.
9	**Link to Epiphan Live** (Pearl-2 and Pearl Mini only)	Click to open Epiphan Live in a new tab.
10	**Log out**	Click to log out of the Pearl admin panel. Click icon again to display the log in window. The role of the currently logged in user displays beside the icon.

You can access the Admin panel using these methods:

- Any web browser, see Connect to the Admin panel.
- Using a connected USB mouse, keyboard, and monitor, see Enable local console access to the Admin panel.
- Remotely using Epiphan Edge, see Remote login to the Admin panel and Epiphan Live.

Connect to the Admin panel

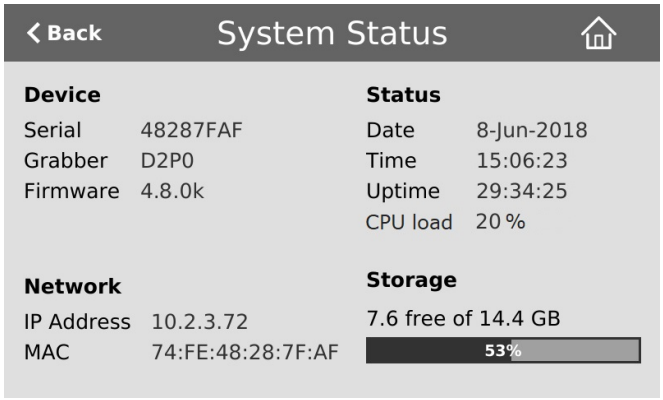
You can access the Admin panel several ways. The most common way is using an internet browser on a computer or tablet that's connected to the same local Ethernet network as Pearl device. All you need is the IP address of the device, which you can get from the settings using the Pearl device's front screen.

Another way to access the Admin panel is to remotely login over the Internet. An Epiphan Edge Pro plan is required for remote login, see Remote login to the Admin panel and Epiphan Live.

Get the IP address of Pearl Mini or Pearl 2

To get the IP address of Pearl Mini or Pearl 2, do one of the following:

- From a single channel view or grid view, tap the system settings (**gears**) icon, then tap **System Status**, or
- If your system doesn't have any channels showing, tap the touch screen anywhere to go to the system settings screen, then tap **System Status**.



Access the Pearl Admin panel

1. When you have the IP address of the Pearl device, enter the URL for your Pearl device into a web browser and include **/admin** to access the Admin panel.

http://<*IP Address of Pearl device*>/admin

If HTTPS is enabled on the Pearl device, replace *http* with *https* in the URL.

2. When prompted, log in using the default user name **admin** and the administrator account password, then click **OK**. If you don't know the password, contact your Pearl system administrator.

For a first-time log in as an administrator-level user, you're prompted to assign passwords to the **admin**, **operator**, and **viewer** accounts. Record the passwords for future reference.

Optionally, you can connect to your Pearl device using the following methods:

- For networks with DHCP, you can Connect using a DNS-based service discovery
- For networks without DHCP, you can Connect using persistent static IP address

Enable local console access to the Admin panel

Operators and administrators can access the Admin panel locally to reconfigure the Pearl device without needing a laptop. With the local console feature, you can connect a USB mouse, keyboard, and a monitor directly to Pearl device. Or you can connect a touch screen monitor. The Pearl device also supports connection of a USB wireless RF receiver for local console. Pearl Nano also supports the connection of a USB hub.

A built-in virtual keyboard is readily available, but you can also connect an external USB keyboard. When you enable local console, you must also enable the **External keyboard** option.

Use the Admin panel or the Pearl device screen to enable local console and the external USB keyboard. Once enabled, simply connect your USB mouse, USB keyboard, and an HDMI monitor to the HDMI OUT port that has local console enabled. You cannot use the HDMI pass-through port for local console.

Optionally, you can disable whether or not users must login to the Admin panel when they access the local console. Login is enabled by default.

You can also change the layout of the built-in and external keyboards to any of the supported languages. If you select multiple languages, you can toggle between languages using Ctrl+Shift (or Ctrl+Alt).

- American English
- Dutch
- French
- German
- Italian
- Netherlands
- Portuguese (European)
- Spanish (Spain)
- Swiss
- Norwegian (Bokmal)
- Russian

Important considerations

- Epiphan Live is not accessible from the local console.
- The live preview link is not accessible from the Channel Status page using the local console.

- You cannot upload/download the following types of media using the local console:
  - Images
  - Channel recordings
  - EDID files
  - Configuration files
  - Firmware update files

Use the web-based Admin panel from your administration computer for full access to all Admin panel functions.

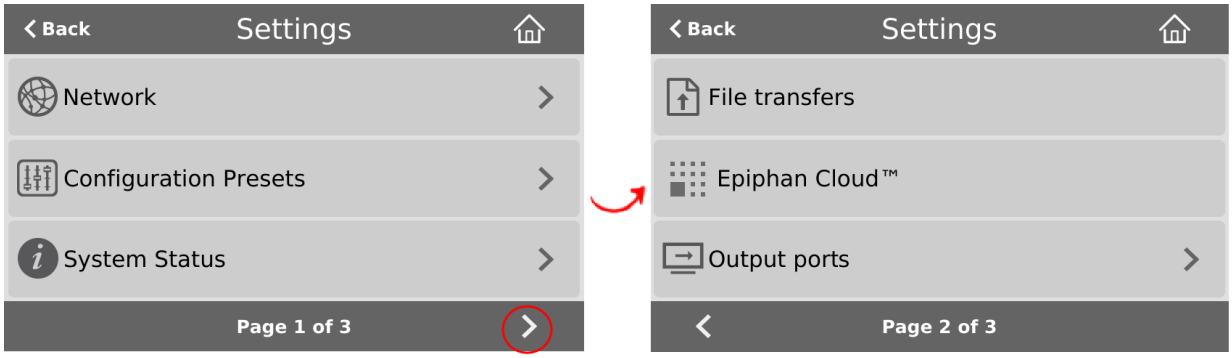
Enable local console and the external keyboard option using the Admin panel

1. Login to the Admin panel as **admin**, see Enable local console access to the Admin panel.
2. From the Configuration menu, select **External keyboard**. The External keyboard configuration page opens.
3. Select **Local console** as the Keyboard application and click **Apply**.
4. (Optional) Check a different keyboard language layout or multiple language layouts. The default layout is American English.
5. (Optional) Choose the keyboard key combination to toggle between keyboard layouts if multiple languages are selected: **Ctrl+Shift** or **Alt+Shift**.
6. From the Output ports menu, select the output port (**HDMI**)(**HDMI 1** or **HDMI 2** on Pearl-2). The video output port configuration page opens.
7. Under Settings, select **Local console** in the Source drop-down menu and click **Apply**.

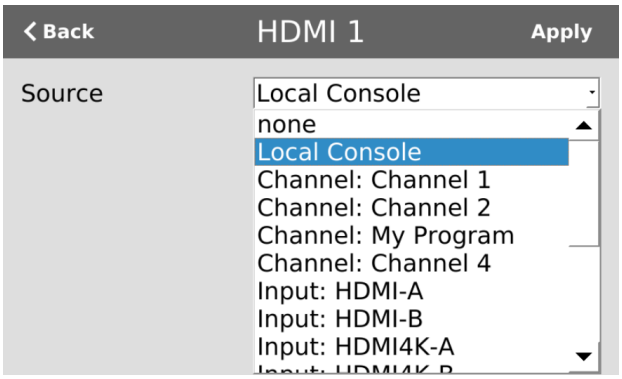
   If you skipped the steps to configure the external keyboard for local console, an error message appears. Click the link to fix it.
8. (Optional) Check **Disable authentication** if you don't want users to have to use their credentials to log in before using the local console to access the Admin panel on the Pearl device.
9. Under Settings, select **Local console** in the Source drop-down menu.
10. Click **Apply**.

Enable local console using the touch screen

1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.
2. Tap the arrow icon in the lower-right corner of the screen to go to the second Settings page.



3. Tap Output port(s) and select an output port.
4. From the Output port's screen, select **Local console** as the Source and tap **Apply**.



What's next?

Connect your USB mouse, keyboard, and connect an HDMI monitor to the output port that has local console enabled to access the local console directly from the Pearl device.

Connect using a DNS-based service discovery

Pearl devices use DNS-based messages to advertise details about itself, including its host name. With a compatible utility installed on your computer, you can access the system simply by typing its serial number and the suffix ".local" into the address bar of your browser.

The following table lists the compatible systems and Bonjour Print Services software needed.

Table 15 Install Bonjour Print Services

System	Action Needed
Microsoft Windows	You must install Bonjour Print Services: 1. Use the following URL http://support.apple.com/kb/DL999 2. Click Download. 3. Follow the system prompts to download and install the application.

System	Action Needed
Mac OS X	The Bonjour software used for service discovery is built into the Mac OS. No special actions are needed.
Linux	The Avahi implementation used for DNS-based discovery is shipped with most Linux distributions. If necessary, check with your administrator to ensure you have the Avahi package installed.

Access the Admin panel of the Pearl device using DNS discovery

1. Find the system's serial number that's printed on a label attached to the device. To find the system serial number using the device screen, do the following:
   - **Pearl-2 and Pearl Mini**: Tap the system information gear icon to display the System information screen. If needed, tap the screen once to display the control icons.
2. Enter the following string into the address bar of your web browser on your admin computer, where *<serial>* is the serial number of your Pearl device:

http://*<serial>*.local/admin

For example: http://95dd40d5.local/admin

If HTTPS is enabled on the Pearl device, replace *http* with *https* in the URL.

3. Log in as an administrator using the default user name **admin** and the administrator account password, then click **OK** to open the Admin panel. If you don't know the password, contact your Pearl system administrator.

For a first-time log in as an administrator-level user, you're prompted to assign passwords to the **admin**, **operator**, and **viewer** accounts. Record the passwords for future reference.

4. (Optional) From the Configuration menu, click **Network** and note the **IP address** of the system from the network configuration page.

Connect using persistent static IP address

Your Pearl device has a default persistent static IP address, also known as the **recovery IP address**. To set up a Pearl device on a network that does not support DHCP, or to recover from a previous static IP address setting, use this procedure to connect directly to the device for configuration.

A workstation computer with access rights to modify your network settings is required.

Pearl device static IP address defaults are:

- **IP Address**: 192.168.255.250
- **Netmask**: 255.255.255.252
- **Username**: admin
- **Password**: your admin password (by default there is no password assigned)

Access the Admin panel using the persistent static IP address

1. Establish an Ethernet connection between Pearl device and the workstation using one of the following methods:
   a. Connect the Pearl device to a local Ethernet network shared with the workstation.
   b. Connect the Pearl device directly to the workstation's Ethernet port using either a regular or a crossover Ethernet cable.
2. Record the network settings of the workstation that are used to connect to the Pearl device so that they can be restored later.
3. Temporarily change the network configuration on the workstation to the following:
   - Use Static IP assignment
   - IP address: 192.168.255.249
   - Subnet mask: 255.255.255.252
4. Start a web browser on the workstation and go to: **http://192.168.255.250/admin/**

   If HTTPS is enabled on the Pearl device, replace *http* with *https* in the URL.
5. Log in as an administrator using the default user name **admin** and the administrator account password, then click **OK** to open the Admin panel. If you don't know the password, contact your Pearl system administrator.

   For a first-time log in as an administrator-level user, you're prompted to assign passwords to the **admin**, **operator**, and **viewer** accounts. Record the passwords for future reference.
6. From the Configuration menu, click **Networking**.
7. Click **use a static address** and enter a static IP address and network settings you want for the Pearl device. For more information, see Configure network settings.
8. Restore the previously saved network configurations on the workstation.

Switching / mixing using the Admin panel

Switching live video inputs, or video mixing, is fast and easy using the Admin panel. For best results, you may wish to be in a location where you can see the live action, and have a solid understanding idea of what is in each of your layouts. Good layout names can help with this. See Rename a layout.

Performing live switching using one interface, like the Admin panel, does not dynamically update the visuals in the other interfaces (e.g. the touch screen and Epiphan Live). The other interfaces must be manually refreshed to accurately reflect the current live switching layout information.

Perform live video mixing

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Layouts**. The layout editor page opens.
3. In the layouts list, the layout with the big red circle beside it is the currently chosen "live" layout.

4. To switch to a different layout as the active "live" layout, click the gray circle beside the layout you want to make go live. The circle turns red to indicate that it's now the active "live" layout.

Epiphan Live

Epiphan Live is a friendly and easy to use web and tablet interface designed for confidence monitoring of channels and sources, switching between layouts while recording and streaming, and to easily stop or start streaming and recording.

Topics include:

- About Epiphan Live
- The Dashboard interface
- Access Epiphan Live using a web browser or mobile device
- Access Epiphan Live from the Admin panel
- Stream, record, and monitor using the Dashboard interface
- Switching / mixing using Epiphan Live
- Your recordings

For information about remote access to the cloud version of Epiphan Live, see Remote login to the Admin panel and Epiphan Live.

About Epiphan Live

The Epiphan Live interface lets you easily operate Pearl-2 using a computer or mobile device such as a tablet. You can:

- Control streaming and recording of channels and recorders.
- Do live switching between sources and layouts while streaming and recording.
- Perform video, audio and system confidence monitoring.

You need administrator or operator-level privileges to use Epiphan Live. See User administration for more information about user privileges.

Epiphan Live is supported on the following operating systems on mobile devices and web browsers:

Operating system or mobile device	Supported web browser(s)
Windows	• Google Chrome • Microsoft Edge
Mac	• Google Chrome • Safari
Linux	• Google Chrome
Android phone or tablet	• Google Chrome
iPhone or iPad	• Google Chrome • Safari

Most instructions assume that a touch screen device is used; however, you can tap or click, depending on your device.

Text scaling using Google Chrome for Android is not supported.

The Dashboard interface

The Dashboard interface is the first page you see when you open Epiphan Live. You'll find helpful tools for confidence monitoring, as well as streaming and recording control.

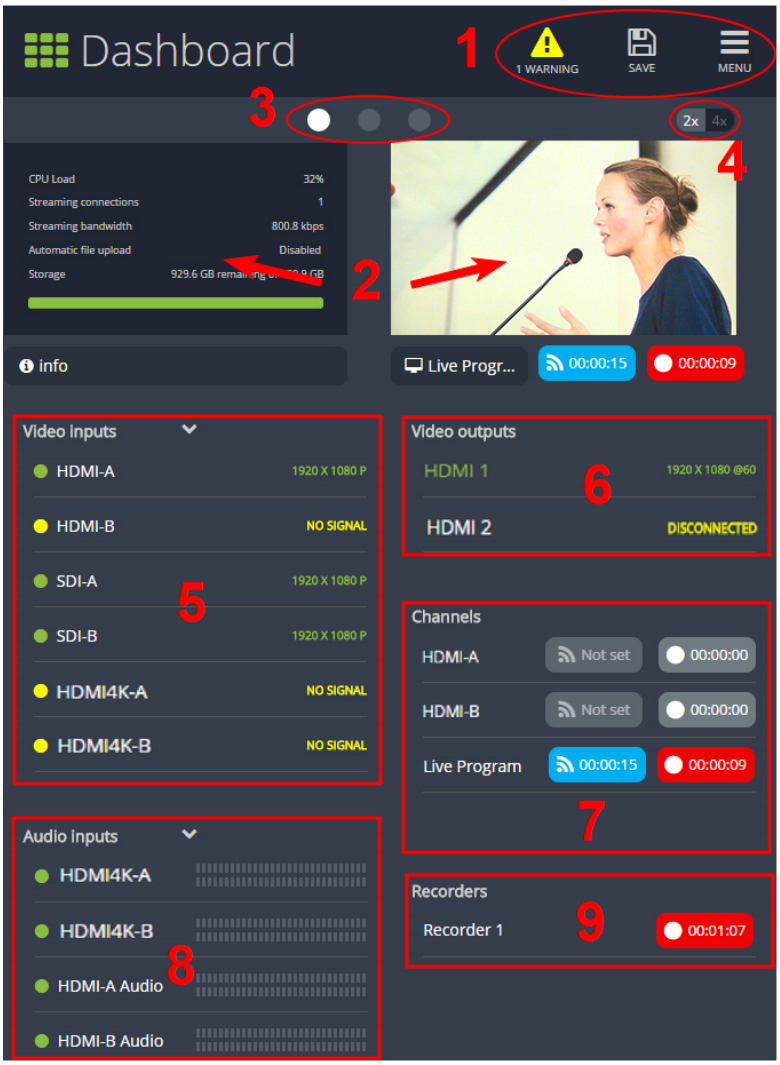


Table 16 Elements in the Dashboard interface

Number	Title	Description
1	**Dashboard header icons**	• **Warning** - This icon displays only if there are any configuration errors in your channels, sources, streams or recordings. Clicking the icon displays more detail about the errors. • **Save** - Save the current Dashboard layout.

Number	Title	Description
		Tap **Save** to preserve the current layout. Logged in operators and administrators will see the latest Dashboard layout when they refresh their Epiphan Live page. The latest saved layout displays the next time you log in. • **Menu** - Access links to the Switcher view, Recordings, and Admin panel.
2	**Dashboard monitoring panels**	Configurable panels for confidence monitoring. You can set each panel to display a source, channel, output, or basic system information. Panels are empty by default.
3	**Dashboard panel navigation icons**	Each dot represents a set of panels. Select a dot to navigate between the three different sets of Dashboard monitoring panels.
4	**Dashboard panel set quantity icons**	• **2x** - Changes the quantity of Dashboard panels per set to 2 (as in the screen shot above). • **4x** - Changes the quantity of Dashboard panels per set to 4.
5	**Video inputs**	Displays a list of your video inputs configured in the Admin panel and includes basic status information for each input.
6	**Video outputs**	Displays a list of your video outputs configured in the Admin panel and includes basic status information for each output.
7	**Channels**	Displays a list of your channels configured in the Admin panel and includes streaming and recording control buttons for each channel, as well as individual control buttons for each stream when you set up multiple streams in a channel.
8	**Audio inputs**	Displays a list of your audio inputs configured in the Admin panel. Includes basic status information and a VU meter for each input.
9	**Recorders**	Displays a list of your recorders configured in the Admin panel and includes a recording control button for each recorder.

Access Epiphan Live using a web browser or mobile device

You can open Epiphan Live using a web browser on your Windows, Mac, or Linux computer. You can also use Epiphan Live on an Android phone or tablet, an iPhone, or an iPad.

You need the IP address of Pearl-2 to connect to Epiphan Live, see Connect to the Admin panel.

1. Enter the following into the address bar of your web browser.
   a. For a web browser on a computer, enter:

      http://<IP address of your Pearl device>/admin/m

   b. For a web browser on a mobile device, enter:

      http://<IP address of your Pearl device>

2. Enter your administrator or operator credentials when prompted.

Some versions of Chrome and Microsoft Edge don't display channel previews from the Dashboard if you're on an HTTPs network and your website has an insecure or invalid security certificate, even after you update the security certificate. Use a different web browser such as Firefox or update the version of your web browser, then add the security certificate for the website to the exceptions list.

Access Epiphan Live from the Admin panel

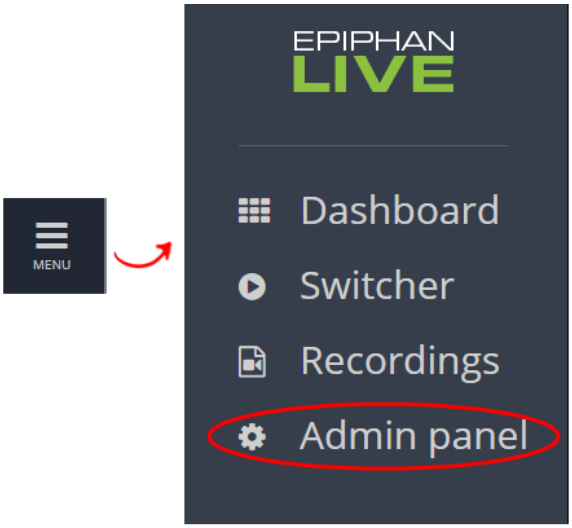
You need the IP address of Pearl-2 to log in to the Admin panel for this procedure, see Connect to the Admin panel.

1. Log in to the Admin panel using your credentials. In your web browser, enter:

   http://<IP address of Pearl-2>

2. Click **Epiphan Live** in the upper-right corner of the Status page for the channel. The Epiphan Live dashboard opens in a new tab.

To open the Admin panel from Epiphan Live, click the **Menu** icon in the upper-right corner of the Dashboard or Switcher interface, and then click **Admin panel**.



Stream, record, and monitor using the Dashboard interface

The dashboard in Epiphan Live is where you can do confidence monitoring, as well as start and stop streaming and recording for your channels.

Topics include:

- Configure Dashboard panels
- Monitor video and audio input sources using Epiphan Live
- Monitor and select the video output source using Epiphan Live
- Control streaming and recording using Epiphan Live

Configure Dashboard panels

You can customize each Dashboard panel to display a specific channel, input source, or video output for live confidence monitoring. Panels can also be set up to display system information:

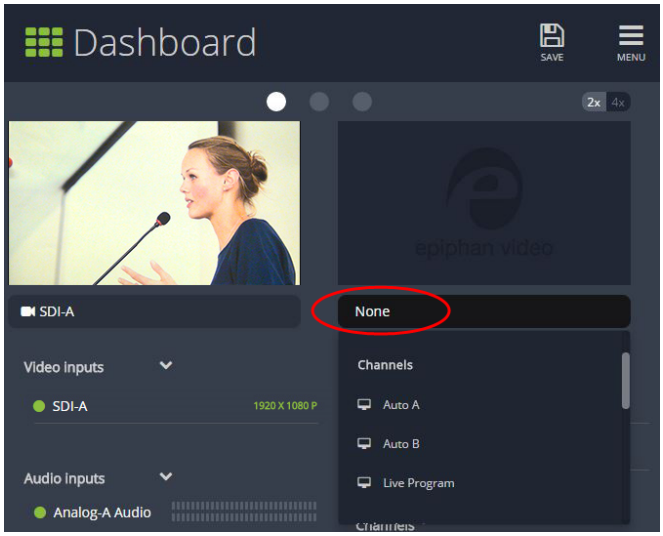
- CPU load (%)
- Quantity of streaming connections
- The current streaming bandwidth (bitrate)
- Automatic file upload status (enabled or disabled). see Automatic file transfers.
- Storage available on Pearl-2.

Other logged in operators and admins must refresh their web browsers to see the latest changes to the Dashboard.

Up to 8 Epiphan Live preview panels can be open at the same time on Pearl devices. This limit live preview panels applies **across all open instances of Epiphan Live**, including multiple users accessing Epiphan Live simultaneously from different web browsers, or duplicate instances of the same Epiphan Live interface open on multiple browser tabs at the same time.

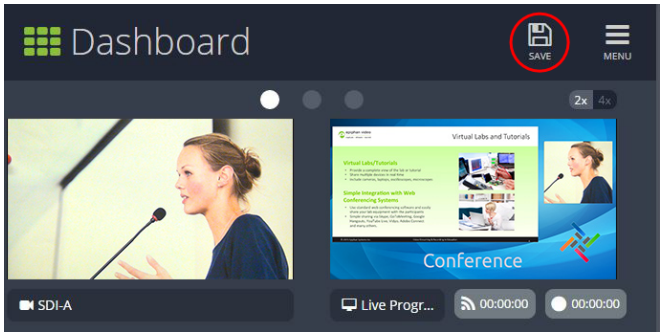
Configure Dashboard panels

1. Log in to Epiphan Live (see Access Epiphan Live using a web browser or mobile device).
2. Tap the drop-down menu that appears below the panel and select the channel, source, or output to display. The label says "None" if the panel is not yet configured.



When a channel is selected, streaming and recording control buttons appear below the panel. You can control streaming and recording of that channel using those buttons.

3. (Optional) To choose between displaying 2 or 4 panels, tap the **2x|4x** icon that appears in the upper-right corner of the panels area.
4. Tap **Save**.



You can navigate between separate sets of Dashboard panels by selecting the **circle icons** along the top of the first row of panels.

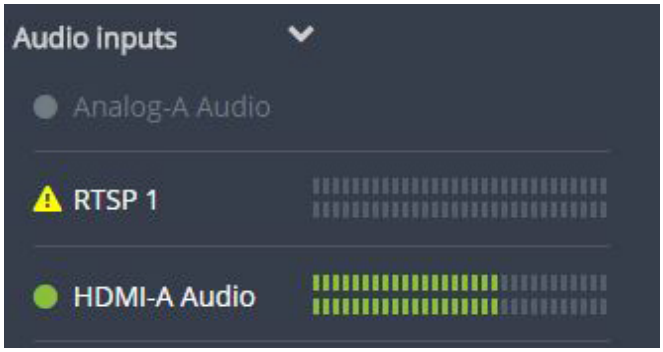
Monitor video and audio input sources using Epiphan Live

Use the Dashboard to monitor your video and audio inputs. The video inputs section of the Dashboard lists all inputs and displays the video resolution.

- A **green dot** means that the video source is connected and a signal is received.
- A **yellow dot** means that a signal is not being receiving from the source.
- A **triangular warning icon** means there is a source configuration issue that needs attention.

Tap the name of a video input to open the source details in a thumbnail view, including warning information if applicable.

The configured audio inputs appear in the **Audio inputs** section of the Dashboard.



- A **grayed-out audio source** means that the audio source is not used in any channels.
- A **triangular warning icon** means there is a source configuration issue that needs attention. Click the audio source name to display the warning message.
- A **green dot** means the source is connected and the accompanying VU meter shows the audio level.

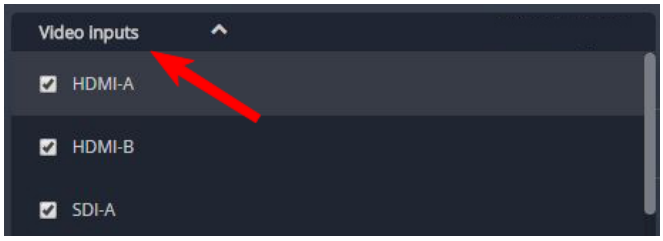
The audio VU meter uses quasi-peak ballistics with samples averaged every 10 ms. The maximum average in each 100 ms period is displayed as a series of colored bars. The following table describes the levels at which the meter changes from green to yellow and red.

Table 17 Audio VU meter levels

Color	Decibel range
Red	0 to -9 dBFS
Yellow	-9 to -18 dBFS
Green	-18 dBFS and lower

Show or hide inputs in the list

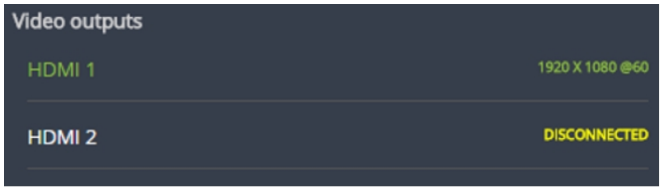
You can pick which video inputs display in the Dashboard view. Just tap the **Video inputs** or **Audio inputs** header and then check the **checkbox** next to the name of each source you want showing in the Dashboard view. Tap **Save** when you're done. The Dashboard input list updates automatically.



Monitor and select the video output source using Epiphan Live

The Dashboard lists the output ports along with the resolution and frame rate. You can select a channel or a video source to display on the video output port using Epiphan Live. You can also enable or disable audio for the

output port. To configure the video output port using the Admin panel, see Set up the video output port using the Admin panel.



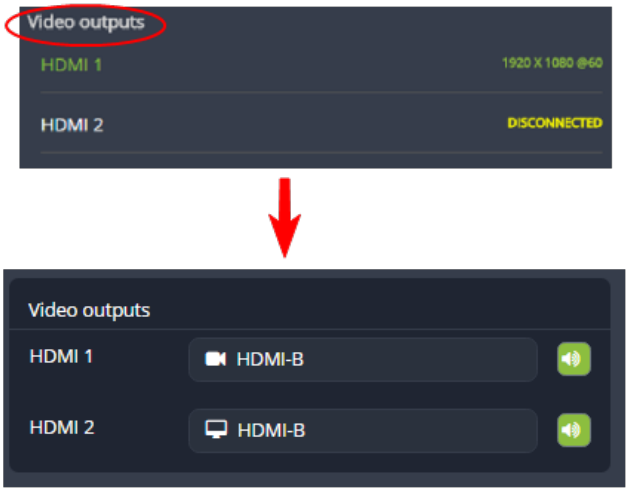
- **Green text** means your output is connected and transmitting to your external display.
- **Grayed-out text** means the output port is disabled.
- **White text** means the output port is enabled but is not connected to an external display.

Click **the name of a video output** to open the port's details in a thumbnail view.

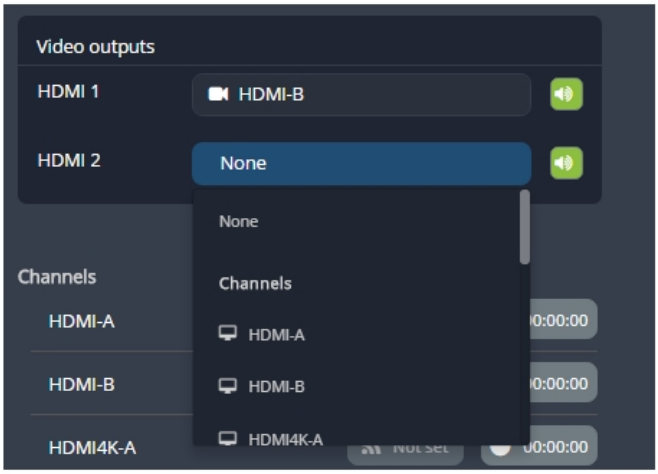
By default, video output ports are configured to maintain aspect ratio, use the display's default resolution, include audio at 100% and they don't include the audio VU meter. You can change these defaults in the Admin panel. See **Video output ports** to learn more about advanced-level video output configuration using the Admin panel.

Select a video source for the output port and enable or disable audio

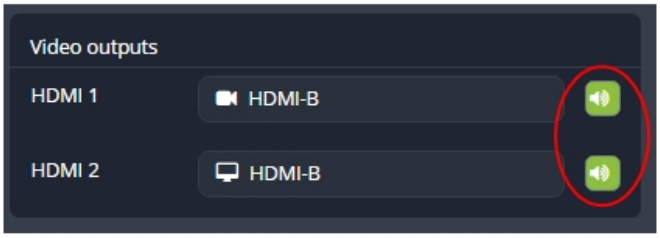
1. Tap **Video outputs** to display the video output configuration menu.



2. Tap the **text field beside the output port** and select a channel or source from the list.



3. To enable or disable audio for the output port, tap the **speaker icon** to toggle audio On and Off for the port. A green icon means audio is enabled. A gray icon means audio is disabled.

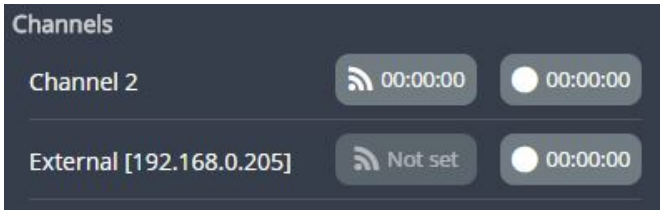


Control streaming and recording using Epiphan Live

From the Epiphan Live Dashboard, you can control streaming and recording for channels using the buttons in the **Channels** section. When a channel is not currently streaming or recording, the buttons are gray and their

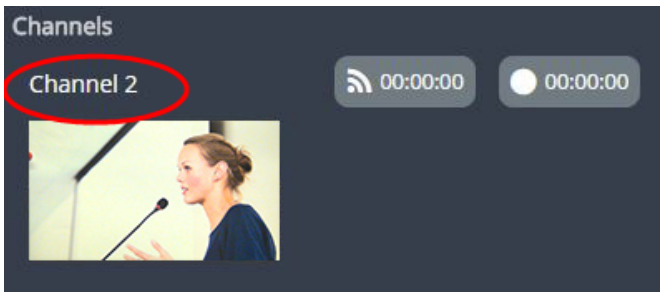
respective timers are set to 00:00:00. If streaming isn't configured for a channel, the streaming button displays as **Not set**.

- The left-most button with the "signal" icon starts and stops streaming for the channel.
- The right-most button with the circle icon starts and stops recording for the channel.



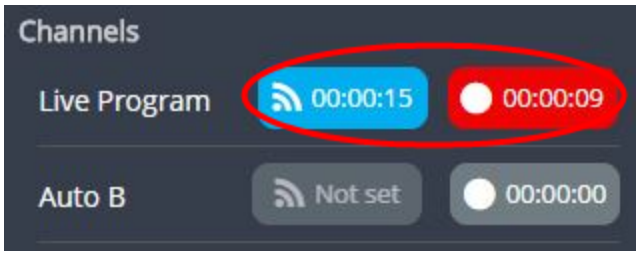
If multiple streams are configured for a channel, a pair of control buttons is displayed for each stream.

Click the channel name to open a preview thumbnail view.

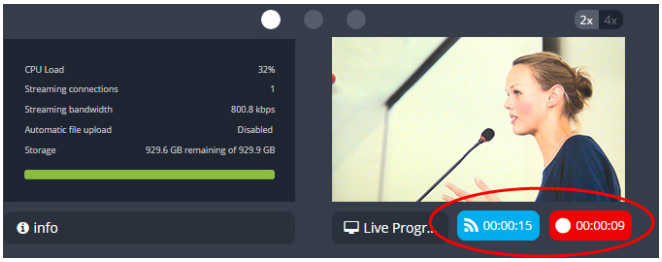


When you're ready to start streaming and recording the channel, tap the streaming and recording control buttons. Tap the buttons a second time to stop streaming and recording.

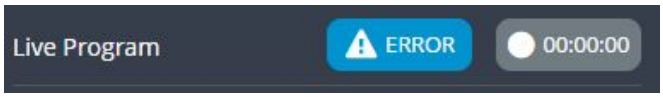
- The streaming button turns blue when the channel is streaming and the timer's clock increments.
- The recording button turns red when the channel is recording and the timer's clock increments.



Streaming and recording control buttons also appear below the Dashboard monitoring panels when they're configure to display a channel. You can use those control buttons to start and stop streaming or recording for a channel too.



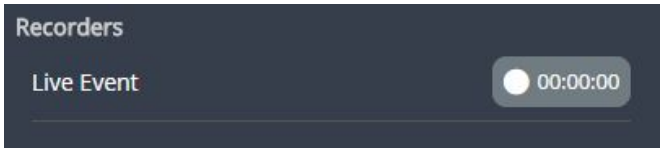
If the stream fails to publish, the streaming button flashes blue and displays **ERROR**. Check the streaming settings for your channel using the Admin panel.



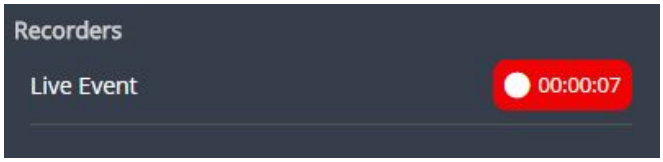
Recording using multi-track recorders

From the Admin panel, you can create multi-trackRecorders to capture multiple channels and audio sources in a single recording. You can then select which combination of video and audio sources to extract from the recording. This feature is useful when you're capturing a video source and multiple languages from different audio sources. Multi-track recorders appear on the Dashboard if they are configured on Pearl-2.

Each multi-track recorder has a recording control button to start and stop recording. When a Recorder is not recording, the button is gray and the timer is set to 00:00:00. See Add a recorder to learn more about configuring multi-track recorders using the Admin panel.



To start recording, simply tap the recording control button for that multi-track recorder. The button turns red when the multi-track recorder is recording and the timer's counter increments. Tap the button a second time to stop recording.



Switching / mixing using Epiphan Live

The Live Switcher view in Epiphan Live is a simple interface that lets you live switch between layouts while streaming and recording. To learn how to create different layouts for a channel using the Admin panel, see Configure a custom layout for a channel.

Switching between layouts using one of the switcher interfaces does not dynamically update what you see in the other switching interfaces (i.e. Epiphan Live and the Admin Panel). You must manually refresh the other interfaces separately to reflect the current state.

Topics include:

- About the Switcher interface
- Switching while live streaming and recording using Epiphan Live

About the Switcher interface

Access the Switcher interface from the Menu button in the top right corner of the Dashboard interface. SeThe Dashboard interface.

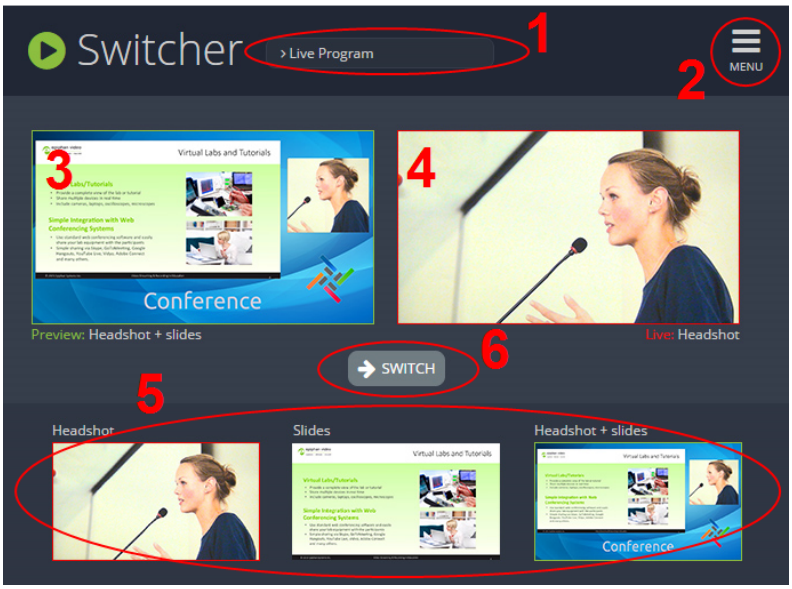


Table 18 Elements in the Switcher view

Number	Title	Description
1	**Channel selector**	The list of channels configured on Pearl-2. Select a channel and switch between the different layouts that are configured for that channel.
2	**Menu icon**	Displays links to the Dashboard view and the Admin panel when clicked.
3	**Preview panel**	Displays a preview of a selected layout, which is outlined with a green border. When you click the **Switch** button, this preview layout becomes the live layout. See Switching while live streaming and recording using Epiphan Live for more information.
4	**Live view**	Displays the active "live" layout that is currently being streamed or recorded. The

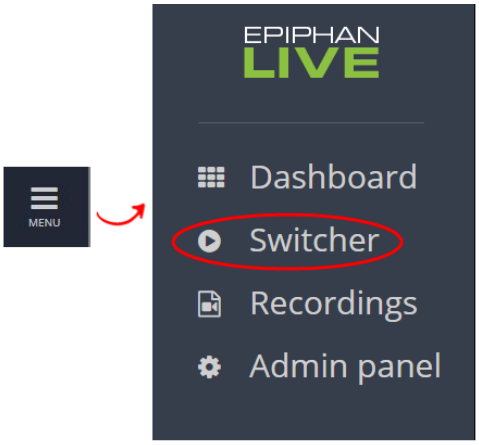
Number	Title	Description
	panel	live layout is outlined with a red border. When you select the **Switch** button, this live layout is replaced with the layout that's loaded in to the **Preview panel**.
5	**Layout carousel**	Displays small previews for all layouts contained within your selected channel. Select a layout from the carousel to add it to the **Preview panel**. Note that the layout selected for the **Preview panel** has a green border and the layout in the **Live panel** has a red border.
6	**Switch button**	When selected, the layout in the **Preview panel** replaces the layout in the **Live panel** and is immediately reflected in your active stream and recordings.

Switching while live streaming and recording using Epiphan Live

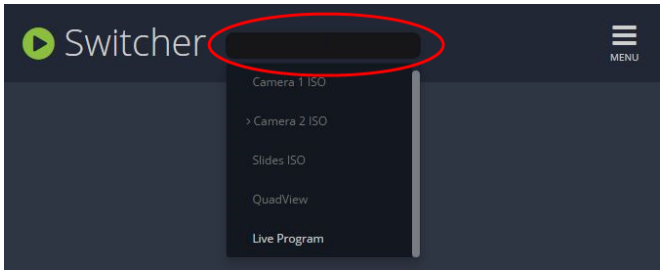
The Switcher interface lets you easily live switch between custom layouts with a simple click.

Switch layouts while live streaming and recording

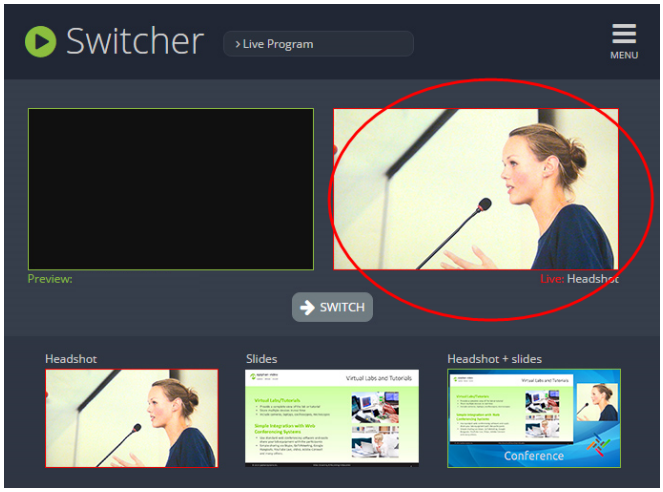
1. Log in to Epiphan Live. The Dashboard view opens by default. See Access Epiphan Live using a web browser or mobile device.
2. Tap the **Menu** icon in the upper-right corner of the Dashboard screen and tap **Switcher** to open the Switcher interface.



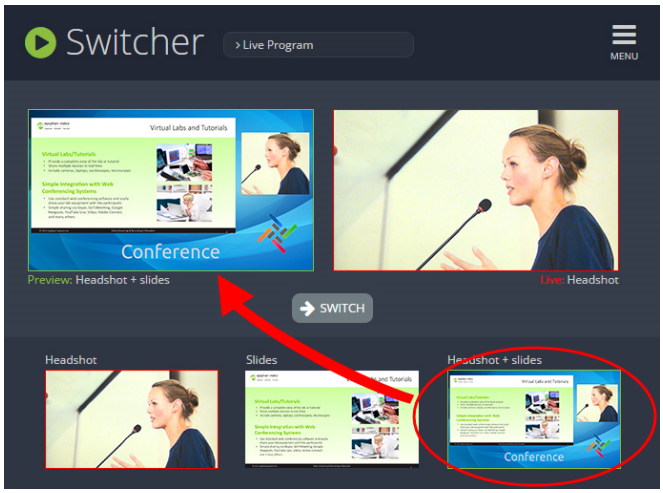
3. Tap the **field** beside the "Switcher" header and select a channel. The field is blank if this is your first time configuring the Switcher. Channels with only one layout are grayed-out and cannot be selected for switching.



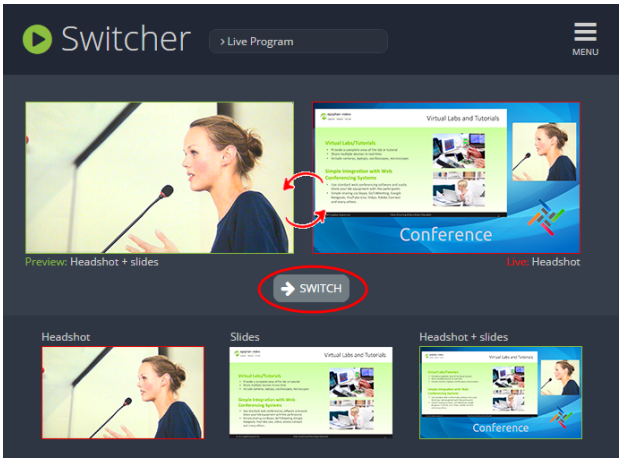
All the layouts for the selected channel are displayed in a carousel along the bottom of the screen. The layout that is live is displayed in the **Live panel** on the right side of the interface, see About the Switcher interface.



4. In the carousel, tap the layout that you want to switch to next. That layout is loaded into the **Preview panel**.



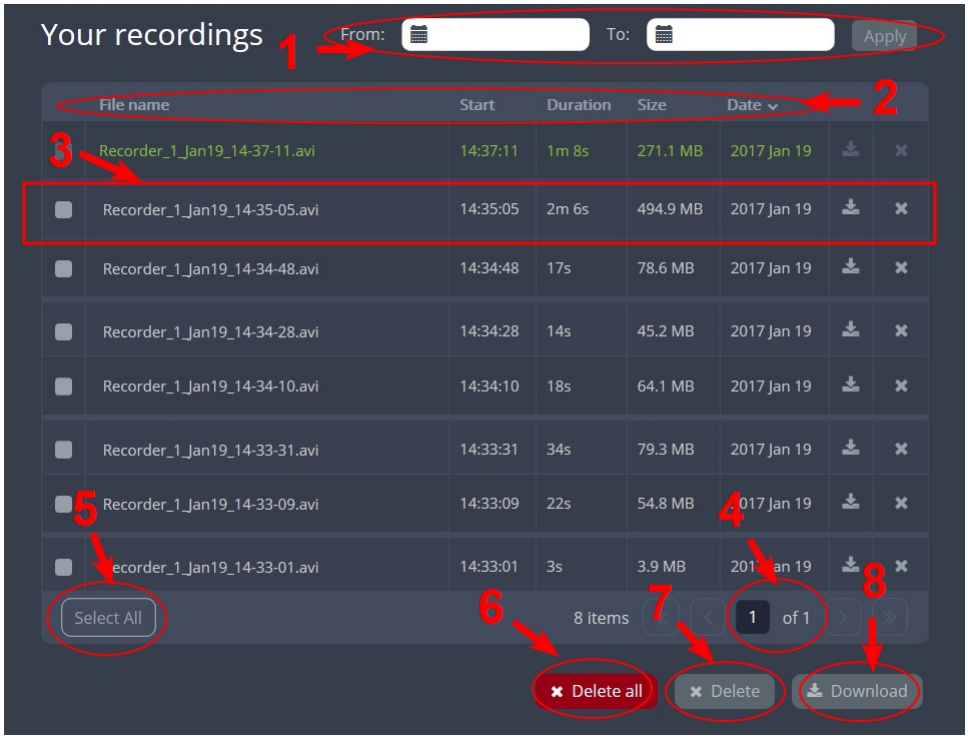
5. Tap the **Switch** button to switch the layout that is currently in the **Preview panel** to the **Live panel**. The layout that was in the Live panel moves to the Preview panel so that it's ready for the next time you switch.



6. To load a different layout into the Preview panel, tap another layout in the carousel.

Your recordings

All recordings made using Epiphan Live are saved to the **Your recordings** panel.



After recoding a file, you can manage it and any other files using the following tools on the page:

Number	Title	Description
1	**Date**	Select a **From** and a **To** date from the pop-up calendar to create a date range.

Number	Title	Description
	selector	Then tap **Apply**. Only recordings that were recorded within that time frame appear in the list below.
2	**File details**	Each heading in the list gives information about that category. Selecting **Date** organizes the list chronologically by the date the recording began.
3	**Files**	Each recorded file that falls within the search parameters appears in this list, including important metadata about the file. Tap or click on the file selects it so that it can be managed through the other tools on the page. You may also download or delete an individual file by using the action items at the end of the file line. Tap the file name to rename the file.
4	**Page indicators**	The page number indicates which page of results you are currently viewing, and how many pages of results are there. The buttons allow you to move between pages one at a time, or straight to the beginning or end of the list. You can also change which page you are on by typing a valid page number into the text box.
5	**Select all**	Tap to select all files on the page.
6	**Delete all**	Tap to delete all files on the list. **Warning**: Deleted files can not be recovered.
7	**Delete**	Tap to delete all selected files. **Warning**: Deleted files can not be recovered.
8	**Download**	Click this button to download all selected files to your local hard drive.

Cloud-based device management

Epiphan Edge is where remote teams can conveniently manage and control all Pearl devices together in one place. An Internet connection and a free Epiphan Cloud account is all you need to get started.

When Pearl-2 is paired with your Epiphan Cloud account, you can start/stop video recording and streaming, monitor the health of Pearl-2 with status alerts and a diagnostics dashboard, monitor video feeds, update firmware remotely, and even remotely configure channel encoding.

Topics include:

- About Epiphan Edge
- Enable or disable Epiphan Edge access
- Pair and unpair from Epiphan Edge
- Remote login to the Admin panel and Epiphan Live

For more information about Epiphan Edge, see the Epiphan Edge User Guide.

About Epiphan Edge

Epiphan Edge is your remote management and control center for all your Pearl devices. All you need is a free Epiphan Cloud account.

After you pair you Pearl devices with your Epiphan Cloud account, you can access Pearl devices from anywhere there's an Internet connection. You can even invite others to join your team for easy remote access.

Using Epiphan Edge you can:

- Preview video sources and audio.
- Start/stop channel recording and streaming remotely.
- Remotely configure channel encoding.
- Create live streams.
- Monitor performance statistics and system alerts 24/7.
- Set up custom email alerts.
- Set up remote teams and assign team members access and control levels.
- Perform updates and batch operations for efficient fleet management.
- Remotely log in to cloud versions of the Admin panel for remote rescue troubleshooting, full administration access, and to control recording and streaming using the Admin panel. You can also control switching with Pearl-2 and Pearl Mini.

For more information about Epiphan Edge features and functions, see the online Epiphan EdgeUser Guide.

Important considerations

- The following actions cause a Pearl device's entry in Epiphan Edge to permanently go offline. You must pair Pearl devices again to remotely control, monitor, or configure Pearl devices using Epiphan Edge.
    - Unpairing Pearl devices in Epiphan Edge.
    - Using the Admin panel to disable the Epiphan Edge feature on a Pearl device while the device is paired to Epiphan Edge.
- If you pair a Pearl device again after you have successfully unpaired from Epiphan Edge, a new device instance is created in Epiphan Edge. The previous instance for the Pearl device remains permanently offline.
- Some features like batch operations and remote login require the Epiphan Edge Premium plan.

Enable or disable Epiphan Edge access

Epiphan Edge is where you go to remotely manage and control all your Pearl devices. Access is enabled on Pearl devices by default. All you need to do is pair the Pearl device to your free Epiphan Edge account for access to your device over the Internet. You can disable Epiphan Edge access on Pearl device from the device screen or using the Admin panel and enable it again later. Access is enabled by default.

Important considerations

- Unpair the Pearl device from Epiphan Edge before disabling Epiphan Cloud access on the Pearl device using the Admin panel.

- If you disable Epiphan Edge access while the Pearl device is paired, the device instance in Epiphan Edge goes permanently offline. For more information, see Pair and unpair from Epiphan Edge.

Enable or disable Epiphan Edge access using the Admin panel

1. Log in as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance**. The Maintenance page opens.
3. Uncheck **Enable Epiphan Edge** to disable the feature or leave it checked to allow the Pearl device to access Epiphan Edge. Click **Apply** to save your changes.

Enable or disable Epiphan Edge access using the touch screen on Pearl-2 or Pearl Mini

1. Tap the **gear** icon on the touch screen to open the system **Settings** screen. If the control icons aren't showing, tap anywhere on the touch screen.
2. Tap the arrow icon in the lower-right corner of the screen to go to the second **Settings** page.
3. Tap **Epiphan Edge**. The Epiphan Edge settings page shows the status as enabled and displays a pairing code by default.
4. Uncheck **Enable Epiphan Edge** to disable the feature or leave it checked to allow the Pearl device to access Epiphan Edge.

Pair and unpair from Epiphan Edge

To manage your Pearl devices from the cloud or access the Admin login feature, the Pearl devices must be paired to your Epiphan Cloud account.

Easily pair the Pearl devices directly from the Admin panel or add a Pearl device as a new device in Epiphan Edge using the Pearl device's device ID paring code. To manually pair a Pearl device in Epiphan Edge using the device's pairing code, see the Epiphan Edge online user guide.

You can see if the Pearl device is currently paired using the touch screen when you tap the **Settings** gear icon and select **Epiphan Edge** from the second page of options. A pairing code displays if Epiphan Edge access is enabled and the device is not paired. To enable Epiphan Edge access, see Enable or disable Epiphan Edge access.

You can unpair from Epiphan Edge using the Admin panel or directly within Epiphan Edge. Each time you unpair the Pearl device, the device ID pairing code changes value. When you pair the Pearl device again, a new instance of the Pearl device with a different device ID is created in Epiphan Edge.

If you unpair from Epiphan Edge using the Admin panel, the Pearl device's status in Epiphan Edge only changes to the offline state. To completely unpair the Pearl device from Epiphan Edge, you must use Epiphan Edge to unpair your Pearl device.

Important considerations

- The Pearl device's entry in Epiphan Edge permanently goes offline when you unpair. You must pair the Pearl device again to use Epiphan Edge to remotely manage or log in to the Pearl device.
- If you pair the Pearl device again after you have successfully unpaired from Epiphan Edge, a new device instance is created in Epiphan Edge. The previous instance for the Pearl device remains permanently offline, which you can delete at any time.

You can still access information about permanently offline device instances in Epiphan Edge.

Pair and unpair Pearl devices using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Epiphan Edge**. The Epiphan Edge status page opens. The pairing code device ID for the Pearl device is shown, as well as a link to pair the device.
3. Select **Click to pair**. The Epiphan Cloud login page opens in a new tab (https://go.epiphan.cloud)
4. Log in to your existing Epiphan Cloud account or sign up for a free account.
5. After you've logged in to Epiphan Cloud, your Pearl device automatically pairs to your default Epiphan Cloud team and the Device Details page opens in Epiphan Edge. If you have multiple teams associated with your account, you're prompted to select a team.
6. In the Admin panel, the status of the Pearl device updates to **paired** on the Epiphan Edge status page.
7. To unpair a Pearl device using the Admin panel, select **Unpair** on the Epiphan Edge status page.

Get the pairing code for Pearl-2 or Pearl Mini using the touch screen

1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.
2. Tap the arrow icon in the lower-right corner of the screen to go to the second Settings screen.
3. Tap **Epiphan Edge** to open the Epiphan Edge screen.
    a. If a Pearl device is not currently paired to Epiphan Edge, the pairing code displays on screen.
    b. If the Pearl device is paired to Epiphan Edge, the screen changes and displays the option to **Unpair** instead of the pairing code.

Remote login to the Admin panel and Epiphan Live

You can remotely log in to the Pearl device for full administration access to configure and operate the Pearl device over the Internet using a cloud version of the Admin panel and Epiphan Live. You just need to pair the Pearl device to an Epiphan Cloud account that has a Premium plan.

With an Epiphan Edge Premium plan, full administrative access to your Pearl device for setup and rescue troubleshooting is fast and convenient. The cloud version of the Admin panel uses the same login credentials as the locally accessed web version.

Anyone on your team can remotely control live switching and recording using the cloud version of Epiphan Live. Epiphan Live also uses the same login credentials as the locally accessed web version of the Admin panel

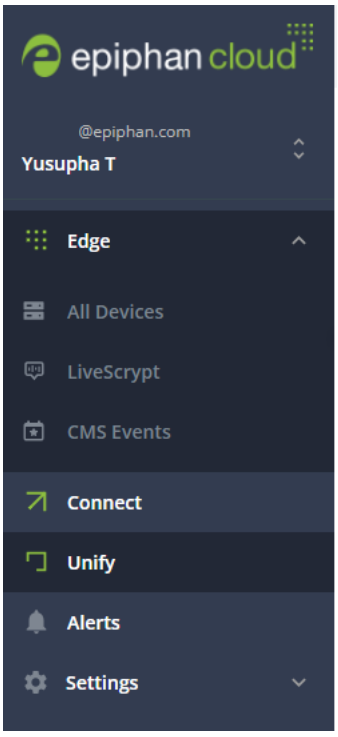
The URL of the local web version of the Admin panel and Epiphan Live are not the same as the URL of the cloud version. An Epiphan Edge Premium plan is only required to access the cloud version.

Before you begin

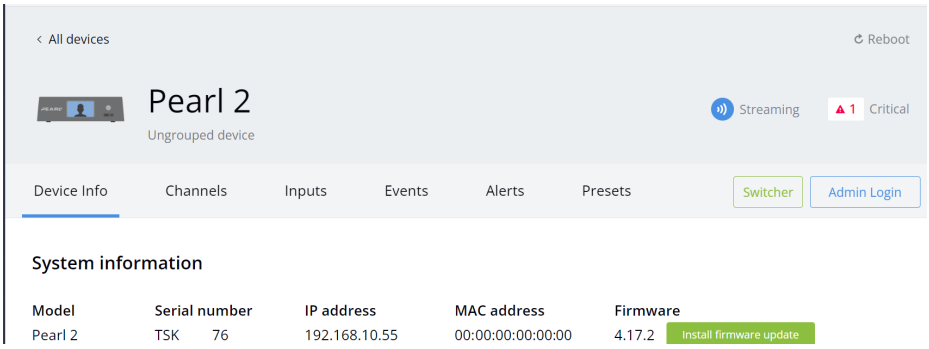
- Make sure the Pearl device is paired to your Epiphan Edge account, see Pair and unpair from Epiphan Edge.
- Upgrade to an Epiphan Edge Premium plan.

Access the cloud version of the Admin panel and Epiphan Live

1. Log in to your Epiphan Edge account at https://go.epiphan.cloud
2. In the left navigation pane, click **Edge > All Devices** to open the All Devices page.



3. Click the device name in the list to open the details page for that device.
4. From the Device Details page, click **Admin login** in the header bar. A new tab with the cloud Admin panel login opens in your browser.



5. Enter your Admin panel login credentials to log in to the cloud version of the Admin panel for that device. The default administrator user name is **admin**.

See The Admin panel andEpiphan Live for instructions to use the interface or to access the local web version.

Setup

This section contains tasks that are needed to get Pearl-2 configured.

Topics include:

- Rackmount installation
- User interfaces and remote access
- Configure network settings
- Configure network security
- Configure date and time
- Configure device info, name, description, and location
- Audio input ports
- Video output ports
- Feature add-ons
- Connect an external keyboard
- Connect a USB status light
- Configuration presets
- User administration
- Status and monitoring

For information about integrating with Content Management Systems (CMSs) like Panopto and related administrator tasks, see Integration.

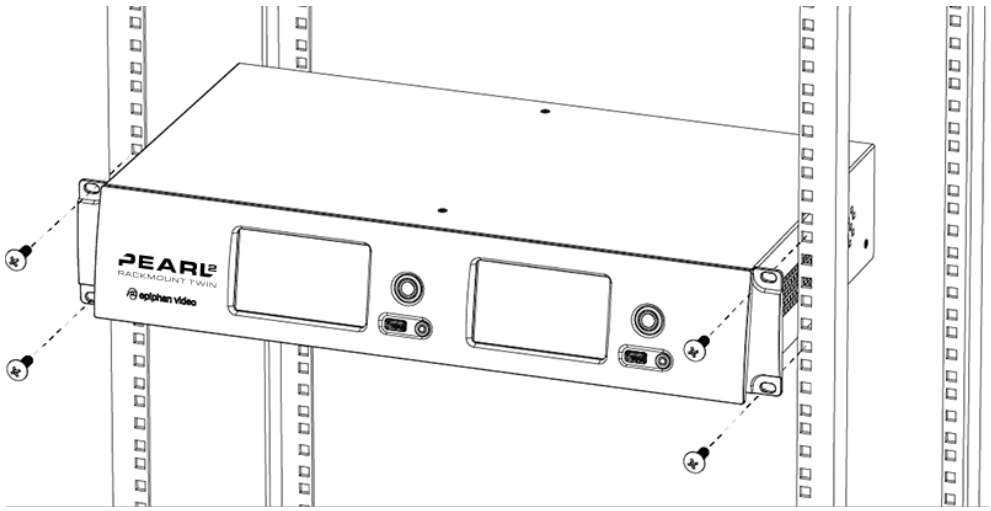
Rackmount installation

All Pearl-2 models can be used in desktop mode, with the system placed on any flat, stable surface. They are also all rackmountable into fixed racks or portable rack cases like the one depicted below.

If you purchased Pearl-2 Rackmount or Pearl-2 Rackmount Twin, you can install your system directly into a 19-inch rack. For the smaller, portable Pearl-2 model, you can purchase our optional rackmount shelf for installation in a rack. (Instructions for the rackmount shelf are included with the shelf.)

To install Pearl-2 Rackmount or Pearl-2 Rackmount Twin in a 19-inch rack:

1. Ensure you have the correct bolts needed for your rack (not included). Pearl-2's rackmount holes are sized to work with both threaded and non-threaded mounting systems.
2. Carefully slide the system into and available 2U space in your 19-inch rack.
3. Attach four bolts as shown below.



Configure network settings

Pearl devices use DHCP to obtain an IP Address over an Ethernet-based network by default; however, you can easily change the network settings.

Topics include:

- Network ports used by Pearl-2
- Verify IP address and MAC address
- Configure a static IP address
- Configure DHCP
- Configure DHCP Option 81
- Configure Dynamic DNS
- Change the HTTP/HTTPS port values
- Perform network diagnostics

To monitor network status information, see View network status

To set up traffic shaping for multicast streams, see Set up traffic shaping.

Network ports used by Pearl-2

The following table lists the default incoming and outgoing network ports.

Do not block traffic over these ports. If you want Pearl devices to operate properly, make sure that your firewall is configured to open these ports. Blocking a port will cause the service that uses that port to fail. It is possible to use the Admin panel to change the default ports that are used for some services.

Table 19 Default incoming network ports for Pearl devices

Port (or range)	Protocol	Description
22	TCP	SSH for remote support. See Support.
80	TCP	HTTP/HTTPS for web-based access to the Admin panel and Epiphan Live, HTTP/HTTPS API, REST API, HLS streaming (if enabled) and the live channel preview. You can change the default HTTP port value using the Admin panel, see Configure HTTPS.
123	TCP/UDP	NTP server, if enabled. See Configure a time server.
319 and 320	UDP	PTP server, if enabled. See Configure a time server.
443	TCP	HTTPS for the Admin panel and HLS streaming if enabled. Port is open only when HTTPS is enabled. You can change the default HTTPS port value using the Admin panel, see Configure HTTPS.

Port (or range)	Protocol	Description
Pearl Mini and Pearl-2: 554 to 554+(x-1) Pearl Nano: 554	TCP	For RTSP/TCP and RTSP/HTTP streaming on your network (where x is the number of channels configured). The number of ports used depends on how many channels you have with RTSP streaming enabled. See Share a live broadcast stream (HTTP, HTTPS, or RTSP). Note that client video players choose whether they are using RTSP/TCP, RTSP/HTTP or RTSP/UDP. Port 554 (and port 555 for Pearl Mini and Pearl-2) is also used for internal communications. If streaming is disabled, these ports remain open but refuse all external connection requests.
Random in range 32768 - 61000	UDP	If the client video player chooses RTSP/UDP, it will negotiate 4 random UDP ports (two for audio and two for video). The port range is dependent on the OS of the client video player and can change with updates to that OS.
5353	UDP	For multicast DNS discovery. See Connect using a DNS-based service discovery.
Pearl Mini and Pearl-2: 8000 to 8000+(x-1) Pearl Nano: 8000	TCP	For Flash (FLV) live stream and MPEG-TS streaming on your network (where x is the number of channels configured). The number of ports used depends on how many channels you have with streaming enabled. See Share a live broadcast stream (HTTP, HTTPS, or RTSP). Port 8000 (and port 8001 for Pearl Mini and Pearl-2) is also used for internal communications. If streaming is disabled for the channel from Channel > Streaming using the Admin panel, these ports remain open but refuse all external connection requests.

In addition to the incoming ports, Pearl devices use some outgoing connections as follows:

- **Port 80** - used for firmware update checks and downloads.
- **Publishing/streaming port** - the actual ports used for streaming to a server depends on the server and protocol used. See Streaming to servers, CDNs, and other devices
- **AFU file recording transfer port** - the actual ports used for AFU depends on your configuration. See Automatic file transfers.

Verify IP address and MAC address

To view the current IP address and MAC address of the Pearl device:

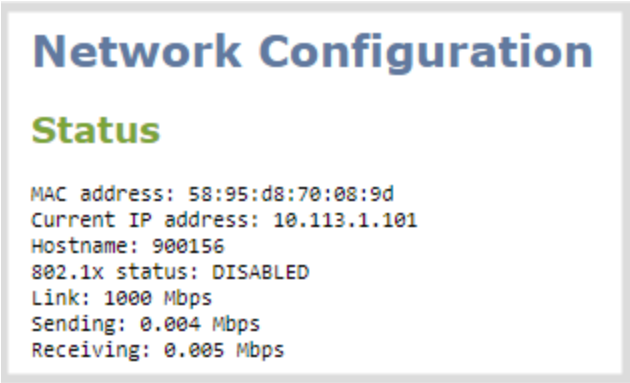
- From the Network configuration page using the Admin panel.
- For Pearl-2 or Pearl Mini, open the Settings menu using the touch screen.

Table 20 Network Information

Item	Description/Options
MAC Address	A media access control address (MAC address) is a unique identifier for the network interface. The value is read-only and cannot be changed. You may need to share this value with your system administrator.
Current IP Address	Reflects the current internet protocol address (IP address) of the system. This value is either obtained from the DHCP server (if using DHCP) or is the configured static IP address. Pearl devices support IPv4 addresses. It does not support IPv6 addresses.

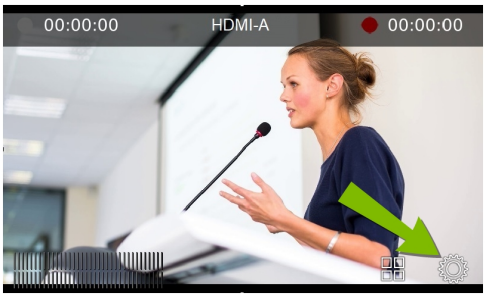
View network information using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Network**. The network configuration page opens.

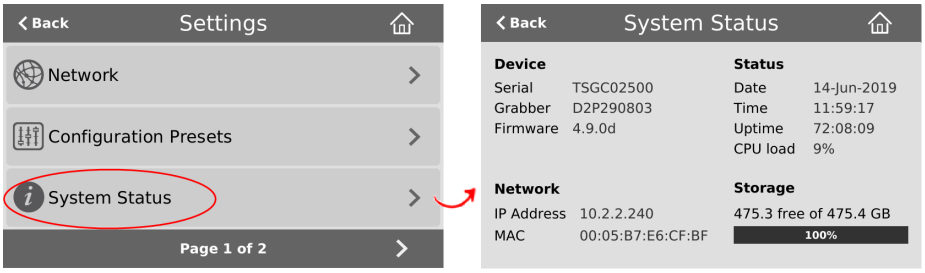


View network information using the touch screen on Pearl Mini or Pearl-2

1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.



2. Tap **System Status** to see the System Status page.



3. Tap **Back** to return to the **System Settings** screen, or the **Home** icon to return to the channel view.

If the system settings control icon won't appear when you tap the touch screen, it may be disabled. See **Configure the touch screen** to enable system information.

Configure a static IP address

There are two ways you can set up a Pearl device to use a static IP address:

- From the Network configuration page using the Admin panel.
- **Pearl-2 or Pearl Mini**: From the Settings menu using the touch screen.

TIP: Using the device screen, you can choose to apply a configuration preset that contains a static network IP. See Configuration presets.

Only IPv4 addresses are supported. Pearl devices do not support IPv6.

Configure a static IP address using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network** . The Network configuration page opens.
3. Choose **No** from the **Use DHCP** drop-down and enter your networking information in to the required fields. Click **Apply** when you're done.

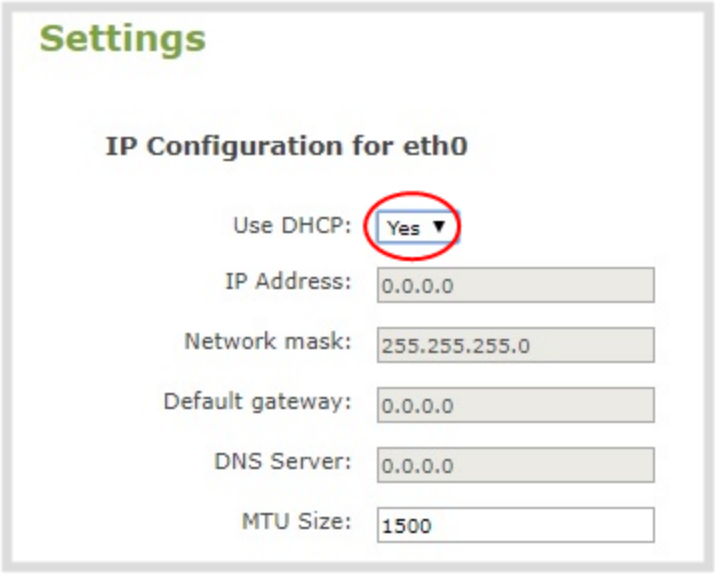


Table 21 Static IP Address Fields

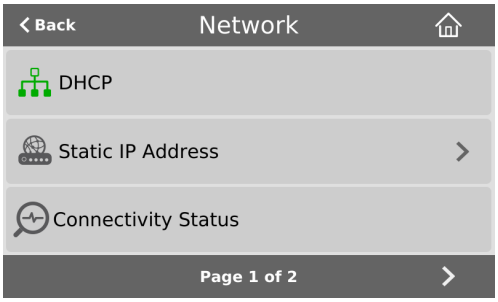
Label	Description
Use DHCP	Select **Yes** to dynamically obtain an IP address at boot up or select **No** to use the configured static IP address.
IP Address	The internet protocol address (IP Address) to assign. Obtain this from your network administrator. Pearl devices support IPv4 addresses. They do not support IPv6 addresses.
Network Mask	Also called the subnet mask, this value denotes a range of IP addresses. Obtain this from your network administrator, from another computer on the same subnet, or calculate the value using an online subnet calculator.
Default gateway	The network node that serves as an access point to the rest of the network. This value cannot be blank unless you are using DCHP. Specify the system's IP address if you don't have a default gateway on your network.
DNS Server	The domain name system server (DNS server) translates human-readable hostnames into corresponding IP addresses. Specify the system's IP address if you don't have a DNS server on your network. This value cannot be blank unless you are using DHCP.
MTU Size	The maximum transmission unit (MTU) specifies the maximum packet size for transfer on the network. The default value is 1500, which is the largest value allowed by Ethernet at the network layer. It's best for all nodes in your network to use the same value. Only change the MTU value if you know that other nodes use a different value.

The default gateway and DNS Server fields cannot be left blank. If you do not have a default gateway or a DNS server for your network, enter the static IP address in those fields.

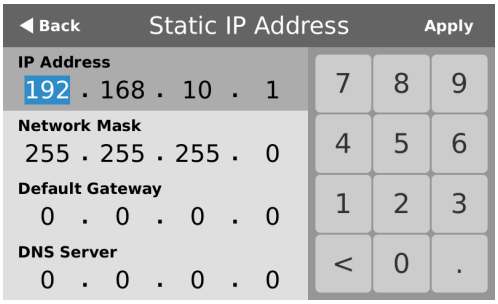
4. Reboot the Pearl device when prompted. From the Configuration menu, select **Maintenance** and click **Reboot Now** on the Maintenance page.
5. After the system has finished rebooting, use the new IP address to log back in to the Admin panel as **admin** and verify that all changes were applied.

Configure a static IP address using the touch screen on Pearl Mini and Pearl-2

1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.
2. Tap **Network**. The Network settings page opens. The currently enabled network type (DHCP or static) is highlighted green.



3. Tap **Static IP Address**. The Static IP Address configuration page opens.



4. Tap a segment of the **IP Address** (e.g. 192) to select it and use the keypad to enter a new static IP address. Continue to enter your Network Mask, Default Gateway, and DNS server information. Tap **Apply** when you're done.

> **STOP** The default gateway and DNS Server fields cannot be left blank. If you do not have a default gateway or a DNS server for your network, enter the static IP address in those fields.

5. Reboot the Pearl device to apply the network changes.

Configure DHCP

If you need to switch Pearl-2 from using static IP address allocation to using dynamic allocation with DHCP, you can do this three different ways:

- Restore factory settings, which clear all your custom settings. See Perform a factory reset.
- Load a configuration preset file that uses DHCP networking. For more information, see:
  - Apply a configuration preset using the Admin panel
  - **Pearl-2 and Pearl Mini** - Apply a configuration preset using the touch screen
- Change the network settings manually using either the device screen or the Admin panel.

Manually select DHCP as the network type using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. Choose **Yes** from the **Use DHCP** drop-down and change the **MTU Size** if needed, then click **Apply**.

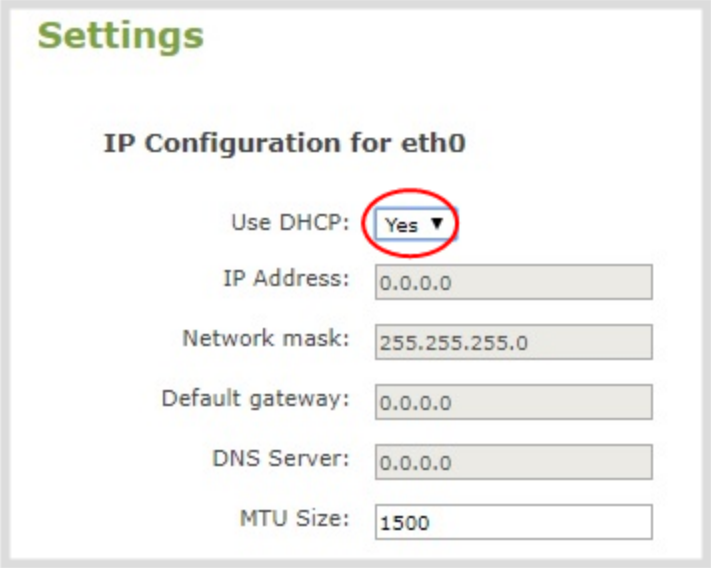


Table 22 DHCP Fields

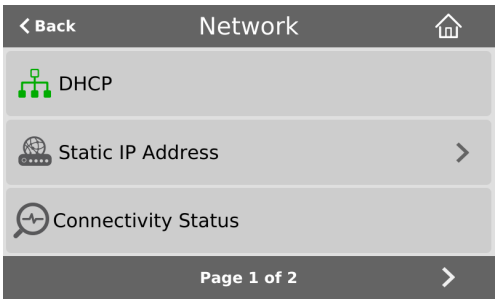
Label	Description/Options
Use DHCP	Select this option to dynamically obtain an IP address at boot up using DHCP
Use static address	Only select this option if you want to use the configured static IP address instead.
MTU Size	The maximum transmission unit (MTU) specifies the maximum packet size for transfer on the network. The default value is 1500, which is the largest value allowed by Ethernet at the network layer. It's best for all nodes in your network to use the same value. Only change this value if you know that other nodes use a different value.

4. Reboot the Pearl device when prompted. From the Configuration menu, select **Maintenance** and click **Reboot Now** on the maintenance page.

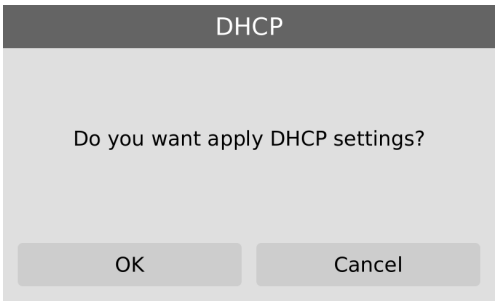
5. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

Manually select DHCP as the network type using the touch screen on Pearl Mini and Pearl-2

1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.
2. Tap **Network**. The Network settings page appears. The currently enabled network type (DHCP or static) is highlighted green.



3. Tap **DHCP**, and then tap **OK** to confirm.



4. Reboot the Pearl device to apply the network changes.

Configure DHCP Option 81

Ensure your Domain Name Server (DNS) always has the Pearl device's most up-to-date IP address mapped to the Pearl device's Fully Qualified Domain Name (FQDN). Option 81 support means you can keep using Pearl's FQDN no matter how many times the DHCP server may change Pearl's IP address. The Pearl device automatically asks the DHCP server to tell the Domain Name Server (DNS) to update the Pearl device's record with any changes to the Pearl device's IP address or FQDN. DHCP Option 81 is disabled by default.

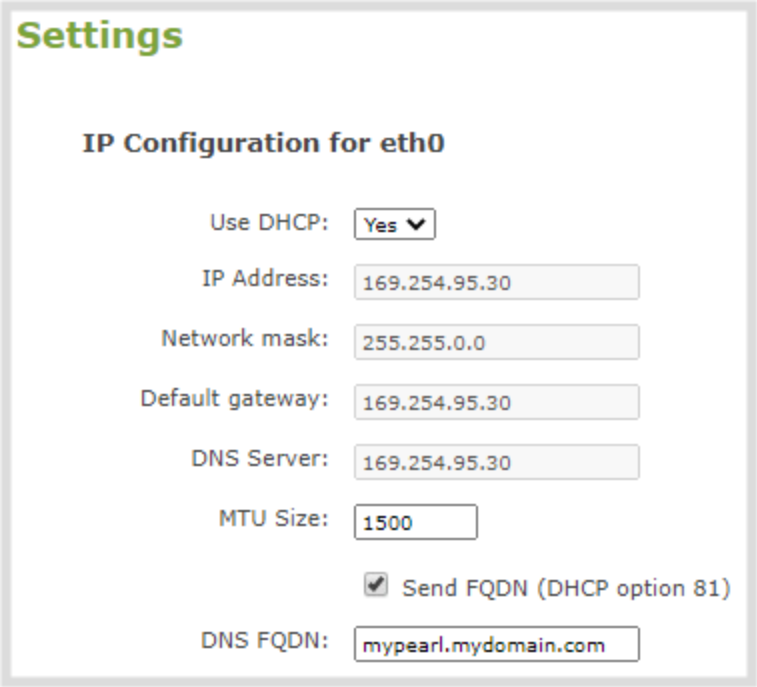
Important considerations

- The DHCP server must support Option 81 for this feature to work.
- DHCP should be enabled and setup before enabling DHCP Option 81, see Configure DHCP.

- You need the FQDN of your Pearl system for this procedure. Consult your network administrator if you don't have that information.

Configure DHCP Option 81 using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. Under Settings, check **Send FQDN (DHCP Option 81)**.



4. In the **DNS FQDN** field, enter the FQDN of your Pearl device, for example: *mypearl.mydomain.com*
5. Click **Apply**.
6. Reboot the Pearl device when prompted.
7. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

Configure Dynamic DNS

You can use Dynamic Domain Name Server (DDNS) to ensure that whenever the DHCP server changes the Pearl device's IP address, the Pearl device informs the DDNS to update it's domain name records. That way, you can keep using the Pearl device's FQDN without worry.

The DDNS feature is useful if your DHCP server doesn't support Option 81. Custom DDNS servers, dyndns.org, and noip.com are supported.

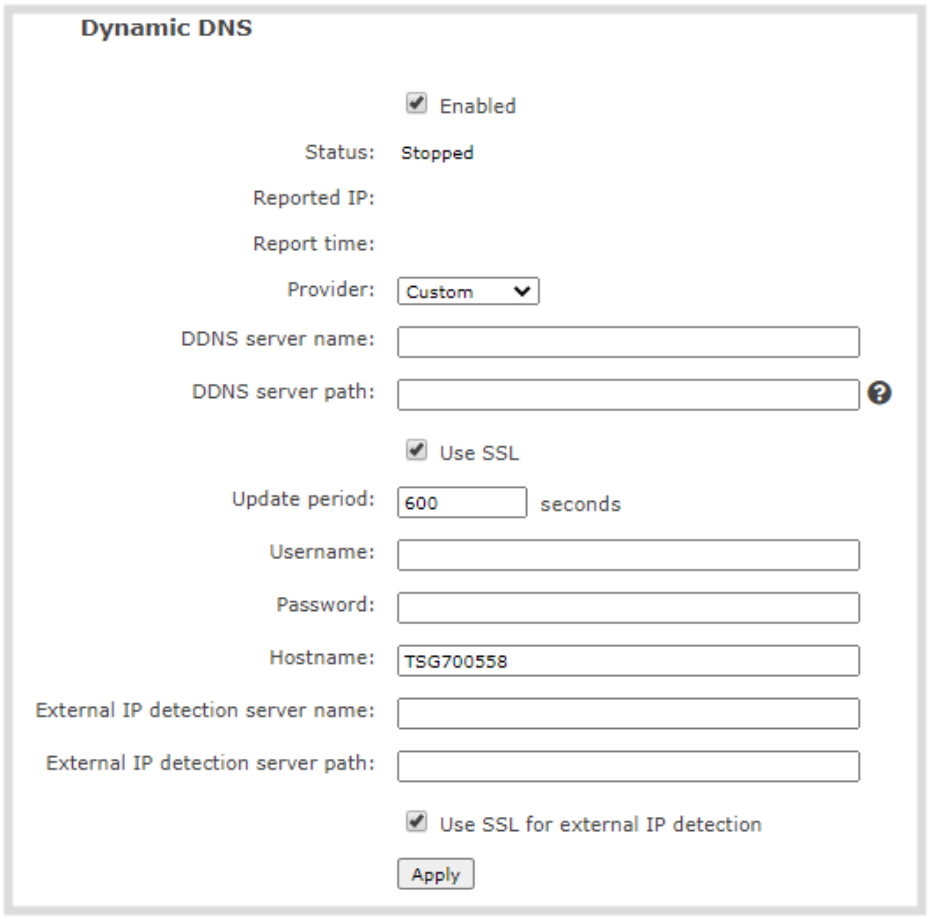
Table 23 DDNS Fields

Label	Description/Options
Provider	Choose if the DDNS provider is dyndns.com, noip.com, or a custom DDNS server of your choice.
DDNS server name	If you are using a custom DDNS provider, you must enter the DDNS server name. If dyndns.com or noip.com are used, you can leave this field blank.
DDNS server path	If you are using a custom DDNS provider, you must enter the DDNS server path. If dyndns.com or noip.com are used, you can leave this field blank.
Use SSL	Choose if you will use Secure Socket Layer (SSL) encryption for communications with the DDNS server. This is enabled by default.
Update period	Enter how often the Pearl device updates the DDNS server with the Pearl device's new IP address when the DHCP server changes it. Enter the update period in seconds from 30 to 864000 seconds (i.e. up to a maximum period of 10 days). The default is 600 seconds.
Username	Enter your user name for the DDNS provider.
Password	Enter your password for the DDNS provider.
Hostname	Enter the hostname to use for this Pearl device in the DDNS server records. Pearl device's serial number is the default hostname.
External IP detection server name	If your DDNS provider uses an external IP detection server, you must provide that server's name.
External IP detection server path	If your DDNS provider uses an external IP detection server, you must provide that server's path.
Use SSL for external IP detection	Choose if you will use SSL encryption for communications with the external IP detection. This is enabled by default.

The status of the connection to the DDNS server, the last external IP address of the Pearl device that was reported to the DDNS server, and the time when the IP address was reported is shown.

Configure DDNS using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. Under Dynamic DNS, check **Enabled** and in the Provider field, choose either **Custom**, **dyndns.com**, or **noip.com** in the drop-down menu.



4. If you selected Custom as the provider, enter the **DDNS server name** and **DDNS server path**. If dyndns.com or noip.com were selected as the provider, you can leave those fields blank.
5. Enter the **Username** and **Password** for your DDNS server.
6. In the **Hostname** field, enter the hostname of your Pearl device, for example: *mypearl*. The default hostname is the serial number of the Pearl device.
7. If your DDNS provider uses an external IP detection server, enter the **External IP detection server name** and **External IP detection server path**.
8. Check **User SSL for external IP detection** if you want to use that feature with an external IP detection server.
9. (Optional) Change the **Update period** in seconds.
10. Click **Apply**.
11. Reboot your Pearl device when prompted.
12. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

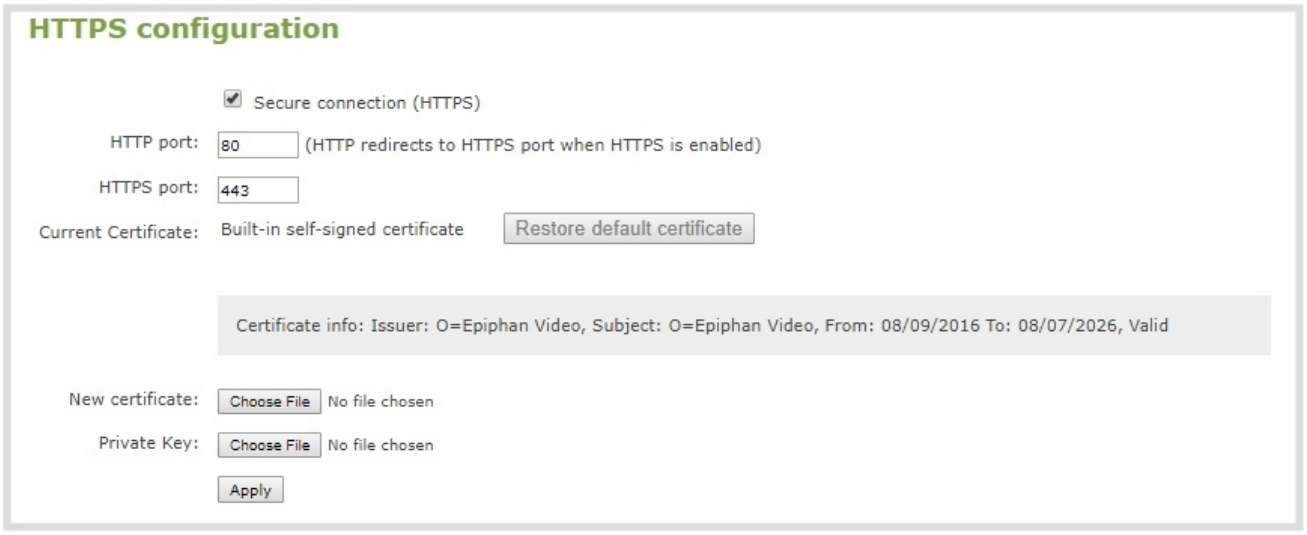
Change the HTTP/HTTPS port values

On the Pearl device, the default HTTP port is 80 and the default HTTPS port is 443. If the default ports used by your Pearl device are not available on your network, you can change them using the Admin panel. Consult your system administrator for the correct port values to use for HTTP and HTTPS traffic.

Ensure that the port value you choose is unique and is not currently assigned on the Pearl device, see **Network ports used by Pearl-2**.

Change the HTTP/HTTPS port values using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Under HTTPS configuration, change the default HTTP and HTTPS port numbers. Click **Apply** when you're done.



Secure connection (HTTPS) must be checked before you can change the HTTPS port.

4. Reboot the Pearl device when prompted. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

Perform network diagnostics

Network diagnostic tools are available to help you troubleshoot your setup. Easily run diagnostics like traceroute, ping, and others from the touch screen on Pearl Mini or Pearl-2, or using the Admin panel. For quick troubleshooting, you can run the Connectivity status diagnostics using the front screen menu of the Pearl Nano. You can also run network diagnostics from Epiphan Edge, see the online Epiphan Edge User Guide.

For more information about the network diagnostic tools and test results, see Diagnostic tools.

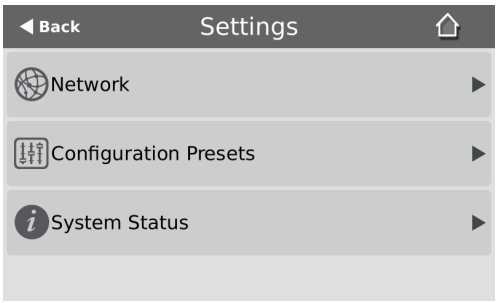
If you are unable to resolve your networking issues using the diagnostic tools, contact your network administrator and provide them with the IP address and MAC address of your Pearl device; otherwise, contact Epiphan Video support for assistance.

Perform network diagnostics using the Admin panel

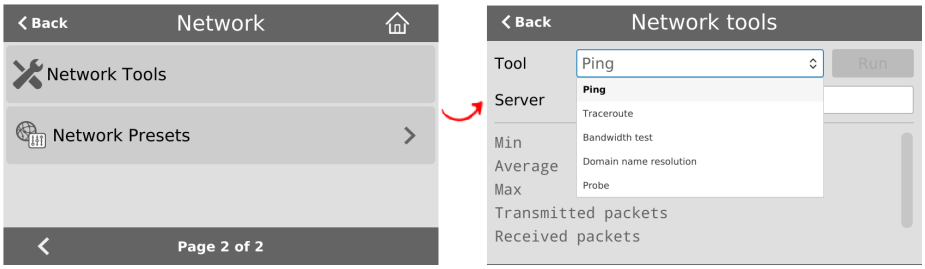
1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. In the Network diagnostics section, choose a diagnostic test from the drop-down menu and select **Start**.

Perform network diagnostics using the touch screen of Pearl Mini or Pearl-2

1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.



2. Tap **Network** and go to the second page of Network options. Then tap **Network Tools**.



3. Tap the **Tools** field and select the diagnostic tool from the drop-down menu. Some tests require you to enter additional information.
4. When you're ready to start the diagnostic test, tap **Run**.

Disable the network discovery port

You can disable the network discovery port on the Pearl device using the Admin panel so that services can no longer discover the Pearl device systems using multicast DNS (mDNS). The network discovery port on the Pearl device is port 5557 and is enabled by default.

Important considerations

- You cannot connect to the Admin panel using a DNS-based service discovery if you disable the network discovery port, see Connect using a DNS-based service discovery.
- The network discovery port must be enabled to use the NDIfeature on Pearl-2.

Disable the network discovery port using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. Uncheck **Make this device discoverable on the network as <uniqueID.local>**, then click **Apply**.

Enable an NDI discovery server

You can enable the use of an NDI discovery server on the Pearl-2 using the Admin panel so that the Pearl-2 can more easily discover NDI devices. The network discovery port on the Pearl device is port 5557 and must be enabled to use NDI.

Enable the network discovery port using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. Scroll to the bottom and enter the address of the NDI discovery server on the network, if adding multiple servers separate them with a comma, then click **Apply**.

Configure network security

Pearl devices support 802.1x network security. You can choose the authentication method, upload user certificates and private key, as well as manage signed CA certificates using the Admin panel. You can also configure your Pearl device to use HTTPS.

Topics include:

- Configure 802.1x network security and manage user certificates
- Manage CA and self-signed certificates
- Configure HTTPS

For higher security, we recommend setting admin, operator and viewer-level passwords on the Pearl device, see Change user passwords.

Configure 802.1x network security and manage user certificates

You can enable 802.1x security and configure the EAP method for the Pearl device to use for secure network access using the Admin panel. Supported EAP methods include:

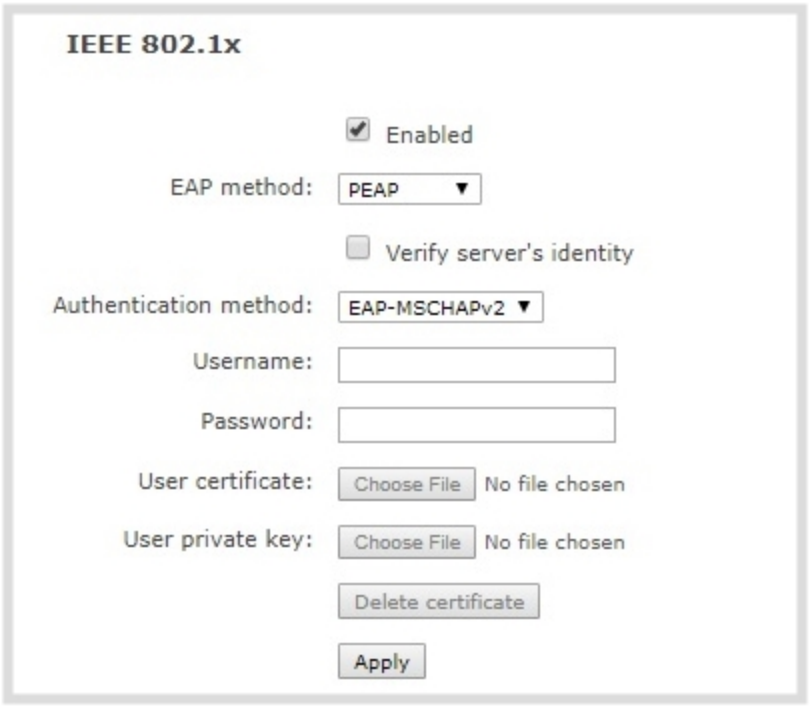
- PEAP (default)
- EAP-TLS
- EAP-TTLS

Important considerations

- If TLS authentication is used on the network, then you need to get a user certificate and a user private key from the network administrator and upload those to your Pearl device as part of this procedure.
- Before you proceed with this setup, check that the network server's signed CA certificate appears in the list of CA certificates on the Pearl device and is valid, see Manage CA and self-signed certificates.
- If the network server's CA certificate doesn't appear in the list of signed CA certificates and you can't obtain a valid signed CA certificate for network server authentication, do not check **Verify server's identity** when performing this setup.
- Security certificates must be PEM encoded.

Configure 802.1x and upload the user certificate and user private key using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Network**. The Network configuration page opens.
3. Under IEEE 802.1x, check **Enabled** and select an **EAP method**: PEAP, EAP-TLS, or EAP-TTLS.



4. (Optional) Check **Verify server's identity**.
5. Choose an **Authentication method** if you selected EAP-TTLS as the EAP method. The authentication method is automatically selected if PEAP or EAP-TLS is the EAP method.

Table 24 Authentication methods

EAP method	Authentication method
PEAP	EAP-MSCHAPv2
EAP-TLS	TLS
EAP-TTLS	EAP-MSCHAPv2
	TLS
	PAP

6. Enter the network access **User name** and **Password** to use for this device. Available fields depend on the EAP method that is selected.
7. If **TLS** is chosen as the Authentication method, upload a user certificate and a user private key. You can request those from your network administrator.
8. Click **Apply** when you're done.
9. Reboot the Pearl device when prompted. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

If you need to delete the user certificate or private key, click **Delete certificate**.

Manage CA and self-signed certificates

You can view the list of CA and self-signed certificates that come preloaded on Pearl-2. CA and self-signed certificates are used for server authentication if **Verify server's identity** is selected when 802.1x network security is configured, see Configure 802.1x network security and manage user certificates.

The self-signed certificate from Epiphan Video is selected by default. You can add more CA signed and self-signed certificates using the Admin panel, as well as delete any certificates that you've uploaded. You cannot delete any of the built-in CA certificates that came preloaded on Pearl-2. Security certificates must be PEM encoded.

When using the Epiphan Video self-signed certificate on Pearl devices:

- Your web browser may warn of an untrusted certificate when you try to access the web-based Pearl-2 Admin panel. You can dismiss the warning and continue to the Admin panel.
- Certain low and medium-level results are expected when scanning the network for vulnerabilities while Pearl-2 is connected and an active Admin panel session is in progress. Contact Epiphan Video Support for more information.

Manage CA and self-signed certificates using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Under CA certificates, click the arrow head to expand the list of built-in CA and self-signed certificates that came preloaded on Pearl-2.
4. To upload a new CA or self-signed certificate, click **Choose File** and select the certificate you want to upload. Then click **Apply**. The uploaded certificate is added to a list of user uploaded CA certificates.
5. To delete a CA or self-signed certificate that you've uploaded, click **Choose File** and select the certificate you want to delete from the list. Then click **Delete**. When you're done, click **Apply**.
6. Reboot the Pearl device when prompted. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

Configure HTTPS

You can configure Pearl-2 to use HTTPS for secure, local network access to the Admin panel, as well as for viewing the live channel preview stream on the local network using the Live broadcast URL.

The default HTTP port 80 redirects traffic to the default HTTPS port 443 when HTTPS is enabled. If the default ports used by the Pearl device are not available on your network, you can change them using the Admin panel, see **Change the HTTP/HTTPS port values**.

Custom applications that use the Pearl device HTTP API should continue to work if you configure the Pearl device for HTTPS.

A default, self-signed certificate from Epiphan Video comes preloaded on the Pearl device. You can upload and delete your own certificate and private key. However, you cannot delete the default self-signed certificate that comes preloaded on the Pearl device.

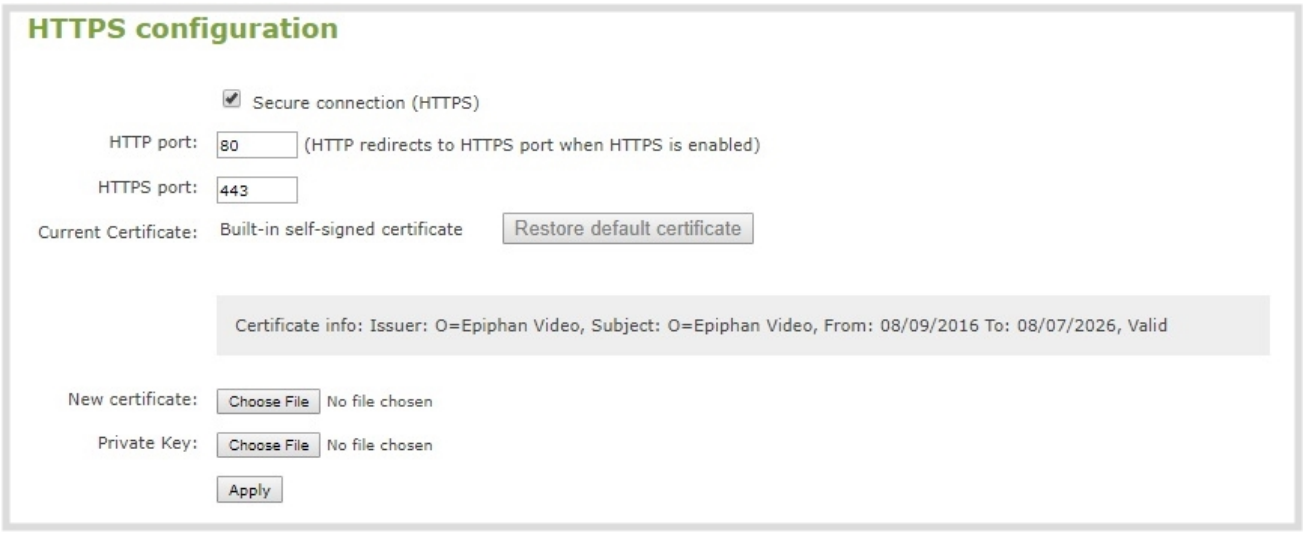
If you upload your own self-signed certificate and private key, ensure they're PEM encoded. Certificates can either include the private key or be separate files.

If you attempt to access the web-based Admin panel using a web browser and the required security certificate isn't found in the list of certificates loaded on the Pearl device, a warning message appears stating that the device isn't trusted. You can choose whether to proceed and connect to the Pearl device's web-based Admin panel without the security certificate authentication or cancel the connection.

If the Epiphan Video self-signed certificate is selected, your web browser may warn of an untrusted certificate when you try to access Pearl's web-based Admin panel. You can dismiss the warning and continue to the Admin panel for your device.

Configure HTTPS and upload a self-signed certificate using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Under HTTPS configuration, check **Secure connection (HTTPS)**.



4. (Optional) Change the default HTTP and the HTTPS port numbers. Consult your network administrator.
5. (Optional) Upload a new certificate and private key as required. You can request those from your network administrator.

If the required certificate isn't included in the list of certificates on the Pearl device when you try and connect to the Pearl device using a web-browser, you'll receive a warning that the device isn't trusted.

6. Click **Apply** when you're done.
7. Reboot your Pearl device when prompted. After the system has finished rebooting, log back in to the Admin panel as **admin** and verify that all changes were applied.

If you need to delete the certificate you uploaded and the private key, click **Delete certificate**, or click **Restore default certificate**.

Configure system settings

Pearl devices use the current date and time in naming recorded files and when synchronizing and timestamping inputs from multiple sources (i.e. when synchronizing an audio and a video source). The Admin panel lets you specify date and time settings to ensure they are correctly configured for your time zone and your network. You can also add information like a unique device name, description, and location.

Topics include:

- View the current date and time settings
- Configure a time server
- Manually set the date, time, and time zone
- Configure device info, name, description, and location

Configure date and time

Pearl-2 uses the current date and time in naming recorded files and when synchronizing and timestamping inputs from multiple sources (i.e. when synchronizing an audio and a video source). The Admin panel lets you specify date and time settings to ensure they are correctly configured for your time zone and your network.

Topics include:

- View the current date and time settings
- Configure a time server
- Manually set the date, time, and time zone

View the current date and time settings

There are two ways to view the current date and time settings:

- From the Date and Time page using the Admin panel.
- From the Settings menu using the touch screen on Pearl-2 and Pearl Mini.

To manually set the date, time, and time zone using the Admin panel, see Manually set the date, time, and time zone.

To change the server used for synchronizing time, see Configure a time server. You can also set up a local Network Time Protocol (NTP) server on Pearl-2 and Pearl Mini.

View the current Date and Time settings using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Date and Time**. The Date and Time configuration page opens.

Table 25 Date and Time configuration options

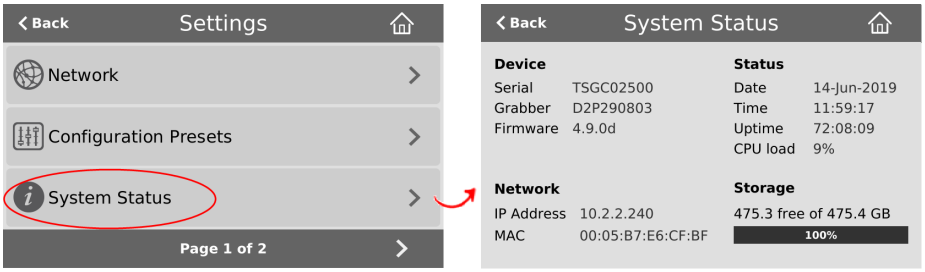
Label	Description/Options
Time Zone	The currently selected time zone.
Enable local NTP server (Pearl Mini and Pearl-2)	Select to enable local NTP server.
Enable time synchronization	Whether or not a time synchronization protocol is being used for setting time. If not selected, time is set manually.
Protocol	The time synchronization protocol.
Service IP Address	The time synchronization server address.
Set time manually	Whether or not time is set manually. If time is not being set manually, a time synchronization protocol is used.

Label	Description/Options
Date	The current date. This is the current date even if the radio button Set time manually is not selected.
Time	The current time. This is the current time even if the radio button Set time manually is not selected.

View the current date and time settings using the touch screen on Pearl-2 or Pearl Mini

1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.

2. Tap **System Status** to see the System Status page.



3. Tap **Back** to return to the **System Settings** screen, or the **Home** icon to return to the channel view.

If the system settings control icon won't appear when you tap the touch screen, it may be disabled. See **Configure the touch screen** to enable system information.

Configure a time server

Pearl-2 uses the Network Time Protocol (NTP) server from the National Research Council of Canada by default. You can change to a different time server using the Admin panel. Contact your system administrator for the time synchronization server settings you should use.

The following table lists the time server types that Pearl-2 supports.

Table 26 Supported time server types

Label	Description/Options
NTP	Network Time Protocol (NTP) servers are used to synchronize system time. Many NTP servers are available on the Internet. Pearl-2 and Pearl Mini can also use a local NTP server. All you need is the IP address of the NTP server and network access to the server to use that as the time synchronization source for Pearl-2. For more information about NTP and to find NTP servers, refer to http://support.ntp.org/bin/view/Servers/WebHome. A local Windows NTP server is not supported.
PTP v1	The Precision Time Protocol (PTP) is used for clock synchronization over the Internet. It has clock accuracy in the sub-microsecond range, making it more granular than NTP.

NTP sends UDP packets over port 123 on Pearl-2 and PTP sends UDP packets over ports 319 and 320. If the Pearl device is behind a firewall, you must open these ports to allow traffic when the Pearl device is configured to use either an NTP or a PTP server to obtain its time and date information.

Set the time synchronization method using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Date and Time** . The Date and Time configuration page opens.
3. For Pearl Mini or Pearl-2 using local NTP servers, check **Enable local NTP server**. Otherwise, skip this step.
4. Select **Enable time synchronization** and choose the time synchronization protocol from the **Protocols** drop down.
    a. If **NTP** is selected, enter the IP address or server name for the NTP server in the **Server IP Address** field.
    b. If **PTP v1** is selected, choose a multicast address for the PTP v1 server from the **PTP domain** field.

Table 27 PTP multicast addresses

PTP Domain	Description
Default	PTP at multicast address 224.0.1.129
Alternative 1	PTP at multicast address 224.0.1.130
Alternative 2	PTP at multicast address 224.0.1.131
Alternative 3	PTP at multicast address 224.0.1.132

5. Click **Apply**.

Manually set the date, time, and time zone

Pearl-2 uses NTP for time synchronization by default. You can manually set the date, time, and time zone. Pearl-2 uses the Eastern (Canada) time zone by default.

Set the date, time, and zone manually using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Date and Time**. The Date and Time configuration page opens.
3. Enter the current date in the **Date** field using the format *yyyy-mm-dd* and enter the current time in the **Time** field using the format *hh:mm:ss*.
4. Select a time zone from the **Time Zone** field.
5. Click **Apply**.

Configure device info, name, description, and location

You can assign a unique device name to the Pearl device using the Admin panel and add information such as a description and location. Alphanumeric characters and hyphens are supported. The serial number of Pearl device is the default device name.

For AFU and USB file transfers that are configured to create a folder upon file upload, the device name you set for the Pearl device is used for the folder name instead of Pearl's serial number.

For CMSs, the device name you set here for the Pearl device appears as the registered name for this device.

Configure the device name, description, and location using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Info**. The system information page opens.

3. Under **Device info**, do any of the following and then click **Apply**:
    a. Enter a name using alphanumeric characters including hyphens up to a maximum of 64 characters.
    b. Enter a description using alphanumeric characters including hyphens up to a maximum of 50 characters.
    c. Enter a location using alphanumeric characters including hyphens up to a maximum of 50 characters. alphanumerical characters and hyphens.

Audio input ports

You can connect external audio devices like mixers directly to the dedicated audio input ports on Pearl devices. Each Pearl device has a unique set of audio input ports.

Topics include:

- Configure audio ports for stereo or mono
- Assign audio sources to an input
- Adjust audio gain and delay
- Mute audio

Pearl-2

- Four XLR professional line-level inputs + 4.0 dBu up to 12.3 V RMS, (+24 dBu) that support balanced and unbalanced signals.
- One stereo pair RCA consumer line-level input (-10 dBV)
- Two USB video/audio ports

The four XLR audio inputs are configured as two stereo pairs by default: XLR A (left/right) and XLR B (left/right). The XLR B audio ports and the RCA audio ports are linked. You can configure Pearl-2 to use both or just one of the audio sources using the Admin panel.

For details about the audio inputs, see Pearl-2 AV inputs.

Configure audio ports for stereo or mono

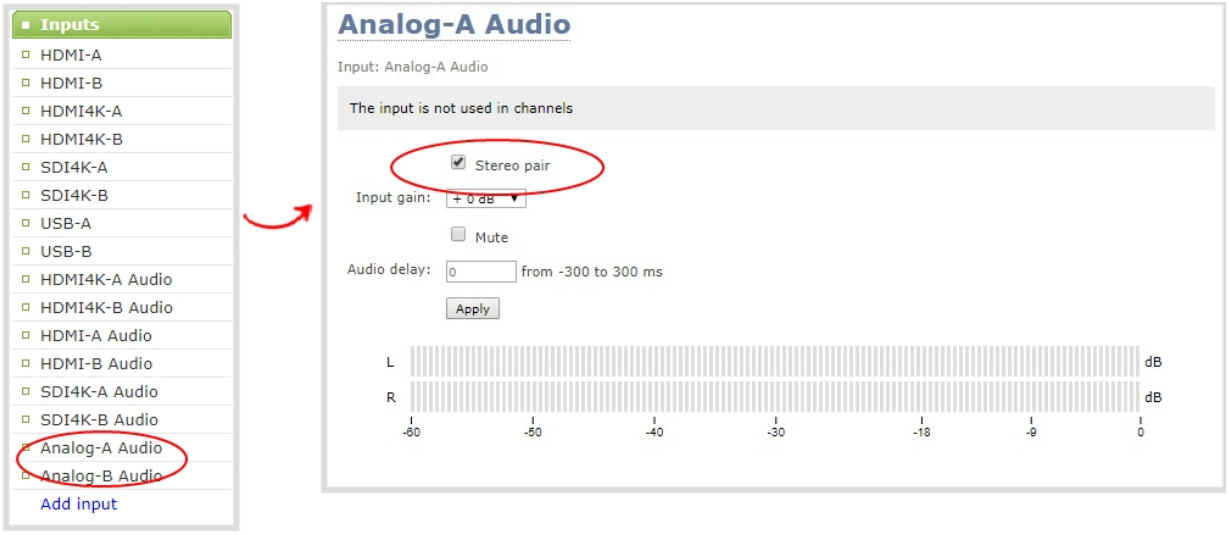
Using the Admin panel, you can configure ports to function as a stereo pair (left/right) or as separate mono ports.

Pearl-2

The four XLR professional line-level inputs are configured as two stereo pairs by default: XLR A (left and right stereo pair) and XLR B (left and right stereo pair).

Configure audio ports as stereo or mono using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. Open the configuration page from the Inputs menu:
   - **Pearl-2:** click **Analog-A Audio** for the XLR A ports or click **Analog-B Audio** for the XLR B ports. The configuration page for the audio ports opens.
3. Do one of the following.
   a. To make the ports function as a stereo pair, check **Stereo pair** and click **Apply**.
   b. To make the ports function as separate mono ports, uncheck **Stereo pair** and click **Apply**.



When mono is selected, two sets of parameters and two audio VU meters appear in the interface - one for each audio input port on the Pearl device. Parameters that are listed only once apply to both ports.

Assign audio sources to an input

Some audio input ports share internal audio processing resources in the Pearl device. These shared audio sources appear in the same configuration menus in the Admin panel and appear under the same audio input label in the user interfaces.

The audio sources that share resources are:

Pearl-2

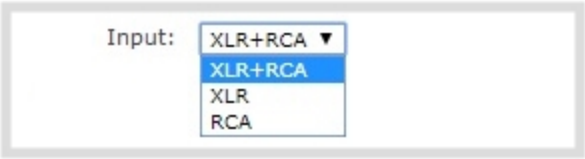
- XLR-B (left and right ports)
- RCA (left and right ports)

Both the XLR-B (left/right) and RCA (left/right) audio sources appear under the label **Analog-B Audio**. You can assign one or both audio sources to **Analog-B Audio**. Choosing one audio source for the shared input disables the other audio source. This means that when you select Analog-B Audio as the audio source for a layout using the custom layout editor, only the audio source you assign to Analog-B Audio is used. Both audio sources are assigned by default.

To avoid unwanted signal noise on the RCA ports, we recommend adding no more than 12dB of gain when RCA, XLR+RCA (for Pearl-2 and Pearl Nano), or XLR+3.5mm (for Pearl Mini) is selected.

Assign the audio source to an input using the Admin panel

1. Login to the Admin panel as **admin**. See Connect to the Admin panel.
2. From the Inputs menu, select the shared audio source. The audio configuration page opens.
3. From the **Input** menu, select the audio source and click **Apply**.



Adjust audio gain and delay

Pearl devices do not introduce audio delay and have near-zero latency when capturing. However, other external factors can cause audio to become de-synchronized, such as the length of audio cables or the configuration of your equipment. The audio delay feature helps you adjust audio coming from external sources so that your video and audio sources are synchronized when captured, streamed, and recorded.

You can apply from -300 ms to +300 ms of delay to any audio source using the Admin panel or Pearl Nano's front screen. By default, there's 0 ms of delay applied to audio sources.

The analog audio input ports on Pearl-2 and Pearl Nano are calibrated for +4.0 dBu XLR or -10.0 dBV RCA audio signals and provide moderate to significant signal headroom. For the analog audio inputs, you can add up to +30 dB of gain.

Microphones typically have low audio signals (less than -30 dBu) and are not supported directly as inputs to Pearl-2. Use an audio mixing board or preamp to amplify microphones and supply the appropriate line level input. See **Connecting microphones to the XLR line level inputs**.

Adjusting the **Input Gain** for an analog audio source affects the volume for that audio source in recordings, streamed output, video output ports, and in the headphone jack. Be aware that excessive amounts of gain can increase the perception of any noise that may be present in the audio signal.

If the gain of your analog audio signal needs adjustment, connect your headphones and use the VU meters to monitor the audio level while you add some gain. As a rule, each 10 dB of gain doubles the perceived loudness of the audio signal.

This table offers some guidelines for adjusting the gain at the audio input port of Pearl-2 for common types of audio input devices. You should add the suggested gain to the audio input to get an average signal to register at a nominal level in the VU meter (i.e. where the green bars change to yellow). The actual amount of gain needed depends on the strength of the original audio signal.

Table 28 Audio input port gains guidelines

Audio source	Input port	Gain
Mobile phone or other consumer line level device	XLR	Add +6 to +12 dB gain to the audio input port.
	RCA[1]	Nominal
Professional mixer	XLR	Nominal
	RCA[1]	Not recommended.
USB microphone	USB	Nominal
Dynamic, condenser, or electret microphones	XLR	Not recommended. To connect microphones to the pro line level XLR inputs, you must use an external preamp to boost the microphone signal enough to provide the proper line level signal at the XLR input port, see Connecting microphones to the XLR line level inputs.

[1] To avoid unwanted signal noise on the RCA ports, we recommend adding no more than 12dB of gain to the RCA port or when XLR B/RCA is used, see Assign audio sources to an input.

Ensure the audio input source is connected to an analog audio input port on Pearl-2 before proceeding.

Adjust the gain and delay for an audio source using the Admin panel

1. Login to the Admin panel as **admin**. See Connect to the Admin panel.
2. From the Inputs menu, select an audio source. The audio configuration page for the audio source opens.

3. In the **Input Gain** field, select the amount of gain to apply to the audio source.
4. In the **Audio delay** field, enter a value between 300 and -300 ms. A positive value adds delay to the audio signal. A negative value adjusts the audio to start earlier.
5. Click **Apply**.

Mute audio

You can mute any audio input port using the Admin panel. For analog audio ports that are configured as mono inputs, you can mute each port separately.

Some audio input ports share internal audio processing resources in the Pearl device. Muting an audio input that shares internal resources mutes all the associated audio sources. The following table lists the audio input ports that share internal processing and the results of applying mute.

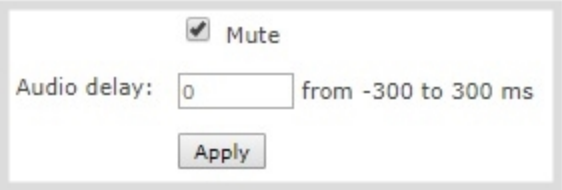
Table 29 Muting audio inputs that share resources

Device	Audio input (Admin panel)	Shared audio input resources	Results
Pearl-2	Analog-B Audio	XLR-B (left/right) RCA (left/right)	**In stereo mode:** Both XLR-B ports (left and right) are muted. Both RCA ports (left and right) are muted
			In mono mode (Analog B audio Left muted): Both the XLR-B left and RCA left ports are muted. The XLR-B right and RCA right ports are not muted.
			In mono mode (Analog B audio Right muted): Both the XLR-B right and RCA right ports are muted.

Device	Audio input (Admin panel)	Shared audio input resources	Results
			The XLR-B left and RCA left ports are not muted.

Mute an audio source using the admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, select an audio source. The audio configuration page for the audio source opens.
3. Check **Mute** to mute the audio source or uncheck **Mute** if you no longer want the audio source muted, then click **Apply**.



Video output ports

The HDMI video output port can send video from the Pearl device to connected devices like a display for confidence monitoring, an in-room projector, or even a video wall. You can use the Admin panel or the Pearl device screen menu to send any video source or channel to the video output port with (or without) the audio.

Use MultiViewer to display a custom mix of channels and video sources in a convenient grid for confidence monitoring with minimal impact to your system's processor.

Since the Pearl Nano has one channel, MultiViewer on the Pearl Nano displays a custom mix of up to two video sources including the channel on the HDMI output port.

Topics include:

- About video output ports
- Video output port resolution
- Set up the video output port using the Admin panel
- Set up and enable MultiViewer
- MultiViewer system information
- Select the video output source using the device screen
- Preview the video output port
- Disable the video output port
- Disable or enable audio and output port volume
- Display and reposition the audio VU meter

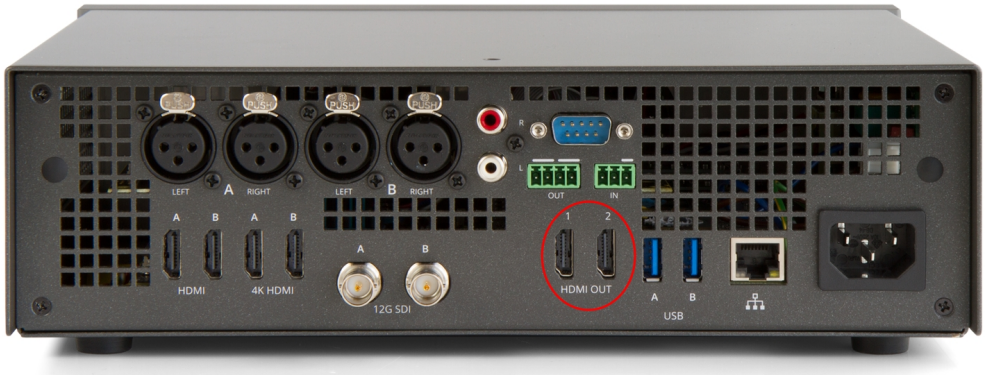
- Rename a video output port
- Mirror the video output port display

Pearl-2 and Pearl Mini - To select the video source displayed on the video output port using Epiphan Live, see Monitor and setup the output port source and audio.

About video output ports

Pearl-2

Pearl-2's rear panel includes two HDMI video output ports. HDMI 1 is set to show Auto A and HDMI 2 is set to show Auto B by default. Both video output ports are configured to maintain aspect ratio, use the display's default resolution, and include audio at 100% volume. However, the audio meter is not shown by default.



Using the video output port takes CPU cycles and adds to the overall load on your Pearl device. For optimum performance, keep displays disconnected from the video output port if you're not using them. Setups that already put a heavy load on the system's CPU may be negatively impacted if the external video output port is used.

You can use the Admin panel to configure the video output port parameters. If you're simply selecting a video source or channel and enabling/disabling audio for the output port, you can use your choice of either the Admin panel, the Pearl device screen, or Epiphan Live (if you are using a Pearl Mini or Pearl-2). For channels that have audio, the audio is enabled by default.

Important considerations

- When changing encoding parameters for a channel that's displayed on the video output port, it may revert to the display's default resolution if the output resolution is set to "Same as source". To resolve this, change the video output to a different resolution then back to "Same as source".
- When using the video output port for confidence monitoring, some delay can be expected. For a 1080p video source, the average delay on the video output port is approximately 100 ms. For a 1080p channel, the average delay on the video output port is approximately 300 ms. The actual amount can vary, depending on the setup.

- If an SDI or HDMI video input source that is selected to display at the HDMI output port also appears in a custom layout for a channel, then the channel's encoding settings are used at the HDMI output. Changing the channel's frame rate will change the frame rate used at the output port for that video input. **Pearl-2 and Pearl Mini** -If the video source appears in multiple layouts in different channels, the one with the highest frame rate set in the encoding settings is used.
- **Pearl-2 and Pearl Mini** - Using the video output ports adds to the overall system load on the Pearl device. If your system has a high system load and you're using the video outputs, monitor the frame rate of your channels on your Pearl device and adjust your setup if there's an unacceptable drop in the frame rate. Remedial measures you can take include eliminating video scaling at the inputs, adjusting the encoding bitrates, and (for Pearl-2 and Pearl Mini) deleting extra layouts and channels that are no longer being used.
- Use MultiViewer to preview multiple sources, including system information like channel status and audio information, on the video output port in a grid for confidence monitoring with minimal impact to system loading.

Numberof Displays	Cable 1	Cable 2	Output resolution
1	passive converter	n/a	Any (1024×768, 1280×720, 1280×960, 1360×768, 1400×1050, 1920×1080)
1		n/a	Any (1024×768, 1280×720, 1280×960, 1360×768, 1400×1050, 1920×1080)
2	passive converter	passive converter	
2	active converter or DisplayPort cable	active converter or DisplayPort cable	Displays can be set independently to any resolution up to 1080p (1024×768, 1280×720, 1280×960, 1360×768, 1400×1050, 1920×1080)
2	active converter or DisplayPort cable	passive converter	One of the two displays will fail to receive a signal.Do not mix passive converters with active converters and DisplayPort cables.
2	passive converter	active converter or DisplayPort cable	

Related links

Set up the video output port using the Admin panel

Set up and enable MultiViewer

Select the video output source using the device screen

Monitor and select the video output source using Epiphan Live

Video output port resolution

The video output port's **resolution** (also known as frame size or display mode) defines the number of pixels displayed horizontally and vertically. For example, the resolution 1920×1080 (1080p) produces an image that is 1920 pixels wide by 1080 pixels tall.

Pearl devices always assume that the output display uses square pixels.

The **aspect ratio** (eg. 4:3 or 16:9) describes the proportional relationship between the video output's pixel width and height. The resolution 1920×1080 (1080p), for example, is quite a bit wider than it is tall. The ratio of its width to height is 16 to 9, which has an aspect ratio that is 16:9.

By default, you can choose from the following output resolutions for your video output ports, but you can also change settings to allow a variety of other resolutions through.

Aspect ratio legend

Aspect Ratio	Common Use
4:3	Standard TV (NTSC/PAL) display and non-widescreen computer displays
16:9	Widescreen (HD) TV displays (1080p, 1080i, 720p etc), and 4K-capable displays
16:10 (8:5)	Widescreen computer displays, and 4K-capable displays
5:4	Sometimes used in larger format computer monitors
1.90:1	Digital Cinema Initiatives standard resolution for 4K or 2K video projection

Resolutions

640×360	640×480	960×540	1024×768
1280×720	1280×1024	1600×1200	1920×1080
1920×1200	2560×1440	3840×2160 4K	4096×2160 4K

Set up the video output port using the Admin panel

You can send a channel or a video source to the video output port using the Admin panel. You can also adjust the video output resolution, aspect ratio, and choose to include audio. The video output port frame rate is set

automatically to the channel's configured frame rate for that video source.

When outputting a channel that has audio or a video source with embedded audio, you can adjust the volume and choose to include the audio meter. The audio meter is set to a fixed size of 15% of the width (or height if displayed horizontally) of the display.

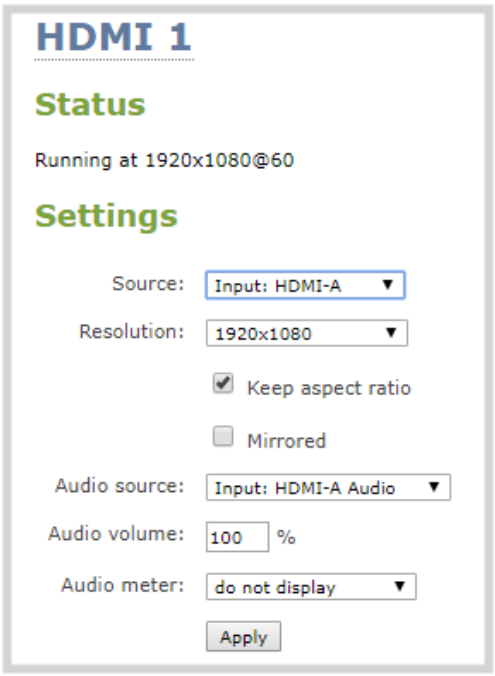
Important considerations

- **Pearl-2 and Pearl Mini** - If an SDI or HDMI video input source that is selected to display at the HDMI output port also appears in a custom layout for a channel, then the channel's encoding settings are used at the HDMI output. Changing the channel's frame rate will change the frame rate used at the output port for that video input. If the video source appears in multiple layouts in different channels, the one with the highest frame rate set in the encoding settings is used.
- **Pearl-2 and Pearl Mini** - Default auto channels have the related HDMI (or SDI) port selected by default. As soon as you connect your video source to the port, it appears automatically in the auto channel's custom layout. Changing the auto channel's frame rate or deleting the auto channel will change the frame rate used at the output port for that video input. Deleting the auto channel forces the video output port to use the original frame rate of the video input source.

To select the video you want to appear on the output port using the device screen or (for Pearl-2 and Pearl Mini) Epiphan Live see About video output ports.

Set up a channel or video source to display on the video output port using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Output ports menu, click the output port (**HDMI 1** or **HDMI 2** for Pearl-2,). The video output port configuration page opens.
3. In the **Source** field, select a channel (prefixed by the word **Channel**) or a video source (prefixed by the word **Input**).



4. In the **Resolution** field, select the resolution for the video output port.

Device	Value	Description
All	Same as source	Set the output to the same resolution as the channel or video source. If that resolution is not supported by the display, the video output port will negotiate a new resolution with the display (generally this ends up being the display's default resolution).
All	Destination default	This is the default value. Each display has a preferred resolution, and when you choose this setting, the video output port will use the display's default resolution.
Pearl-2 and Pearl Mini	640×360, 640×480, 960×540, 1024×768, 1280×720, 1280×960, 1360×768, 1400×1050, 1920×1080, 1920×1200, 2560×1440, 3840×2160[4K], 4096×2160[4K]	Choose a specific resolution for the output port.

5. Do one of the following:
    a. Check **Keep aspect ratio check** to have the system maintain the correct aspect ratio. If the aspect ratio is different between the source and the chosen display aspect ratio, black bars are automatically inserted at the top and bottom or left and right sides of the video.
    b. Uncheck **Keep aspect ratio check** to have the system stretch the source to fit the aspect ratio of the display.
6. For a channel, do the following:
    a. Check **Enable audio** to include audio in the output. Leave this unchecked for no audio with the video.
    b. (Optional) For a channel with audio enabled, adjust the volume. Enter a value from 0 to 100 percent in the **Audio volume** field.
    c. (Optional) For a channel with audio enabled, choose whether or not to display the audio meter from the **Audio meter** drop down.
    d. If displaying the audio meter, select horizontal or vertical from the **Audio meter orientation** drop-down menu to change the orientation of the displayed audio meter.
7. For an input source, do the following:
    a. Select an **Audio source** from the drop down list.
    b. (Optional) Adjust the volume. Enter a value from 0 to 100 percent in the **Audio volume** field.
    c. (Optional) Choose whether or not to display the audio meter from the **Audio meter** drop down.
    d. If displaying the audio meter, select horizontal or vertical from the **Audio meter orientation** drop-down menu to change the orientation of the displayed audio meter.
8. Click **Apply**.

The audio meter can be displayed even if you are not playing audio over the video output port (i.e. even when the **Enable audio** check box is not checked).

Set up and enable MultiViewer

MultiViewer displays a custom mix of video sources including channels on the HDMI output port in a convenient grid for confidence monitoring with minimal impact to the system's processors. MultiViewer features differ by Pearl device:

- **Pearl-2** - six video sources. Grid options include: 1x2 video sources, 2x2 video sources, 2x3 video sources

Save processing power so you can do more with your Pearl system while previewing multiple video sources on the HDMI output port. With MultiViewer, the video output displays at a lowered frame rate to economize CPU usage. Using MultiViewer does not lower the frame rate of channel recordings and live streams.

No audio signal present at the output port, but audio meters do display for channels and video sources that have embedded audio signals.

Use the Admin panel to choose which video sources appear in the pre-configured MultiViewer grids and to set the video output port resolution. You can enable MultiViewer for the output port using the Admin panel, the Pearl device screen, and using local console.

Deleted network sources or channels may appear in MultiViewer.

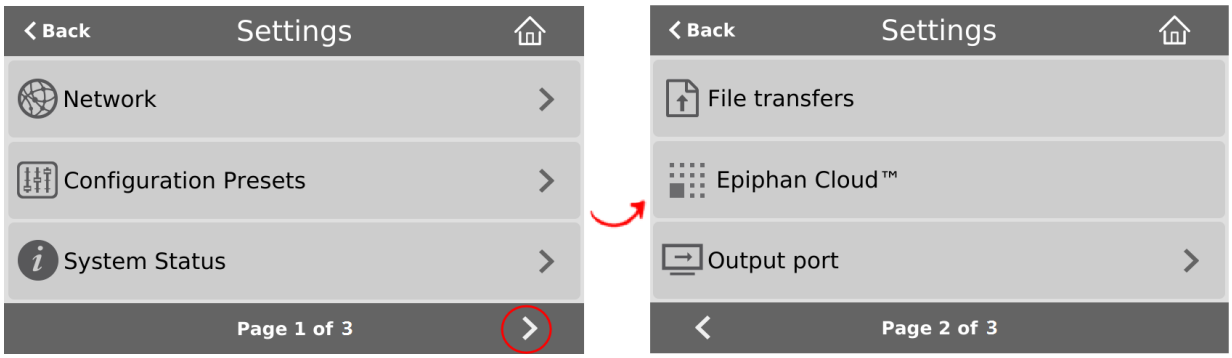
Set up and enable MultiViewer using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Output ports menu, click the output port (**HDMI 1** or **HDMI 2** for Pearl-2,). The video output port configuration page opens.
3. In the **Source** field, select **MultiViewer**.
4. In each cell of the grid, select a channel, video source, or system information.
   - **System Information** > **Channels** : provides you with information on **Channel** status or **Audio Inputs** status. For more information, see MultiViewer system information.
   - **Show information about upcoming and ongoing CMS events** (optional) - Select the check box and MultiViewer displays the name of upcoming or ongoing events, time remaining before upcoming events, and the time remaining of an ongoing event.
   - **Text size** (optional) - Increase or decrease to change the size of the display text in MultiViewer.
5. In the **Output Resolution** field, select the resolution for the video output port and then click **Apply**.

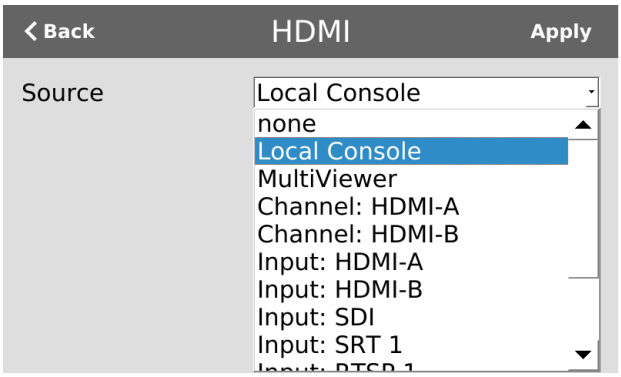
Value	Description
Destination default	This is the default value. Each display has a preferred resolution, and when you choose this setting, the video output port will use the display's default resolution.
• All devices: 1024×768, 1280×720, 1280×960, 1360×768, 1400×1050, 1920×1080 • Pearl-2 only: 3840×2160	Choose a specific resolution for the output port.

Enable MultiViewer using the touch screen on Pearl Mini and Pearl-2

1. From the device's touch screen, tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.
2. Tap the arrow icon in the lower-right corner of the screen to go to the second Settings page.



3. Tap Output port(s) and select a video output port.
4. From the Output port's screen, select **MultiViewer** and tap **Apply**.



MultiViewer system information

MultiViewer can display system information, including channel and audio input information. To display system information in the MultiViewer, select **Channels** or **Audio Inputs** in the **Source** drop-down on the HDMI outputs page.

Channels

If **Channels** is selected, the following information is displayed on the MultiViewer:

- **Channel** - the status of the channel status
  - - The are no errors or warnings, and the channel is ready to use.
  - - There is an error with either the channel's recorder or any of the channel's publishers.
  - - There are publishing warnings. This is also shown if the channel is not in running state.

- **Recording** - The recording status of the channel
  - - Currently recording
  - - Recording error
  - **Stopped** - Not currently recording
- **Streaming** - The streaming status of the channel
  - - There are active publishers. The numbers show how many publishers are active.
  - - Publishing errors, and the number of publishing errors.
- **Actual FPS** - The current rate of frames per second

Audio Inputs

A list of the active audio inputs on the Pearl device.

- **Input name** - the name of the audio input
- **Audio meter** -
  - - the audio is live and the input is being monitored

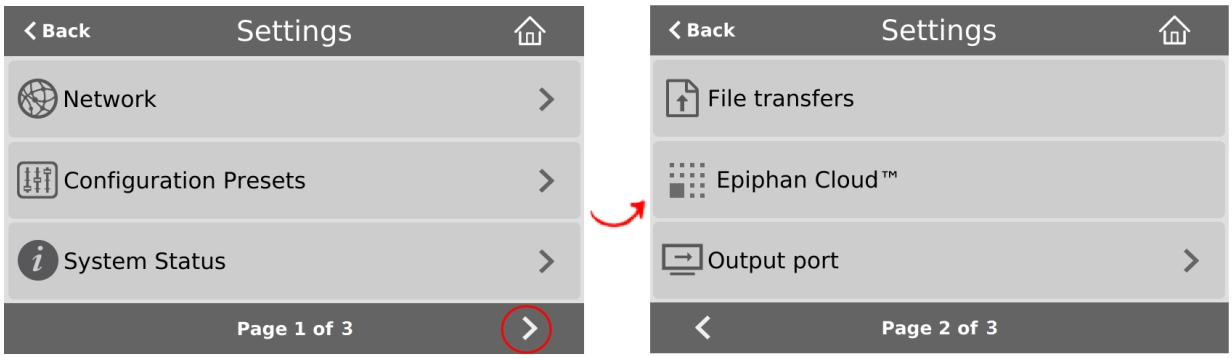
Select the video output source using the device screen

It's easy to change the video source that appears at the video output port using the front screen or touch screen. For video sources that have audio, you can enable and disable the audio as well. Audio is enabled by default.

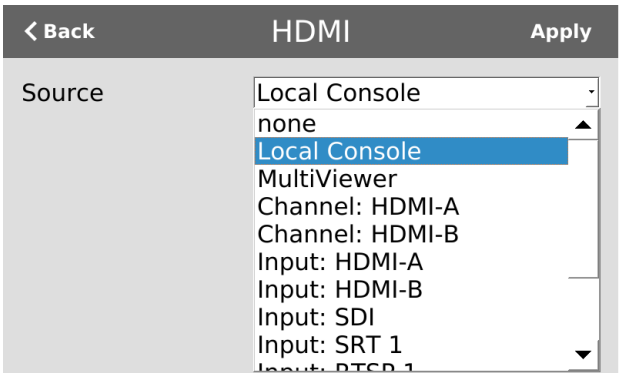
To configure the video output port parameters, use the Admin panel. See **Video output ports**.

Select the video output source using touch screen on Pearl-2 or Pearl Mini

1. From the touch screen, tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.
2. Tap the arrow icon in the lower-right corner of the screen to go to the second Settings page.



3. Tap Output port(s) and select a video output port.
4. From the Output port's screen, select the source you want displayed on the video output port and tap **Apply**.



Preview the video output port

You can preview the video signal that is shared over your video output port by looking at the preview window at the bottom of the video output configuration page in the Admin panel.

The preview is updated every few seconds and always maintains the same aspect ratio as the source it is copying. It doesn't reflect black bars, the audio meter or actual aspect ratio/resolution on the display.

If the video output port is showing a source and that source has no signal, the source's no signal image is displayed.

If the video output port is showing a channel and that channel is unavailable or has no signal, a no signal message is shown for 2.5 seconds, then the display output is changed to a black screen.

Pearl-2 and Pearl Mini - You can also preview video output ports using the Epiphan Live control interface. See **Monitor and select the video output source using Epiphan Live** for more information.

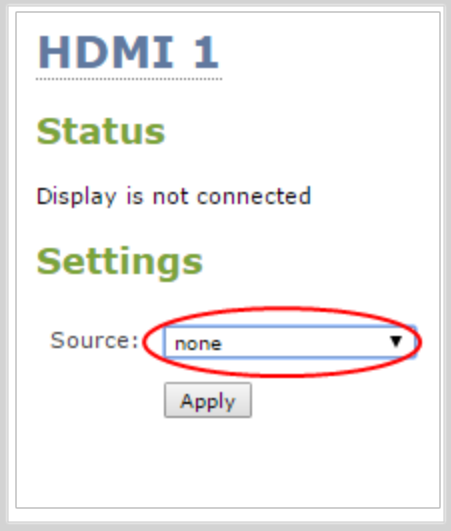
Disable the video output port

You can use the Admin panel to disable a video output port so that even if a display is connected, nothing is shown.

Pearl-2 and Pearl Mini - To disable video output ports using the Epiphan Live, see Monitor and select the video output source using Epiphan Live.

Disable the video output port using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Output ports menu, click the output port (**HDMI 1** or **HDMI 2** for Pearl-2,). The video output port configuration page opens.
3. In the **Source** field, select **none** to disable the video output port and then click **Apply**.



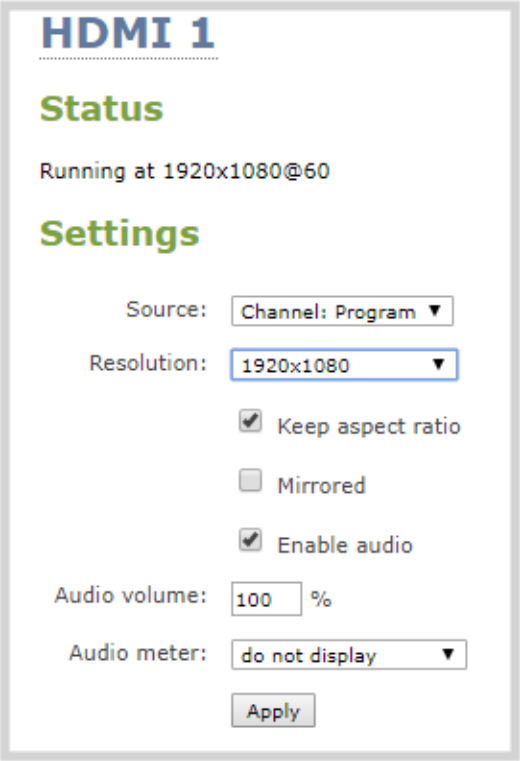
Disable or enable audio and output port volume

If you're displaying a channel as the source for your video output port, audio for that channel is also encoded and sent over the port by default. You can disable the audio on the output port using the Admin panel. You can also adjust the volume of the audio on the video output port using the Admin panel. Disabling the audio on the video output port improves latency for the port.

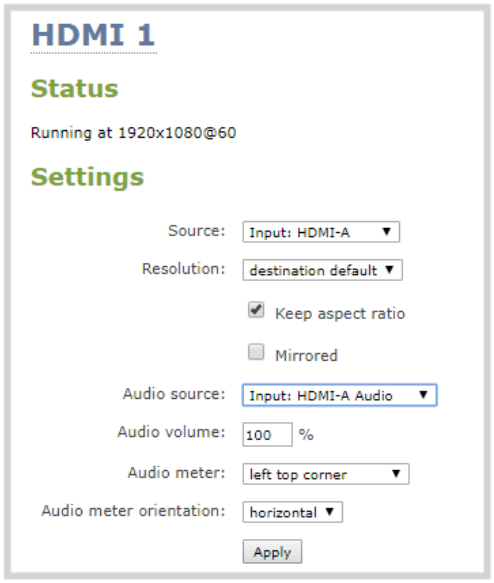
If you're displaying a video input as the source for your video output port, you can select an audio source and adjust the volume. Audio is taken from the video input source you've selected for the video output port by default.

Disable audio for a channel on the video output port and adjust the volume using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Output ports menu, click the output port (**HDMI 1** or **HDMI 2** for Pearl-2,). The video output port configuration page opens.
3. For a channel, do the following:
    a. Check **Enable audio** to include audio in the output. Leave this unchecked for no audio with the video.
    b. (Optional) For a channel with audio enabled, adjust the volume. Enter a value from 0 to 100 percent in the **Audio volume** field.
    c. (Optional) For a channel with audio enabled, choose whether or not to display the audio meter from the **Audio meter** drop-down menu.
    d. If displaying the audio meter, select horizontal or vertical from the **Audio meter orientation** drop-down menu to change the orientation of the displayed audio meter.



4. For input sources, do the following:
    a. Select an **Audio source** from the drop down list.
    b. (Optional) Adjust the volume. Enter a value from 0 to 100 percent in the **Audio volume** field.
    c. (Optional) Choose whether or not to display the audio meter from the **Audio meter** drop down.
    d. If displaying the audio meter, select horizontal or vertical from the **Audio meter orientation** drop down to change the orientation of the displayed audio meter.



5. Click **Apply**.

Pearl-2 and Pearl Mini - You can also disable or enable audio on the video output port and adjust the volume using Epiphan Live, see **Monitor and select the video output source using Epiphan Live**.

Display and reposition the audio VU meter

When sending a channel with audio over the video output port, you can choose whether or not to display the audio VU meter using the Admin panel. You can also determine the position and orientation of the audio meter.

Audio pass-through, adjusting the volume, and displaying an audio meter are only supported when a channel is the selected video source.

Configure the audio meter for the video output port using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Output ports menu, click the output port (**HDMI 1** or **HDMI 2**). The video output port configuration page opens.
3. In the **Audio meter** field, choose an option.

Value	Description
do not display	No audio meter is displayed.
left top corner	Audio meter is displayed at the top left side of the display.

Value	Description
right top corner	Audio meter is displayed at the top right side of the display.
left bottom corner	Audio meter is displayed at the bottom left side of the display.
right bottom corner	Audio meter is displayed at the bottom right side of the display.

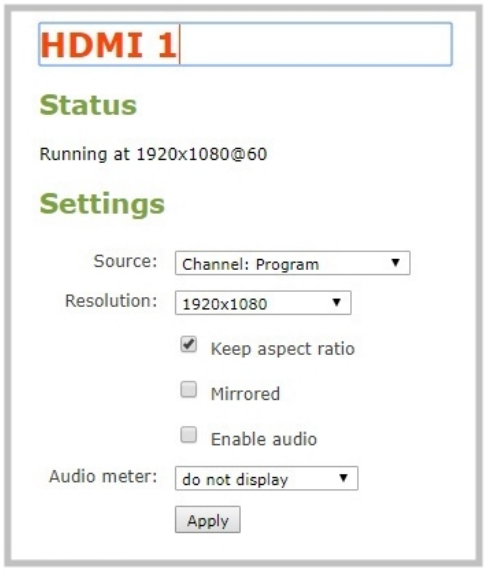
4. If you've selected a location for the audio meter, you can also select an orientation (horizontal or vertical) in the **Audio meter orientation** field.
5. Click **Apply**.

Rename a video output port

Using the Admin panel (or Epiphan Live on Pearl-2 and Pearl Mini), you can easily change the video output port default name to something more suitable. For example, Projector Output or Confidence Monitor.

Change a video output port name using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Output ports menu, click the video output port. The video output port configuration page opens.
3. Select the **video output port name** at the top of the page and enter a new name using your keyboard. The text turns red when it's selected for editing.

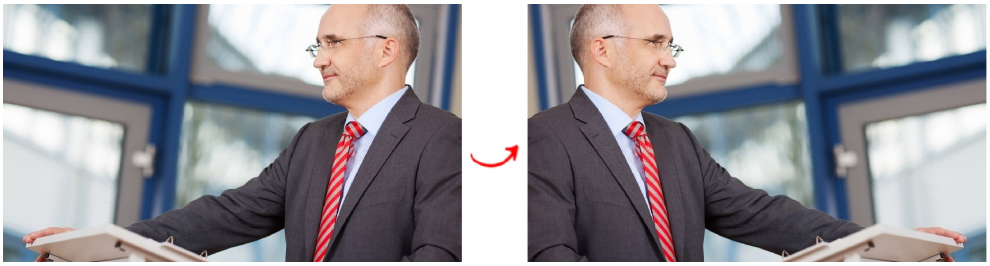


4. Press **Enter** using your keyboard to save the changes.

You must press **Enter** to save the new name. The **Apply** button does not save the source name change.

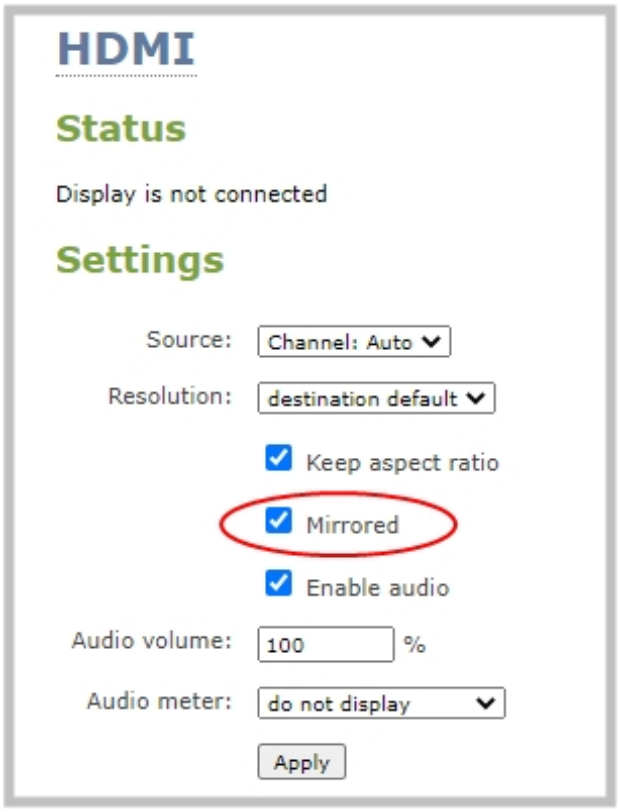
Mirror the video output port display

You can use the Admin panel to mirror the original video source on the output port so that it appears reversed on the connected display. If there's an on-screen image that includes text such as a custom no signal image, the text will appear reversed.



Mirror the video source at the video output port using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Output ports menu, click the output port you want to mirror. The video output port configuration page opens.
3. Check **Mirrored** to flip the video source's orientation on the display port. Uncheck **Mirrored** to display the video source in it's original orientation, then select **Apply**



Connect external devices

You can connect external devices to your Pearl device for control and monitoring.

Topics include:

- Connect an external keyboard
- Connect a USB status light

To connect an external monitor to your Pearl device for confidence monitoring, see Video output ports.

Connect an external keyboard

Instead of using the built-in virtual keyboard on the Pearl device's scree, you can connect a USB keyboard to Pearl device and use that. Simply enable the external keyboard feature using the Admin panel and connect your keyboard directly to any available USB port.

You can change the keyboard layout to any of the supported languages. When multiple languages are selected, you can use **Ctrl+Shift** or **Ctrl+Alt** to toggle between languages.

- American English (default)
- Dutch

- French
- German
- Italian
- Netherlands
- Norwegian (Bokmal)
- Portuguese (European)
- Spanish (Spain)
- Swiss
- Russian

When an external keyboard is connected to the USB port, the **Lock Caps** key on the external keyboard controls both the external keyboard and the virtual keyboard.

Enable the external keyboard feature using the Admin panel

1. Login to the Admin panel as **admin**, see Connect an external keyboard.
2. From the Configuration menu, select **External keyboard**. The External keyboard configuration page opens.
3. In the **Keyboard application** drop-down menu, select **Touch screen**.
4. (Optional) Check a different keyboard language layout or multiple language layouts. The default layout is American English.
5. (Optional) Choose the keyboard key combination to toggle between keyboard layouts if multiple languages are selected: **Ctrl+Shift** or **Alt+Shift**.
6. Click **Apply**.

What's next?

Learn about keyboard shortcuts, see External keyboard shortcuts.

Connect a USB status light

Pearl devices support connection of an external USB status light to visually indicate the status of recording and streaming. You can connect a USB status light directly to a USB port on the Pearl device.

The following USB status lights are supported:

- Kuando BusyLight models: UC Alpha and UC Omega
- Delcom Products USB HID single color and multi-color signal indicators

The status light is activated as soon as it is connected to a USB port on the Pearl device and flashes once.

Table 30 Status light indicator

Light	Description
Solid off	The Pearl device is not currently recording or streaming.
Solid on	Recording or streaming is in progress.
Flashing	Rapid flashing (approximately five blinks per second) commences five minutes before a scheduled event begins. Slow flashing (approximately two blinks per second) indicates that an error occurred during recording or live streaming.

Feature add-ons

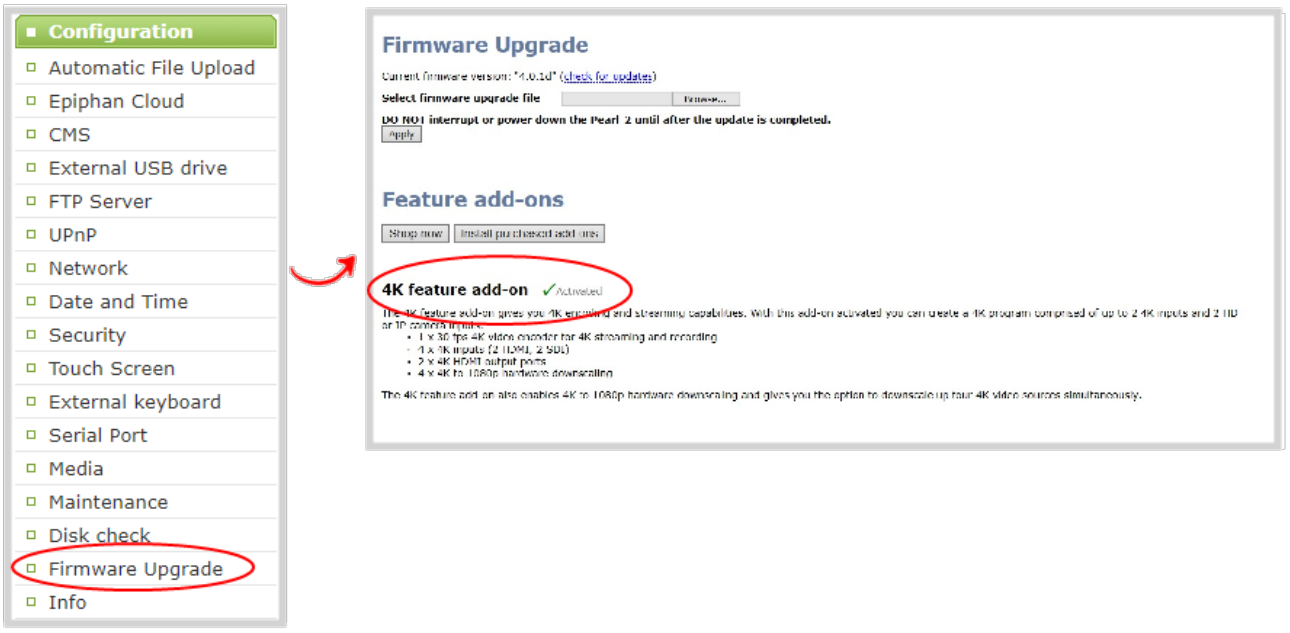
Epiphan offers add-on features so you can do even more with your system. Pearl-2 and Pearl Nano currently offer feature add-ons for extra functionality.

See Add-ons overview for details about the availability of add-ons for your system, as well as instructions to purchase and install add-ons.

Where you see this symbol 4K in the guide, that means the feature or function applies only if you have activated the 4K feature add-on.

Add-ons overview

Add-ons are listed in the Admin panel when you click Firmware upgrade from the Configuration menu.



Add-ons must be purchased, installed, and activated before their features can be used. If you have already purchased an add-on either on our site at epiphan.com/add-ons or have purchased the full version of Pearl-2 or Pearl Nano, you can go ahead and click **Install purchased add-ons** to activate the feature. A system reboot is required. If you want to purchase an add-on, follow the process outlined below.

Purchase 4K add-on

You can go to the add-ons store page on the Epiphan website at epiphan.com/add-ons to purchase feature add-ons or navigate there from the Admin panel.

From the Firmware Upgrade page in the Admin panel, click **Shop now** to go to the add-ons store page to select and purchase available add-ons.

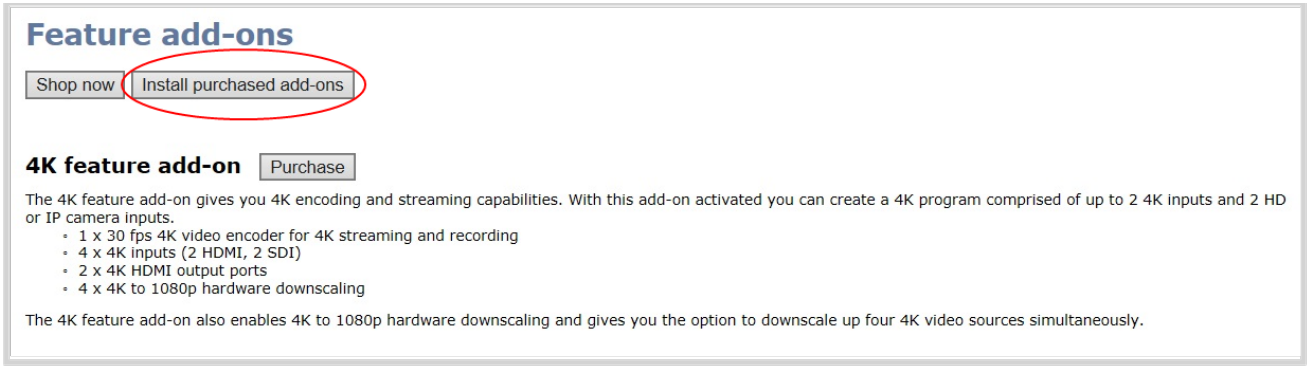
You can also click **Purchase** beside any feature add-on that's listed on the Firmware Upgrade page to go to the epiphan.com website and purchase that specific feature.

Install purchased add-ons

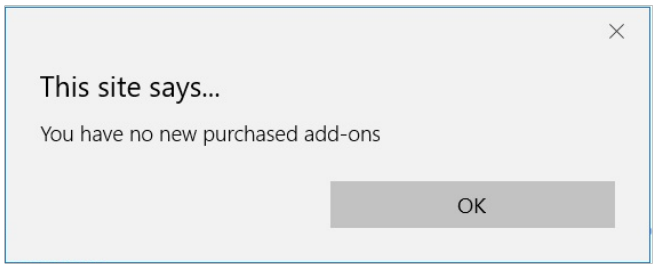
Purchase the 4K feature add-on to enable that feature on Pearl-2 and Pearl Nano. Each purchased add-on can be installed and activated on a single device.

To install purchased add-ons:

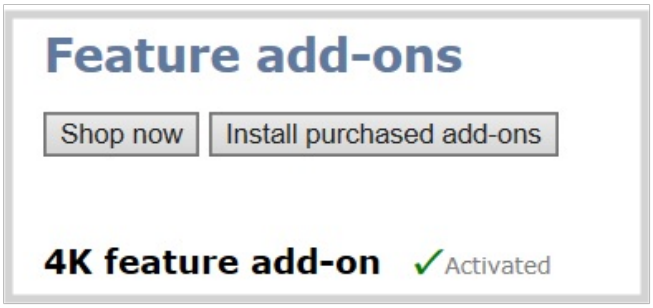
Click **Install purchased add-ons** from the Firmware Upgrade page to start the installation process. A system reboot is necessary to activate add-ons. Click **OK** when prompted. If you click **Cancel**, the device installs the add-on but does not reboot. The add-on is not activated until the device is rebooted.



Even if you have already purchased a feature, the **Purchase** button remains next to the feature until you have activated the feature and the system is rebooted. To determine if a feature with a **Purchase** button next to it has already been purchased, click **Install purchased add-ons**. If no add-ons are ready to be activated and installed, a message appears.



After you've activated your feature add-ons and the system reboots, the Purchase button beside those features is replaced by an Activated indicator.



Current list of add-ons

If you have the base model of Pearl-2 or Pearl Nano, you can add the 4K feature add-on.

4K feature add-on

The 4K feature provides Pearl-2 or Pearl Nano with the following 4K features:

Specification	Pearl-2	Pearl Nano
4K video inputs	4 (2 HDMI and 2 SDI)	2 (1 HDMI and 1 SDI)
4K Hardware scaling (4K down to full HD)	4	2
4K video outputs (HDMI)	2	N/A
4K video encoding	1	1

You can find more details on the add-on, along with installation instructions and the add-on itself, at www.epiphan.com/add-ons.

Activating your 4K add-on might not be necessary with older versions of Pearl-2. As the first Feature Add-on, the 4K add-on was included automatically in some systems. If you purchased the full version of Pearl-2 or an early copy with firmware 4.0.0, the 4K add-on was included with your purchase and is automatically activated, so in those cases no action is required.

About 4K on Pearl devices

Pearl-2 and Pearl Nano support resolutions from low-res SD to 4K, which means that you can use them to capture DCI 4K (Pearl-2 only) and 4K UHD digital signals. You need the 4K feature add-on to access this feature, see Add-ons overview.

4K feature add-on

The 4K feature provides Pearl-2 or Pearl Nano with the following 4K features:

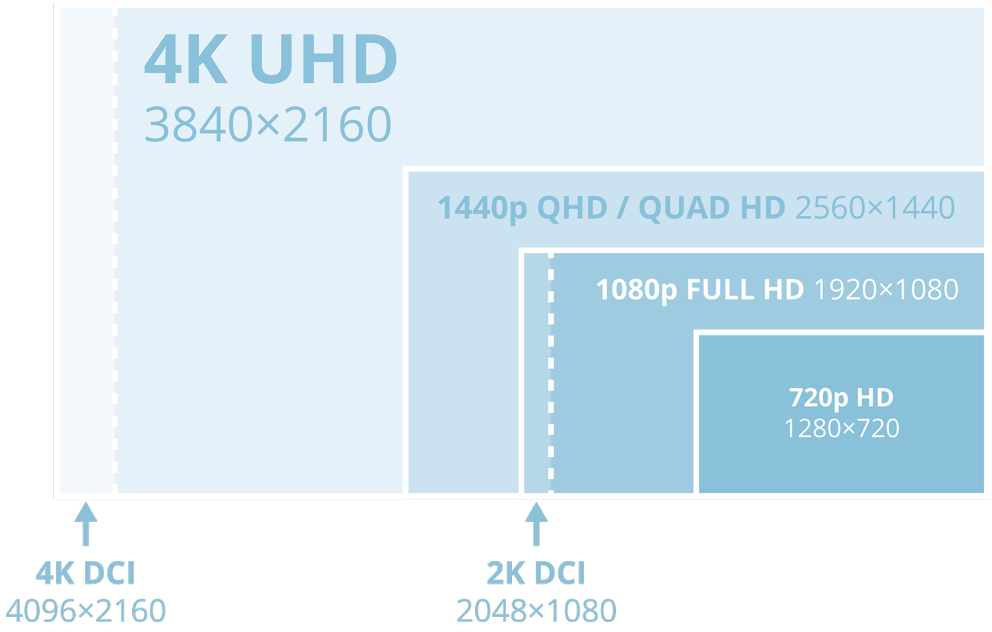
Specification	Pearl-2	Pearl Nano
4K video inputs	4 (2 HDMI and 2 SDI)	2 (1 HDMI and 1 SDI)
4K Hardware scaling (4K down to full HD)	4	2
4K video outputs (HDMI)	2	1 pass through port
4K video encoding	1	1

You can find more details on the add-on, along with installation instructions and the add-on itself, at www.epiphan.com/add-ons.

Activating your 4K add-on might not be necessary with older versions of Pearl-2. As the first Feature Add-on, the 4K add-on was included automatically in some systems. If you purchased the full version of Pearl-2 or an early copy with firmware 4.0.0, the 4K add-on was included with your purchase and is automatically activated, so in those cases no action is required.

4K UHD vs. DCI 4K

DCI 4K and 4K UHD are just different definitions of a 4K resolution. 4K UHD (3840×2160) is the standard 4K resolution available on televisions and other common display screens. The 4K resolution of 4096×2160 (Pearl-2 only) referred to as Digital Cinema Initiatives (DCI) 4K, and is the resolution used almost exclusively for cinema-scale film production. It is rare to find this resolution outside of a cinematic context. Pearl-2 and Pearl Nano capable of supporting input and output at either definition with the Feature add-ons.



User administration

Pearl-2 has different types user accounts. Depending on the type of user, you will have different privileges.

Topics include:

- User types and privileges
- Change user passwords
- Overcome lost passwords
- Remove user password
- Log in using a different user account
- Assign administrator privileges to operators
- Configure LDAP user authentication
- Restrict viewers by IP address

User types and privileges

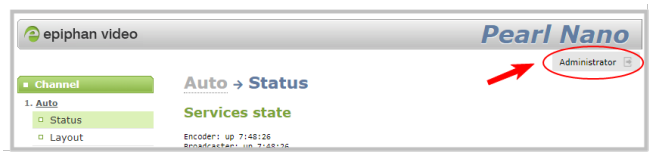
There are different types of user accounts:

- Administrator
- Operator
- Viewer

No password is assigned to the user accounts by default. The first time you login to the Admin panel using the administrator-level account, you're prompted to set passwords for all three user accounts. The Pearl administrator can change passwords at any time using the Admin panel, see Change user passwords.

You cannot change the default user names or disable user levels. When you log in to the Pearl device, you must log in as one of the three user levels. Private profiles with individually set passwords are not used.

Admin and operator-level users have access to the Admin panel to control the Pearl device. When logged in to the Admin panel, the user level is displayed at the top right corner of the screen.



Administrator

The administrator account is used for all system configuration and has full access to all configuration features with full access to the web-based Admin panel, local console, and remote log in access. The default user name used to log in to the Pearl device is **admin**.

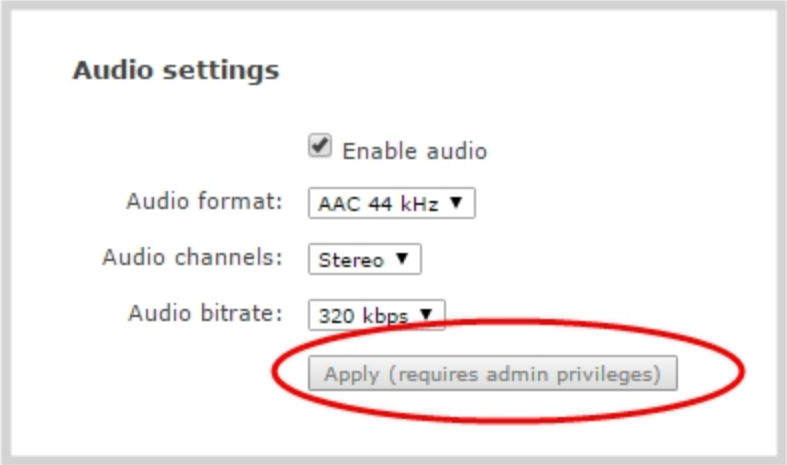
Operator

The **operator** account allows users limited configuration control with limited access to the web-based Admin panel, local console, and remote login access. The default user name used to log in to the Pearl device is **operator**.

Operators can to do the following:

- Configure inputs
- Control recordings (start and stop)
- Rename, download and delete recordings
- Perform network diagnostics
- Switch layouts while live streaming

If an operator does not have the privileges to apply a particular configuration in the Admin panel, the **Apply** button appears grayed-out in color and is not selectable. Administrators can grant operators permission to perform some administrator tasks, see Assign administrator privileges to operators.



Viewer

The global **viewer** account is exclusively used to view streamed channels. You're prompted to enter the default user name **viewer** and password to view a channel's live broadcast.

In addition to the global viewer account, each channel can set a viewer password that overrides the global value, see Restrict viewer access to channel streams.

User privileges

The following table outlines the default privileges for each user level. For administrator-level privileges that can be assign to operators, see Assign administrator privileges to operators.

Table 31 User privileges in the Admin panel

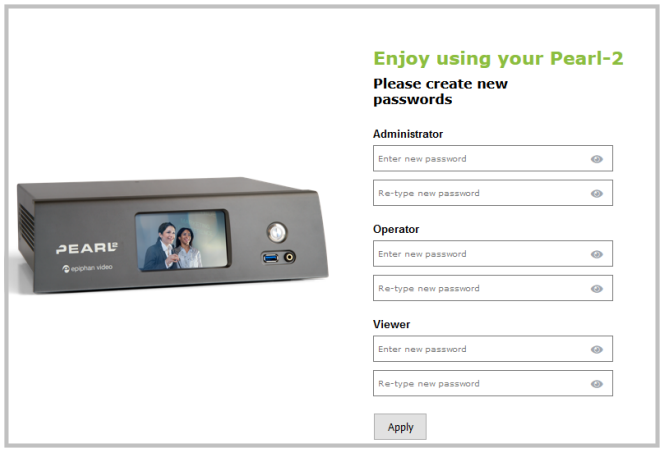
Action or Menu Option	viewer	operator	admin
View channel output	✓	✓	✓
Channel Operations			
View channel configuration		✓	✓
Rename a channel			✓
Configure stream channel			✓
Configure stream sources			✓
Start/stop recording		✓	✓
Start/stop a stream		✓	✓
Configure channel metadata			✓
Switch layouts while streaming/recording (Pearl-2 and Pearl Mini)		✓	✓
Add, duplicate, configure and delete recorders (Pearl-2 and Pearl Mini)			✓
Start the stream recorder (Pearl-2 and Pearl Mini)		✓	✓
Stop the stream recorder (Pearl-2 and Pearl Mini)		✓	✓
View recorded files list		✓	✓
Rename recorded files		✓	✓
Download recorded files		✓	✓
Delete recorded files		✓	✓
Input Source Operations			
View input source configuration		✓	✓
Rename input			✓
Configure input		✓	✓
View input snapshot		✓	✓
Network & security			

Action or Menu Option	viewer	operator	admin
Configure static IP address			✓
Configure DHCP (including Option 81) and DDNS			✓
Change HTTP/HTTPS port values			✓
Configure 802.1x			✓
Configure HTTPS			✓
CMS Operations			
Start/stop scheduled events from the device screen	✓	✓	✓
Create ad hoc events from the touch screen (Pearl-2 and Pearl Mini)	✓	✓	✓
Enable CMS and register			✓
Disable CMS or deregister			✓
Configure CMS settings and default event parameters			✓
Start/stop scheduled events (Admin panel)		✓	✓
Create ad hoc events (Admin panel)		✓	✓
View the Events page		✓	✓
System Configuration Operations			
View system configuration		✓	✓
Configure Automatic File Upload (AFU)			✓
Select External USB drive behavior			✓
Cancel USB file transfers		✓	✓
Configure network address			✓
Configure date and time preferences			✓
Set or change user passwords			✓
Configure the touch screen (Pearl-2 and Pearl Mini)			✓
Configure serial port flow control			✓

Action or Menu Option	viewer	operator	admin
Upload and delete media			✓
Enable remote support			✓
Backup device configuration			✓
Restore device configuration			✓
Restore factory configuration			✓
Reboot device (Admin panel)			✓
Shutdown device from the Admin panel (Pearl-2 and Pearl Mini)			✓
Perform a manual disk check (Pearl-2)			✓
View disk information (Pearl-2)		✓	✓
Enable/disable Epiphan Edge feature			✓
Upgrade Firmware			✓
View System Information		✓	✓
Network Diagnostics			
Bandwidth test		✓	✓
Connectivity status		✓	✓
Domain name resolution		✓	✓
Ping		✓	✓
Probe		✓	✓
Trace route		✓	✓

Change user passwords

The admin, operator and viewer-level user accounts have no assigned password by default. The first time you access the Admin panel using the administrator-level account you're prompted to set passwords for all the three user accounts. Record passwords somewhere safe for future reference.



Passwords are case sensitive and can include up to 64 alphanumeric characters within the ASCII range. Restricted characters include:

- spaces
- single quotes
- double quotes
- backslash

Contact your system administrator for your organization's specific password requirements.

In addition to setting the viewer-level user account password, you can set access passwords and IP restrictions on a per channel basis from the channel's **Streaming** page, see Restrict viewers by IP address.

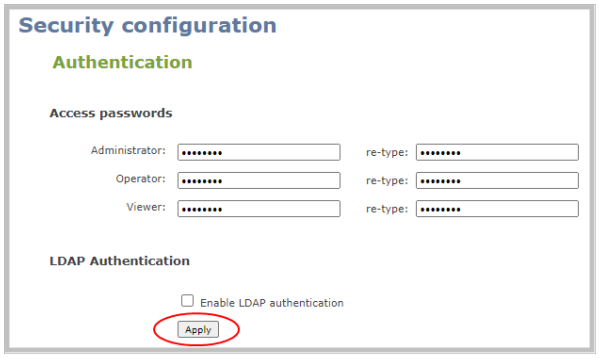
If you lose the admin password, see Overcome lost passwords.

Users are automatically logged out when a password changes. Viewers may need to refresh their browser window or press play in their media player.

Change the admin password when there is no live stream in progress. Changing the admin password while live streaming disrupts the stream for viewer-level users.

Change a user account password using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Under the Authentication section, delete the current password for a user account and enter a new password. Passwords are case sensitive.
4. Enter the identical password in **re-type** and click **Apply**.



You can set multiple account passwords before clicking **Apply**. If the passwords don't match, re-enter both passwords and try again.

If you're logged in when the password changes, you're automatically logged out and must log back in with the new password. If you add or change the viewer user's password, all channel streams pause for people watching the stream using the viewer account and must log back in using the new password.

Overcome lost passwords

If you have lost the password for the operator or viewer account, you can log in to the Admin panel and reset the password using the procedure described in Change user passwords.

If you have lost the admin password and you have remote support enabled on the device, contact Epiphan Support to request a remote password reset. If remote support is disabled, you must return the system to Epiphan for password recovery. Contact Epiphan support.

Alternatively, you can regain access to the Pearl device if you apply the factory default configuration preset using the device screen menu, see:

- **Pearl-2 and Pearl Mini** - Apply a configuration preset using the touch screen

The factory default configuration will change the current settings on the Pearl device, see The Factory default configuration preset and Factory reset. . You can also perform a factory reset, see Perform a factory reset.

Remove user password

After passwords are assigned to the three user account levels (admin, operator, and viewer), we do not recommend deleting them without setting a new password. To change passwords using the Admin panel, see Change user passwords. If you don't remember the admin password, see Overcome lost passwords .

Changing the password while someone is logged into the account automatically logs out that user. If viewers are watching a broadcast when the viewer password is changed, they are automatically

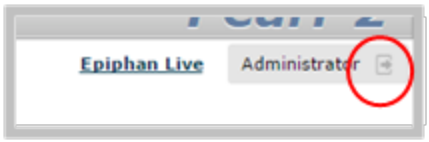
logged out. Viewers may need to refresh their browser window or press play in their media player to trigger the log in prompt.

Log in using a different user account

After you log in to the Admin panel as an Administrator or Operator, your browser remembers and automatically logs you in using the same user account the next time you log in to the Pearl device. You must log out of the Admin panel, then log back in using a different user account.

Log in using a different user account

1. In the Admin panel, select the logout icon at the top right corner of the screen. A new log in screen appears.



Some browsers may require you to click twice before the you are logged out.

2. Enter the credentials that you want to use to log in to the Admin panel.

Assign administrator privileges to operators

Administrators can assign additional administrative-level privileges to operators from the Security menu in the Admin panel. The following table lists the available options and their associated privileges.

Table 32 Options with additional operator privileges

Option	Operator admin functions
Channel configuration	Add, remove, and rename a channel
	Configure channel encoder settings
	Create and configure a custom layout for a channel
	Configure, remove, rename, and publish a stream for a channel
	Configure channel metadata
	Pearl-2 and Pearl Mini - Add, duplicate, configure, and delete recorders

Option	Operator admin functions
	Upload, download, and delete media files
Input configuration	Add and rename video and audio inputs
Network configuration	Configure network address
	Configure 802.1x and manage CA certificates
	Enable and disable DHCP Option 81
	Configure Dynamic DNS (DDNS)
	Reboot the Pearl device.
Configuration presets control[1]	Create, delete, and apply configuration presets
System configuration	Configure the video output settings
	Enable CMS and register
	Disable CMS or deregister
	Configure CMS settings and default event parameters
	Configure Automatic File Upload (AFU)
	Select external USB drive behavior
	Configure the date and time preferences
	Configure the device screen
	Configure the serial port flow control
	Enable/disable Epiphan Edge feature for remote control and remote login
	Video output configuration
System maintenance	Apply configuration presets[2]
	Upgrade firmware
	Enable remote support
	Reboot device (Admin panel)
	Shutdown device (Admin panel)
	Restore factory configuration
	Configure the name, location, and description

Option	Operator admin functions
	Perform disk check

[1]Only configuration presets that don't include the System group are allowed.
[2]Allow operators to apply configuration presets that include the System group, as well as apply the factory default configuration preset.

Assign administrative privileges to operators using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Under **Additional operator privileges**, check options to assign those administrator privileges to operators, and then click **Apply**.

Configure LDAP user authentication

You can use the Lightweight Directory Access Protocol (LDAP) to authenticate users. Specify user roles by using group DNs for users who log in as an Administrator, Operator, or as a Viewer.

The system has only **one** admin user and **one** operator. LDAP users must log in as either an admin or an operator and do not have their own private profiles. Any LDAP users with the name admin, operator, or viewer are ignored and the local accounts are used instead.

When enabled, LDAP authentication is an **alternative** to the regular system user names and passwords. You may still login as **admin**, **operator** or **viewer** using the passwords for those accounts.

LDAP replaces the local **viewer** account instead of working side-by-side with it when LDAP is enabled and the viewer account has no password (either there is no global viewer password configured or the channel overrides the global password with a blank password). In this case, the viewer must authenticate with LDAP and **cannot** use the default **viewer** account with a blank password to log in.

For security reasons, you should configure passwords for the local accounts.

These instructions assume you have a pre-configured LDAP server. The server must support anonymous binding or have a special bind account with search access privileges. Note that Active Directory does not support anonymous binding. LDAP referrals, restrictions and failovers are not supported.

Configure LDAP authentication using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.

2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. In the **LDAP authentication** section, check **Enable LDAP authentication**. Uncheck the check box to disable LDAP authentication.
4. In the **Server address[:port]** field, enter the server IP address and (optional) port for your LDAP server. For example, 192.168.1.101:389.
5. In the **Connection encryption** drop-down, choose the type of encryption used by your LDAP server (if any is used).

Connection encryption	Description/Default port used
No Encryption	No encryption is used to connect to the LDAP server. The default port is 389.
SSL	SSL encryption is used to connect to the LDAP server. The default port is 636.
TLS/STARTTLS	The connection is initially unencrypted then upgraded to TLS encryption is used. The default port is 389.

6. In the **Bind DN** and **Bind password** fields, specify the fully qualified DN and password for LDAP bind. These fields are only needed if your LDAP server does not support anonymous binding.
7. In the **Base DN** field, specify the baseObject to search for entries. The system will search this object and the whole subtree starting at the base DN.
8. (Optional) By default the Authentication attribute is *uid*, which is suitable for a unix environment. You can specify a different value in the **Authentication attribute** field, if needed. For Active Directory environments, specify *userPrincipalName*. The value of this attribute must be unique in the Base DN.
9. In the **Administrators (group DN)** field, specify the distinguished name of the group users must be part of to be logged in as the administrator. Users must have the *member* or *uniquemember* attribute for the specified group to be granted Administrator access.
   If left blank, LDAP is not supported for Administrators (but can still be used for Operators and Viewers).
10. In the **Operators (group DN)** field, specify the distinguished name of the group users must be part of to be logged in as the operator. Users must have the *member* or *uniquemember* attribute for the specified group to be granted Operator access.
    If left blank, LDAP is not supported for Operators (but can still be used for Administrators and Viewers).
11. In the **Viewers (group DN)** field, specify the distinguished name of the group users must be part of to be logged in as a viewer. Users must have the *member* or *uniquemember* attribute for the specified group to be granted Viewer access.
    If left blank, LDAP is not supported for Viewers (but can still be used for Administrators and Operators).
12. Click **Apply**.

When a user of the LDAP server next visits the admin or viewer page for the system, the system prompts for use the username and password. For ActiveDirectory servers, the user needs to enter his fully qualified username (i.e. username@domainname) in addition to his LDAP password.

Users are required to authenticate once to the system and one time per channel they view. Therefore users see a prompt to log in to the system (the system name is shown) and a second time to log in to the channel (the channel name is shown).

Restrict viewers by IP address

Pearl devices permit you to restrict which computers can access broadcasts by building a list of allowed and denied IP addresses. You can do this at a global level for the system and can also override these settings on a per-channel basis. Both global and per-channel configuration procedures are described.

The following table describes what happens when an IP address is added to the allowed and denied IP address lists.

Table 33 IP Based Restriction Options

Item	Description
Allow IP's	Users connecting from addresses in this list are permitted to view broadcasts from the device, provided their IP address is not in the Deny IP's list. To allow all except IP addresses in the deny list, if any, leave the field blank. You can use the Allow list by itself, or in conjunction with the Deny IP's list as an exception to a rule in the allow list.
Deny IP's	Users connecting from addresses in this list are not allowed to view broadcasts from the device, unless their IP address is in the Allow IP's list. If a specific IP address is in both lists, access to the stream is denied. You can use the Deny list by itself, or in conjunction with the Allow IP's list as an exception to a rule in the allow list.

If your viewer account has a password, your viewers must connect to the device from a computer (or gateway) with a permitted IP address and must also supply the user name (viewer) and password before they can view the broadcast.

To restrict access by IP address, you need to know the IP addresses or range of addresses for your viewers. By default, all IP addresses are allowed to connect to the broadcast.

If a user attempts to connect to the stream from a disallowed IP address, access is denied. If there's an attempt to connect using a web browser, the message "IP address rejected" is displayed.

If you're not familiar with creating allow/deny lists, see IP restriction examples.

IP address restriction is valid for the viewer only and does not affect the Admin panel or the mobile configuration interface.

Restrict viewer access to watch streams for all channels by their IP address

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Enter the allowed IP addresses or address ranges in the **Allow IP's** field and enter denied IP addresses or address ranges in the **Deny IP's** field. Separate addresses with a comma. To specify a range, use a hyphen (-). Optional spaces improve readability.
4. Click **Apply**.

Restrict viewer access to watch streams on a channel by their IP address

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Streaming**. The channel's streaming configuration page opens.
3. From the **Stream access control** drop-down, select **Use these Settings** to enable local password and Allow/Deny IP lists are enabled.
4. (Optional) Enter a password for the viewer in the **Viewer Password** field.
5. Enter the allowed IP addresses or address ranges in the **Allow IP's** field and enter denied IP addresses or address ranges in the **Deny IP's** field. Separate addresses with a comma. To specify a range, use a hyphen (-). Optional spaces improve readability.
6. Click **Apply**.

IP restriction examples

The following table lists some sample allow lists.

Table 34 Example allow lists

Example	Description
Allow list with distinct IP addresses	The simplest allow/deny list is to use the list of known IP addresses to craft a list of allowed IP addresses. All other addresses are denied access to the broadcast. For example if your system is accessible on your local area network (LAN) and you want to make sure only the CEO's specific desktop, laptop and tablet computers (with IP Addresses 192.168.1.50, 192.168.1.51, and 192.165.1.75, respectively) can connect to the broadcast, construct the following allow list: Allow: 192.168.1.50, 192.168.1.51, 192.168.1.75
Allow list with a range of IP addresses	Sometimes you'll want a range of computer IP addresses to connect to your system. This may happen when you have one range of IP addresses assigned to desktop computers (i.e. in the range 192.168.1.1 to 192.168.1.100) and another range assigned to boardroom computers (i.e. the range 192.168.1.200

Example	Description
	to 192.168.1.250). If you only want the boardroom computers to connect to broadcasts from the system you can specify the range of boardroom IP addresses rather than needing to type in each individual address. The allow list looks as follows: Allow: 192.168.1.200-192.168.1.250 Note that we could have specified two of the IP addresses in the previous example as a range.
Allow list with a range of IP addresses and one or more specific IP addresses	Putting the first two examples together, we want to permit access to IP addresses in the range of boardroom computers (192.168.1.200-192.168.1.250) and also want to add the desktop, laptop and tablet computers of the CEO (IP addresses 192.168.1.50, 192.168.1.51, and 192.168.1.75, respectively). Note the first two IP addresses are consecutive, so they can be added as a second range. Add these IP addresses to the list as follows: Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75 Your list can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.
Allow list with a range of IP addresses, distinct IP addresses, and an exception	Building on the previous examples, consider a situation where you want the CEO's computers (192.168.1.50, 192.168.1.51, 192.168.75) and all boardroom computers (192.168.1.200-192.168.1.250) to access the broadcast, with the exception of the public boardroom computer (192.168.1.211). Use both allow and deny lists to create the rule as follows: Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75 Deny: 192.168.1.211 Both lists can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.

The following table lists some sample deny lists.

Table 35 Example deny lists

Example	Description
Deny list with distinct IP addresses	Another simple allow/deny list is to use the list of known IP addresses to list specific denied IP addresses. All other addresses are allowed access to the

Example	Description
	broadcast. For example imagine your system is accessible on your local area network (LAN) and you want to allow any computer on the LAN can access the stream except your publicly-accessible boardroom (with IP address 192.168.1.211). You can use the following deny list (leave the allow list empty) to permit all computers except the boardroom computer: Deny: 192.168.1.211 As with allow lists, your deny list can specify a range of IP addresses, and can specify multiple ranges or distinct IP addresses in a comma-separated list.
Deny list with a range of IP addresses	Consider a situation where you want every computer on the network to access the broadcast, with the exception of the CEO's desktop, laptop and tablet computers. Additionally, boardroom computers should not be permitted with the exception of the cafeteria computer (IP address 192.168.1.222). The deny list is an "exception" list for the allow list. So to craft the rule described above we need to allow all the computers in the local subnet, then deny specific sub-ranges including two groups of boardroom computers ensuring the cafeteria computer's IP address is not in the deny list: Allow: 192.168.1.1-192.168.1.250 Deny: 192.168.1.200-192.168.1.221, 192.168.1.223-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75

Configuration presets

Configuration presets are the perfect solution for backing up your system configuration so you can restore later when needed. They are also useful if you have changing configuration requirements for Pearl-2 or are managing multiple systems and you want them to have similar configurations.

Topics include:

- About configuration presets
- Configuration preset considerations
- Configuration groups
- The Factory default configuration preset and Factory reset
- Create a configuration preset
- Apply a configuration preset using the Admin panel
- **Pearl-2 and Pearl Mini** - Apply a configuration preset using the touch screen
- Export and import configuration presets
- Update a configuration preset
- Delete a configuration preset

About configuration presets

Configuration presets are groups of settings that get applied to the system, leaving other important settings intact. They make it easy to manage multiple Pearl-2 setups in shared spaces, like a studio, and ensures a consistent setup each time you go to use Pearl-2. You can even export a configuration preset and upload it to another Pearl-2 system.

Configuration presets are not cross compatible between different Pearl models or between Pearl devices and Unify projects.

The system's settings are divided into the following configuration groups. You can choose to include any number and combination of configuration groups in a preset and create as many different configuration presets as you need.

Pearl-2 and Pearl Mini configuration group list

System

Inputs

Automatic file uploads

Network

Channels

EDID

Output ports

Touch screen

CMS

Epiphan Edge

You can create and apply any saved configuration preset from the Configuration menu when you select **Maintenance** using the Admin panel. A special **Factory default** configuration preset, which cannot be erased, is included in the list of configuration presets. Use that to return to the factory setup without destructively erasing any saved recordings or media files you've uploaded.

It's important to note that configuration presets are applied over existing settings. They affect only the settings groups included in the preset. All other settings are unaffected. Read the Configuration preset considerations section carefully to understand caveats around using configuration presets.

Example of presets in action

You could upload custom background images to Pearl-2 in advance of a conference and create custom channel configuration presets for several different keynote speakers, each with a different setup, and then apply them later when you need them.

For example, you could create two configuration presets called Session 1 and Session 2. Each session could include things like custom backgrounds, images and logos, channels and layouts, metadata, streaming settings, and automatic file upload (AFU) locations. Then download those presets to your local computer so you can upload them to your entire fleet of Pearl-2 systems.

Channel configuration includes any applied backgrounds and image files. If these files aren't present when the configuration preset is saved, the save function will fail. Be careful when deleting background images and logo files.

At the conference, simply apply the configuration preset that you need for the appropriate session using the Admin panel or the Pearl device screen. When applying the configuration preset, all other preset groups remain unchanged. The preset only affects channels and their configuration.

Session 1 preset

Session 2 preset

After applying a configuration preset, recorded files from the previous session remain present on the system. If AFU is configured, the recorded files continue to upload even after the new configuration preset is applied (if AFU is not yet complete), but the channels reflect the newly loaded session's background file name and presenter name.

Configuration preset considerations

There are important considerations that you should know before you start using configuration presets, including:

- Access to presets and privacy considerations
- Recording and streaming states
- Recorded files in a channel (or recorder on Pearl-2 and Pearl Mini)
- The potential to lock the device screen
- Orphaned Kaltura resource registrations and duplicate resources
- Channel and recorder index number behavior on Pearl-2 and Pearl Mini
- Deleting channels and recorders
- and more

Access to presets and privacy considerations

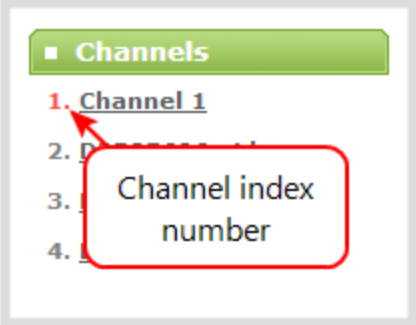
- Recorded files are not removed when you apply a configuration preset. Any user with access to Pearl-2 has access to all the saved recordings, custom channel layout, etc that are associated with an applied configuration preset.
- Configuration presets can be overwritten and deleted without a password. Users who are logged in to the Admin panel can remove or change an existing configuration preset.
- Applying a configuration preset does not clear the settings from groups that aren't a part of the preset, which means user information is not private.
- Media and recorded files can be deleted, affecting more than just the currently applied configuration preset. Users can erase uploaded media or recordings that belong to other users.

Locking out the touch screen on Pearl-2 and Pearl Mini

The **touch screen** configuration group includes all the security settings for the touch screen. It's possible to apply a preset that effectively locks out all further use of the touch screen. If this happens, use the Admin panel to re-enable the touch screen, see Configure the touch screen.

Channel and recorder index number behavior (Pearl-2 and Pearl Mini)

Each channel and recorder has an index number. The first channel created on a system is channel 1, subsequently channel 2, 3, 4, etc. Recorders are also created starting at index 1 with numbers incrementing as new recorders are created. The channel (or recorder) index number is found to the left of the channel or recorder name in the Admin panel:



Configuration presets that contain the **channels** configuration group specify the channels in the preset by their index number. This means if you have channels 1, 2, 3 and 4 when you save your preset, applying that preset will overwrite the configuration of your current channels with indexes 1, 2, 3 and 4. If prior to applying that preset you also had channels with indexes 5 and 6, the configuration settings for those two channels are erased when the preset is applied (because the preset only has 4 channels).

There are three areas where channel (and recorder) index numbers affect what happens when applying configuration presets. See Recording and streaming states and Recorded files in a channel or recorder for more information.

Configuration groups

The following table describes what settings are saved with each configuration group.

Table 36 Configuration group definitions

Group Name	Settings included in the configuration group
System	Date and time settings, serial port settings, remote support settings, custom disk check schedule, access passwords, LDAP configuration settings, and deny/allow lists.
Network	Network settings.
Inputs	All audio and video source configuration settings (including no signal images) except EDID settings, which are in their own group.
EDID	EDID settings for sources. Applying configuration presets with this group automatically applies the included EDIDs. This process can take a while.
Channel(s)	All channel configuration data and current recording state, all layouts) images used in layouts, streaming state, all recording configuration data and current recording state.
AFU	Automatic file upload type, parameters and schedules. SFTP/SCP **private keys** are included (in encrypted format) in the automatic file upload preset.
CMS	Include CMS settings for integrations.
Epiphan Edge	Epiphan Edge pairing and encoder selection information.
Pearl-2 and Pearl Mini - Touch screen	Permitted touch screen use settings.
Output ports	All configuration settings for the output ports.

The Factory default configuration preset and Factory reset

Administrators can apply the default factory configuration preset to Pearl devices or Unify projects, which resets most of the settings in each of the main configuration groups. Applying the factory default configuration preset is similar to a factory reset, but a **Factory reset** is more invasive. This table describes the differences.

Table 37 Factory default configuration preset vs a factory reset

Item	Factory default configuration preset	Factory reset function
Deletes all created channels	✓	✓
Deletes all recorded files in the channels		✓

Item	Factory default configuration preset	Factory reset function
(Pearl Nano has a single channel)		
Pearl-2 and Pearl Mini - Deletes all created recorders	✓	✓
Pearl-2 and Pearl Mini - Deletes all recorded files in recorders		✓
Resets network configuration	✓	✓
Pearl-2 and Pearl Mini - Resets touch screen configuration	✓	✓
Resets user passwords	✓	✓
Deletes all created configuration presets		✓
Removes Kaltura and Panopto CMS registration information	✓	✓
Removes records for all scheduled and completed CMS events	✓	✓
Deletes all uploaded media files		✓
Resets all Source settings	✓	✓
Resets EDID to factory	✓	✓
Deletes all SCP/SFTP identities	✓	✓
Deletes all LDAP settings	✓	✓
Deletes all Automatic file upload settings	✓	✓

There are different ways you can apply the **Factory default** configuration preset to the Pearl device, you can:

- Apply a configuration preset using the Admin panel
- **Pearl-2 and Pearl Mini** - Apply a configuration preset using the touch screen

A reboot is required to apply the factory default configuration preset.

To perform a factory reset, see Perform a factory reset.

Operators who are assigned certain administrative-level privileges can apply the Factory default configuration preset and perform a factory reset, see Assign administrator privileges to operators.

Returning the Pearl device to the factory defaults or performing a factory reset does not delete the registered resource instance in Kaltura CMS. You can reregister your Pearl device using the same resource name and take over for the resource instance that is still registered in Kaltura, see **Reassign a registered resource**.

Create a configuration preset

You can create as many configuration presets as you need; however, there's a limit to the amount of space available for configuration presets. A maximum of 256 MB is available for configuration presets and the maximum size of a single configuration preset is 128 MB.

Before creating and using a configuration preset, read Configuration preset considerations.

For each configuration preset you create, you get to name the preset and choose which groups of settings to include. See Configuration groups for which settings are included in each group.

After you finish configuring Pearl-2, it's good practice to save a full backup with all groups selected so that you can restore your full configuration at a later date.

Configuration presets for Pearl devices that include **network** or **system** settings require a system restart when applied.

Important considerations

- Configuration preset file names should be unique and should not contain # or + symbols.
- If you try to save a configuration preset but one or more of the related image files is missing, an error message is displayed. You'll be unable to save the preset until the missing files are restored or the layouts referencing the missing files are modified to remove the bad references.
- If you try to save a configuration preset but there isn't enough space, an error message is displayed. You'll need to delete some presets before proceeding.

Create a configuration preset using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance** . The maintenance page opens.
3. Under **Create a configuration preset**, enter a name for your configuration preset in the **Name** field. Configuration preset file names should be unique and should not contain # or + symbols.
4. Check the configuration groups you want to include in the preset. For a full system backup, select all groups.

After a configuration preset has been created, you can select which sections of the configuration preset to apply. For more information, see Apply a configuration preset using the Admin panel.

5. Click **Save**. Your configuration preset appears in the list.

Apply a configuration preset using the Admin panel

When you apply a configuration preset, the system settings for all included configuration groups are updated. Other settings on the system are not affected. For example if you apply a preset that includes the configuration groups channels and **automatic file upload**, your network settings, passwords, time server, source configurations, etc are not modified. Similarly, if you apply a configuration preset that has only **network** settings included, only the network settings change.

If you apply a preset that has the **network** or **system** configuration group, a reboot is required. If you apply a preset that has the EDID configuration group, the system may appear unresponsive for a short time while it applies these EDIDs to the video grabbers.

You can verify which configuration groups are included in a preset by looking at the list to the right of the configuration preset name. The term 'all' means all groups are included. Otherwise groups are listed individually.

You may apply multiple presets one after another. If you apply two (or more) configuration presets that include a particular configuration group, the settings (for that group) from the last applied preset are the active settings. In short, last in wins.

Apply a configuration preset using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance**. The maintenance page opens.
3. In the **Configuration presets** section, select which sections of the configuration you wish to apply. For example, if you have imported a configuration preset and don't want to apply the Network section, clear the **Network** check box for the configuration preset. If you want to apply all of the sections, skip to the next step.
4. Click **Apply selected** below the configuration preset you want to apply.
5. Click **OK** when prompted. The Pearl device reboots automatically if the configuration preset includes the **network** or **system** configuration groups.

Apply a configuration preset using the touch screen

You can use the touch screen on Pearl Mini and Pearl-2 to apply configuration presets that are either stored locally on the internal storage of Pearl or from a USB drive that is attached to a USB port on Pearl. See below for instructions on how to prepare the USB drive and use it to apply a configuration preset to your Pearl.

Configuration presets that only contain the **network** configuration group can also be applied using an alternative method, which is also described in this procedure.

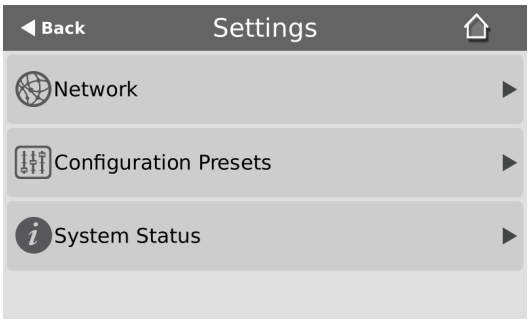
If you apply a preset that has the EDID configuration group, the system may appear unresponsive for a short time while it applies these EDIDs to the video grabbers.

Prepare USB drive and use it to apply a configuration preset

1. Make sure that USB drive is formatted with either FAT, exFAT, ext2 or ext4
2. Connect the USB drive to a computer.
3. Change the USB drive label to 'EPIPHAN'. In majority of operating systems, this is usually performed by right clicking on the USB drive and select the rename option.
4. Create a folder called 'EPIPHAN' as a top level level folder.
5. Copy one or more Pearl Configuration Presets to the EPIPHAN folder created in the previous step.
6. Safely eject the USB drive from your computer.
7. Connect the Maintenance USB drive to one of the USB ports on your Pearl.

Apply a configuration preset using the touch screen

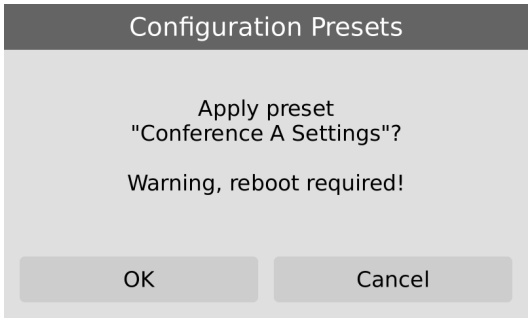
1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen.



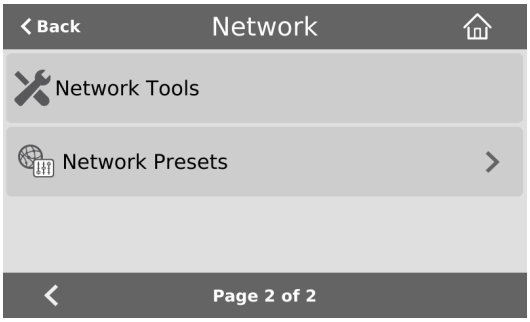
2. Tap **Configuration Presets**.A list of all the presets that are saved on the internal drive or on an attached USB drive presets appears. Compatible Configuration preset stored on an attached USB drive have USB icon before their name and these are always listed first before internally stored presets.

3. Use the arrows at the bottom of the page to navigate through the list and tap the name of the preset you want to apply.

4. Click **OK** when prompted to apply the configuration preset. If the configuration preset includes the network or system configuration groups, a reboot is required.



Alternatively, you can apply a configuration preset from the **Settings** when you select **Network** and go to the second page of Network options. Then tap **Network Presets** to display the list of saved configuration presets. Only configuration presets that contain the network configuration group are listed when you use this method.



Export and import configuration presets

You can download configuration presets to your local computer, then upload and apply the preset to another Pearl-2 or save the configuration preset as a backup of your current configuration. Either way, it's a simple two-step process to download the preset from one system and upload it to another.

Before you begin

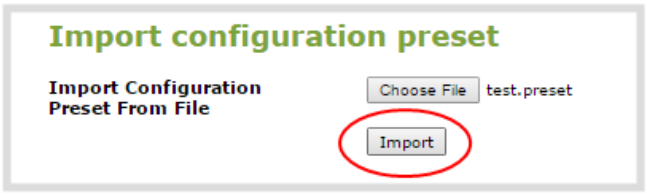
- Read Configuration preset considerations.
- Configuration presets are not cross compatible between different Pearl models or between Pearl devices and Unify projects.
- You cannot download/upload configuration presets using the local console on the Pearl device. Use the web-based Admin panel instead.

Download or export a configuration preset using the Admin panel

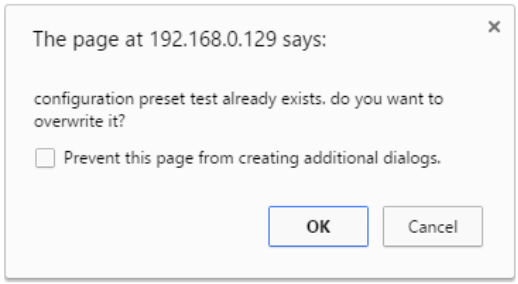
1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, Click **Maintenance** . The maintenance page opens.
3. In the **Configuration presets** section, click the **Download** button next to the configuration preset you want to export. The configuration preset file (with extension .preset) is saved to your admin workstation (in your browser's download folder).

Import a configuration preset using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance**. The maintenance page opens.
3. In the **Import configuration preset** section, click **Choose file** and select the file you want to upload (with the extension *.preset*), then click **OK**.
4. Click **Import**.



5. If your system already has a configuration preset with the same name as the one you're loading, a warning is shown. Click **OK** to overwrite the existing preset or **Cancel** to cancel the upload.



What's next

After you upload a configuration preset file, you must apply the configuration preset to Pearl-2. To apply the configuration preset, see Apply a configuration preset using the Admin panel or:

- **Pearl -2 and Pearl Mini** - Apply a configuration preset using the touch screen

Update a configuration preset

To update a configuration preset, or add/remove different configuration groups from the preset using the Admin panel, use the following procedure:

Update a configuration preset using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance** . The maintenance page opens. All existing configuration presets are listed in the **Configuration presets** section.
3. Copy the name of the preset you want into the **Name** field and select the configuration groups to include,

then click **Save**.

4. Click **OK** when prompted to overwrite the existing configuration preset with the new one.

Delete a configuration preset

You can delete individual configuration presets from the **Maintenance** page in the Admin panel.

Delete a configuration preset using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Maintenance**. The maintenance page opens.
3. Click **Delete** beside the configuration preset that you want to delete, and then click **OK** when prompted.

Pearl devices can delete all configuration presets at once by doing a factory reset. You cannot delete the Factory default configuration preset.

Capture

Capturing is the process of taking the signals from your video and audio sources and encoding them so they're ready for streaming and recording. You add the captured video and audio to channels, which you customize for live streaming, switching, and recording.

This section covers how to create channels and add custom layouts so that you can capture, stream, and record exactly what you want - how you want! Whether that's a simple channel with a single video and audio source or channels that have multiple video and audio sources and custom layouts like picture in picture.

Topics include:

- What is a channel?
- Channel layout examples
- About automatic channels
- Channel configuration
- Custom layout configuration
- Video and audio input sources

What is a channel?

A channel is an encoding instance associated with your video and audio inputs to produce video recordings and/or live streams. Your video and audio sources can be combined and added to a channel, which you can stream and record.

- **Pearl-2 -** we recommend a maximum of six 1080p sources in up to six full HD channels or up to four 4K sources in a single channel for best performance.

Default auto channels have the related HDMI port selected by default. As soon as you connect your video source to the port, it appears automatically in the channel's custom layout. Changing the channel's frame rate or deleting the channel will change the frame rate used at the output port for that video input. Deleting the channel forces the video output port to use the original frame rate of the video input source.

Channel layout examples

Here are some examples of different layouts you can create using the custom layout editor with just two video input sources and two media image files.

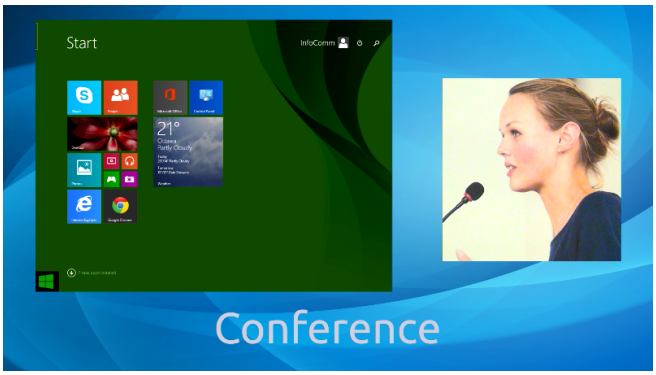
In the Epiphan products column, "All" means the layout can be created with Pearl-2, Pearl Mini, Pearl Nano, and Epiphan Unify.

Layout example	Epiphan products	Description
	All	One video source (a slideshow presentation in this case), at the full size of the channel. **To get this look:** Using the custom layout editor, add one video source to the layout, select **keep aspect ratio** and stretch to fill the entire layout area.
	All	One video source with a logo (.png with transparency) in the bottom left corner. **To get this look:** Upload an image with transparency. Using the custom layout editor, add one video source to the layout, select **keep aspect ratio** and stretch to fill the entire layout area. Then, add the image to the layout and drag it where you

Layout example	Epiphan products	Description
		want it to appear on screen.
	All	One source with a text overlay in the bottom right corner. **To get this look:** Using the custom layout editor, add one video source to the layout, select **keep aspect ratio** and stretch to fill the entire layout area. Then, add a text overlay to the layout and drag it where you want it to appear on screen.
	All	One video source (a slideshow presentation in this case), with a green background matte. **To get this look**: Using the custom layout editor, select a background color. Add a video source to the layout and size appropriately, leaving the background matte visible.
	All	Two video sources (a slideshow and a presenter cropped to a new aspect ratio using the tool to Crop a video source), a background image, and a logo. Make sure the background image has the correct aspect ratio. **To get this look:** Upload your background and logo images (you can do this from the Media page or the Layouts page for the channel). Using the custom layout editor, add the background image to the layout and stretch it to fill the entire layout area. Then add your two video sources to the layout, adjusting their size and position as needed. Lastly, add the logo to the layout and move it in to position. For the second video source, use the **Crop tool** to crop the

Layout example	Epiphan products	Description
		second source to a square aspect ratio.

Examples including a 4x3 video source.

Layout example	Pearl Devices	Description
	Pearl-2 and Pearl Mini	One 4x3 video source at the full size of the channel. **To get this look:** Using the custom layout editor, add one video source to the layout, select **keep aspect ratio** and stretch to fill the entire layout area. The channel broadcasts in 4x3 if you have **Use current signal resolution as frame size** selected on the encoding page.
	Pearl-2 and Pearl Mini	One 4x3 video source in a 16x9 frame with a green background matte. **To get this look**: From the Encoding page for the channel, make sure that the 16x9 frame size is selected. Then using the custom layout editor, select a background color. Add a video source to the layout and stretch to the full height of the screen, leaving the background matte visible.
	Pearl-2 and Pearl Mini	One 4x3 video source and a cropped 16x9 video source together with a background image. Make sure the background image has the correct aspect ratio. **To get this look:** Upload your background image (you can do this from the Media page or the Layouts page for the channel). Follow the steps from the first 4x3 example to add the video sources, then use the **Crop** tool to crop the second source

Layout example	Pearl Devices	Description
		to a square aspect ratio.

About automatic channels

Pearl-2

To get you started as quickly as possible, Pearl-2 comes pre-configured with two automatic channels called Auto A and Auto B. Simply plug a source into one of the "A" inputs and a second source into one of the "B" inputs. Pearl-2 automatically configures the channel's frame size to match the source resolution and configures a frame rate and bitrate. The detected video source's audio is also automatically added to the channel.

Embedded audio from a DVI source that is connected to the HDMI input using an adapter is not detected on automatic channels. You must manually add the audio to the channel's layout using the custom layout editor.

You can start viewing the automatic channel immediately on the device screen or using a web browser on the same local network as the Pearl device. Browse to the following URL:

Pearl-2

For Auto A: http://<serial>.local/preview.cgi?channel=1
For Auto B: http://<serial>.local/preview.cgi?channel=2

For example:http://d560515f.local/preview.cgi?channel=2

If Bonjour services, which permits browsing by serial number, are not installed on your admin computer, you can get the IP address of your Pearl device by doing the following:

Pearl-2

Tap settings on the touch screen and browse to:

For Auto A: http://<IP Address for Pearl-2>/preview.cgi?channel=1

Links for other channel streams (i.e. RTSP or MPEG-TS) can be found by logging into the Admin panel and selecting **Status** in the Channel menu.

Important considerations

- The default auto channel has the related HDMI (or SDI) port selected by default. As soon as you connect your video source to the port, it appears automatically in the auto channel's custom layout. Changing the auto channel's frame rate or deleting the auto channel will change the frame rate used at the output port for that video input. Deleting the auto channel forces the video output port to use the original frame rate of the video input source.
- If you delete the auto channel, it will re-appear upon factory reset or when loading the default configuration preset.

Which signal does the auto channel use?

The Pearl device has video input sensing, which means that it knows when a video signal is received from an attached source.

If you attach more than one video source to the video inputs ("A" inputs on Pearl-2) while the Pearl device is powered on, the first source you attach has the highest priority. If you attach more than one source (to inputs that are labeled with the same letter A or B on Pearl-2) before powering on the Pearl device, the following priority is used:

Priority	Pearl device	Connector Type
1	All	HDMI (with HDMI Audio)
2	Pearl-2 only	HDMI 4K[4K] (with HDMI Audio)
3 - Pearl-2	All	SDI (with SDI Audio)
4	Pearl-2 and Pearl Mini	USB video (with USB audio)

The auto channel uses a source until that source no longer has a signal. Then, it switches to the next highest priority signal.

Pearl-2 example, if you attach an SDI source to the "SDI-A" slot and then HDMI into the "HDMI-A" slot, Auto A will show HDMI and use HDMI audio. If the HDMI video signal is lost or you manually select the SDI audio source using the custom layout editor, Auto A will switch to SDI video with SDI audio.

If all the connected sources lose signal at the same time (i.e. for example, is SDI loses video signal and no other video signal is found) no change is made and the auto channel continues to use the current source. In this case, a no signal image is displayed for viewers.

You can see which video and audio sources are configured for the channel from the Info page, see View system information using the Admin panel

Channel configuration

A channel lets you encode your video and audio sources so they can be live streamed and recorded. Before using a channel, you should check the channel settings. You can fine-tune your channel to maximize the quality

of your live streams, minimize the amount of bandwidth used, and ensure your video and audio encoding settings are optimized for your event. You can control exactly how the video is presented and streamed to shared destinations and multiple viewers.

If you create multiple layouts for a channel on Pearl-2 or Pearl Mini using the custom layout editor, you can switch live between the layouts.

Live switching on Pearl-2 and Pearl Mini

If you're planning to do live switching with your channel, we recommend you set the frame size to a fixed size instead of using the default setting. The default setting automatically sets the channel frame size to match the frame size of the video source. Changing the frame size to a fixed value ensures that you don't experience any stream interruptions if the frame size of the video source changes, like when switching between different layouts that contain a single video source with different frame sizes.

Channel encoding settings may be automatically overwritten when using a Pearl device with a Content Management System, see About Panopto recording and webcasting

Topics include:

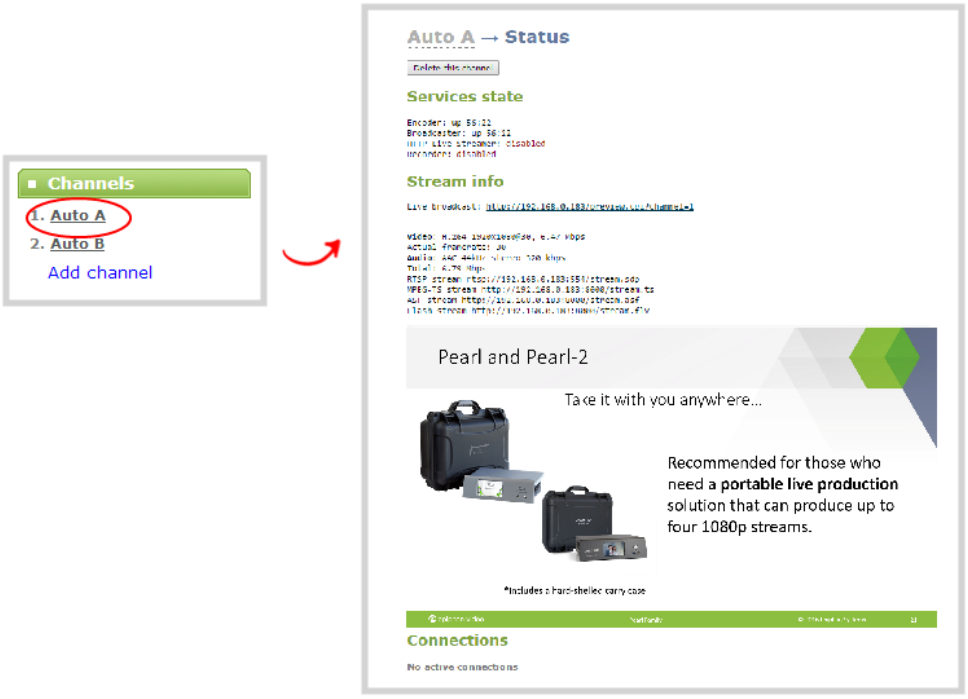
- Pearl-2 and Pearl Nano - Configure an auto channel
- Create a channel
- Add video sources or a channel as a source
- Add an audio source to a layout
- Duplicate a channel
- Rename a channel
- Delete a channel
- Preview a channel
- Add or remove channel metadata
- Configure encoding
- Codecs and file format compatibility
- Configure video encoding
- Configure audio encoding
- Pearl-2 and Pearl Mini - Multi-encoding and channel as a source

Configure an auto channel

Pearl-2 and Pearl Nano include Auto channels to make setup quick and simple. However if you want to set custom encoding or streaming configuration for the channel, you can configure it like any other channel.

Configure an automatic channel using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
3. From the Channel(s menu, click **Auto A or Auto B**. The channel's status page opens



4. Configure the automatic channel as you would any other channel.

To change the video source for the automatic channel, just select a different video source using the custom layout editor, see **Add video sources or a channel as a source**. The channel name automatically changes to the name of the selected video source if there's only one source in that channel. For important information about changing the channel name, see **Rename a channel**.

Create a channel

Create channels on Pearl-2 using the Admin panel. New channels automatically use the same aspect ratio as the default frame size setting for the channel, which is 16:9. You can change the encoding settings for a channel after the channel is created.

The default encoding settings for a channel are:

- **Video**: H.264, 1920x1080@30 fps, auto bitrate
- **Audio**: AAC, 48kHz stereo, 320 kbps

If the channel's video source doesn't have a 16:9 aspect ratio, the system automatically detects the correct aspect ratio and updates the layout after you leave and return to the custom layout editor page. This happens because the channel's encoding page has **Use current signal resolution as frame size** selected by default. If you want to change the aspect ratio for your channel, see **Configure encoding**.

Each additional channel and layout consumes additional CPU processing capacity of Pearl-2, see Optimum System Load.

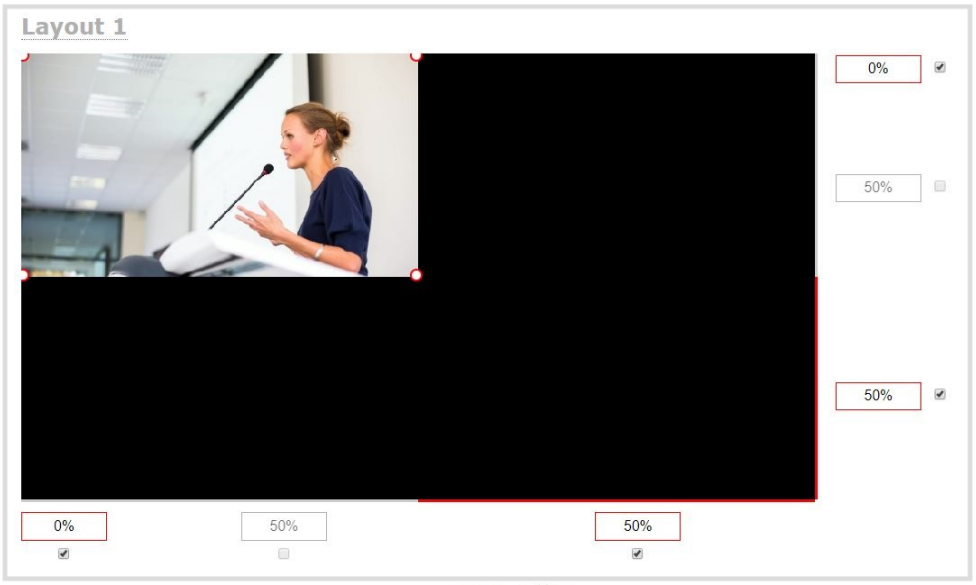
When you create a channel, it's convenient to add your video and audio sources at that time. Channels can have one or more video and audio sources. This procedure includes basic steps to add a single video and audio source.

Create a channel using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channels** menu, click **Add channel**. The custom layout editor for the new channel opens and the default layout is selected. A 16:9 workspace appears in the layout area.
3. Click **Add new item** and select **Video Source**.
4. From the Source settings, select a video source in the **Source** drop down.

For best results, **Keep aspect ratio when scaling** should be checked under **Source settings**.

The selected video source appears in the layout area.



5. Click and drag the red and white handles on the corners of the source to re-size it in the layout editor area. For a single source channel, it should fill the entire layout area. Alternatively, you could enter a percentage or pixel value in the boxes that are along the side and bottom of the layout editor area to resize the selected source.
6. Select an audio source from the list of audio sources.

> If a channel is selected as a video source, the corresponding audio for that channel is selected by default.

7. Click **Save**. Your channel is ready for basic streaming and recording.

> Because this is a single-source channel with only one layout, the channel's name is updated to display the source's name next time you view the channel. Click the channel name in the **Channels** menu to refresh. Rename the channel and choose a custom name if you don't want the channel name to change, see Rename a channel.

What's next?

The default channel encoding setting should work fine in most cases. To check the encoding settings for the channel, seeConfigure encoding. There are a lot of creative things you can do next with your channel, including creating more layouts, adding multiple video and audio sources, and customizing layouts to add images and backgrounds, see Custom layout configuration.

Add video sources or a channel as a source

Pearl-2 and Pearl Mini

You can add one or multiple video sources to any of the layouts for your channel using the custom layout editor. You can even add the output from another channel as a video input source.

When you add a channel as a video source in another channel, whatever is displaying live in that channel also displays in the other channel. This is useful when you need to stream the same switched program to multiple destinations that have different encoding settings. That's because the encoding settings are set at the channel level.

For example, to stream your switched program to YouTube at 1920×1080 and to Facebook at 1280×720, you could:

1. For Pearl Mini, set up HDMI-A as Channel 1 and HDMI-B as Channel 2. For Pearl-2, continue to step 2.
2. Set up **Channel 1** as your switched program channel. Add all your custom layouts to Channel 1 and stream this channel to YouTube at 1920×1080.
3. Set up **Channel 2** as your Facebook streaming channel. Configure Channel 2 with a single layout that uses Channel 1 as the video source, and then stream Channel 2 to Facebook at 1280×720.

For instructions to set up multi-encoded channels using the channel as a source feature, see Multi-encoding and channel as a source.

If more than one video source is added to a channel, we recommend configuring the channel encoding to use a fixed resolution as the frame size instead of automatically using the resolution of the video source as the frame size (default). A fixed channel resolution ensures that your channel displays properly at a fixed resolution.
Pearl-2 and Pearl Mini - Using a fixed channel resolution also avoids unintended resolution changes when switching between multiple layouts if the different layouts happen to have different video sources with different resolutions.
For more information, see **Configure encoding**.

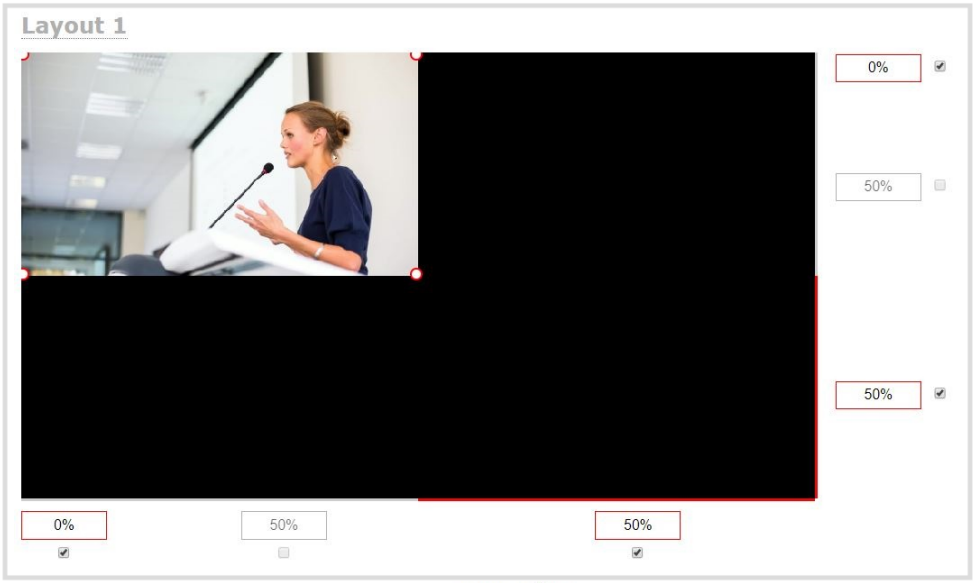
Add a video source using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select the channel and click **Layouts**. The custom layout editor opens.
3. **Pearl-2 and Pearl Mini** - In the Layouts list that appears at the top of the page, click a layout's row to select that layout or click **Add new layout**.
4. Below the Layout editing area, click **Add new item** and select **Video Source**. The Source settings appear.

5. Under **Source settings**, select either a video input or a channel in the **Source** drop-down menu.
6. Under **Source settings**, select a video input in the **Source** drop-down menu.

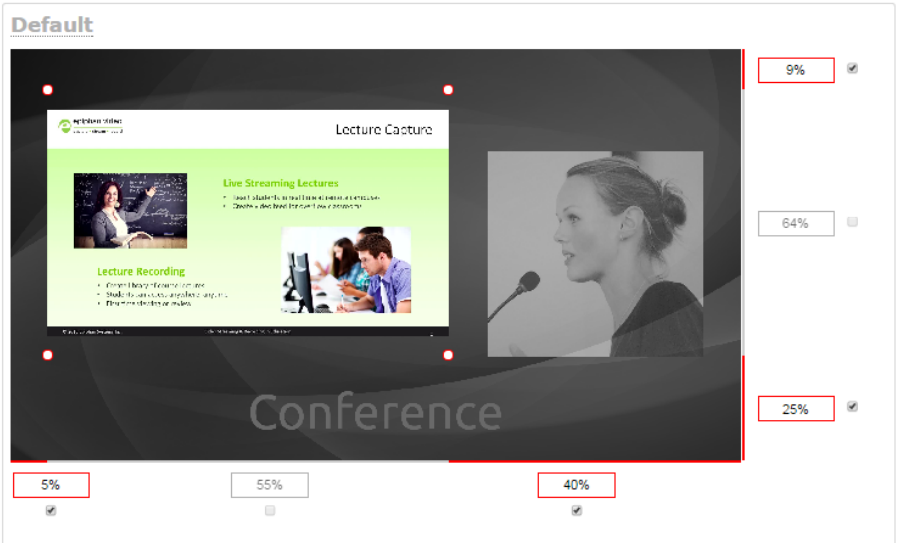
For best results, check **Keep aspect ratio when scaling** in the **Source settings**.

The selected video source appears in the layout editing area.



When adding an RTSP network source, a preview image may not display in the layout area until you Save the layout. The preview can also appear to have no signal if the RTSP source is not currently sending content.

7. Click and drag the red and white handles on the corners of the source to re-size it in the layout editor area. Alternatively, enter a value in the fields along the side and bottom of the layout editing area to resize the selected item.



To layer video sources over top of each other, like for picture in picture, you can click and drag the video sources that appear in the item list beneath **Add new item** and

change their order. Items that are higher up the list appear over top items that are lower down the list.

8. Select an audio source from the list of audio sources.

If a channel is selected as the video source, the corresponding audio for that channel is selected automatically by default.

9. Click **Save**.

A note about item positioning and sizing

There are multiple ways to position and size images, text overlays, and video sources in the layout area

- Using the mouse.
- Using the keyboard.
- Using the manual positioning values with percents.
- Using the manual positioning values with pixels.

Using the mouse

Click and drag to move the item. Click and drag the round, red and white handles to resize an image or video source (for text overlays, just use the padding settings). Using this method you can make quick changes that are in increments of approximately 5% of the width or height of your layout area. For more refined movements, press the Ctrl key on your keyboard while dragging the item with the mouse.

Using the keyboard

Use the arrow keys on the keyboard to move the item up, down, left or right in the layout. Changes are in increments of approximately 5% of the height or width of the layout area. Press the Ctrl key while using the arrow keys to make more refined movements. To change the size of an image or video source, press the Shift key while using the arrow keys (for text overlays, just use the padding settings). Press both Ctrl and Shift for fine-grained size control.

Using percents

Specify a whole number, followed by a percent sign (e.g. 4%) in any of the manual positioning fields. See Resize and position items using percents or pixels for more information.

Using pixels

If you need to specify an exact amount in pixels (rather than percent) you can type a pixel value in any of the positioning value squares followed by the characters px (e.g. 56px). You can mix and match pixels and percents changing only the boxes you want to use pixel values. At any time you can switch back to percents by typing a percent. See Resize and position items using percents or pixels for more information.

Add an audio source to a layout

You can add multiple audio sources to the layouts for a channel using the Admin panel. By default, audio is enabled for the channel on the channel's encoding page.

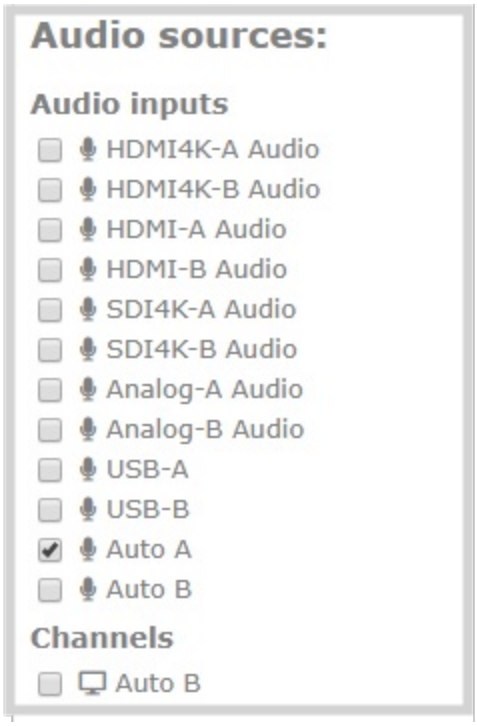
Pearl-2 and Pearl Mini - Each layout can have the same audio sources in them or you can choose different audio sources. An audio source has the same gain no matter how may layouts the audio source is added to, or if you've added just the one audio source or several audio sources to the same layout.

Important considerations

- For SRT, NDI, and RTSP input sources, there's no need to manually add the audio sources separately to your channel. When the network stream is connected to your Pearl device as an input source, a corresponding audio source is automatically added to the list of audio sources for your channels, even if there is no audio in the stream.
- The XLR-B audio inputs and the RCA audio inputs are linked within Pearl-2. The XLR L/R audio inputs and the RCA L/R audio inputs are linked within Pearl Nano. If you use both at the same time, their audio is mixed. If the two audio sources share the same audio signals, the common audio signals are amplified. To avoid this, you can disable one or the other audio port, see Assign audio sources to an input.
- If a channel is selected as the video source for a layout, the corresponding audio for that channel is added automatically.
- You can add multiple audio sources to the same layout. However, if the two audio sources share all or some of the same audio signals, then the common audio signals are amplified.
- Selecting multiple loud audio sources in the same layout may cause audio clipping on that layout. Before going live, always check the volume levels for the layout and adjust the volumes at audio sources to avoid clipping, see Adjust audio gain and delay.
- If audio encoding is not configured for a channel, no audio signal is processed or sent with the video content when recording, streaming, or confidence monitoring, see Configure audio encoding.
- If an audio source is added to a layout and then the audio device is disconnected from the input port on the Pearl device, some residual noise may be detected in the layout. Remove the audio source from the layout.

Add an audio source to a layout using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel**(s) menu, select the channel and click **Layouts**. The custom layout editor opens.
3. In the Layouts list that appears at the top of the page, click a layout's row to select that layout.
4. Check the audio source that you want to use for the layout and click **Save**.



What's Next

You can check the audio encoding settings for your channel and ensure that audio is enabled, see Configure encoding.

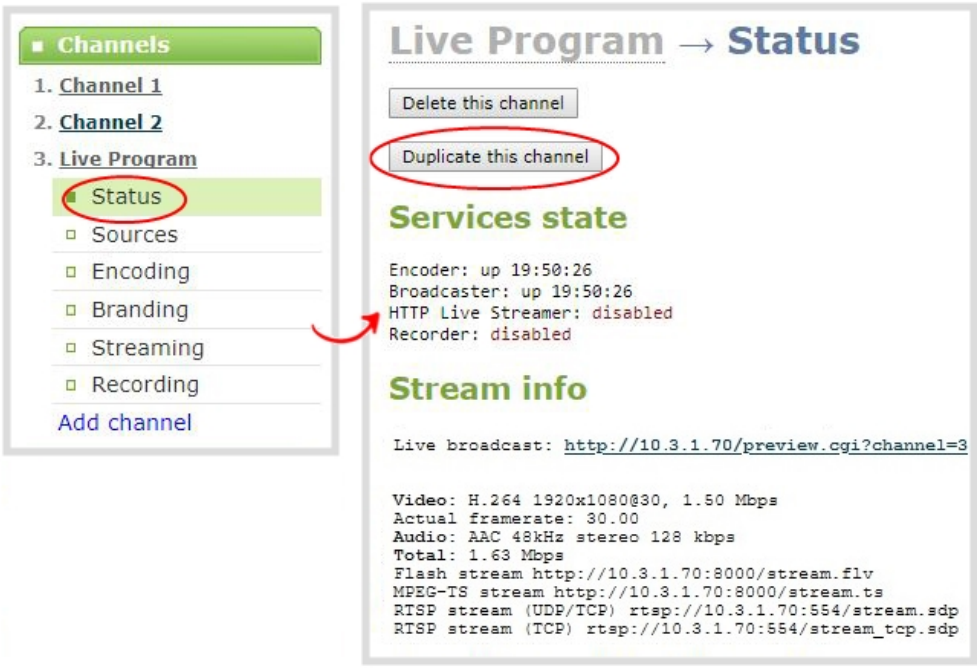
To adjust the gain for an audio input source, see Adjust audio gain and delay.

Duplicate a channel

You can duplicate any channel you've created. All settings in the channel you duplicate are recreated.

Duplicate a channel using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Admin panel, scroll to the Channels menu option.
3. From the Channels menu, click **Status**. The Status page opens.



4. Click **Duplicate this channel**. The duplicate channel is created and assigned the next sequential number in the Channel menu.
5. Click **Save**.

Rename a channel

You can change a channel's name from any of the channel configuration pages or using the custom layout editor.

Auto channels on Pearl-2 and Pearl Nano

Auto channels initially have the channel name Auto Auto A and Auto B on Pearl-2). If you manually change the video input source on the layout to something other than the automatic video source, the name of the channel changes to the name of the video input source. To revert the channel name back to the auto channel's default name, delete the channel name and leave the name field blank. When you save, the Pearl device will automatically repopulate the name field with the default name.

Assigning channels to second layouts and video sources on Pearl-2 and Pearl Mini

Channels are created with the same name as their video source by default. When a second layout or a second video source is added to the channel, the channel name changes to **Channel X**, where **X** is the index number for the channel. To stop a channel name from automatically changing, you should assign the channel a custom name using the Admin panel.

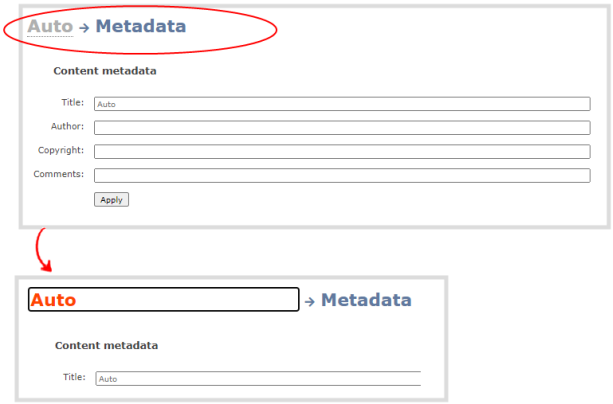
International characters

You can include certain international characters in channel names. For a complete list, see International character support.

Do not include any special currency, mathematical symbols, and other special characters such as slashes or spaces in the channel name. Pearl-2 replaces special characters with an underscore.

Rename a channel using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select the channel and choose any of menu options for the channel. For example, select **Metadata**.
3. Click on the channel name that appears at the top of the page. The text turns red.



4. Enter the new name using alphanumeric characters. We recommend using underscores to separate words rather than using spaces.
5. Press **Enter** using your keyboard to save the new name.

Delete a channel

You can delete a channel using the Admin panel. Deleting a channel removes all recorded files that are associated with that channel. You cannot recover recordings for a channel after the channel is deleted. We recommend that you stop recording or streaming for the channel before deleting the channel.

If you have multiple configuration presets, deleting a channel removes all recorded files that are related to that channel across all presets. For important information about how channels are indexed in Pearl-2 and how that affects deleting channels when configuration presets are used, see **Configuration preset considerations**.

Delete a channel using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel menu, select a channel and click **Status**. The Status page for the channel opens.
3. Click **Delete this channel** and click **OK** when prompted to delete the channel, or click **Cancel**.

Preview a channel

You can open a live preview of a channel in your web browser to see any configuration changes you make to the channel as you make them. Web browsers that support HTML5 and Flash are supported.

There are several ways to preview a channel:

- Preview a channel from the Info page
- Preview a channel from the Status page
- **Pearl-2 and Pearl Mini** - Preview all channels at the same time

With Pearl-2 and Pearl Mini, you can also preview a channel using Epiphan Live. See **Configure Dashboard panels** for more information.

Important considerations

- Some web browsers disable auto playback of videos with audio. In those cases, the audio for the channel being previewed is muted by default.
- HTML5 does not support PCM audio encoding. If PCM audio encoding is configured for a channel, audio does not play in the preview link for the channel.
- PCM audio encoding at 48 kHz is not supported. A live broadcast preview link is not provided for a channel that is configured for PCM audio encoding with a sampling bitrate of 48 kHz.
- If HTTPS is configured for Pearl-2, the live broadcast URL will start with *https* instead of *http*.

The Info page has preview links for all the channels that are configured on Pearl-2 and Pearl Mini.

Preview a channel from the Info page using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Info**. The information window opens. Then click **View** to open a preview window of the channel.

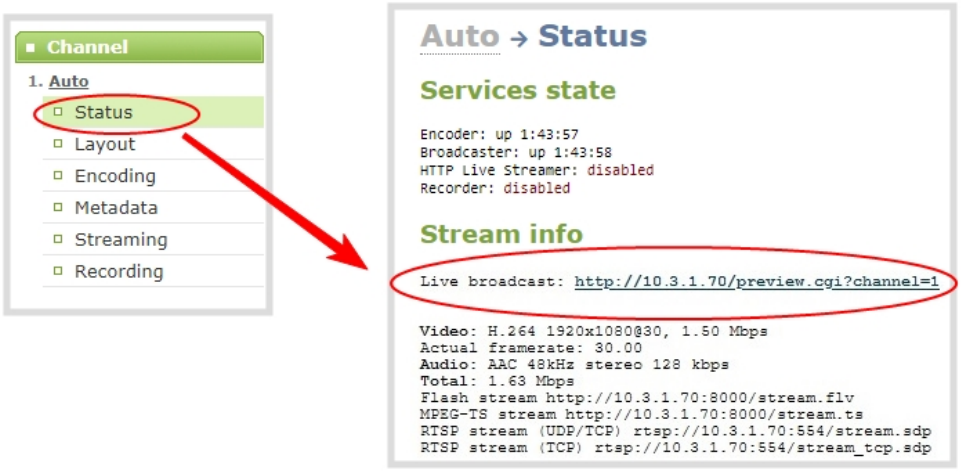
Preview a channel from the Status page using the Admin panel

You can use the Admin panel to open a preview link for a channel from the Status page. The Live broadcast preview can be viewed using web browsers that support HTML5 or Flash. You can also see a preview of the channel directly from the Status page itself.

The Status page lists information about the channel, including stream information such as the bitrate, frame size, streaming and preview links, as well as the state of the services on Pearl-2.

This feature is not available using the local console on the Pearl device.

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select the channel and click **Status**. The Status page opens and a live preview snapshot appears below the Stream info.
3. Right-click the **Live Broadcast** link and select **Open in a new Tab** or **Open in a new Window**.



Pearl-2 and Pearl Mini: Preview all channels at the same time using the Admin panel

The resulting web page can be very large. You can use your keyboard's zoom keys or the zoom buttons for your web browser to adjust the screen view. Plus many browsers support short cuts, like Ctrl- (control minus) to zoom out and Ctrl+ (control plus) to zoom in.

1. Open a new tab in your web browser on the Admin computer.
2. Go to the following URL to open the preview web page for your Pearl device, where *<ip address>* is the IP address of the Pearl device. To find the IP address of your system, see View system information using the Admin panel or View system information using the touch screen

http://*<ip address>*/preview.cgi?channels

For example: http://172.1.1.10/preview.cgi?channels

To preview a single channel, you can enter the following URL: **http://<ip address>/preview.cgi?channel=X**

where*<ip address>* is the IP address of the Pearl device and *X* is the channel's index number.

Add or remove channel metadata

When you configure metadata for a channel, that metadata is embedded in all channel recordings and streams. You can specify the following metadata that the media player displays for your viewers:

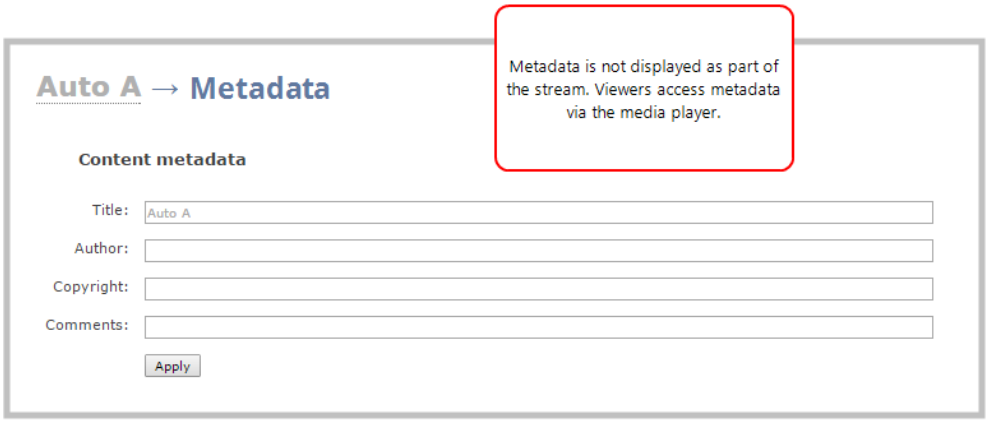
- title of the presentation
- Author
- copyright date or other labels such as proprietary information, preliminary etc.
- additional comments about the broadcast, such as time of the broadcast, or change to the schedule

How metadata is displayed depends largely on the media player. For example VLC, stores the metadata in a media information file, while other media players scroll the text horizontally from right to left across the bottom of the media player window.

Use only alphanumeric and diacritic characters in metadata descriptions. The whole metadata string is refused if any special currency or mathematical symbol appears in the description. You must remove the offending characters before Pearl-2 will accept the description.

Add or remove channel meta data using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select the channel and click **Metadata**. The Metadata configuration page opens.
3. Type information into the fields or modify existing content as needed, then click **Apply**.



Configure encoding

You can modify the encoding settings for a channel. The encoding settings let you fine tune your channel recording or live stream. You can select a specific frame size, bitrate, audio or video codec, and more.

Channel encoding settings may be automatically overwritten when using the Pearl device with a Content Management System, see About Panopto recording and webcasting.

Topics include:

- Codecs and file format compatibility
- Configure video encoding
- Configure audio encoding
- **Pearl-2 and Pearl Mini** - Multi-encoding and channel as a source

Codecs and file format compatibility

Pearl-2 supports the following codecs:

Table 38 Supported video codecs

Value	Description
H.264	H.264 provides high quality video while using low bandwidth. This is the default and preferred codec for the Pearl-2 and Pearl Mini.
Motion JPEG (Pearl-2 and Pearl Mini only)	This codec is suitable for streaming and recording video, however you get lower quality images and it requires a large amount of bandwidth. Motion JPEG does not support audio.

Table 39 Supported audio codecs and bitrate guidance

Value	Description
AAC	AAC is comparable to MP3 and may even provide better sound quality at a similar sample bitrate. Supported sampling bitrate values are: 16, 22, 44 and 48K kHz. Setting the channel bitrate to match the audio source's bitrate provides the best sound quality and avoids audio resampling. Most digital signals (HDMI or SDI sources) use 48 kHz. Most digital signals (HDMI or SDI sources) use 48 kHz audio. For analog signals, 44 kHz provides a good quality audio sample. The maximum bitrate for mono encoding of a 44 kHz signal is 264 kbps. For stereo, 320 kbps is supported. Note that lower bitrates (e.g. 32 kbps) with a 44 kHz signal may result in distorted audio.
MP3	MP3 provides a common audio format for audio storage. Supported sampling bitrate values are: 22 kHz, 44 kHz and 48 kHz. Setting the channel bitrate to match the audio source's bitrate provides the best sound quality and avoids audio resampling. Most digital signals (HDMI or SDI sources) use 48 kHz. For analog signals, 44 kHz provides a good quality audio sample.

Value	Description
	Web browsers that use Flash (FLV) do not support 48 kHz MP3 audio. When selecting this encoding, you must use a web browser that supports HTML5 or a media player to preview your channel.
PCM	Pulse Code Modulation (PCM) is a standard for digital audio in computer and other devices such as, digital telephone systems. Setting the level to match the audio source's level provides the best sound quality and avoids audio resampling. Most digital signals (HDMI or SDI sources) use 48 kHz audio. For analog signals, 44 kHz provides a good quality audio sample.

Format compatibility

Not all streaming and recording protocols support all combinations of video and audio codecs. The following table lists any video/audio codec compatibility considerations for the supported streaming formats on Pearl-2.

Table 40 Video/audio codecs and formats for streaming

Video Codec selected	Audio Codec selected	RTSP	FLV	MPEG-TS	MJPEG
H.264	No audio codec	✓	✓	✓	
	PCM	✓	✓		
	MP3	✓	✓	✓	
	AAC	✓	✓	✓	
MJPEG (Pearl-2 and Pearl Mini only)	No audio codec				✓

The following table displays the compatibility between the video/audio codecs and the supported recording formats.

Table 41 Video/audio codecs and formats for recording

Video Codec selected	Audio Codec selected	MP4 and MP4-Frag-mented	AVI	MOV	MPEG-TS
H.264	No audio codec	✓	✓	✓	✓
H.264	PCM	✓	✓	✓	
H.264	MP3	✓	✓	✓	✓

Video Codec selected	Audio Codec selected	MP4 and MP4-Frag-mented	AVI	MOV	MPEG-TS
H.264	AAC	✓	✓	✓	✓
MJPEG (Pearl-2 and Pearl Mini only)	No audio codec	✓	✓	✓	✓

Configure video encoding

You can configure the video encoding settings for a channel using the Admin panel. Video encoding settings include:

- **Video codec**: The video codec determines the type of compression and decompression, and also affects the video quality.
  - Pearl Mini and Pearl-2 options are H.264 (default) and Motion JPEG.
- **Hardware or software encoding**: Hardware encoding is the default setting on Pearl Mini or Pearl-2 and is the recommended encoding.
- **Video encoding profile**: This can be set to High, Main, or Baseline.
- **Frame size:** The resolution applied to the channel when you stream, record, or output video to a confidence monitor. This can be set to automatically match the input video's resolution or set to a fixed resolution.
- **Key frame interval**: How often a key frame that contains all the pixels is sent when streaming. The longer the key frame interval, the smaller the video file size (and vice versa).
- **Limit frame rate**: You can limit the frame rate for the channel.
- **Bitrate**: Increase or decrease image quality by increasing or decreasing the channel's **Bitrate** value. Video with a high level of motion and high resolution, such as sporting events, requires a higher bitrate. This does not work with Motion JPEG.

By default, Pearl-2 automatically uses the incoming video source frame size as the frame size for streaming and recording when the channel has only one layout with a single video source. If you're channel has multiple video sources or layouts, you must manually set a frame size for the channel. If you plan to switch layouts during a live stream, a fixed frame rate is recommended. This avoids the stream from stopping and restarting due to frame size changes when switching between single-source layouts that use different frame sizes.

Important considerations

- For optimum system performance, the frame size of the channel should be set to match the frame size of your video input source to avoid scaling, see Optimum System Load.

- If your channel has a custom layout with only one source and your source and stream aspect ratios differ, then your source appears centered in the frame and matte bars are added automatically to the top and bottom (or left and right sides) of the frame to make up the difference. See Remove black bars (matte) from the video.
- If an SDI or HDMI video input source that is selected to display at the HDMI output port also appears in a custom layout for a channel, then the channel's encoding settings are used at the HDMI output. Changing the channel's frame rate will change the frame rate used at the output port for that video input. If the video source appears in multiple layouts in different channels, the one with the highest frame rate set in the encoding settings is used.
- The larger the channel's frame size, the more bandwidth is needed for streaming and the recorded files are bigger. Instead of using the same frame size as the original video source, you can configure a smaller frame size for the channel and let Pearl-2 downscale the video. For example, if the input video signal resolution is 1920×1080 (a 16:9 aspect ratio) and the channel's frame size is set to 1280×720, Pearl-2 downscales the video and streams/records the channel at the lower frame size, using less bandwidth and producing smaller recorded files.
- If you have unchecked all the manual resizing and positioning boxes in the custom layout editor and you downscale the video source using the frame size setting on the **Encoding** tab (for example, select 1280×720 frame size for a full HD video source), then the source appears cropped within the frame instead of scaling to fit the frame.

You can add black bars around your video source by adjusting the frame size. For example, if your video source has a 16:9 widescreen/HD format but you need a 4:3 frame size on your output, Pearl-2 automatically adds black bars to the top and bottom of the frame if you choose a frame size for the channel that has a 4:3 aspect ratio.

There is some trade off between video quality and bandwidth size, depending on the encoding settings you choose. The following table lists some additional considerations when choosing video encoding settings.

Table 42 Video encoding settings

Setting	Description
H.264	H.264 provides high quality video while using low bandwidth. This is the default and preferred codec for the Pearl-2 and Pearl Mini.
Motion JPEG (Pearl-2 and Pearl Mini only)	This codec is suitable for streaming and recording video, however you get lower quality images and it requires a large amount of bandwidth. Motion JPEG does not support audio.
Key frame interval	• The key frame interval feature specifies how often a key frame (a frame that contains all the pixels) is sent when streaming the video. This setting also impacts how quickly a video moves through the frames when a viewer uses the search function of their media player. • Increasing the number of seconds between key frames can significantly reduce your bandwidth and system resource usage with minor impact to your video quality. A good rule of thumb is to keep the interval between 2 to 3 seconds and decrease the key frame interval as the motion increases.

Setting	Description
	• Try different settings and note changes in the video quality. If your video quality is poor and jittery you may need to decrease the interval between key frames. If you have unlimited bandwidth and system resources you can choose an option to stream key frames only.
Frame rate	Frame rate reflects the number of images that are encoded per second. Reducing the frame rate for a channel reduces bandwidth usage, and vice versa. The system's ability to maintain a set frame rate is based on several factors, for example: • overall system load affects the ability for the device to process pixels; • available network bandwidth; • the source and stream frame size (resolution); • the type of motion that is captured; and • number of users accessing the stream. When adjusting the frame rate, you may need to try different values to achieve the best outcome.
Bitrate	In general, higher bitrates mean higher image quality, but more bandwidth is needed for streaming and video recordings are larger. You can set the bitrate to improve the image quality (this does not work with Motion JPEG encoding). For example, an HD Blu-ray video is typically in the range of 20 Mbps, whereas a standard-definition DVD is usually 6 Mbps. If you're unsure what bitrate value to use, start at 5000 kbps (slightly less than a typical DVD) and test to see how this looks for your viewers.

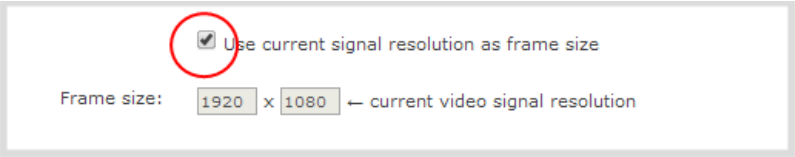
Configure video encoding for a channel using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Encoding**. The encoding configuration page opens.
3. Select a video **Codec** and do one of the following:
   - If **H.264** is selected, select a **Video encoding preset** and a **Video encoding profile**.
   - **Pearl-2 and Pearl Mini** - If **Motion JPEG** is selected, click **Page refresh time** and enter a time in seconds.

Item	Options
Video encoding preset	**Hardware Accelerated**: This is the default H.264 encoding preset. Choose this setting for best performance. **Software**: This matches the default from previous generations of Epiphan products. Only select this if you need software encoding or X.264 encoding to match results created with previous generations of Epiphan products or firmware

Item	Options
Video encoding profile	**Baseline**: Choose this option when streaming to an application that requires robustness and cannot tolerate data loss, for example video-conferencing. **Main**: Choose this option for standard-definition broadcasts. **High**: This is the default. Choose this option when video is viewed for broadcast and disk storage applications, particularly for high definition television application such as Blu-ray disk storage format and HDTV broadcast service.

4. Configure the frame size, do the following:
   a. Uncheck **Use current signal resolution as the frame size**.



> Enabling **Use current signal resolution as the frame size** is not recommended if the video input resolution changes frequently. An unstable cable or other disturbance that causes the resolution of the video input signal to change during a live stream can cause the stream to drop. Unchecking this feature helps prevent that.

   b. Select a **Frame size** from the list of options or enter a custom frame size in pixels.
5. Change the **Limit frame rate**. The default should be adequate in most applications. While decreasing the limit may improve system performance, you may need to test different values to balance video smoothness and processing power
6. Change the **Bitrate**. You can increase or decrease image quality by increasing or decreasing the target **Bitrate** value. Video with a high level of motion and high resolution, such as a sporting event, requires a high bitrate.
7. Click **Apply**.

Configure audio encoding

If your channel includes audio sources in any of the layouts, then **AAC 48 kHz** is set as the default audio codec for the channel. You can choose a different audio codec for a channel using the Admin panel. The following table lists the supported audio codecs and bitrates.

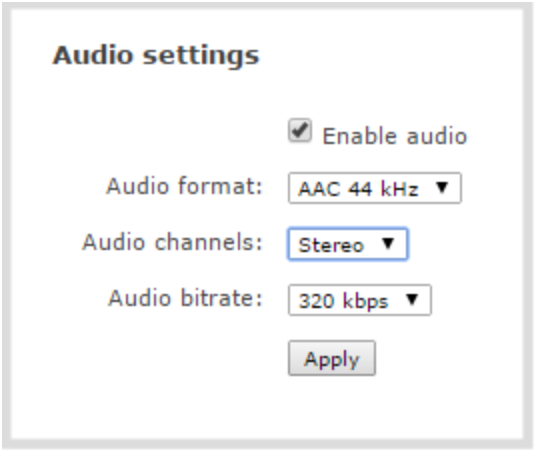
Table 43 Supported Audio codecs and bitrates

Value	Description
AAC	The AAC (default) audio codec is comparable to MP3 and may produce better sound

Value	Description
	quality with a similar bitrate. Supported values are 16, 22, 44 and 48K kHz. Most digital signals (HDMI or SDI sources) use 48 kHz audio. Matching the encoded level with the source level provides the best sound quality by avoiding audio resampling. For analog signals, 44 kHz provides higher sampling. The maximum bitrate for mono encoding of a 44 kHz signal is 264 kbps. For stereo, 320 kbps is supported. Note that lower bitrates (e.g. 32 kbps) with a 44 kHz signal may result in distorted audio.
MP3	MP3 provides a common audio format for audio storage. Supported values are 22 kHz, 44 kHz and 48 kHz. Most digital signals (HDMI or SDI sources) use 48 kHz audio. Matching the encoded level with the source level provides the best sound quality by avoiding audio resampling. For analog signals, 44 kHz provides higher sampling. Flash (FLV) doesn't support 48 kHz MP3 audio. When selecting this value you'll need to use a media player to preview your channel.
PCM	Pulse Code Modulation (PCM) is a standard for digital audio in computer and other devices such as, digital telephone systems. Most digital signals (HDMI or SDI sources) use 48 kHz audio. Matching the encoded level with the source level provides the best sound quality by avoiding audio resampling. Flash (FLV) doesn't support 48 kHz PCM audio. When selecting this value you'll need to use a media player to preview your channel.

Change the audio codec for a channel using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select the channel and click **Encoding**. The encoding configuration page opens.



3. In the Audio settings, ensure that **Enable audio** is checked to include audio in the channel.
4. From the **Audio format** drop down, select an audio codec.
5. From the **Audio channels** drop down, choose mono or stereo (default).

> Choose **Mono** to have left and right stereo channels combined so that when you listen to the streamed or recorded audio, the same blended sound comes through both the left and right channels.
>
> If you have only one mono analog input, use the left jack and select mono encoding to have the same sound come from both the left and right channels. (If stereo sound is chosen, the sound will only come through on the left channel.
>
> **Pearl-2** - XLR/TRS 1

6. From the **Audio bitrate** drop down, choose a bitrate. For guidance, see audio bitrates. For stereo audio, we recommend 256 kbps or 320 kbps.
7. Click **Apply**.

Multi-encoding and channel as a source

Pearl-2 lets you easily do multi-encoding so you can record and stream the same content at different encoding settings. This is useful when you want to:

- Record a video at a high bitrate and frame size and live stream the same content at lower encoding settings.
- Record the channel while also sending two (or more) streams of that channel using different encoding

settings for CDNs that don't use adaptive bitrates.

- Or record the same channel simultaneously at different resolutions, like 4K and full HD.

For example, take a scenario where you want to record a video at 1080p and 8 Mbps, while simultaneously live stream the same video online 720p and 1 Mbps. You can create your custom layouts and do all your switching in one channel (i.e. Channel 1) and then configure Channel 2 to use Channel 1 as a source. That way, both channel's have the identical program. All you need to do now is configure each channel for the encoding settings you want.

Follow these steps:

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. Create Channel 1 with your video and audio inputs. Add all your live switching layouts.
3. Set the **encoding** and **streaming** settings for channel 1.
4. Create Channel 2 for your recording with just one layout and add Channel 1 as the video source. Stretch it to fill the full screen.
5. For Channel 2's **audio source**, choose Channel 1 if not already selected by default.
6. Set **encoding** and **streaming** settings for channel 2.

Using this process, you can again use the same video you're recording on Channel 2, and stream it at a different bitrate and frame size.

For alternative ways to set up multi-publishing, see Streaming to a CDN, multicasting, and streaming to multiple destinations .

Custom layout configuration

Using the custom layout editor, you can create completely different looks for your channel - like picture in picture or side-by-side video sources. You can add media like transparent images and custom backgrounds to a layout, then resize and arrange all the different media elements the way you want.

Topics include:

- About the custom layout editor
- Resize and position items using percents or pixels
- Open the custom layout editor for a channel
- Configure a custom layout for a channel
- Rename a layout
- Delete, move, or duplicate a layout
- Set the background color
- Add an image to a layout
- Upload or remove an image or video file using the Media page
- Add a text overlay
- Custom system variables for text overlays

- Crop a video source
- Configure chroma keying

Multiple Layouts on Pearl-2 and Pearl Mini

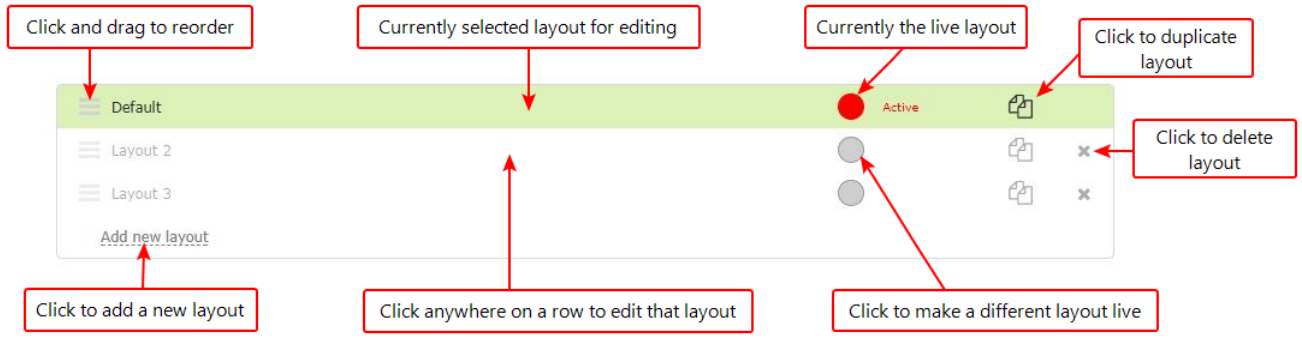
When you add multiple layouts to a channel, you can switch between the different layouts for a more interesting and dynamic presentation. Each layout you add to your channel adds overhead to Pearl-2 and Pearl Mini, and more complex layouts consume more of the system's resources. So, it's a good idea to delete any layouts you're not using.

About the custom layout editor

The custom layout editor gives you full control of the size and position of images, video sources, and text overlays.

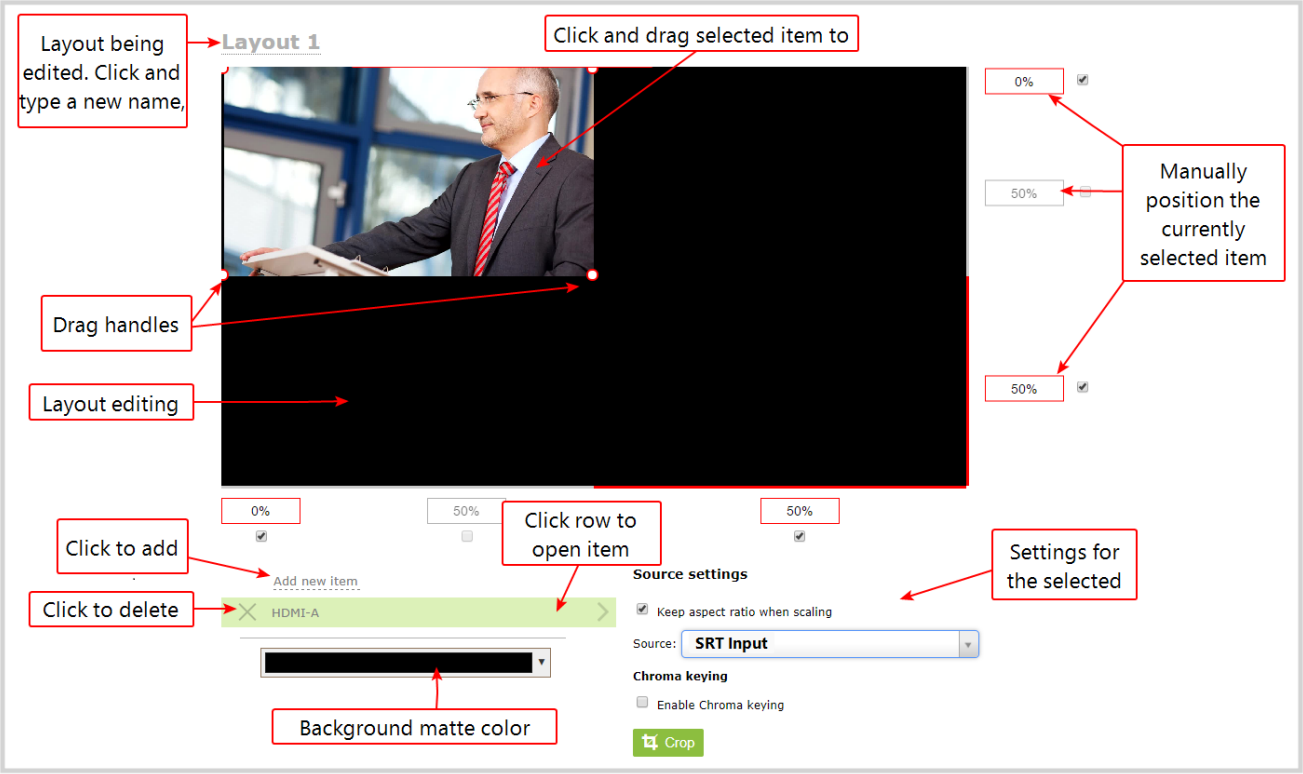
Access the custom layout editor using the Admin panel when you select your channel from the Channels menu and click **Layouts**.

Pearl-2 and Pearl Mini - To add or delete a layout, see Configure a custom layout for a channel. When you open the custom layout editor for a channel, a list of layouts appears at the top. You can create and delete layouts, duplicate layouts, choose which layout to preview and edit, and select the active live layout for live switching.



Layout editing

The layout editing area is where you can add images, video sources, and text overlays to your layout. You can also choose a background matte color, crop images and video, and edit video sources.



The main layout area has the same frame size and aspect ratio as the encoding setting of the channel. As you add items to the layout, they appear in the layout editing area. The currently selected item is presented in full color. Unselected items appear transparent.

To change the settings for an item, click an item in the item list that appears below the layout editing area. The settings for that item appears.

Move and size items in the layout editing area

You can use the mouse to click and drag items into position, or you can type values into the fields along the side and bottom of the layout area and manually position the selected item. You can also enter values as a percentage of the full layout area (for example, enter **4%**) or in pixels (for example, enter **16px**).

You can **resize** an image, text overlay, or video source by clicking and dragging the red and white handles at the corners of an item or by entering values into the fields along the side and bottom of the layout area. To maintain the aspect ratio when resizing an item, make sure you've checked the **Keep aspect ratio when scaling** box for that item.

A note about item positioning and sizing

There are multiple ways to position and size images, text overlays, and video sources in the layout area

- Using the mouse.
- Using the keyboard.

- Using the manual positioning values with percents.
- Using the manual positioning values with pixels.

Using the mouse

Click and drag to move the item. Click and drag the round, red and white handles to resize an image or video source (for text overlays, just use the padding settings). Using this method you can make quick changes that are in increments of approximately 5% of the width or height of your layout area. For more refined movements, press the Ctrl key on your keyboard while dragging the item with the mouse.

Using the keyboard

Use the arrow keys on the keyboard to move the item up, down, left or right in the layout. Changes are in increments of approximately 5% of the height or width of the layout area. Press the Ctrl key while using the arrow keys to make more refined movements. To change the size of an image or video source, press the Shift key while using the arrow keys (for text overlays, just use the padding settings). Press both Ctrl and Shift for fine-grained size control.

Using percents

Specify a whole number, followed by a percent sign (e.g. 4%) in any of the manual positioning fields. See Resize and position items using percents or pixels for more information.

Using pixels

If you need to specify an exact amount in pixels (rather than percent) you can type a pixel value in any of the positioning value squares followed by the characters px (e.g. 56px). You can mix and match pixels and percents changing only the boxes you want to use pixel values. At any time you can switch back to percents by typing a percent. See Resize and position items using percents or pixels for more information.

Audio source selection and saving edits

Select audio source(s) for your channel by adding them to your layouts. The bottom section of the custom layout editor is where you select the audio source for the currently selected layout. It's also where you'll find the **Save** button.

- **Pearl-2, Pearl Mini, and Epiphan Unify** - If a layout doesn't have an audio source selected, there will be silence when that layout is selected during live switching, recording, and confidence monitoring.
- **Pearl-2 and Pearl Nano** - If an Auto channel is selected as a video source, then Auto A (or Auto B on Pearl-2) audio is selected by default.

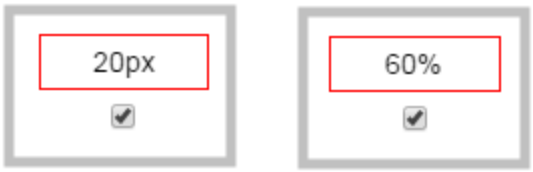
You can have multiple audio sources in a layout. The audio sources are mixed together at the same volume level as one another.

When setting the audio gain for your channel, add all your audio sources to your layout first, then set level of gain for your audio sources appropriately. When you're done all your changes, click **Save**.

Resize and position items using percents or pixels

You can resize layout items using the percent/pixel adjustment boxes in a layout using the custom layout editor. You can also reposition video sources. See Resize layout items and Position layout items.

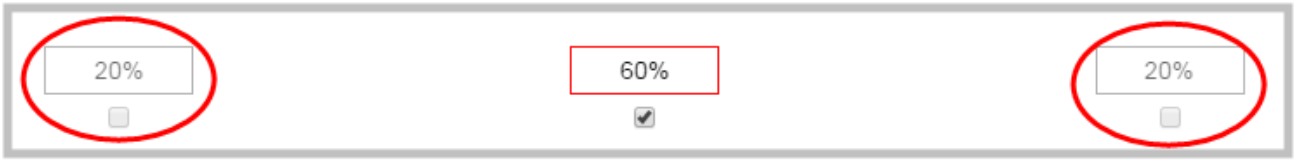
There are three adjustment boxes along your layout's horizontal axis and another 3 boxes along the vertical axis. You can enter **percent or pixel values** into checked adjustment boxes (bordered with red) to position and resize your item(s).



Percent values are used in adjustment boxes by default, and can be converted to pixels by simply overwriting the percent value in a given adjustment box and replacing it with a pixel value.

When entering **percent values**, ensure the suffix "%" is added to your value (i.e. "20%"). When entering **pixel values**, ensure the suffix "px" is added to your value (i.e. "200px"). A layout item's total pixel dimensions are a reflection of your channel's frame size, as configured in your encoding settings (see Configure encoding).

Unchecked boxes are grayed-out in color and are not directly editable but dynamically change their values to reflect a 100% total of either the horizontal or vertical axis, depending on values entered in adjacent adjustment boxes. See the Adjustment boxes for item resizing and positioning table below for more information.



The values contained in checked boxes (bordered with red) are **anchored** and do not dynamically adjust their values.

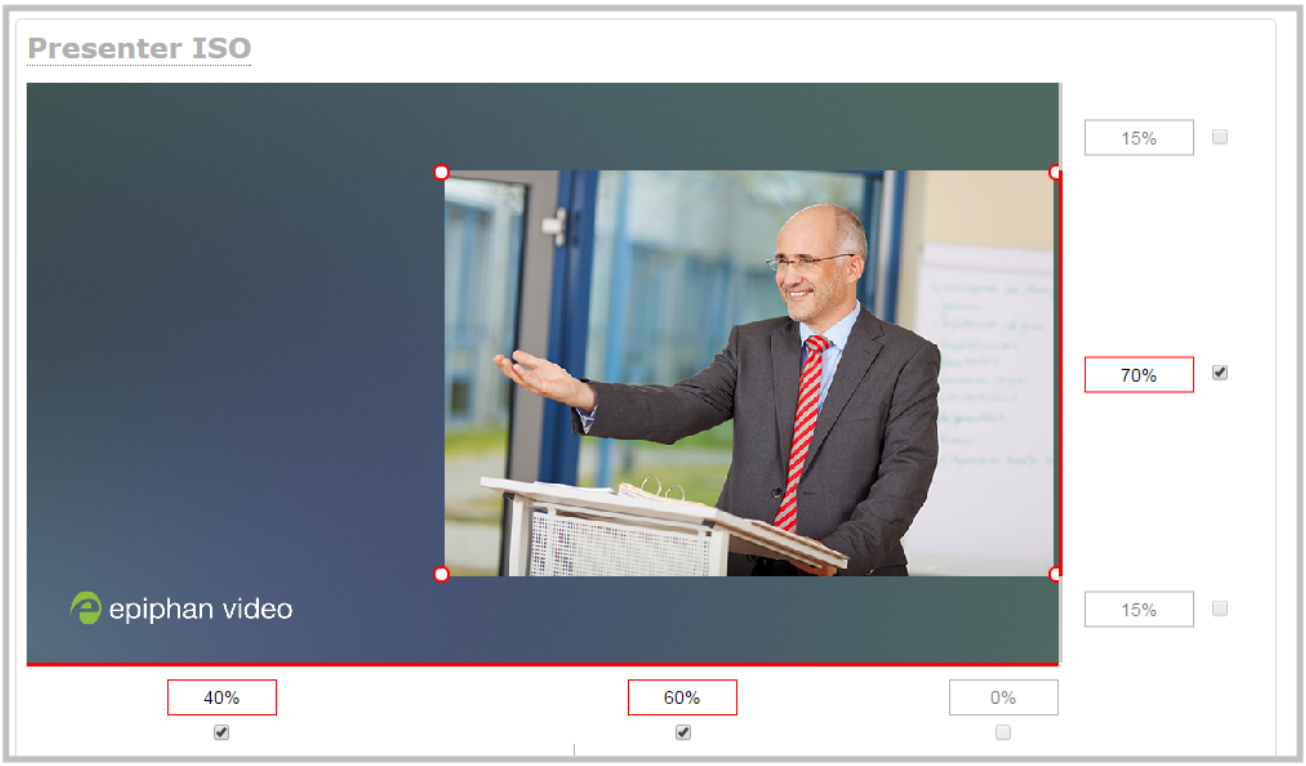
Table 44 Adjustment boxes for item resizing and positioning

Item	Description
1	The area of your layout item. The four red/white dots represent the boundaries of your layout item. There may be some black space between your item and its boundaries if **Keep aspect ratio when scaling** is enabled (see Add an image to a layout).
2	The percentage of blank space (or number of pixels) from **left to right** on the layout's horizontal axis. (for example, the item is displaced 20%, or 200px, to the right).
3	If using percents, this value is the item's percentage of **total width on the layout's horizontal axis**. (for example, the item takes up 60% of the layout's width – represented by a thin red bar above the percent box). If using pixels, this value is **the item's width, in pixels**, with a maximum pixel width (for example, frame size) identified in your channel's encoding settingsConfigure encoding.
4	The percentage of blank space (or number of pixels) from **right to left** on the layout's horizontal axis. (for example, the item is displaced 20%, or 200px, to the left).
5	The percentage of blank space (or number of pixels) from **the bottom upward** on the layout's horizontal axis. (for example, the item is displaced 10%, or 100px, from the bottom up).
6	If using percents, this is the items percentage of **total height on the layout's vertical axis**. (for example, the item takes up 80% of the layout's height – represented by a thin red bar to the left of the

Item	Description
	percent box). If using pixels, this value is **the item's height, in pixels**, with a maximum pixel width (for example, frame size) identified in your channel's encoding settings Configure encoding.
7	The percentage of blank space (or number of pixels) from **the top downward** on the layout's vertical axis. (for example, the item is displaced 10%, or 200px, from the top down).

Resize layout items

The easiest way to resize a layout item is to use the **center adjustment boxes** (annotated as #3 and #6 in the image above) on each of the horizontal and vertical axes to set your item's width and height respectively. You can also use your mouse cursor to select the corners and manipulate them into the size you want. Hold the shift key while doing so to keep the frame size constant. If you need to **crop** your image, see Crop a video source.



In the example, the video source is resized to 60% of the layout's width and 70% of the layout's height (with aspect ratio maintained). (Alternatively, pixels could be used to resize the layout item in a similar fashion.)

An important consideration when resizing layout items

Your item will resize automatically if both left and right (or top and bottom) adjustment boxes contain values (percents or pixels) that exceed the total of 100% (if using percents), or maximum pixel count (if using pixels) for the corresponding horizontal (or vertical) axis.

For example, if you originally set the width of an item to 50% of the layout area (or 960 pixels, assuming your item has a maximum width of 1920 pixels in this example) with no values entered in the left and right adjustment boxes (i.e. the left and right boxes are deselected), the item automatically centers itself in the layout area with the left and right percents at 25% each (remember – percents are used by default in the layout editor, even if pixels are used in adjacent boxes). Combined with the 50% (960px) width of the image, these two 25% (480px) values total 100% (1920px) of the layout's horizontal axis.

If you instead decide to enable the left and right percent boxes and change their values to 30% each (instead of the current 25%), then the image's width shrinks from 50% (960px) to 40% (750px) to accommodate the change and maintain a total layout width of 100% (1920px).

Setting the left and right (or top and bottom) percent values so the axis total among the three percent boxes exceeds 100% will always result in the center percent box value automatically reducing itself to maintain the 100% total, shrinking your selected layout item in the process.

Position layout items

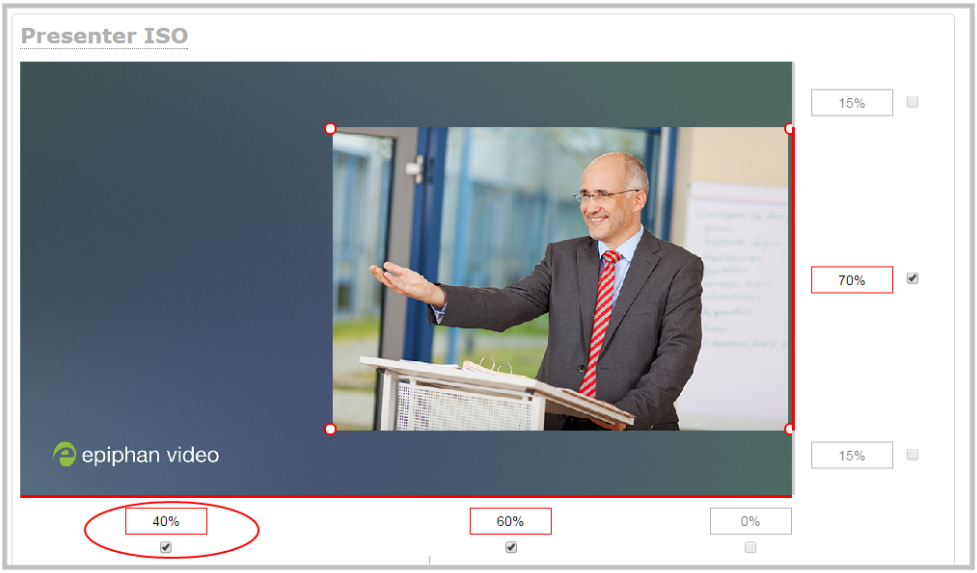
There are multiple ways to reposition items in the frame using the layout editor:

- You can reposition images and video sources by entering values into the left/right and top/bottom adjustment boxes (identified as #2/4 and #5/7 respectively in the Adjustment boxes for item resizing and positioning table). The values entered into these boxes represent a portion of the total percentage (or pixels) of the layout's width or height.
- Alternatively, you can position your layout items using the keyboard by selecting the item with your mouse cursor, and pressing the arrow keys to move the selected item by 5% in any direction.
- You can also position your item with additional keyboard precision by **holding Ctrl and pressing the arrow keys** to nudge your item by a very small fraction in the direction of your choice.

Example 1: horizontal positioning using percents

To position your item along the horizontal axis, first resize your items if desired (as described in Resize layout items), then enter a percent or pixel value into either the left or the right adjustment box to shift your layout item.

> For example, using **percents** to move a layout item with a 60% width as far to the right of the layout area as possible, you would need to enter 40% into the left percent box to push the item to the right. The layout item originally takes up 60% of the layout width, so this added 40% shift pushes the item as far to the right as possible (I.e. 100% of the horizontal axis).

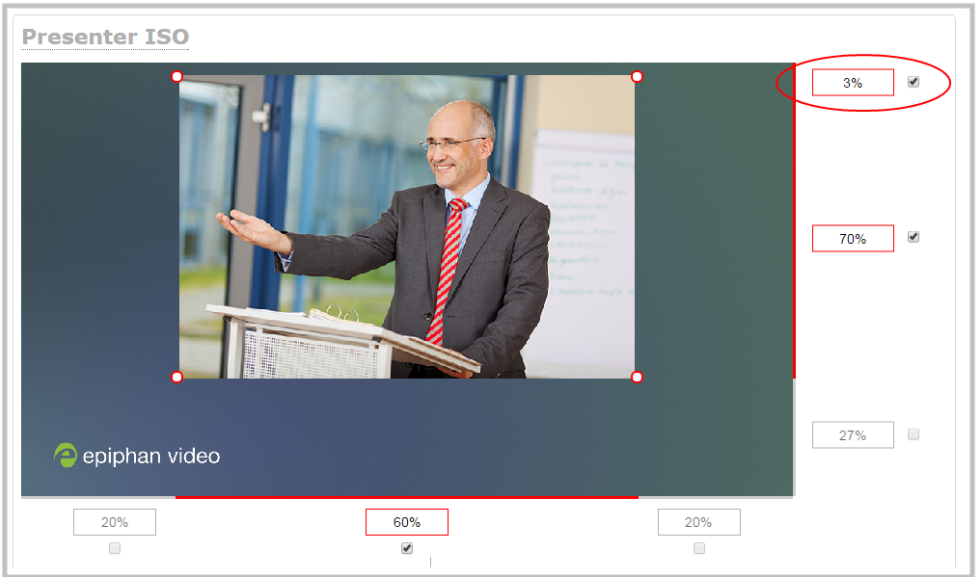


The right adjustment box automatically sets itself to 0% to reflect that there is no more room remaining to maneuver the image along the horizontal axis any further. Alternatively, you could reposition the image in the exact same way by instead setting the right percent box to 0%.

Example 2: vertical positioning using pixels

To position your layout item along the vertical axis, enter a percent or pixel value into either the top or the bottom adjustment box to shift your layout item downward or upward, respectively.

> For example, using **pixels** to move a layout item that is set to 756px in height to the top of the layout while leaving a small margin of background (say 25px), you could either enter "25px" into the top percent box (to specify the small margin from the top down) or enter 27% into the bottom percent box (to specify a 27% margin from the bottom up – added to the item's 70% height this leaves a 3% margin above your layout item.)



You can manipulate elements to get the custom look that you want using percents, pixels, your keyboard, or any combination. Here's an example of using pixels and percents to created a custom layout with two video sources and a background image. The slideshow video source is scaled and the presenter's video source is cropped in this example.

Open the custom layout editor for a channel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Layout(s)**. The custom layout editor opens.

3. From the **Layouts** list, select the layout you want to edit. The layout editor updates to display the selected layout and the row for the selected layout is highlighted in green.

If this is a new layout, an unformatted layout, or there is no video source connected, then the layout area is empty and a black background matte appears.

Configure a custom layout for a channel

If you want to do live switching on your channel for a more dynamic video presentation, then you need to add different layouts that you can switch between. We recommend that you rename your channel and layouts to something more intuitive rather than using the default names, see Rename a channel and Rename a layout.

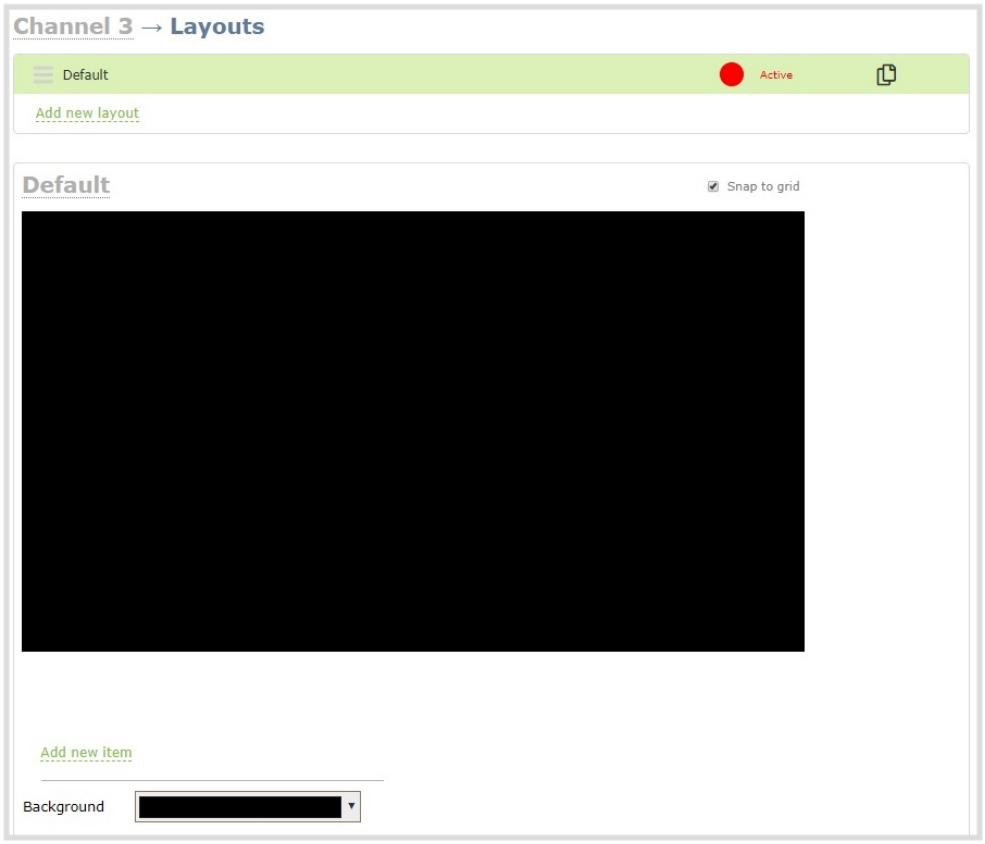
Creating layouts gives you full control over what's presented to your viewers. You can do things like change the size and position of images, add custom backgrounds, up scale and downscale your video sources, add multiple audio sources and text overlays to mention just a few. For examples of how to get different channel layouts, see Channel layout examples

Important considerations:

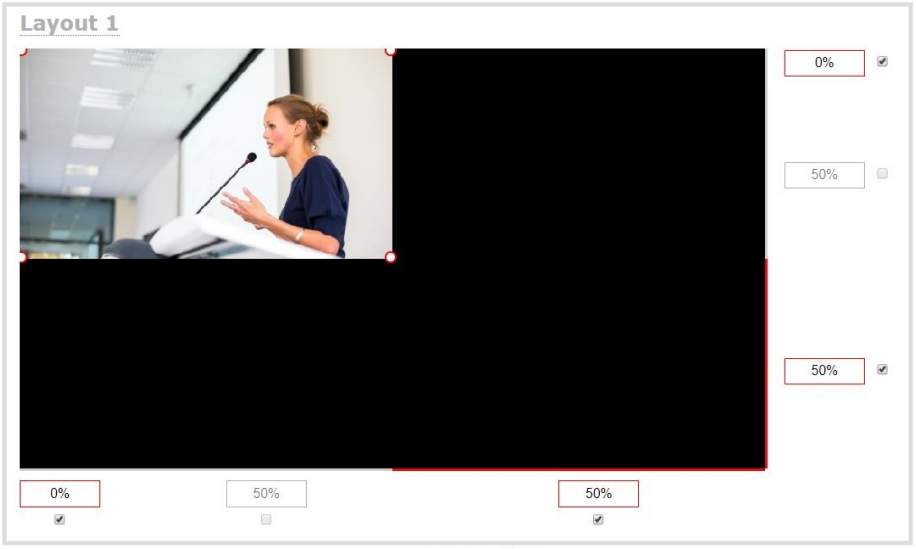
For live switching a channel, we recommend that you set the frame size to a fixed size instead of using the default automatic detection of source frame size. Setting the frame size to a fixed value ensures you don't experience any stream interruptions if the source frame size changes due to layouts that contain a single video source that has a different frame size than those in other layouts, see Configure video encoding.

Configure a custom layout for a channel using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select the channel and click **Layouts**. The custom layout editor opens.
3. - **Pearl-2 and Pearl Mini** - Select a layout from the layout list or click **Add Layout** to create a new layout. If this is a new channel or layout, the layout area is empty and you see a black background matte. see Add video sources or a channel as a source Add video sources or a channel as a source for instructions to add a video source to a layout.



4. Click and drag the red and white handles on the corners of the video source to re-size it in the layout editor area.



5. Click **Save** when you're done or continue to add additional video sources to the layout, resize and crop each video source to exactly how you want them to appear. For examples, see Channel layout examples.

Rename a layout

You can rename a layout using the custom layout editor.

Pearl-2 and Pearl Mini - If you're using the touch screen for live switching, consider using shortened names for layouts. Long names get truncated on the touch screen.

You can include certain international characters in layout names. For example, common character sets for Western and Central European languages, Nordic languages, and Russian are supported. For a complete list, see International character support.

Rename a layout using the Admin panel's custom layout editor

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Layout(s)**. The custom layout editor opens.
3. Select a layout from the layout list at the top of the page.

4. Click the name of the layout so that the name turns red. Type a new name and then press the **Enter** key.

Delete, move, or duplicate a layout

It's simple to re-order, remove, and duplicate layouts using the custom layout editor.

Important note for channels with multiple layouts

When a channel has only one layout and that layout has only one video source, the default channel name is the same as the name of the video source. So for example, a channel with one layout that has HDMI-A in it is named HDMI-A by default.

When you add a second layout to the channel, the channel name automatically changes to a generic name **Channel *X***, where *X* is the channel index number. For example, SRT 1 changes to Channel 1.

Changing the channel name affects system operation.

- If the channel is streaming, the stream is stopped and restarted.
- If the channel's recorder is recording, then recording is stopped and a new file is started.

If you delete all the layouts in a channel until there is only one layout left and that layout has only one video source assigned, then the channel name changes back to the name of the video source.

To avoid channel name changes, we recommend that you rename the channel to a custom name. Changing the channel name to a custom name ensures that no automatic channel renaming happens, see Rename a layout.

Reorder layouts using the Admin panel's custom layout editor

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Layouts**. The custom layout editor opens.
3. In the layouts list, click and drag the icon with the three horizontal bars at the left side of the row to rearrange the order of your layouts.

Delete a layout using the Admin panel's custom layout editor

You can delete any layout except the currently active layout.

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Layouts**. The custom layout editor opens.
3. Click the **X** at the right side of the row for the layout you want to delete. The system prompts you to make sure you want to delete the layout.

4. Click **OK**.

When using the switcher on Epiphan Live, refresh your browser if you still see a layout that was deleted. The deleted layout should disappear.

Duplicate a layout using the Admin panel's custom layout editor

If you're planning to use live switching, we strongly recommend you rename the channel rather than using the default channel name, see Rename a channel.

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Layouts**. The custom layout editor opens.

3. Click the double folder icon at the right side of the row for the layout you want to duplicate. A duplicate of the layout is added at the bottom of the list.

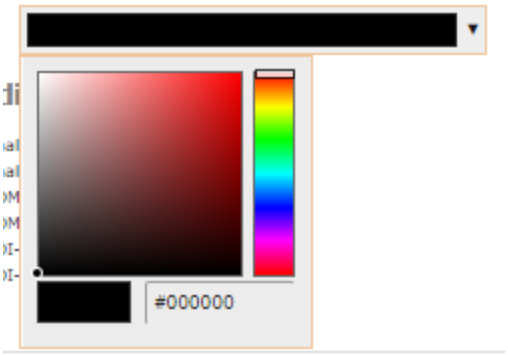
4. Click **OK**.

Set the background color

You can select the background color to fill any unused space in a layout using the custom layout editor. For example you can add a color from your corporate color scheme.

Set a background color matte for a layout using the Admin panel's custom layout editor

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Layout(s)**. The custom layout editor opens.
3. Click the drop down arrow next to the existing (by default black) background color field. The color picker opens.



4. Pick a new color or type in an RGB value in the field; the color is updated in the layout area.
5. Click anywhere off the color picker to close the picker.
6. Click **Save**.

Add an image to a layout

You can add images to a layout using the custom layout editor. Use images to create a background for your source, to add your corporate logo, or to add relevant information about the event you're streaming.

Pearl-2 supports .PNG and .JPEG images up to a maximum size of 4096×2160. For many applications like a background, you will want your image to have the same aspect ratio as the channel in which the image appears.

Pearl-2 supports images of all different shapes, such as 16×16 pixels; however, we recommended that you upload exactly the size you need and avoid scaling the image using the custom layout editor.

Images can be uploaded in advance from the Media page, see Upload or remove an image or video file using the Media page. Otherwise, you can drag and drop to upload an image using the custom layout editor. Note that no warning is displayed if the image is too large or if an image exists with the same name using drag and drop. The file will be replaced with the new image you upload.

Any image without the proper file extension appears in the layout editor but doesn't display in the actual video output. For instance, a .PNG image with the file extension .bmp or an invalid file extension such as .png2 are examples of improper file extensions.

If your uploaded image does not appear in the list, ensure it doesn't exceed the maximum image size of 4096×2160. No warning or error message is displayed if your image is too large.

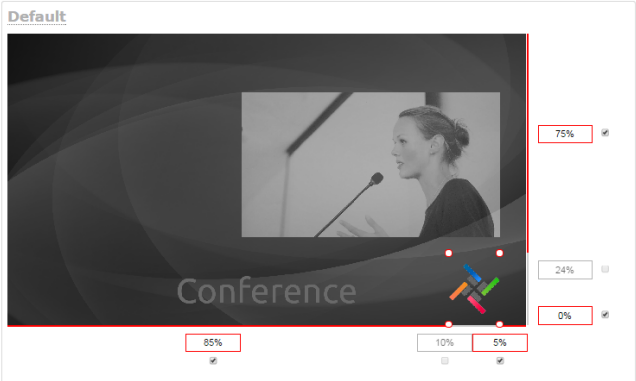
Add an image to a layout using the Admin panel's custom layout editor

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Layout(s)**. The custom layout editor opens.
3. Click **Add new item** and choose **Picture** from the drop down. The picture settings appears.

4. Select an image from the **Use picture** drop-down menu. To upload the image, drag and drop it from your desktop to the gray **Please select picture** area. For best results, keep the **Keep aspect ratio when scaling** check box selected (default).

   For best results, check **Keep aspect ratio when scaling** in the **Source settings**.

5. Your picture appears in the **Picture settings** preview and is added to the layout area.
6. In the layout area, use the mouse, the keyboard or the manual position value fields to position and resize your image. For background images, click and drag to fill the full layout area. For more details, see About the custom layout editor.



7. Re-order the items in your layout by clicking and dragging items in the item list.

> To layer items over top of each other, like for background images or a transparent logo, you can click and drag elements that appear in the item list beneath **Add new item** and change their order. Items that are higher up the list appear over top items that are lower down the list.

8. Click **Save**.

Add a video file to a layout

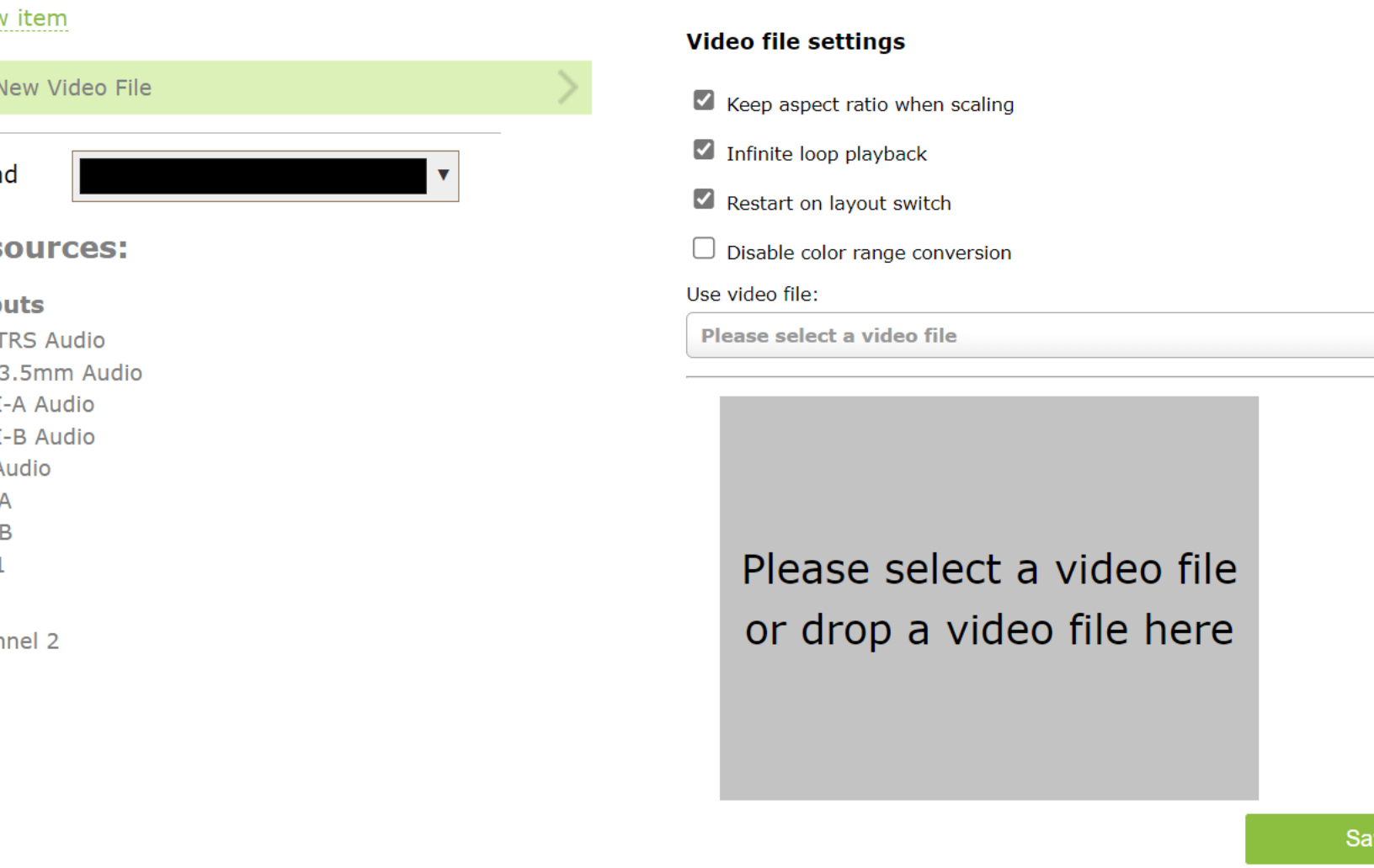
You can add a video to a layout using the custom layout editor. Use a video file to create a motion background for your layout, to add a pre-roll and post-roll video to your channel, or to play back a pre-recorded video in a channel without needing to use a computer connected to the HDMI input on Pearl to play back video.

Pearl supports H.264 encoded .MP4 video files up to a maximum size of 250 MB.

> If you want your video file to play continuously when you switch layouts, you need to do two things. First, you need to include the video file in every layout that you use. Second, you need to uncheck the option **Restart on layout switch** in the video file settings. This way, your video file will not restart or stop when you switch between layouts.

Add a video file to a layout using the Admin panel's custom layout editor

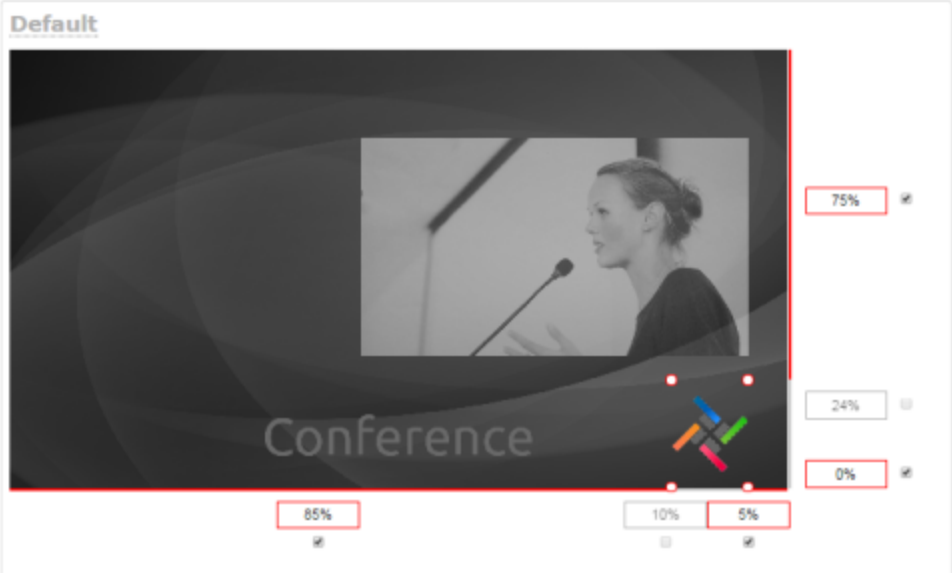
1. Log in to the Admin panel as **admin**, seeConnect to the Admin panel
2. From the **Channel(s)** menu, select the channel and click **Layout(s)**. The custom layout editor opens.
3. Click **Add new item** and choose **Video file** from the drop down. The video file settings appears.



4. Select a video file from the **Use video file** drop-down menu. To upload the video file, drag and drop it from your desktop to the gray **Please select a video file** area. For best results, keep the **Keep aspect ratio when scaling** check box selected (default).

For best results, check **Keep aspect ratio** when scaling in the **Source settings**.

5. Your video file added to the layout area and a preview of first frame is shown.
6. In the layout area, use the mouse, the keyboard or the manual position value fields to position and resize your image. Click and drag to fill the full layout area. For more details, see About the custom layout editor.

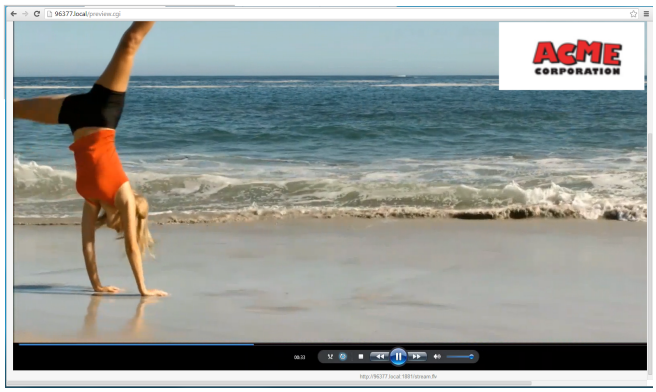


7. Re-order the items in your layout by clicking and dragging items in the item list.
8. Click **Save**.

Upload or remove an image or video file using the Media page

You can customize a channel by adding pictures as backgrounds, overlays, or transparent overlays. Video files can also be uploaded and can be used for use cases such motion background, pre and post roll as well as video playback in a channel. Image file formats supported include: PNG and JPEG for pictures, and H.264 encoded MP4 file for video files.

The maximum supported picture image size is 4096×2160, and the maximum size of a video that can be uploaded is 250 MB. No warning or error message is displayed if your image is too large. Files that exceed the maximum size won't appear in the drop-down list.



For best results always upload images that are already the correct size needed in your layout. Background images should match the frame size of your channel (frame size is set in the **Encoding** configuration page).

There are two ways to upload images and video files. You can upload images and videosfrom the Media page using the Admin panel or drag and drop your image onto the **Add new item** area using the custom layout editor, see Add an image to a layout.

Important considerations

- Media file names should not include special characters, slashes, or spaces. The underscore character "_" is allowed.
- Uploading an image of the same name overwrites the existing image.
- Any image without the proper file extension appears in the layout editor but doesn't display in the actual video output. For instance, a .PNG image with the file extension .bmp or an invalid file extension such as .png2 are examples of improper file extensions.

Upload or remove an image using the Admin panel's Media page

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Media**. The Media page opens.
3. To upload a file, click **Choose File** and browse to select the file to upload, then click **Upload**.
4. To remove a file, click **Remove** beside the file name and click **OK** when prompted.

If you delete an image that is used as part of the layout for any channel, select a different image or no image by using the drop-down list in the **Picture settings** box within that channel's layout before deleting the file using the steps below.

Add a text overlay

Text overlays are useful to add information like a title, location, or the date and time in to layouts in your channel. You can add text to any layout using the custom layout editor. The following tables lists shortcut codes that you can enter and the resulting content that appears on screen.

Table 45 Overlay text shortcut codes

Item	Shortcut code	Example
date format: yyyy-mm-dd	%F	2019-01-26
date format: mm/dd/yy	%D	01/26/19
year	%G	2019

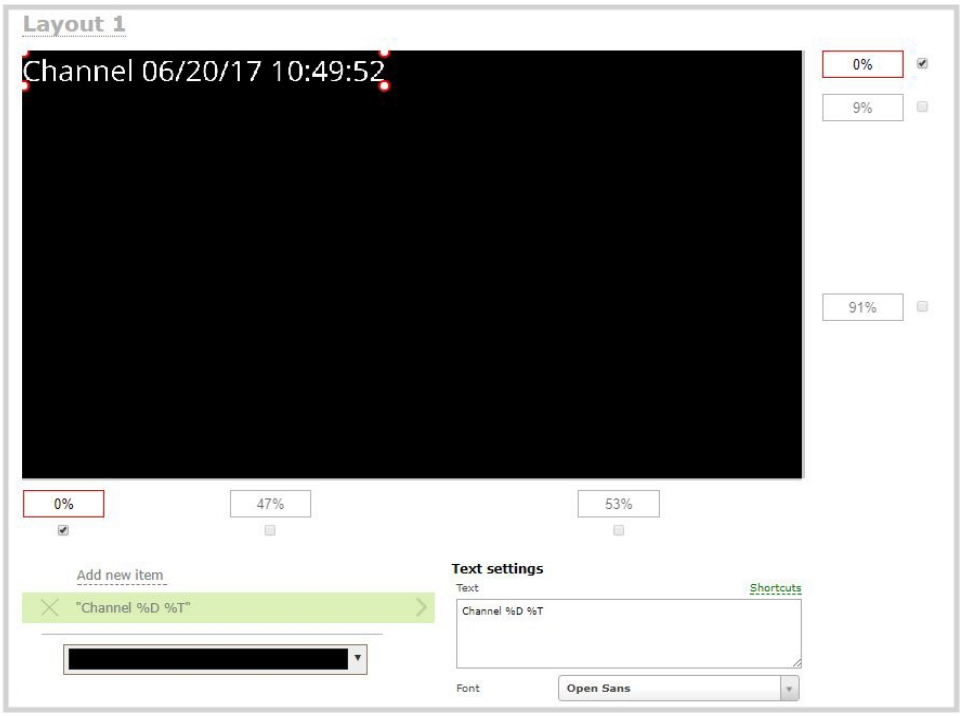
Item	Shortcut code	Example
month (01)	%m	01
month (Jan)	%b	Jan
month (January)	%B	January
day of the month	%d	26
weekday (Thu)	%a	Thu
weekday (Thursday)	%A	Thursday
time	%T	08:40:45
hour	%k	08
minute	%M	40
second	%S	45
millisecond	%#m	378
channel name	%c	Camera Feed 1

If you use a non-monospaced font, the size of the text overlay changes as the letters, numbers, and the length of words change. Use a monospaced font to maintain a consistent size for the text overlay (assuming the total number of characters in the text string doesn't change).

You can include certain international characters in text overlays. For a complete list, see International character support.

Add a text overlay using the custom layout editor

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Layout(s)**. The custom layout editor opens.
3. Click **Add new item** and select **Text**. The new item is added to the layout editing area and to the top of the list of items. The Text settings also appear.



You can change the order in which items appear on the layout editing area by re-arranging the order the items appear in the list beneath **Add new item**. Items at the top of the list appear in front, and items lower down the list appear behind.

4. In the **Text** field, type what you want to appear in the text overlay. Include Overlay text shortcut codes as needed. Press **Tab** or click outside the text field to refresh the preview in the custom layout editor.

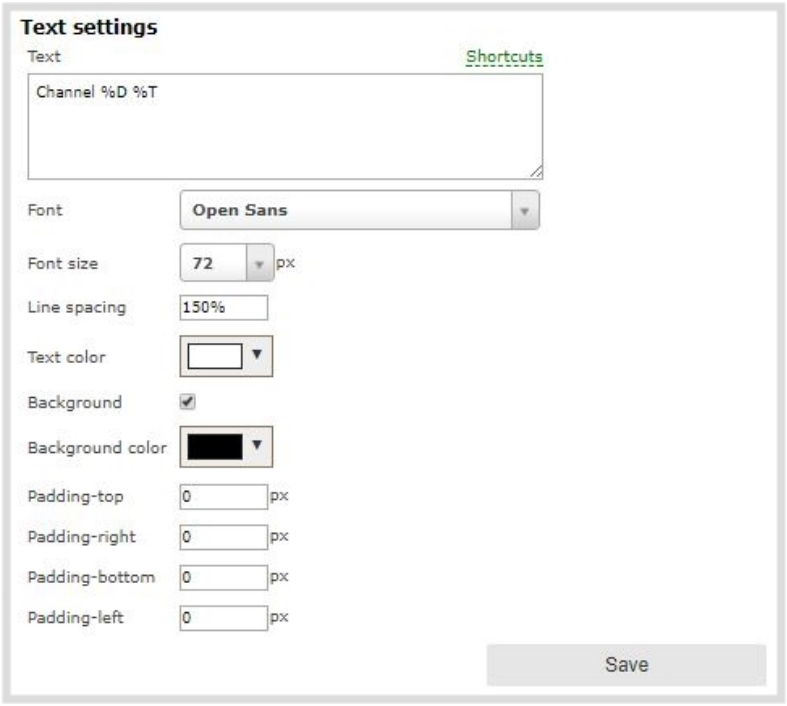
   For example, if you enter:

```
%A %B %d, %G. Live streaming channel Input A.
```

   The resulting text is displayed:

5. Select the **Font**, **Font size**, and **Text color**. You can also change the default **Line spacing** in percentages. For a mono-spaced font, use Droid Sans Mono.

Limitations: The maximum supported text size is 500 px. Padding values must not exceed the frame size. Do not enter negative padding values.



6. Resize the overlay text box using the padding settings.

> The handles on the corner of the overlay text box are not click-and-drag and do not resize the text box. To resize the text box, use the padding fields to add space above, below, and on either side of the text.

7. In the layout editing area, click and drag to move the overlay text box or enter values in the manual position value fields along the side and bottom of the layout area.
8. Click **Save**.

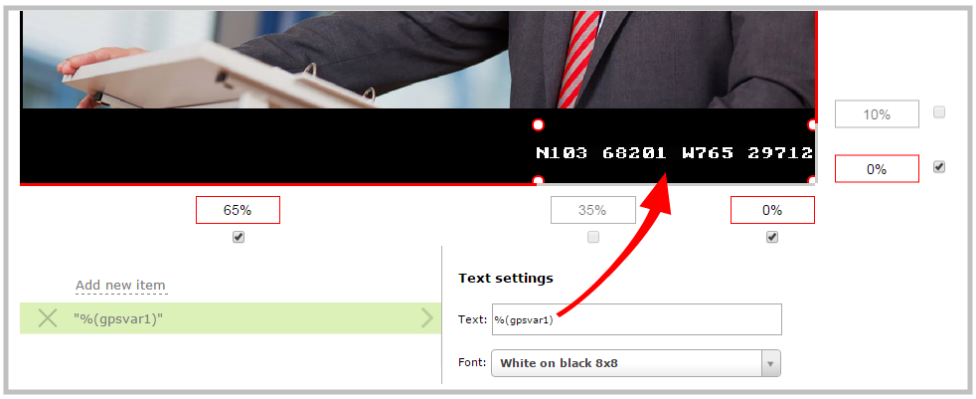
Custom system variables for text overlays

Using HTTP APIs, you can create your own custom system variables for use in text overlays. Pearl devices also support RS-232 APIs. This is useful to add custom overlay text that changes throughout the course of your live stream or recorded program.

For example, using the HTTP API you can create a system variable for the current GPS co-ordinates, then use a script to update the GPS co-ordinates in your custom variable as the physical location in your stream changes.

Here's an example custom variable called **gpsvar1** that has a value of `N103 68201 W765 29712`. To insert the custom system variable into a text overlay, simply type **%(gpsvar1)** into the **Text** field.

If you use a non-monospaced font, the size of the text overlay changes as the letters, numbers, and the length of words change. Use a monospaced font to maintain a consistent size for the text overlay (assuming the total number of characters in the text string doesn't change).



The RS-232 SET command syntax in this case is `VAR.SET.<name>=<value>`, for example:

```
VAR.SET.gpsvar1=N103 68201 W765 29712
```

where *<name>* is **gpsvar1** and *<value>* is **N103 68201 W765 29712**.

There are no limits for the frequency of system variable commands using RS-232. However, only one command can be issued at a time.

HTTP system variable commands are issued at a frequency of **5 per second**. You can include up to six variables in a single HTTP SET command. After issuing a SET command, all channels using the specified variables are updated.

System variables are considered volatile. They are deleted when a Pearl system reboots.

To learn more about global variable command syntax and important considerations when using them, see the Pearl System API Guide for details.

For more information about sizing and positioning elements in the custom layout editor area, see About the custom layout editor.

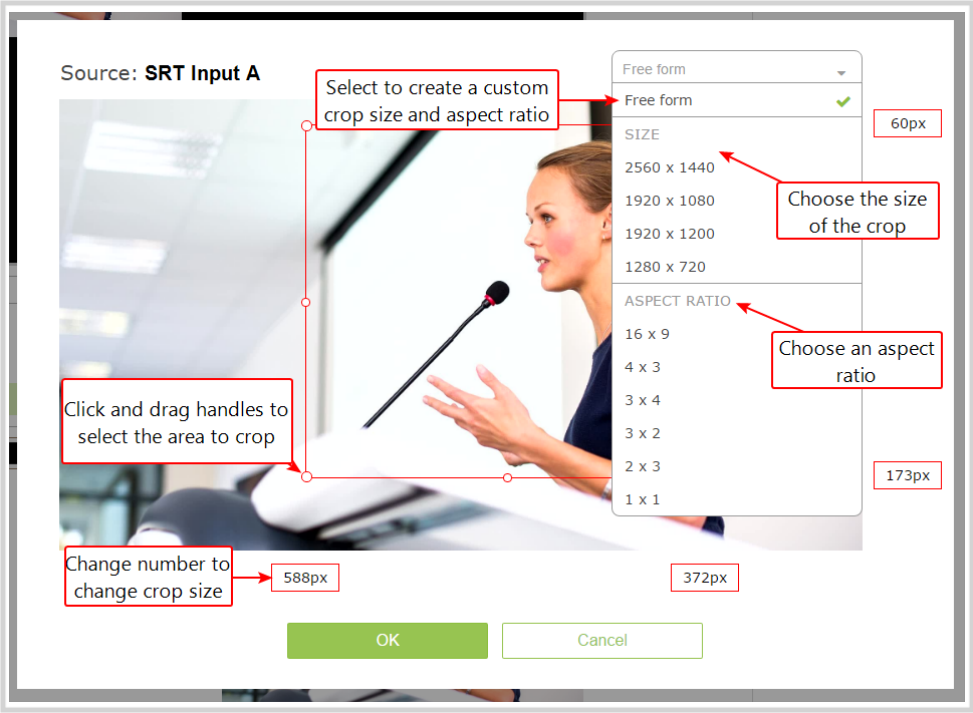
Crop a video source

You can crop a video source to change the size and shape of your video as it appears on screen using the custom layout editor. Cropping a source gives you a lot of advantages and can help to conserve the overall amount of processing CPU usage for Pearl-2.

Pearl-2 and Pearl Nano can capture a 1080p section from a 4K source, a specific aspect ratio or size from a source, or select a crop that fits into your layout better than the full area of your video.

Crop a source using the Admin panel's custom layout editor

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Layout(s)**. The custom layout editor opens.
3. Select a video source from the items list. The **Source settings** appears.
4. Click **Crop**. Your video source appears in a pop-up editing window.



5. The **Crop** window has several tools for creating the best crop possible.
    - **Free form** is the default crop mode. In this mode, you can change the size, aspect ratio, and position of the crop with minimal restrictions.
    - The red box with click-and-drag circular handles in the corners shows the cropped area that appears in the final layout. Only the content inside the box shows in the layout. In **Free form** mode, you can click and drag the red handles to change the size and ratio of the box, and you can click and drag the box itself to change its position. When you have selected an aspect ratio, you can alter the size by dragging the red handles. When you have selected a size, you can change its position by dragging the box.
    - The number boxes allow you to make precise crops. Click the text boxes and enter a number to determine how many pixels of distance from the edge that line is drawn. You can also erase the "px" after the number and type in "%" to manipulate the box using percentages. For more details on how these boxes work, see Resize and position items using percents or pixels.
    - To create a crop with a specific resolution, choose a **Size** from the available list. This creates a box with that exact resolution. Click and drag the box to move it into position. The size cannot be changed except by selecting a different size, or by selecting **Free form** or **Aspect Ratio**.
    - Selecting an aspect ratio allows you to create a crop box of almost any size in a particular ratio. After selecting a ratio, you can manipulate the crop area's size and position without changing its shape.
6. Click **OK** to close the crop window.
7. Click **Save**.

You can also manipulate the crop-box using keyboard controls. You can move the crop box using the arrow keys, and holding **Ctrl** or **Shift** while resizing the box keeps the aspect ratio of the box constant. Hold **Shift** and use the arrow keys to move one side of the box while leaving the other in the same location.

If creating a crop on a video source that has no active signal the crop is based on the default resolution of the 'No Signal' image, which is 1280x720p. To work around this set a custom 'No Signal' image at the same resolution as the video source you intend to bring in and crop.

Configure chroma keying

Add special effects to any video source in a custom channel with chroma keying. Add great looking effects such as animated lower thirds using a titler software or add a custom background using green screen. It's easy to get creative.

With chroma keying, you can choose a specific color in your video scene and replace everything of that color with a different image or video.

The most common color used for chroma keying is green. In this example, the original video source shows someone standing in front of a green screen. Using chroma key, an image of an office space replaces the green background.

White, grey, and black are not recommended colors for chroma keying. Those are treated as the same color with a different luminance value. The result is that the chroma keying affect gets applied to all shades ranging from white to black.

You configure chroma keying using the custom layout editor, see About the custom layout editor.

Topics include:

- Performance considerations
- What is upstream chroma keying?
- What is downstream chroma keying?
- Set up chroma key for a green screen video source
- Add external titler software effects to Pearl-2
- Add chroma key titler effects using Microsoft Powerpoint slides

Performance considerations

Chroma keying can impact performance depending on how many chroma key sources you add, if you scale the chroma key video source using the custom layout editor, and your frame rate.

For best performance, avoid excessive scaling of video sources that have chroma keying enabled. Cropping video sources that have chroma keying enabled helps reduce processing and optimizes the performance.

You can monitor performance from the **Info** tab using the Admin panel for the custom channel that has chroma keying enabled.

Observe the following:

- The maximum resolution is 1920×1080 at 30 fps for chroma keying.
- Avoid scaling a video source that has chroma key enabled.
- Where possible, crop the video source that has the chroma key enabled to minimize the area to process for the chroma key effect.
- Overloading the processor can cause frame drops.

What is upstream chroma keying?

Upstream chroma keying applies the chroma key effect to a specific video source before it's processed, switched, and broadcast.

For example, you could display the name of a guest using titler software on only the camera that is dedicated for close ups of that person but not on any of your other video sources.

To get an upstream key effect, create custom layouts for each video source using the custom layout editor. Then set up chroma keying on just one custom layout. Only the video source that appears in the custom layout with chroma key enabled has the chroma key effect applied to it.

To apply the chroma key effect to a video source that appears in several different custom layouts, enable the chroma key effect in each custom layout where that particular video source appears.

What is downstream chroma keying?

Downstream chroma keying applies the chroma key effect to all video sources you broadcast after they're processed and switched.

A common use of downstream keying is to display a persistent image, like a company logo, so that it always appears on screen.

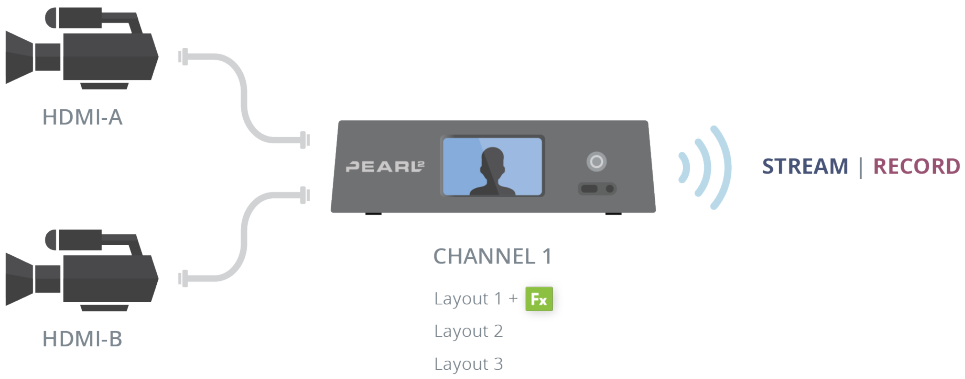
To get a downstream key effect, enable the same chroma key effect on all your custom layouts. This way, the same chroma key effect gets applied to everything you stream or record.

Set up chroma key for a green screen video source

A common use of chroma keying is to use a green screen and then replace the green background with another video or still image.

Your chroma key source can come from a video camera or an effects computer connected to Pearl-2. The background you use can be from another video source, a still image that you've uploaded to Pearl-2, or from an effects computer.

This example shows two camera sources connected to Pearl-2. The green screen appears in the video source connected to HDMI-A and the office background is from HDMI-B.



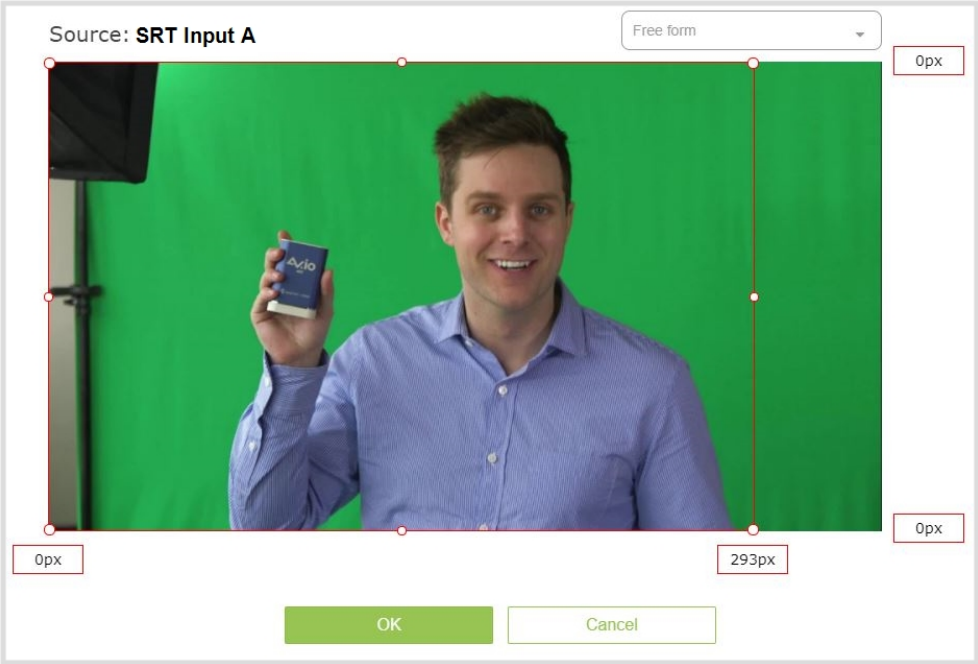
Configure chroma keying for green screen using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. Follow the steps in Set up chroma key for a green screen video source to create a custom channel.
3. From the custom layout editor, click **Add new item** and select **Video Source**.

4. Click **Source** and select the video source that you want showing through the background of your chroma key colored areas. For detailed steps, see Add video sources or a channel as a source.
5. In the layout editing area, click and drag to position the video. See the note after this procedure for positioning techniques.

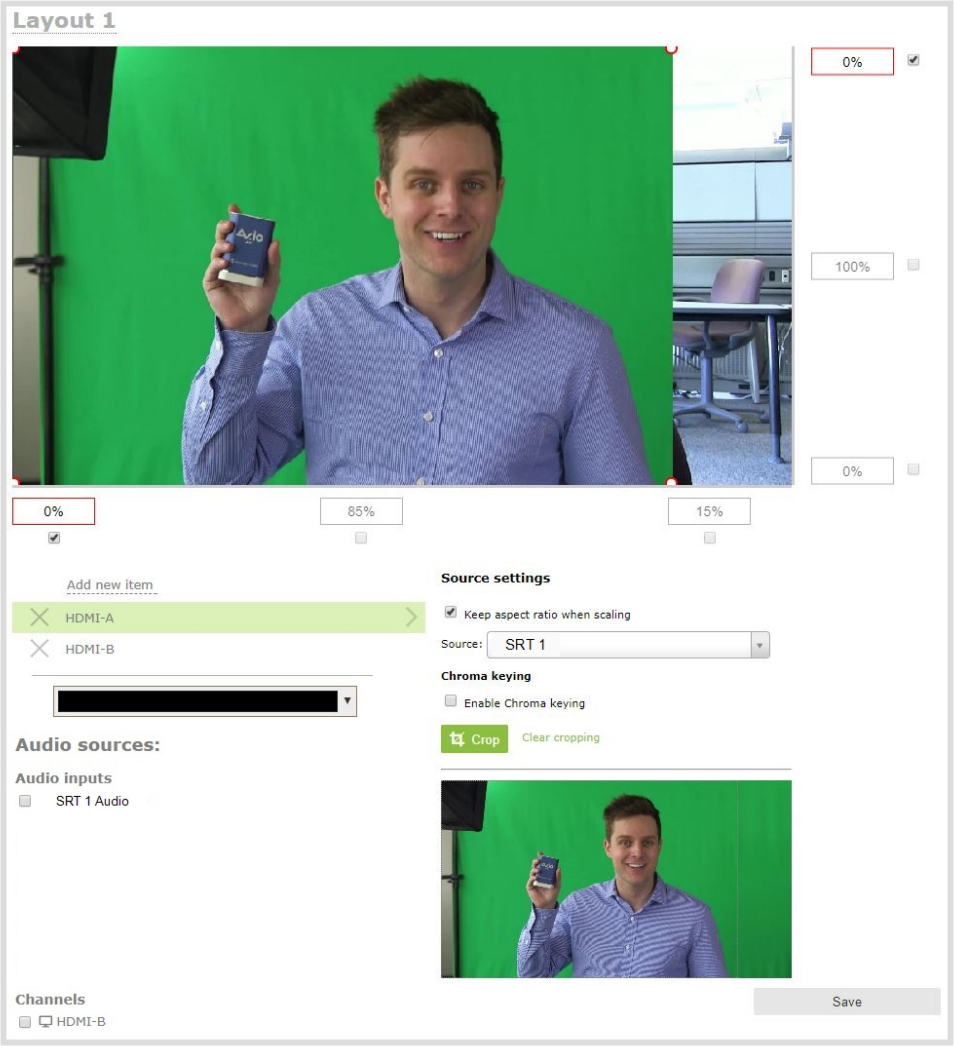
> For best results, select the **Keep aspect ratio when scaling** checkbox from the **Source settings** box.

6. Click **Add new Item** again and add the video source that has the green screen image.
7. Click the **Crop** button and crop your green screen video source in the pop-up crop editing window. Click **OK** when your done to return to the custom layout editor.

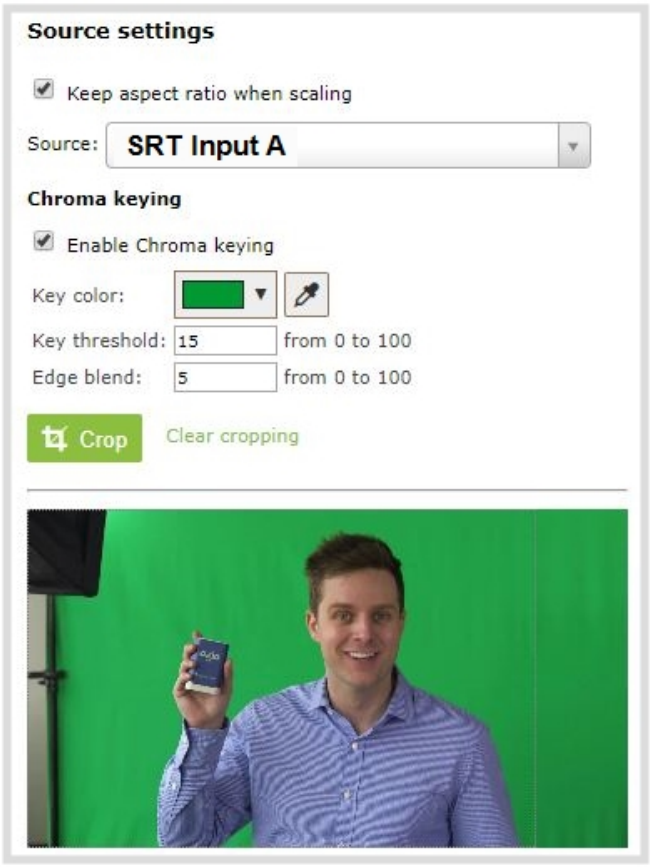


Cropping the green screen video source helps optimize the performance of Pearl-2.

8. In the layout area, position the green screen video source over top the other video source. To optimize performance, avoid scaling the green screen video source if you can.



9. With the green screen video source selected, check **Enable Chroma keying** in the custom layout editor. The chroma keying options appear.



White, grey, and black are not recommended colors for chroma keying. Pearl-2 treats them as the same color with different luminance values. As such, chroma keying affects all shades ranging from white to black.

10. Click the eye dropper and then click on a color in the thumbnail image to choose the chroma key color.

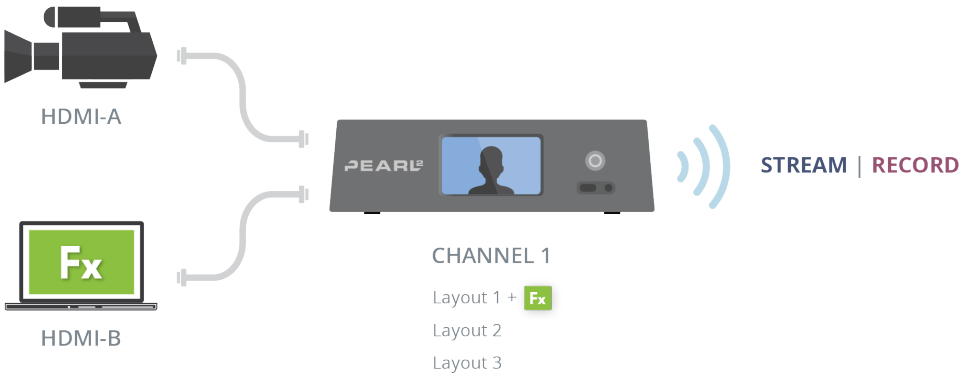
The background video image shows through all the colored areas on the chroma key video layer that match the color you select as the chroma key.

11. Adjust the chroma color selection and blend the edges to remove unwanted chroma effects or residual color.
    a. Enter a number in the **Key threshold** field to adjust the color selection. A value of 0 equals the original color you selected. A higher value widens the range of the selected chroma color. A lower number narrows the range of the selected chroma color.
    b. Enter a number in the **Edge blend** field to smooth out and adjust the color around the edges in your image.
12. Click **Save** when you're done.

Add chroma key titler effects using Microsoft Powerpoint slides

You can use the chroma key feature on Pearl-2 with Microsoft Powerpoint slides to add animated titles and other Powerpoint effects. The setup is really the same as using a dedicated titling software on an effects computer with Pearl-2.

This example shows an HDMI camera connected to the HDMI-A port on Pearl-2 and an effects computer that has a Powerpoint presentation loaded on it connected to the HDMI-B port. To the computer, Pearl-2 is treated just like an external display.



You can connect the effects computer with the Powerpoint file to any supported port that is available on Pearl-2.

Apply chroma key effect to a Powerpoint video source using the Admin panel

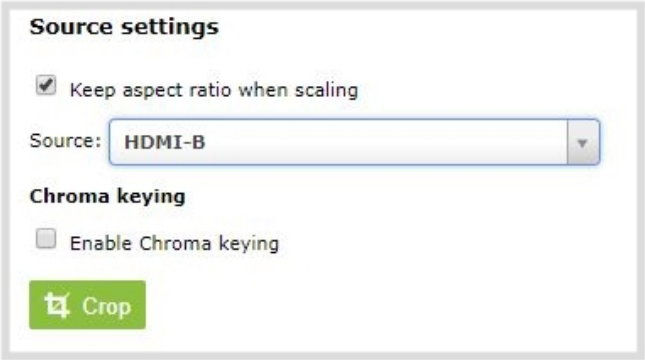
1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.

2. Follow the steps in Configure a custom layout for a channel to create a custom channel.
3. From the custom layout editor, click **Add new item** and select **Video Source** from the drop down box.

4. Click **Source** and select the video source that you want showing in the background. For detailed steps, see Add video sources or a channel as a source.
5. In the layout editing area, click and drag to position the video. See the note after this procedure for positioning techniques.

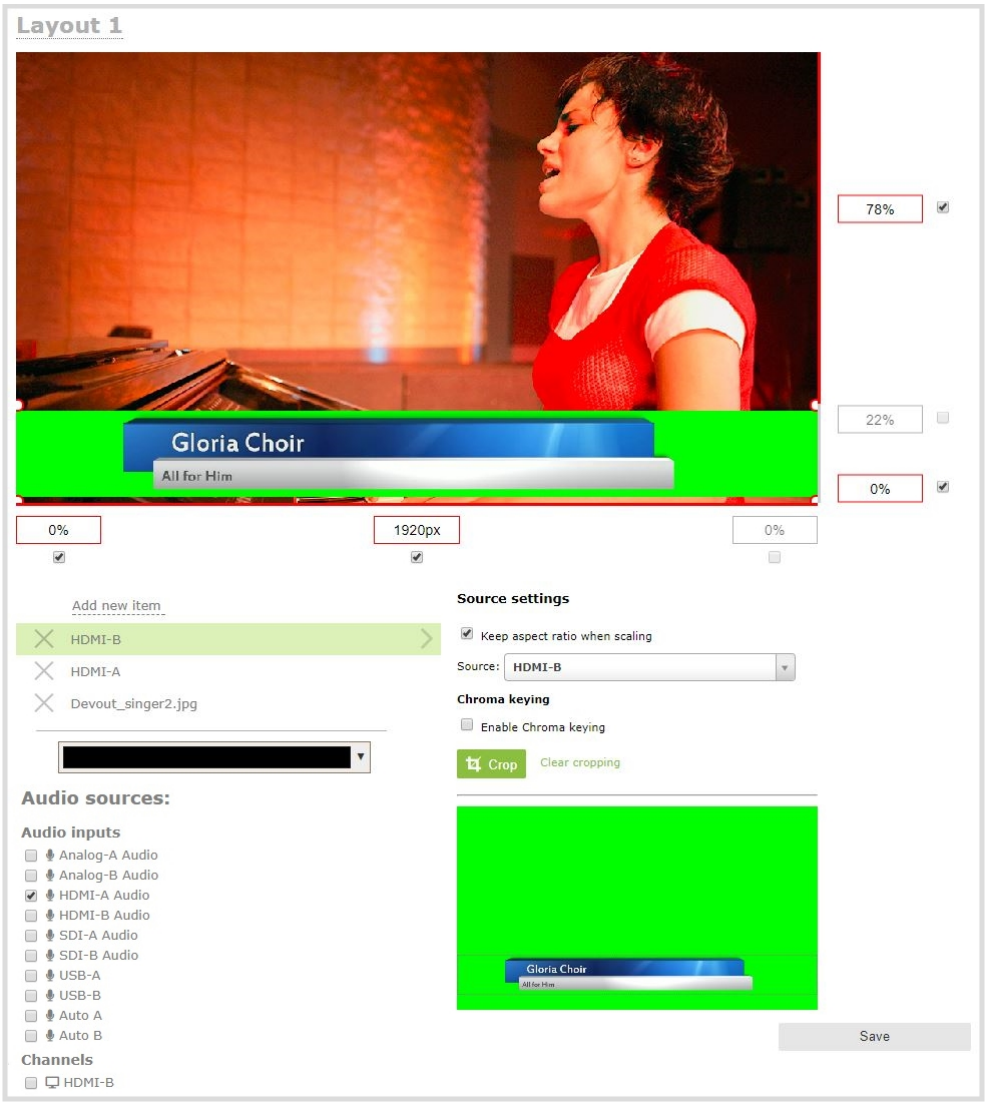
For best results, select the **Keep aspect ratio when scaling** checkbox from the **Source settings** box.

6. Click **Add new Item** again and add the video source from your effects computer.
7. Click the **Crop** button and crop your Powerpoint video source in the pop-up crop editing window. For detailed steps, see Crop a video source. Click **OK** when your done to return to the custom layout editor.

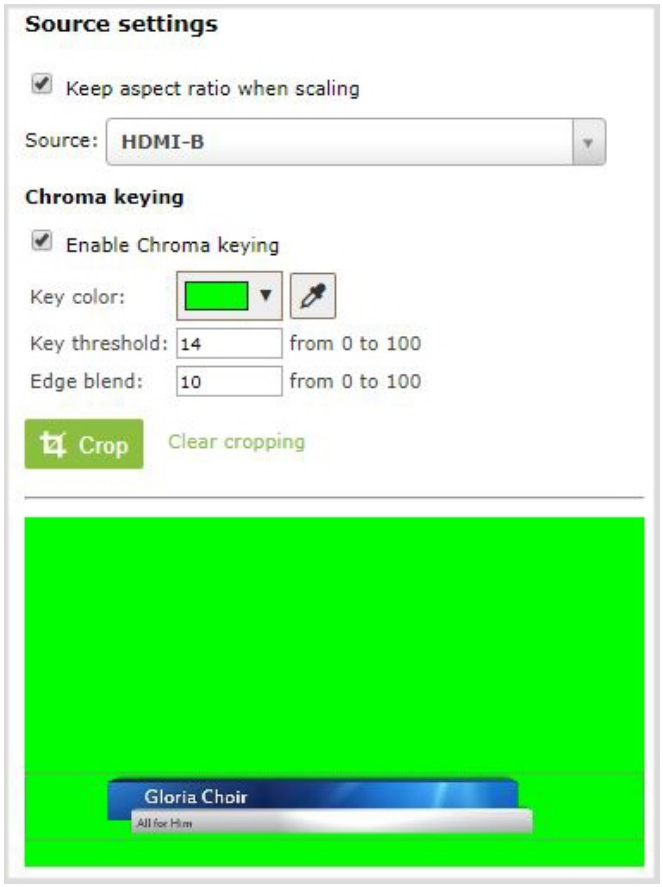


Cropping the Powerpoint computer video source helps optimize the performance of Pearl-2.

8. In the layout area, position the Powerpoint video source over top the other video source. To optimize performance, avoid scaling the Powerpoint video source if you can.



9. With the Powerpoint video source selected, check **Enable Chroma keying** in the custom layout editor. The chroma keying options appear.



10. Click the eye dropper and then click on a color in the thumbnail image to choose the chroma key color.

> The background video image shows through all the colored areas on the chroma key video layer that match the color you select as the chroma key.

11. Adjust the chroma color selection and blend the edges to remove unwanted chroma effects or residual color.
    a. Enter a number in the **Key threshold** field to adjust the color selection. A value of 0 equals the original color you selected. A higher value widens the range of the selected chroma color. A lower number narrows the range of the selected chroma color.
    b. Enter a number in the **Edge blend** field to smooth out and adjust the color around the edges in your image.
12. Click **Save** when you're done.

A note about item positioning and sizing

There are multiple ways to position and size images, text overlays, and video sources in the layout area

- Using the mouse.
- Using the keyboard.

- Using the manual positioning values with percents.
- Using the manual positioning values with pixels.

Using the mouse

Click and drag to move the item. Click and drag the round, red and white handles to resize an image or video source (for text overlays, just use the padding settings). Using this method you can make quick changes that are in increments of approximately 5% of the width or height of your layout area. For more refined movements, press the Ctrl key on your keyboard while dragging the item with the mouse.

Using the keyboard

Use the arrow keys on the keyboard to move the item up, down, left or right in the layout. Changes are in increments of approximately 5% of the height or width of the layout area. Press the Ctrl key while using the arrow keys to make more refined movements. To change the size of an image or video source, press the Shift key while using the arrow keys (for text overlays, just use the padding settings). Press both Ctrl and Shift for fine-grained size control.

Using percents

Specify a whole number, followed by a percent sign (e.g. 4%) in any of the manual positioning fields. See Resize and position items using percents or pixels for more information.

Using pixels

If you need to specify an exact amount in pixels (rather than percent) you can type a pixel value in any of the positioning value squares followed by the characters px (e.g. 56px). You can mix and match pixels and percents changing only the boxes you want to use pixel values. At any time you can switch back to percents by typing a percent. See Resize and position items using percents or pixels for more information.

Add external titler software effects to Pearl-2

You can use Pearl-2 with titling software that provides chroma key output to add effects like animated lower thirds.

This example shows an HDMI camera connected to the HDMI-A port on Pearl-2 and an effects computer with titler software connected to the HDMI-B port. To the computer, Pearl-2 is treated just like an external display.

You can connect the effects computer with the titling software to any supported port that is available on Pearl-2.

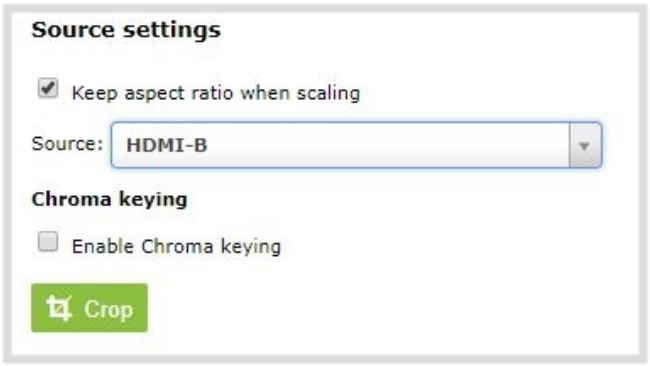
Apply chroma key effect to an effects computer video source using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. Follow the steps in Configure a custom layout for a channel to create a custom channel.
3. From the custom layout editor, click **Add new item** and select **Video Source** from the drop down box.

4. Click **Source** and select the video source that you want showing in the background. For detailed steps, see Add video sources or a channel as a source.
5. In the layout editing area, click and drag to position the video. See the note after this procedure for positioning techniques.

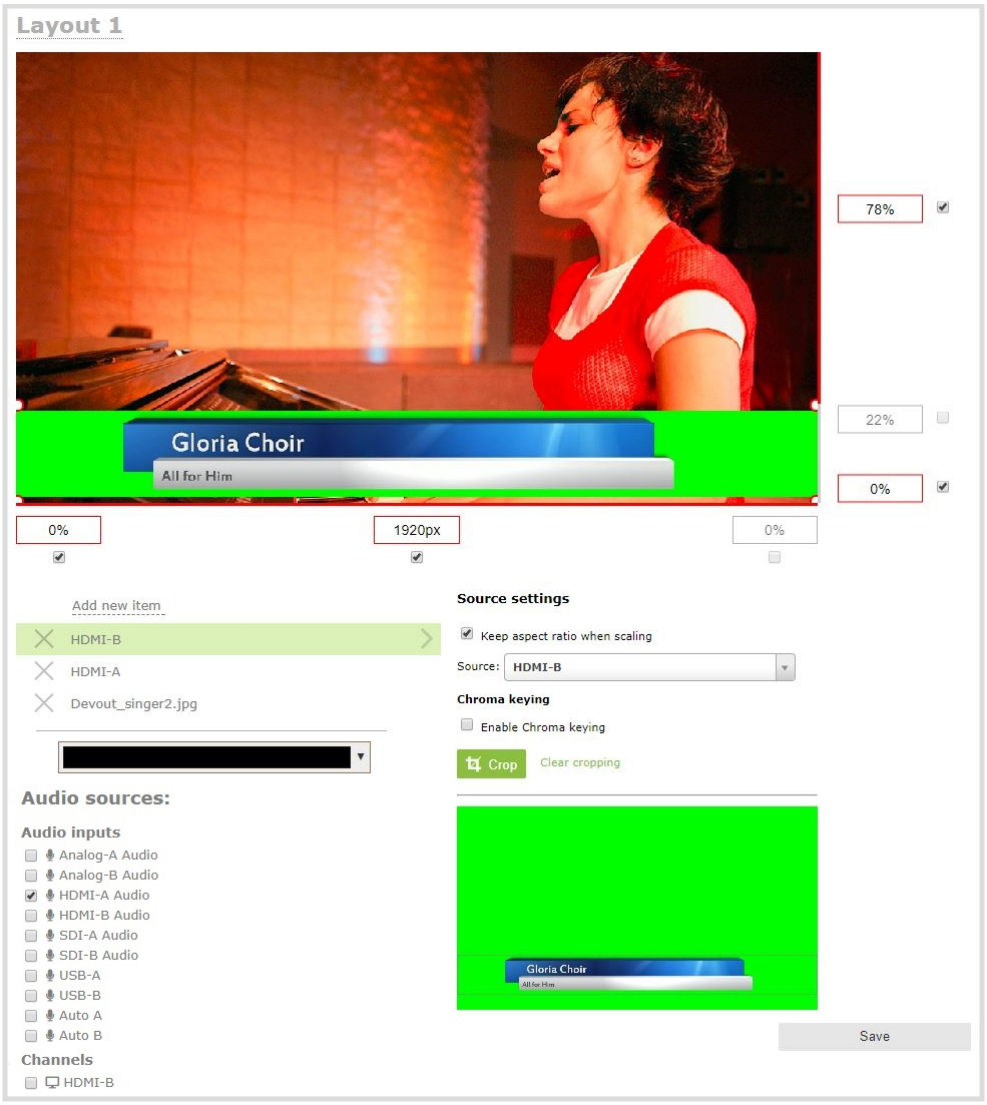
> For best results, select the **Keep aspect ratio when scaling** checkbox from the **Source settings** box.

6. Click **Add new Item** again and add the video source from your effects computer.
7. Click the **Crop** button and crop your effects video source in the pop-up crop editing window. For detailed steps, see Crop a video source. Click **OK** when your done to return to the custom layout editor.

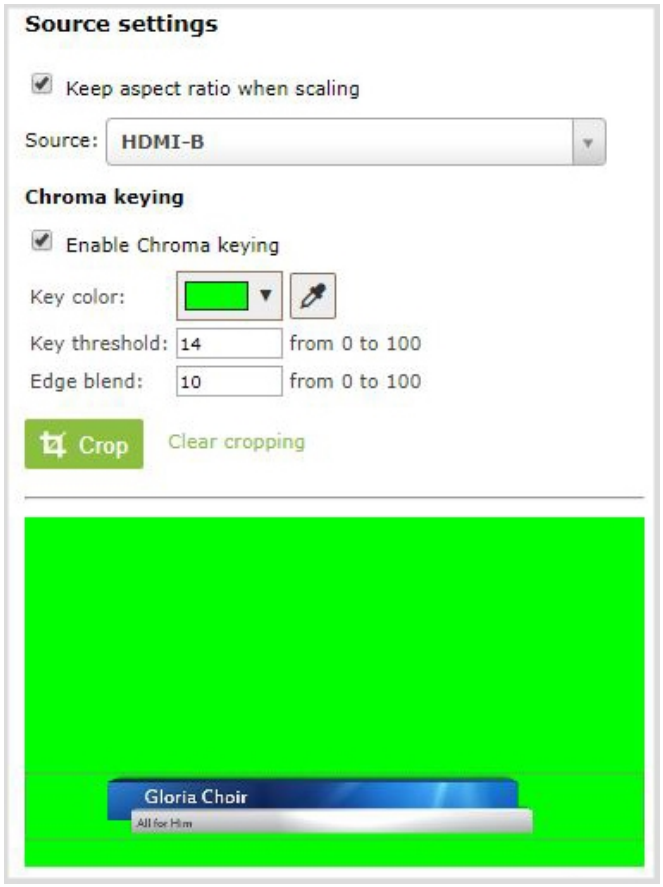


Cropping the effects computer video source helps optimize the performance of Pearl-2.

8. In the layout area, position the effects video source over top the other video source. To optimize performance, avoid scaling the effects video source if you can.



9. With the effects video source selected, check **Enable Chroma keying** in the custom layout editor. The chroma keying options appear.



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> The background video image shows through all the colored areas on the chroma key video layer that match the color you select as the chroma key.

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    a. Enter a number in the **Key threshold** field to adjust the color selection. A value of 0 equals the original color you selected. A higher value widens the range of the selected chroma color. A lower number narrows the range of the selected chroma color.
    b. Enter a number in the **Edge blend** field to smooth out and adjust the color around the edges in your image.
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Using the keyboard

Use the arrow keys on the keyboard to move the item up, down, left or right in the layout. Changes are in increments of approximately 5% of the height or width of the layout area. Press the Ctrl key while using the arrow keys to make more refined movements. To change the size of an image or video source, press the Shift key while using the arrow keys (for text overlays, just use the padding settings). Press both Ctrl and Shift for fine-grained size control.

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Specify a whole number, followed by a percent sign (e.g. 4%) in any of the manual positioning fields. See Resize and position items using percents or pixels for more information.

Using pixels

If you need to specify an exact amount in pixels (rather than percent) you can type a pixel value in any of the positioning value squares followed by the characters px (e.g. 56px). You can mix and match pixels and percents changing only the boxes you want to use pixel values. At any time you can switch back to percents by typing a percent. See Resize and position items using percents or pixels for more information.

Video and audio input sources

The Admin panel automatically discovers all video and audio sources that you connect to the input ports on the Pearl device and lists them in the Inputs menu of the Admin panel. You can also configure a video source's settings using the Admin panel.

Networked video sources like SRT need to be manually added before they display in the Inputs menu. A corresponding audio source is always added to your custom layout editor when you add a networked video source, even if the video stream contains no audio, see Add an audio source to a layout.

An input source's content can be video, a picture, or music from a connected audio mixer. Content can originate from a camera, computer screen, an imported image in the Pearl device, and even another Pearl device.

Video sources are also displayed on the Epiphan Live control interface. See Monitor video and audio input sources using Epiphan Live for more information.

Topics include:

- About connecting video and audio sources
- Tested RTSP-based IP cameras
- Connect an RTSP source
- Connect an SRT stream as an input
- Connect an NDI sourceConnect an NDI source
- Connect a web URL as a video source
- Connect an AV.io video grabber
- Preview a video source using the Admin Panel
- Rename an input port
- Configure a video input source
- Add a custom No Signal image

For instructions to configure an audio input and adjust audio gain or delay, see Audio input ports.

About connecting video and audio sources

You can connect and disconnect video and audio sources while the Pearl device is powered on and when it is powered off. However, for network video sources connecting via the Ethernet port, the source device sending the stream and the Pearl device must both be powered on to make the connection.

Connect your video and audio sources to the following input ports on your device:

Table 46 Cable and port connections

Source type	Input port
SDI	SDI port
HDMI (HDCP-protected) or DVI (adapter)	HDMI port
USB audio (UAC) **Pearl-2 and Pearl Mini** - USB video	USB 3.0 port (rear)
Ethernet	RJ-45 port. SRT, NDI,web URLs, and RTSP are digital sources you connect to your Pearl device via the Ethernet network port.
Audio	**Pearl-2 and Pearl Nano** - XLR or RCA

You can also connect RTSP sources such as IP cameras and even another Pearl device over the network using the Admin panel.

Application of amplified speaker signals to the audio line inputs exceeds the recommended ratings and may permanently damage the device.

The Admin panel automatically discovers all video and audio sources that you connect to the input ports on Pearl device and lists them in the Inputs menu of the Admin panel. Sources coming from the Ethernet network such as SRT, NDI, and RTSP need to be added manually to appear in the Inputs menu. When a network source is added as an input, a corresponding audio source is automatically added to the list of audio sources for your channels, even if there is no audio. See Add an audio source to a layout.

When a video source is connected, the system automatically detects and adjusts the image capture settings every 60 seconds. The interval is configurable. Generally no further configuration is needed; however you can fine tune some settings using the Admin panel.

If no video source is connected to an input port or no stream is being transmitted from a source over the Ethernet connection, "No Signal" displays wherever that input is used. You can change that to display the default "No Signal" image for Pearl devices or create your own custom no signal image. See Add a custom No Signal image .

Changing the video or audio source while streaming or recording can cause the recording to stop or the stream frame size to change, depending on how your channel is configured. If the frame size changes, viewers may get disconnected and need to re-connect to the live stream.

Audio mixers and other line-level audio devices can be connected to:

- **Pearl-2 and Pearl Nano** - the XLR and RCA audio input ports .

Embedded audio from sources connected to the HDMI, SDI, and USB ports (only USB audio on Pearl Nano) is also supported.

For guidance on connecting an audio source, see Selecting an audio source .

Tested RTSP-based IP cameras

Pearl devices are compatible with all Ethernet-based IP cameras and other RTSP sources. The cameras listed in the following table represent a sample of common third-party cameras that have been tested to work with Pearl devices. Information such as URL syntax, default credentials and audio streaming capability specific to each camera is included.

The URL syntax refers to the additional piece of text that needs to be included in the source URL to connect your IP camera to a Pearl device, see Connect an RTSP source to learn how to connect an RTSP source like an IP camera using the Admin panel.

For example, to connect a Sony SRG300SE camera with an IP address of "192.168.0.160", your source URL needs to be entered as:

"rtsp://192.168.0.160/**video1**"

Or, if using a Q-See QCN8029Z camera, your source URL needs to be entered as:

"rtsp://192.168.0.160/"

Table 47 List of tested IP cameras

Brand	Model	Image	URL syntax	Audio?	Default user-name and password
Q-See	QCN8029Z		/	No	admin admin
Sony	SRG300SE		/video1	Yes	admin admin
Panasonic	AW-HE40HPK*		/MediaInput/h264/stream_1 (To add a second URL, use: "/MediaInput/h264/stream_2")	Yes	admin 12345

Brand	Model	Image	URL syntax	Audio?	Default user-name and password
Axis	P1428-E		/axis-media/media.amp	No	root root
Axis	M1034-W		/axis-media/media.amp	Yes	root admin

*During testing, the Panasonic AW-HE40 did not consistently synchronize its time with Pearl devices.

Supported web cameras

Pearl devices support most webcams and USB audio sources, such as USB microphones. The following list of web cameras have been tested for compatibility with Pearl devices. If your web camera doesn't appear in the list, that just means your model hasn't been tested. It's likely that it will work without any issues.

The following web cameras have been tested by Epiphan:

- Logitech HD Pro Webcam C920 (Max video mode: 1920x1080@30)
- Logitech C925e (Max video mode: 1920x1080@30)
- Microsoft LifeCam Studio (Max video mode: 1280x720@30)
- Microsoft LifeCam HD-3000 (Max video mode: 1280x720@30)
- IPEVO Ziggi-HD Plus

For the Ziggi-HD Plus web camera, enable the power line frequency setting in the web camera before connecting the camera to a Pearl device.

When you configure a source, the **Default video mode** is not necessarily achievable for that web camera. For instance, a camera might have a default mode of 1080p but have a **Maximum video mode** of 720p. If no settings are changed, the camera simply outputs video at 720p in this case.For more information, see Configure a video input source

Connect an RTSP source

You can connect an RTSP source (such as an IP camera or another Pearl device) to Pearl-2 over a network using the Admin panel.

For a list of tested cameras and their URL syntax, see Tested RTSP-based IP cameras .

RTSP video encoding is supported with H.264 video codec and MP3 or AAC audio formats. We recommend using the hardware acceleration option for improved performance (enabled by default).

Important considerations

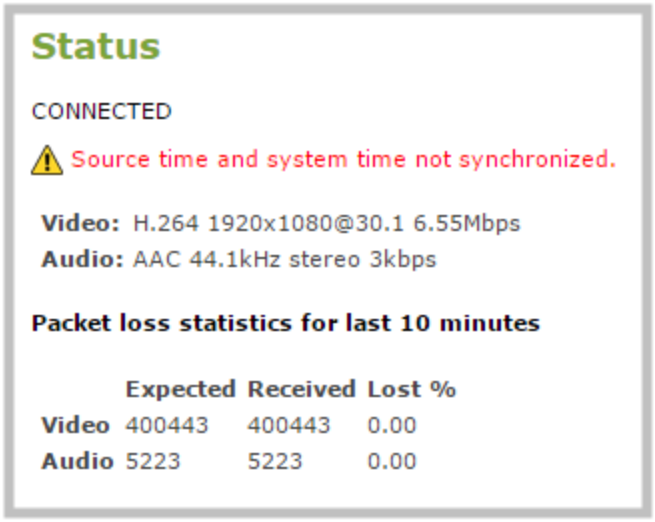
- If an RTSP source is connected but unused in any channel, only key frames are encoded to preserve CPU resources.
- **Pearl-2** - Multiple RTSP sources can be used with Pearl-2.
- To synchronize timestamps between your RTSP source and Pearl-2, the same time synchronization server should be used for both. We recommend that you configure an NTP server on your Pearl device and use it as a time synchronization server for your RTSP source. see Configure a time server.

The timestamps of an RTSP source and Pearl device tend to gradually go out of sync. If there's a **2500 -3000 ms** difference between the timestamp of your RTSP source and the Pearl device, a "no signal" image displays and your RTSP source won't stream audio. Re-connect your RTSP source to reset any time synchronization issues.

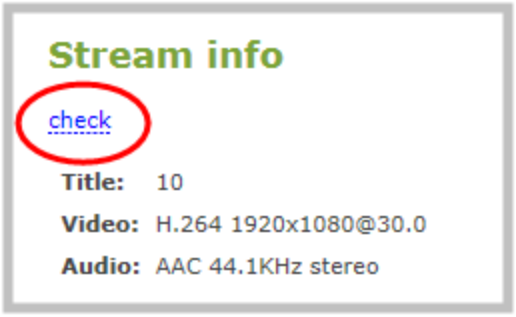
Connect an RTSP source using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, click **Add input**, and then click **Add RTSP input** The RTSP input page opens.
3. Enter the **Input URL**, **Username** and **Password** for your RTSP source and select either **UDP** or **TCP** as the Preferred transport. If you're using another Pearl device as an RTSP source, see Share a live broadcast stream (HTTP, HTTPS, or RTSP) .
4. (Optional) Select **Use hardware acceleration** for improved performance (default).
5. (Optional) Rename the RTSP source, see Rename an input port .
6. (Optional) Configure a custom "No signal" image, see Add a custom No Signal image .
7. Click **Apply** to save your settings and connect your RTSP source.

After your RTSP source is connected, you can view basic video and audio signal information and packet loss statistics for the source under the **Status** header at the top of the page. Any warnings or errors associated with your RTSP stream are also displayed on this page.



Alternatively, you can view stream connection information when you click **check** at the bottom of the page.



Connect an SRT stream as an input

Secure Reliable Transport (SRT) is a low-latency protocol used to stream over the Internet to SRT destinations (decoders), such as CDNs and other SRT decoders.

You can configure Pearl-2 as an SRT destination (decoder) and ingest SRT streams as video inputs that you can add to custom layouts for switching, recording, and streaming.

When adding an SRT input, be sure to select the correct SRT mode. For example, if the SRT source stream is using rendezvous mode, ensure you set the SRT input in the Admin panel to rendezvous mode. If the SRT source stream is using caller mode, then set the SRT input in the Admin panel to listener mode. For more information about SRT modes, see About streaming using SRT.

What's needed for this setup

- The IP address and SRT port of the SRT source (encoder) is needed for caller mode and rendezvous mode.

- For rendezvous mode, you must configure the SRT input to use the same port value as the SRT source. For an example SRT stream using rendezvous mode, see Set up an SRT stream using rendezvous mode.
- For caller/listener modes, you must know which mode the SRT source uses and configure the SRT input on Pearl-2 to use the corresponding mode.
  - Caller mode can be used only for connection with the publicly accessed destination/source.
  - Listener mode can be used for connection with any source/destination (including within a local network behind the firewall).
  - For example, if the SRT source is in caller mode, then the input must be in listener mode. For an example SRT stream using caller/listener modes, see Set up an SRT stream using caller and listener modes.
- If AES encryption and a passphrase is required, consult your IT administrator for this information. Pearl-2 supports 128 bits, 192 bits, and 256 bits AES encryption. Special characters are not supported in the passphrase.

If AES encryption and a passphrase is configured, ensure this information is provided to the SRT source. The SRT stream from the source must use the same AES and passphrase values, see Set AES encryption and a passphrase for SRT.

Add an SRT stream as an input using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, select **Add input** and select **Add SRT input**. The SRT input configuration page opens.
3. In the **Connection mode** field, select the SRT mode:
   a. For **Caller** mode, enter the following:
      - **URL** - the URL of the SRT source (encoder) using the format *srt://<encoder-ip-address>:<port>*, where the *<encoder-ip-address>* and *<port>* could be a Pearl device sending an SRT stream.
      - **Source port** - enter the port number for Pearl-2 to use for SRT traffic.
      - **Stream ID** - In the **Stream ID** field, enter a unique name for this stream.
   b. For **Listener** mode, optionally enter the following:
      - Enter the **Port** number for this device to use for SRT traffic. See Network ports used by Pearl-2 to determine available ports.
   c. For **Rendezvous** mode enter the following:
      - **URL** of the SRT source (encoder) using the format *srt://<encoder-ip-address>:<port>*, where the *<encoder-ip-address>* and *<port>* values are provided by the SRT encoder device.

4. Enter the following optional settings:
    - **Encryption** - select the check box and choose the AES **Key length** if the SRT destination requires AES encryption. These settings must match the encryption settings of the destination device.
    - **Passphrase** - Enter a passphrase if one is required along with AES encryption.
    - **Latency** - Add from 80 ms to 8000 ms of latency to the SRT stream. Increasing latency gives more time to buffer packets and resend any that got lost in transit to the destination. If the latency value set for the stream is too low and there is packet loss over the network, retransmission of lost packets will not be possible and the stream quality will suffer.If you require real-time responses from your audience, you should use as little latency as possible.
    - **Audio delay** - The audio delay feature helps you adjust audio coming from external sources so that your video and audio sources are synchronized when captured, streamed, and recorded. You can apply from -300 ms to +300 ms of delay. By default, there's 0 ms of delay applied to audio sources.
    - **Use hardware acceleration** - This is the default H.264 encoding preset. Choose this setting for best performance. (Pearl-2 and Pearl Mini only)
    - **Disable color range conversion** - Color range conversion ensures that the ingested SRT video signal is full-range RGB (0-255), even if the signal was sent with limited RGB color range. By default, color range conversion is enabled.
    - **No signal image** - Select an image to be displayed if there is no signal in the SRT stream. from the dropdown list. The **DEFAULT** image displays the words **NO SIGNAL**. To add a new image, select **Media** in the **Configuration** menu and click **Choose File**.
    - **Timeout** - Select an amount of time with no signal before the **No signal image** appears.
5. Click **Apply**.

We recommend using the default latency value for an initial test stream. After you perform a test stream, you can determine the Quality of Service (QoS) and calculate the latency requirements. To set the SRT stream latency, see Adjust latency and view the SRT stream status.

Connect an NDI source

NDI® lets you to transmit and receive low latency video over Gigabit Ethernet networks. Pearl-2 accepts multicast and unicast NDI video content, high efficiency NDI|HX, and supports Alpha channel.

Video and audio can come from a variety of NDI sources, including:

- Remote NDI enabled PTZ cameras
- Any NDI unaware HDMI/SDI source using an NDI converter
- Webcams connected to remote computers using the NewTek Connect application
- NDI output from IOS and Android mobile devices running the NewTek NDI camera app

Pearl-2 discovers and lists all available NDI resources on the same network. Simply choose which NDI source you want from a list. Optionally, you can search for specific NDI sources by name and NDI group. You can also discover specific NDI devices installed on different networks, subnets, and on networks that have mDNS disabled. Pearl-2 now also supports adding an NDI discovery server to the network configuration to help discover NDI sources on the network, see Enable an NDI discovery server.

NDI devices that use versions earlier than NDI version 2.0 do not support remote resource discovery across subnets and are detected only when installed on the same local network as Pearl-2.

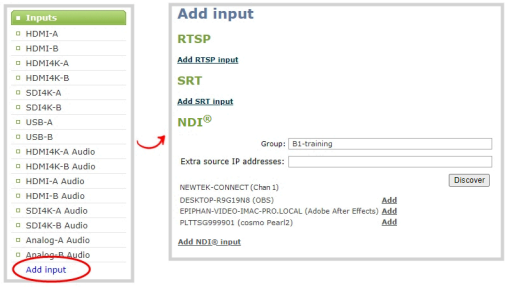
Pearl-2 shows up on the network as an NDI resource for other NDI devices to access as soon as an NDI stream is started on Pearl-2, see Start and stop an NDI stream.

Important considerations

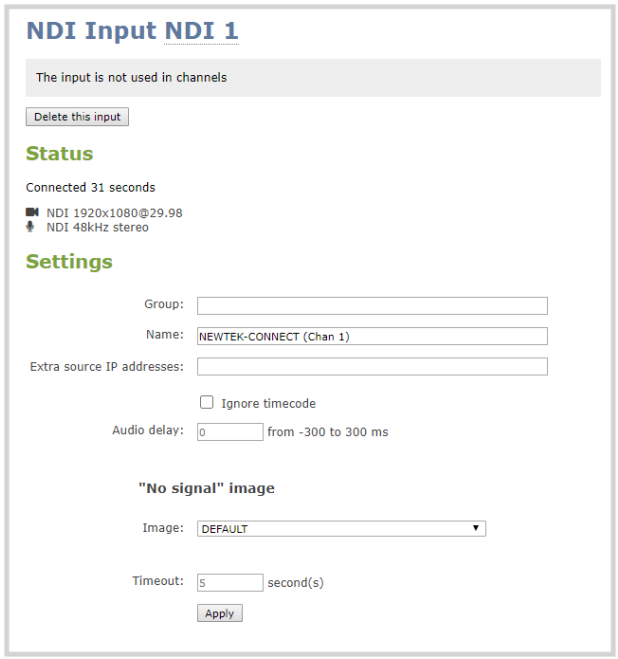
- For NDI to work properly, network ports 49152 to 65535 need to be open for two-way traffic. Contact your network administrator for assistance.
- The network discovery port 5557 on Pearl-2 must be enabled (default), see Disable the network discovery port.
- Pearl-2 supports up to six 1920×1080@30 fps inputs simultaneously. Up to three of those 1080@30 inputs can be from NDI sources. Up to six of those 1080@30 inputs can be from NDI|HX sources.
- Pearl-2 supports up to four 4K[4K] inputs simultaneously. One of those 4K inputs can be from an NDI source.
- Pearl-2 accepts multicast and unicast NDI inputs.
- Streaming an NDI output consumes about the equivalent of an encoded 1920×1080@30 fps channel on Pearl-2. For best performance, see Optimum System Load.
- You can use NDI on wired and wireless networks; however, NDI video is bandwidth intensive. We recommend high efficiency NDI|HX for wireless networks, which has H.264 compression to help lower bandwidth consumption.
- Depending on the video content, a single 1920×1080@30 fps NDI video source needs about 125 Mbps of dedicated bandwidth. A single 1920×1080@30 fps NDI|HX video source needs from 8 to 20 Mbps of dedicated bandwidth.

To connect an NDI source to Pearl-2:

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, click **Add input**. The Add input page opens with all available NDI resources listed.



3. Do one of the following:
    a. If the NDI resource is listed, select **Add** beside an NDI resource to select it. The new NDI input details page opens.
    b. If the NDI resource is assigned to an NDI group, enter the group name and then click **Discover** to see a list of available NDI resources in that group. Select **Add** beside an NDI resource to select it.
    c. If a remote NDI resource is on a different network or subnet than Pearl-2, or the network has mDNS disabled, enter the IP address of the remote NDI resource in the **Extra source IP addresses** field, then click **Discover**. Use a comma to separate multiple IP addresses. Select **Add** beside an NDI resource to select it.
        - Alternatively, if Pearl-2 is configured with the IP address of an available NDI Discovery server (check Enable an NDI discovery server), Pearl-2 will query the discovery server for available NDI sources registered with the NDI Discovery Server.
    d. If you want to add an NDI input to Pearl-2 without selecting an NDI resource, click **Add NDI input**. The new NDI input is added and a blank NDI input details page opens. You can search for and assign an NDI resource to it later.
4. (Optional) On the NDI input details page, check **Ignore timecode** to configure Pearl-2 to ignore any timecode information in the NDI signal. This is useful if the NDI source doesn't send a timecode or if the source's timecode is unstable.



5. Click **Apply**.

After your NDI source is connected, you can view basic video and audio signal information and packet loss statistics for the source under the **Status** header at the top of the page. Any warnings or errors associated with the NDI signal are also displayed there.

Change an NDI input resource

You can choose an NDI resource when you first create an NDI input on Pearl-2 using the Admin panel. Pearl-2 automatically discovers all the available NDI resources on the same network and lists them for you. You can also discover specific NDI resources installed on different networks, subnets, and on networks that have mDNS disabled when you know the IP address of the NDI resource, see Connect an NDI source.

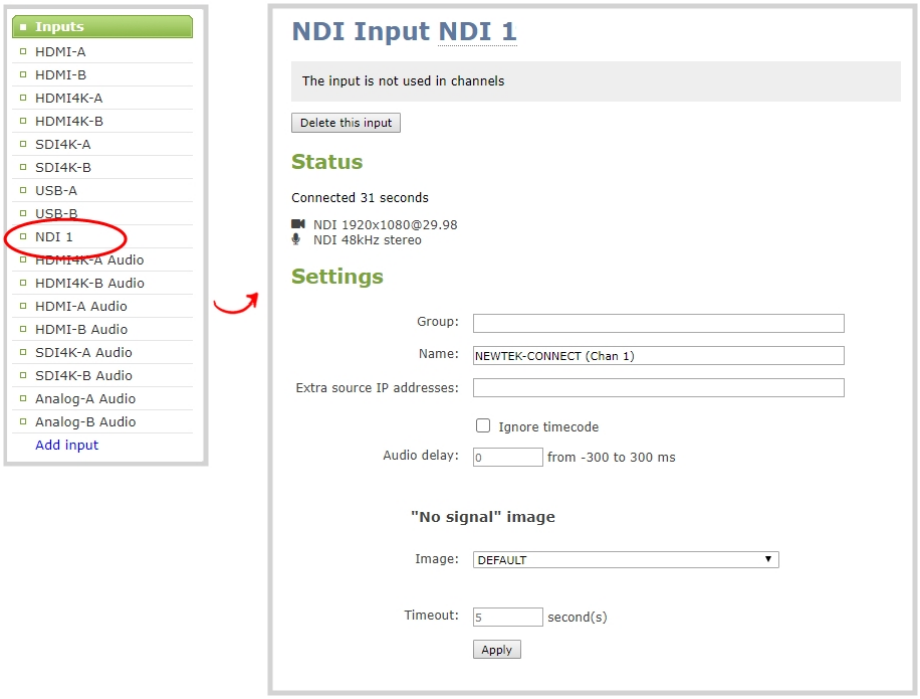
NDI devices that use versions earlier than NDI version 2.0 do not support remote resource discovery across subnets.

If you created an NDI input on Pearl-2 without assigning an NDI resource to it, you can go back later and assign one. You can also change the assigned NDI resource at any time from the NDI input configuration page using the Admin panel.

You must know the exact NDI name and NDI group (if applicable) or the NDI resource's IP address to assign a resource using this method.

To change an NDI input resource using the Admin panel:

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, select the NDI input. The configuration page for that input opens.



3. Under Settings, do one of the following and then click **Apply**.
    a. Enter the NDI name and group (if applicable).
    b. Enter the IP address of the NDI source in **Extra source IP addresses**.

Connect a web URL as a video source

You can add a web URL as an input to a Pearl just the same as you would connect an SRT source. This feature is helpful for adding lower-thirds, titling and, bugs.

Add a web URL as an input using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, select **Add input** and select **Add Graphics input**.
3. Enter the following:
    a. **Web-output url**: the URL of the graphics source using the format **https://<host.domain>**, where <host.domain> is the web output of the graphics.
    b. **Rendering resolution**: Optionally provide the resolution for Pearl to render this graphics input.
    c. **No signal image**: Select an image to be displayed if there is no signal in the web URL stream from the dropdown list. The **default** image displays the words **NO SIGNAL**. To add a new image, select **Media** in the **Configuration menu** and click **Choose File**.
    d. **Timeout**: Select an amount of time with no signal before the **No Signal** image appears.
4. Click **Apply**.

Connect an AV.io video grabber

You can connect an Epiphan AV.io frame grabber to a USB input port just the same as you would connect a web camera.

Pearl-2 treats the video source from the frame grabber just like any other video source.

Use AV.io frame grabbers to connect extra HDMI, DVI, or SDI sources. Using AV.io HD, you can add up to two VGA sources to Pearl-2.

You can set up and operate frame grabbers using the same Configure a video input source

- **AV.io HD**: https://www.epiphan.com/userguides/avio-hd/Content/Home-AVioHD.htm
- **AV.io SDI**: https://www.epiphan.com/userguides/avio-sdi/Content/Home-AVioSDI.htm
- **AV.io 4K**: https://www.epiphan.com/userguides/avio-4k/Content/Home-AVio4K.htm

Preview a video source using the Admin Panel

You can preview the images captured from your video sources in the Admin panel.

Pearl-2 and Pearl Mini - You can also preview your sources using the Epiphan Live control interface, see Monitor video and audio input sources using Epiphan Live.

Preview an input source using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. Ensure a source is connected to the input port.
3. From the Inputs menu, click the **source name**. The configuration page for the source opens. A preview appears at the bottom of the page.

Rename an input port

The input port names are used when adding your video and audio sources to channels. A channel that has only one source is automatically assigned the same name as the input source by default. If you change the name of the input source, the channel name will update automatically to match.

Sometimes it's helpful to configure the input port name to match the data it's capturing so that it's clear what the channel is capturing. Alternately you can change the channel's name, see Rename a channel.

For a complete list of international characters supported, see International character support.

To change an input port name:

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Inputs** menu, click the source name. The configuration page for the source opens.
3. Click on the input port name that appears at the top of the page. The text turns red.
4. Enter the new name using alphanumeric characters. We recommend using underscores to separate words rather than using spaces.
5. Press **Enter** using your keyboard to save the new name.

Configure a video input source

Captured video sources don't usually need configuration, but you can change some of the video settings using the Admin panel, including:

- Video settings
- SDI video settings
- USB video and web camera settings

For details to configure networked video sources on your Pearl device, see:

- Connect an RTSP source
- Connect an SRT stream as an input
- Connect an NDI sourceConnect an NDI source

Open the configuration page for an input source using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. Ensure a source is connected to the input port, see About connecting video and audio sources.
3. From the Inputs menu, click the **source name**. The configuration page for the source opens.

Video settings

Value	Input type	Description
Enable deinterlacing (Pearl-2 and Pearl Mini)	HDMI, DVI	Enable this feature to convert an interlaced source signal to a non-interlaced signal.
Enable 4K downscaling[4K] (Pearl-2)	HDMI	Selecting this option means that your 4K UHD[1] source will be automatically downscaled to 1080p using the Pearl device's hardware.
Image	HDMI, DVI, SDI	This menu allows you to choose a custom no-signal image for the channel. The drop-down list gives you the option to choose the default image or any image you have uploaded through the Add a custom No Signal image
Timeout	HDMI, DVI, SDI	The timeout represents the number of seconds after losing the signal that the no-signal is displayed. You may change this number to adjust how soon you wish the no-signal image to appear after the signal disappears.

[1]Requires 4K feature add on

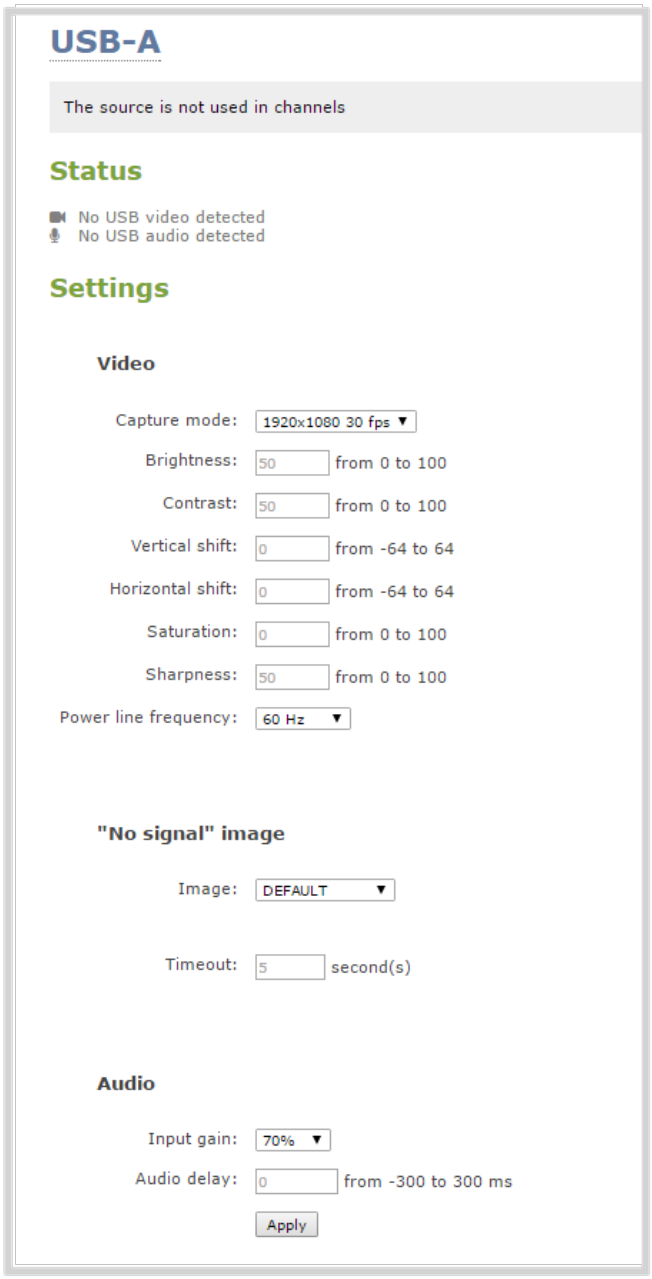
SDI video settings

The following options are available for signals via the SDI port.

Value	Description
Image	This menu allows you to choose a custom no-signal image for the channel. The drop-down list gives you the option to choose the default image or any image you have uploaded through the Add a custom No Signal image
Timeout	The timeout represents the number of seconds after losing the signal that the no-signal is displayed. You may change this number to adjust how soon you wish the no-signal image to appear after the signal disappears.

USB video and web camera settings

The following options are all potentially available for video input sources connected to the USB port. However, some settings apply only to certain types or brands of USB web cameras and not all options are available or needed for all types of USB video sources.



Value	Description
Capture mode	This feature is useful for simultaneously dictating the resolution and fps at which the

Value	Description
	video source is captured. The drop down list of available resolutions and frame rates changes depending on the attributes of the connected device.
Brightness	The brightness of the video can be adjusted by entering a numerical value from 0 to 100. Estimate values and view the result in the preview area until desired result is achieved.
Contrast	The contrast of the video can be adjusted by entering a numerical value from 0 to 100. Estimate values and view the result in the preview area until desired result is achieved.
Vertical shift	The vertical positioning of the video can be adjusted by entering a numerical value from -64 to 64. Estimate values and view the result in the preview area until desired result is achieved.
Horizontal shift	The horizontal positioning of the video can be adjusted by entering a numerical value from -64 to 64. Estimate values and view the result in the preview area until desired result is achieved.
Saturation	The saturation of the video can be adjusted by entering a numerical value from 0 to 100. Estimate values and view the result in the preview area until desired result is achieved.
Sharpness	The sharpness of the video can be adjusted by entering a numerical value from 0 to 100. Estimate values and view the result in the preview area until desired result is achieved.
Powerline frequency	The powerline frequency of the video can be adjusted by selecting the desired output from a drop-down list of frequencies available to your source.
Image	This menu allows you to choose a custom no-signal image for the channel. The drop-down list gives you the option to choose the default image or any image you have uploaded through the Add a custom No Signal image
Timeout	The timeout represents the number of seconds after losing the signal that the no-signal is displayed. You may change this number to adjust how soon you wish the no-signal image to appear after the signal disappears.
Audio input gain	You can add audio gain to your source from this page by selecting the % gain from the drop-down list. Estimate values and check the result in the preview area until desired result is achieved.
Audio delay	If your audio is not synchronized with your video, it can be adjusted from -300 to 300 ms. Estimate values and check the result in the preview area until desired result is achieved.

Add a custom No Signal image

By default the system displays a No Signal image when there is no video signal coming in to any of the video input ports on the Pearl device. You can customize this image to display a different message to your viewers. For example if a viewer logs in early, or if you are experiencing delays you could indicate the start time (or expected resolution time) using the no signal image.

Before you can specify a custom No Signal image for an input port on a Pearl device, you must upload the image. For more information, see Upload or remove an image or video file using the Media page.

Set the no signal image for an input port using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, click the **source name**. The configuration page for the source opens.
3. In the **"No signal" image** section, select an image from the **Image** drop down list.

4. In the Timeout field, enter the number of seconds before the No Signal image is displayed. If no manual value is entered, the default time to display is 5 seconds.
5. Click **Apply**.
6. Test that the No Signal image is correctly applied by disconnecting your source and previewing the channel(s) containing said source, see Preview a channel.

Stream

Streaming is a powerful way to deliver live video content to your viewers. Stream to viewers, servers, and media players. Using the Admin panel, you can configure streaming in multiple formats to multiple destinations and devices, such as web browsers, media players, set-top boxes, Smart TVs, and Content Distribution Networks.

Pearl-2 is flexible, easy to setup, and supports all the standard codecs, as well as the most common media players. Streaming options include: unicast, multicast, SRT, HLS, RTMP, SAP, and more.

Topics include:

- What is streaming?
- Viewing a channel's live broadcast stream
- Directly sharing channel stream URLs with viewers
- Suggested stream settings
- Streaming a channel direct to viewers
- Streaming to servers, CDNs, and other devices
- Streaming to a media player or smart TV

For instructions on how to use Pearl-2's touch screen to start/stop scheduled webcasts and authenticate with a CMS to create unscheduled ad hoc events, see CMS event controls using the touch screen.

For information about streaming to Content Management Systems (CMSs) like Kaltura and Panopto, see CMS recording and webcasting control.

What is streaming?

After you connect your camera, audio source, and set up a channel, it's time to stream your content live and share that with your viewers.

Epiphan products provide many different streaming options and supports a variety of streaming protocols. The easiest way to stream a single channel directly to viewers on the same local network is to share the channel's live broadcast URL. Various stream types are available so users can watch using their favorite devices, including: HTTP/HTTPS, HTTP FLASH (.FLV), MPEG-TS (HTTP), and RTSP.

At the same time, stream to a multicast server or CDN and reach viewers across the globe. You can even stream to smart TVs in overflow rooms using SAP. The streaming method you choose depends on factors like the number of viewers of your stream, are you broadcasting live over a local TCP-based network or streaming to a CDN over the Internet, how much bandwidth do you have available, and is live streaming security a concern?

Pearl devices can stream to a CDN or media server using any of the following streaming protocols:

- SRT (push)
- HLS (push)
- RTMP/RTMPS (push)
- RTSP Announce

A channel can support multiple streams. That means you can stream a channel to multiple destinations using different streaming protocols. Unicast and multicast streams are also supported.

- **Pearl-2 and Pearl Mini** - start and stop streaming by using One touch control from the touch screen, see Specify channels for Single Touch streaming or directly from the Admin panel . You can also control streaming using Epiphan Edge or using Epiphan Live from a mobile device or tablet. See Control streaming and recording using Epiphan Live for instructions to use Epiphan Live.
- **Pearl-2 and Pearl Mini** - To start/stop scheduled streams and authenticate with a CMS to create unscheduled ad hoc events using the touch screen, see CMS event controls using the touch screen.

In addition to streaming from the Pearl device, the following streaming formats are supported as input sources that the Pearl device can ingest:

- SRT
- RTSP

The Pearl device also comes with APIs so you can setup third party tools to control streaming, see the Pearl System API Guide for details.

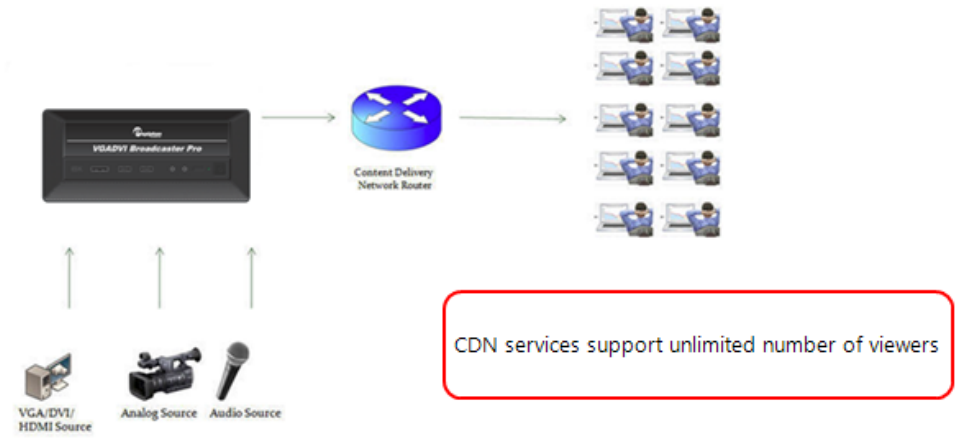
Additional considerations

- Are you streaming live video or recorded video?
- Do you need to stream the content to one client (peer-to-peer) or deliver a single stream to multiple clients (multicast)?
- Do you need to provide web-based streaming that multiple clients can access using a Content Distribution Network (CDN), such as YouTube or Facebook Live?

- Do you need to encrypt your live stream for higher security?
- Streaming to a Content Management System (CMS) like Kaltura or Panopto? See CMS recording and webcasting control

Streaming to a CDN, multicasting, and streaming to multiple destinations

A Content Delivery Network (CDN) relies on geo-diverse CDN servers to receive and disperse web content to the CDN server closest to the user. The closer the server is to the user, the faster the content is delivered. Streaming your content through a CDN allows you to stream any time, anywhere, regardless of the viewing device and you don't have to worry about maintaining your own video streaming servers on site.



Streaming content to a multicast IP address is different than streaming to a CDN. Multicasting lets you directly share the stream with multiple viewers on the same LAN. All viewers receive the same stream at the same time. Similar to turning on a radio station where all listeners hear the same music at the same time. Multicasting is useful for training sessions when there is a specific time frame for the audience to view the content live.

Pearl-2 can publish to multiple destinations at the same time. Do not use Motion JPEG (MJPEG) encoding when streaming a channel to CDNs and multicast streaming at the same time. For more information, see Configure video encoding.

Publishing Options	Use this option to...
Content Distribution Network (CDN)	Stream web content to many viewers on different Content Delivery Networks simultaneously to any geographical location. Using a CDN to host your broadcast is highly scalable and saves you from having to purchase and maintain your own servers to host and deliver video content. Using one or more CDNs to stream live content allows you to reach a large geographically diverse audience and because CDNs perform format conversion, the stream is platform independent. Streaming protocols supported include: SRT (push), HLS (push), RTMP/RTMPS, NDI (Pearl-2 only).

Publishing Options	Use this option to...
	For more information about streaming to a CDN, see Streaming to servers, CDNs, and other devices.
Multicast Streaming	This delivery method relies on network equipment that supports multicasting and is usually used on high bandwidth corporate LANs and not on Internet-based architectures. Multicasting is what's typically used to stream video and audio to an IP TV or set-top box playlist. If you're streaming over a Gigabit Ethernet network to a 10/100 Mbps set-top box that is dropping frames, you can limit the stream's bandwidth, see Set up traffic shaping. Multicast streaming protocols supported include: MPEG-TS UDP, MPEG-TS RTP/UDP, and RTP/UDP. For more information about using multicasting for streaming your content, see Multicast streaming

To stream video outside of your LAN, use a CDN or configure port forwarding on your router. Consult your Network Administrator to set up port forwarding.

By default, no streaming is configured for the channels configured on Pearl-2.

Publishing to a CDN

When you publish a stream to a CDN provider, make sure you use a streaming protocol that the CDN supports. Contact your CDN for a list of supported streaming protocols and audio codecs they support.

To publish content to a CDN provider, ensure you have:

- the URL (or path) to the mount point or an XML configuration file (provided by the CDN provider)
- the supported transport protocols, audio codecs, and any other settings like key frame rates and bit rates recommended by the CDN provider
- See Suggested stream settings for the best streaming settings for Pearl-2.

You can control streaming to a CDN using the Admin panel. You can also use:

- Pearl-2 and Pearl Mini - touch screen

For more information see Start and stop streaming to a CDN.

You can also test how your content is streamed by sending your content to Epiphan's CDN. For a list of Epiphan's preferred CDN providers, see: https://www.epiphan.com/partners/cdn-partners/.

Streaming to multiple destinations

There are a few different ways to stream to multiple destinations using Pearl-2. One option is to configure a channel on Pearl-2 as your switched program channel, then use the Admin panel to create multiple streaming destinations for that channel. You can add multiple RTMP streams to different CDNs, configure multicast

streaming, and even share the live broadcast link with viewers on your network all at the same time. But remember, the more streams you configure, the more network bandwidth you need. To stream to CDNs and multicast a channel at the same time, the channel must have H.264 configured as the channel encoding

Another option is to set up multiple channels on Pearl-2 and stream those using the Admin panel. That way, you can configure each channel with different encoding settings. For example, you can configure one channel with the streaming specifications for YouTube and configure the second channel for streaming to Facebook. Using one channel as your main switched program, use Pearl-2's channel as a source feature to feed that channel into your second channel. That way, you're streaming the exact same switched program to different destinations at different encoding settings. For information about using a channel as a source, see Add video sources or a channel as a source.

As you can see, setting up streaming to multiple destinations is very flexible with Pearl-2.

Directly sharing channel stream URLs with viewers

People on the same local network as Pearl-2 can easily view a channel's live broadcast stream. All you need to do is provide the channel's stream URL and log in credentials for viewers, see Change user passwords.

- **Pearl-2 and Pearl Mini** - You can provide people separate URLs for streams coming from each channel, or one URL that includes all the streams for the channel.

Choose the right type of URL for the type of device the person will use to watch the stream. Viewers can watch the stream using a digital media player or browser. For more information on supported streaming formats and devices, see Viewing a channel's live broadcast stream.

MPEG-TS: Used in broadcast systems sych as DVB, ATSC and IPTV. It is supported by media players such as MPlayer, VLC and KMPlayer.

FLV: Supported on most web browsers and media players. Supports the H.264 standard and analog audio from an external source.

RTSP: Supported by most media players including QuickTime, MPlayer and VLC. Supports H.264, MPEG4, and analog audio from an external source.

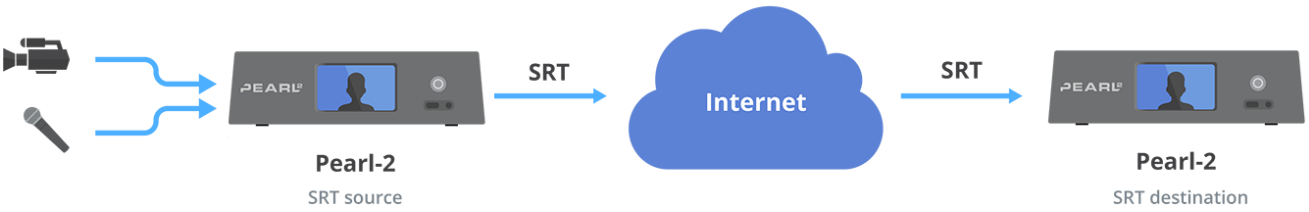
RTSP (UDP/TCP): Client chooses UDP or TCP as the prefered protocol.
RTSP (TCP): Use TCP to steam RTSP to the client.

HTTP is used for MPEG-TS and FLV streaming. HTTPS is not supported.

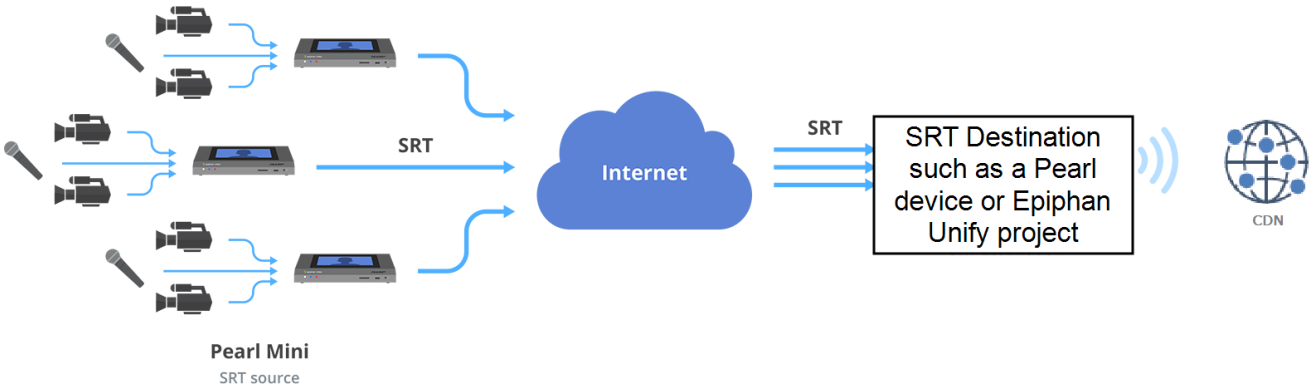
About streaming using SRT

Secure Reliable Transport (SRT) is an open-source streaming protocol that offers quality, low-latency streaming to CDNs and other SRT enabled decoders across unreliable Internet connections using User Datagram Protocol (UDP) transport and additional error checking. Low-latency SRT is particularly good for real-time, two-way communications between a remote guest and a local on-site host.

You can configure Pearl-2 as an SRT source encoder and stream video using SRT. You can also configure Pearl-2 as an SRT decoder and ingest SRT streams as video inputs.



Up to six of the video inputs configured for Pearl-2 can come from SRT sources (or one 4K SRT input) and Pearl-2 can stream up to six SRT streams.



Before content is streamed between the SRT source and destination, a communication link must be established between them for SRT control and recovery packets. Any firewalls blocking the path must be traversed.

SRT streaming modes and firewalls

Streaming through firewalls can be a challenge. With SRT you get easy firewall traversal with little to no IT involvement.

SRT offers three modes to simplify the process: Rendezvous, Caller, and Listener.

- Rendezvous mode is the easiest to setup and usually doesn't need any intervention from your IT administrator for the SRT stream from the source to traverse the firewall to the destination. The SRT source and destination devices must use the same SRT port value, see Set up an SRT stream using rendezvous mode.
- Caller and Listener modes work together to establish the SRT connection between your source and destination devices when traversing the firewall is difficult. In this case, your IT network administrator must configure the network to allow traffic that comes in on the port configured for SRT streaming and forward the traffic to the destination device, see Set up an SRT stream using caller and listener modes.

The device you set as the Caller (or Listener) is arbitrary, as long as one device is a Listener and the other is a Caller. To establish the SRT connection between a source and destination device in rendezvous mode, both devices must be configured and ready to establish the connection between them.

SRT latency controls and AES stream encryption

SRT includes latency controls to adjust for poor network quality while maintaining an acceptable amount of delay. Pearl-2 provides statistics to determine the amount of packet loss. Using the Admin panel, you can increase or decrease the amount of latency applied to the stream to help mitigate any Quality of Service (QoS) issues. The default latency values are 125 ms for an SRT stream and 80 ms for an SRT input, see Adjust latency and view the SRT stream status.

For greater security, you can set the SRT stream to 128 bits, 192 bits, or 256 bits AES encryption. Encryption settings must be set to the same values on both the SRT encoder sending the stream and the SRT decoder that's receiving the stream, see Set AES encryption and a passphrase for SRT.

Secure streaming

Secure streaming is a great option for confidential content, such as corporate meetings or internal employee training. There are several ways to secure your live stream.

- Stream to a CDN or media server over the Internet using Secure Reliable Transport (SRT).
- Stream to a CDN or media server over the Internet using Real Time Messaging Protocol Secure (RTMPS).
- Stream HLS (push) over local HTTPS networks.

SRT streaming includes additional AES encryption settings for even more security. You can set the SRT stream for 128 bits, 192 bits, or 256 bits AES encryption. Encryption settings must be set to the same values on both the SRT encoder sending the stream and the SRT decoder that's receiving the stream, see Set AES encryption and a passphrase for SRT.

RTMPS wraps the RTMP stream in TLS/SSL packets before it's transported over a TCP connection between the network server and the Pearl device(i.e. the client). To set up secure streaming using RTMPS, see Set up an RTMP or RTMPS (push) stream

Suggested stream settings

When you're setting up your live stream, you would typically consult your CDN or publishing destination for their recommended settings to use.

Stream setup can be a matter of balancing quality and system resources. When choosing your stream settings, it's important to consider the type of content you're streaming and the streaming protocol you've chosen.

For streaming fast moving video, a higher bitrate and frame rate delivers a better image. If you're streaming a slide presentation, you can save bandwidth and system processing by lowering the bitrate and frame rate without any noticeable image degradation.

The following table provides suggested settings to maximize your video quality while minimizing system resource usage when streaming video content from Pearl-2.

Table 48 Suggested stream settings for video

Option	Setting
Codec	**Pearl-2 and Pearl Mini** - H.264
Video encoding preset	Hardware accelerated
Video encoding profile	**Pearl-2 and Pearl Mini** - High
Key frame interval	2 sec[1]
Limit frame rate	30[1]
Bitrate	**Pearl-2**: • 6 Mbps for Full HD • 12 Mbps for 4K UHD[4K]
Audio format	AAC 44 KHz[1]

[1]For HLS streaming, the key frame interval should be set to 2s and the frame rate should be set to 30 fps for live NTSC content.

The following table provides suggested settings to maximize your stream quality while minimizing system resource usage when streaming a slide presentation from a PC, Mac, or tablet.

Table 49 Suggested stream settings for slides

Option	Setting
Codec	**Pearl-2 and Pearl Mini** - H.264
Video encoding preset	Hardware accelerated
Video encoding profile	**Pearl-2 and Pearl Mini** - High

Option	Setting
Key frame interval	2 sec
Limit frame rate	30
Bitrate	**Pearl -2**: • 6 Mbps for Full HD • 12 Mbps for 4K UHD
Audio format	AAC 44 KHz

We recommend the following frame rates (per stream):

- 60 fps at 1920×1080 capturing and streaming 2 sources simultaneously
- 30 fps at 1920×1080 capturing and streaming 6 sources simultaneously
- 30 fps at 4K UHD[2], capturing and streaming one source

Streaming a channel direct to viewers

Stream content directly to viewers on the local network using the default streaming settings as soon as you've powered on the system and configured a channel. Just choose the live broadcast method that's right for your viewers. They can tune into the stream and watch using their favorite web browser or media player.

Table 50 Publishing options for streaming direct to viewers on the local network

Publishing Options	Use this option to...
HTTP or HTTPS	Viewers on the same local network as Pearl-2 can access the Live broadcast URL using a web browser on the local network and are instantly connected. Viewers can also choose to use their favorite media player to watch the stream on the local network. They just need the URL for any of the other supported streaming methods (like FLV or MPEG-TS) to watch using their media player. Use these direct streaming methods for only a small number of viewers because each viewer uses the full stream bandwidth and consumes resources on Pearl-2. For more information about using an HTTP stream, see Share a live broadcast stream (HTTP, HTTPS, or RTSP).
RTSP	Viewers can copy and paste the URL of the RTSP stream into a media player and watch the stream on the local network. For more information about using RTSP streaming, see Share a live broadcast stream (HTTP, HTTPS, or RTSP).
HTTP Live Streaming (HLS) pull	Stream live over the standard HTTP port 80, making it possible to cross firewalls and proxies that are normally accessible to other HTTP traffic and facilitates content delivery to CDNs. If HTTPS is configured on Pearl-2, traffic from port 80 is redirected to port 443. See Enable HLS (pull) for details. There is approximately a 30 second delay when streaming using HLS.

To stream video outside your LAN using the channel's HTTP/HTTPS or RTSP URLs, you must configure port forwarding on your router. Consult with your Network Administrator.

To set up Pearl-2 for direct streaming to viewers, see:

- Disable and enable direct channel streaming
- Restrict viewer access to channel streams
- Share a live broadcast stream (HTTP, HTTPS, or RTSP)
- Change HTTP and RTSP streaming port values
- Enable HLS (pull)

Share a live broadcast stream (HTTP, HTTPS, or RTSP)

The easiest way to deliver your content to your viewers is to give them the live broadcast URL of the channel. You can get that using the Admin panel. A separate URL exists for each channel you stream.

The format of the URL depends on the method you used to access Pearl devices, which can be done though network discovery using a Pearl device's serial number or IP address. The Pearl device must be accessible on the viewer's LAN for them to access and view the stream using serial discovery.

If HTTPS is configured, the live broadcast URL will start with *https* instead of *http*.

If Pearl-2 is behind a firewall and you want to share a stream with remote viewers, you need to set up port forwarding on your network. Consult with your network administrator.

Table 51 URL options

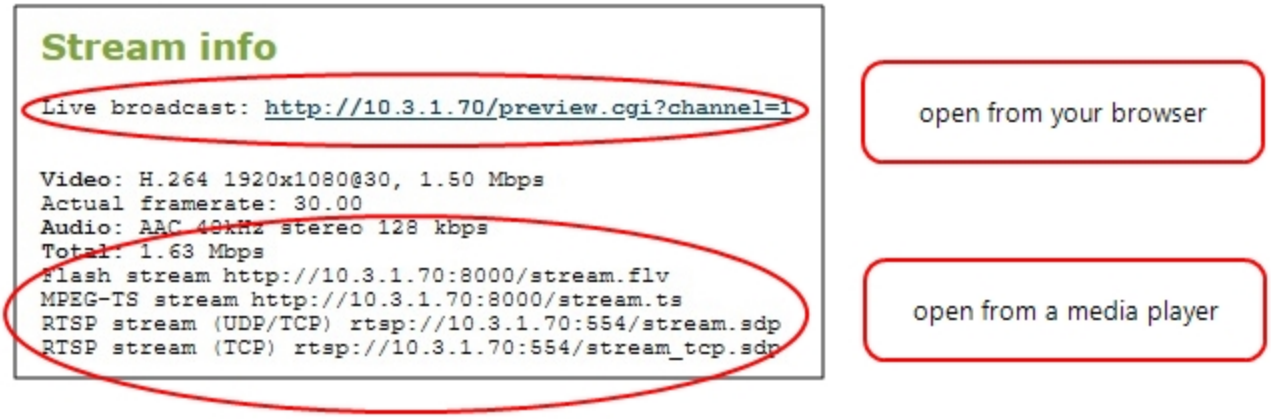
Access Method	URL Format
serial discovery	http://<*serial*>.local/preview.cgi?channel=<channel number> https://<*serial*>.local/preview.cgi?channel=<channel number> rtsp://<*serial*>.local:<*port*>/stream.sdp Where *serial* is the serial number of the system, the *port* number for the channel is found on the Info page, and the channel number is provided from the Admin panel. You must install **Bonjour Print Services** on your Windows or Mac computer to access the live Preview using the serial number.
IP address	http://<*IP Address*>/preview.cgi?channel=2 https://<*IP Address*>/preview.cgi?channel=2 rtsp://<*IP Address*>:<*port*>/stream.sdp Where *IP address* is the IP address of the system, the *port* number for the channel is found on the Info page, and the channel number is provided from the Admin panel.

An RTSP stream is supported by most media players such as QuickTime and VLC. You can choose from two RTSP transport protocol options.

- **RTSP (UDP/TCP)**: The client chooses UDP or TCP as the preferred transport protocol. The preferred option for Pearl-2 is UDP, which is a connectionless transport protocol that does minimal error checking for less delay when transporting packets. UDP is suitable for use with stable, low-loss networks.
- **RTSP (TCP)**: Uses TCP as the transport protocol. Use TCP if you're network connection is lossy and would benefit from the error-checking and packet-loss retransmission that TCP performs.

Retrieve the stream URL for your viewers using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Status**. The Status page appears.



3. Record the **Live broadcast**, **RTSP stream** URL or other web streaming address. This is the address you can send to viewers or use to create a link to your broadcast.

If you're seeing URLs with serial numbers instead of IP addresses and want to change this, log into the Admin panel by IP address (instead of by Serial number/Bonjour Print Services) to see URLs with the IP address, see **Connect to the Admin panel**.

Enable HLS (pull)

Stream a live broadcast of a channel directly to viewers on the same local network as Pearl-2 using HTTP over port 80. This gives viewers with iOS devices convenient access to the channel's live broadcast. If HTTPS is configured for Pearl-2, the traffic from port 80 is redirected to HTTPS port 443.

HTTP Live Stream (HLS) supports the H.264 codec and MP3 or AAC audio encoding. Audio and video are sent as a series of small files called media segment files. You can set the segment duration, as well as define the playlist size using the Admin panel. By default, the segment duration is 9 seconds and the playlist size is 3.

When live broadcasting a channel using HLS (pull), there is approximately a 30 second delay.

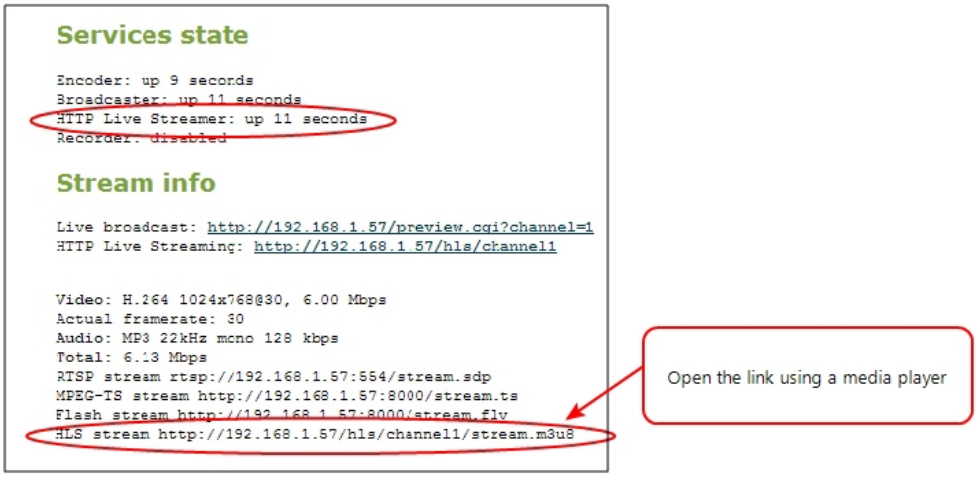
Enable HLS (pull) streaming using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select the channel containing video you want to stream and click **Streaming**. The Streaming configuration page opens.
3. Under **HTTP Live Streaming (HLS)**, check **Enabled**.
4. (Optional) Set the **Segment duration** and **Playlist size**.

5. (Optional) Check **Bypass stream access control for HLS video data** to allow the viewer software to read the HLS stream's video data without having to provide a viewer password or LDAP authentication as configured on Pearl-2. A viewer password or LDAP authentication that is configured on Pearl-2 is still needed to access the HLS stream's playlist.

   Try enabling this option if your viewer is unable to access the HLS stream when a viewer password or LDAP authentication is configured on Pearl-2.

6. Click **Apply**
7. To share the HLS (pull) URL with viewers, click **Status** from the Channels menu, then copy the HLS URL and provide that to your viewers.



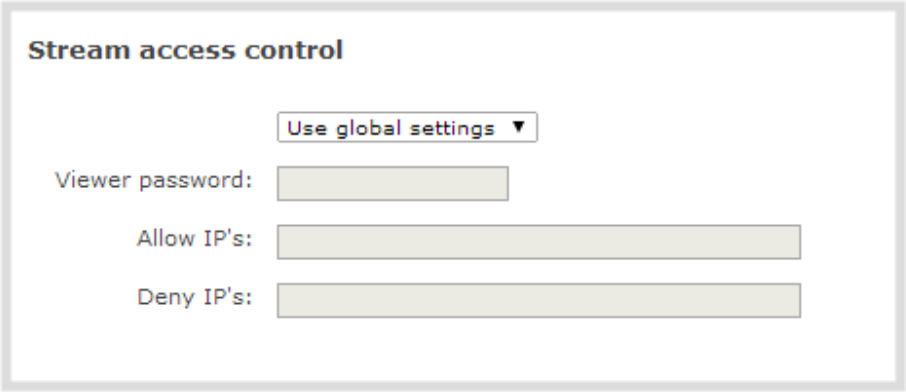
Restrict viewer access to channel streams

Your Pearl device can restrict access to all viewer streams from the channel using global viewer passwords and IP allow/deny lists. see Change user passwords andRestrict viewers by IP address.

If LDAP is configured for viewer authentication, the viewer must pass global autentication using LDAP credentials (or the viewer global password, if there is one) and must meet the local channel settings (come from an allowed IP address). See Configure LDAP user authentication for more information on LDAP configuration.

Restrict viewers for a channel using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select the channel and click **Streaming**. The streaming configuration page opens.
3. In the **Stream access control** section, select **Use these settings** from the drop down.



To return the channel to the global access control settings, select **Use global settings** from the drop down and click **Apply**. The configuration fields are disabled and any changes to the configuration fields are not saved.

Global LDAP settings are always enforced. Any local settings are in addition to LDAP sign on.

4. (Optional) Specify a password for viewers of this channel. The password is masked as you enter it.

If you have global allow/deny lists or a global user password, you can override the global settings and remove all access control for a channel by selecting **Use these settings** and leaving all the fields blank.

5. (Optional) Enter the allow and deny IP addresses for viewers of this channel. see Restrict viewers by IP address for details about allow and deny lists.
6. Click **Apply**.

Restrict viewers by IP address

Pearl devices permit you to restrict which computers can access broadcasts by building a list of allowed and denied IP addresses. You can do this at a global level for the system and can also override these settings on a per-channel basis. Both global and per-channel configuration procedures are described.

The following table describes what happens when an IP address is added to the allowed and denied IP address lists.

Table 52 IP Based Restriction Options

Item	Description
Allow IP's	Users connecting from addresses in this list are permitted to view broadcasts from the device, provided their IP address is not in the Deny IP's list.

Item	Description
	To allow all except IP addresses in the deny list, if any, leave the field blank. You can use the Allow list by itself, or in conjunction with the Deny IP's list as an exception to a rule in the allow list.
Deny IP's	Users connecting from addresses in this list are not allowed to view broadcasts from the device, unless their IP address is in the Allow IP's list. If a specific IP address is in both lists, access to the stream is denied. You can use the Deny list by itself, or in conjunction with the Allow IP's list as an exception to a rule in the allow list.

If your viewer account has a password, your viewers must connect to the device from a computer (or gateway) with a permitted IP address and must also supply the user name (viewer) and password before they can view the broadcast.

To restrict access by IP address, you need to know the IP addresses or range of addresses for your viewers. By default, all IP addresses are allowed to connect to the broadcast.

If a user attempts to connect to the stream from a disallowed IP address, access is denied. If there's an attempt to connect using a web browser, the message "IP address rejected" is displayed.

If you're not familiar with creating allow/deny lists, see IP restriction examples.

IP address restriction is valid for the viewer only and does not affect the Admin panel or the mobile configuration interface.

Restrict viewer access to watch streams for all channels by their IP address

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Security**. The Security configuration page opens.
3. Enter the allowed IP addresses or address ranges in the **Allow IP's** field and enter denied IP addresses or address ranges in the **Deny IP's** field. Separate addresses with a comma. To specify a range, use a hyphen (-). Optional spaces improve readability.
4. Click **Apply**.

Restrict viewer access to watch streams on a channel by their IP address

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Streaming**. The channel's streaming configuration page opens.
3. From the **Stream access control** drop-down, select **Use these Settings** to enable local password and Allow/Deny IP lists are enabled.
4. (Optional) Enter a password for the viewer in the **Viewer Password** field.

5. Enter the allowed IP addresses or address ranges in the **Allow IP's** field and enter denied IP addresses or address ranges in the **Deny IP's** field. Separate addresses with a comma. To specify a range, use a hyphen (-). Optional spaces improve readability.
6. Click **Apply**.

IP restriction examples

The following table lists some sample allow lists.

Table 53 Example allow lists

Example	Description
Allow list with distinct IP addresses	The simplest allow/deny list is to use the list of known IP addresses to craft a list of allowed IP addresses. All other addresses are denied access to the broadcast. For example if your system is accessible on your local area network (LAN) and you want to make sure only the CEO's specific desktop, laptop and tablet computers (with IP Addresses 192.168.1.50, 192.168.1.51, and 192.165.1.75, respectively) can connect to the broadcast, construct the following allow list: `Allow: 192.168.1.50, 192.168.1.51, 192.168.1.75`
Allow list with a range of IP addresses	Sometimes you'll want a range of computer IP addresses to connect to your system. This may happen when you have one range of IP addresses assigned to desktop computers (i.e. in the range 192.168.1.1 to 192.168.1.100) and another range assigned to boardroom computers (i.e. the range 192.168.1.200 to 192.168.1.250). If you only want the boardroom computers to connect to broadcasts from the system you can specify the range of boardroom IP addresses rather than needing to type in each individual address. The allow list looks as follows: `Allow: 192.168.1.200-192.168.1.250` Note that we could have specified two of the IP addresses in the previous example as a range.
Allow list with a range of IP addresses and one or more specific IP addresses	Putting the first two examples together, we want to permit access to IP addresses in the range of boardroom computers (192.168.1.200-192.168.1.250) and also want to add the desktop, laptop and tablet computers of the CEO (IP addresses 192.168.1.50, 192.168.1.51, and 192.168.1.75, respectively). Note the first two IP addresses are consecutive, so they can be added as a second range. Add these IP addresses to the list as follows: `Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75`

Example	Description
	Your list can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.
Allow list with a range of IP addresses, distinct IP addresses, and an exception	Building on the previous examples, consider a situation where you want the CEO's computers (192.168.1.50, 192.168.1.51, 192.168.75) and all boardroom computers (192.168.1.200-192.168.1.250) to access the broadcast, with the exception of the public boardroom computer (192.168.1.211). Use both allow and deny lists to create the rule as follows: Allow: 192.168.1.200-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75 Deny: 192.168.1.211 Both lists can have multiple ranges and multiple distinct IP addresses, provided they are separated by commas.

The following table lists some sample deny lists.

Table 54 Example deny lists

Example	Description
Deny list with distinct IP addresses	Another simple allow/deny list is to use the list of known IP addresses to list specific denied IP addresses. All other addresses are allowed access to the broadcast. For example imagine your system is accessible on your local area network (LAN) and you want to allow any computer on the LAN can access the stream except your publicly-accessible boardroom (with IP address 192.168.1.211). You can use the following deny list (leave the allow list empty) to permit all computers except the boardroom computer: Deny: 192.168.1.211 As with allow lists, your deny list can specify a range of IP addresses, and can specify multiple ranges or distinct IP addresses in a comma-separated list.
Deny list with a range of IP addresses	Consider a situation where you want every computer on the network to access the broadcast, with the exception of the CEO's desktop, laptop and tablet computers. Additionally, boardroom computers should not be permitted with the exception of the cafeteria computer (IP address 192.168.1.222). The deny list is an "exception" list for the allow list. So to craft the rule described above we need to allow all the computers in the local subnet, then deny specific sub-ranges including two groups of boardroom computers ensuring the cafeteria computer's IP address is not in the deny list:

Example	Description
	Allow: 192.168.1.1-192.168.1.250 Deny: 192.168.1.200-192.168.1.221, 192.168.1.223-192.168.1.250, 192.168.1.50-192.168.1.51, 192.168.1.75

Change HTTP and RTSP streaming port values

You can use the Admin panel to configure a specific streaming port value for the channel. Ensure that each channel has unique streaming port values that are not currently assigned to any other process, see Network ports used by Pearl-2.

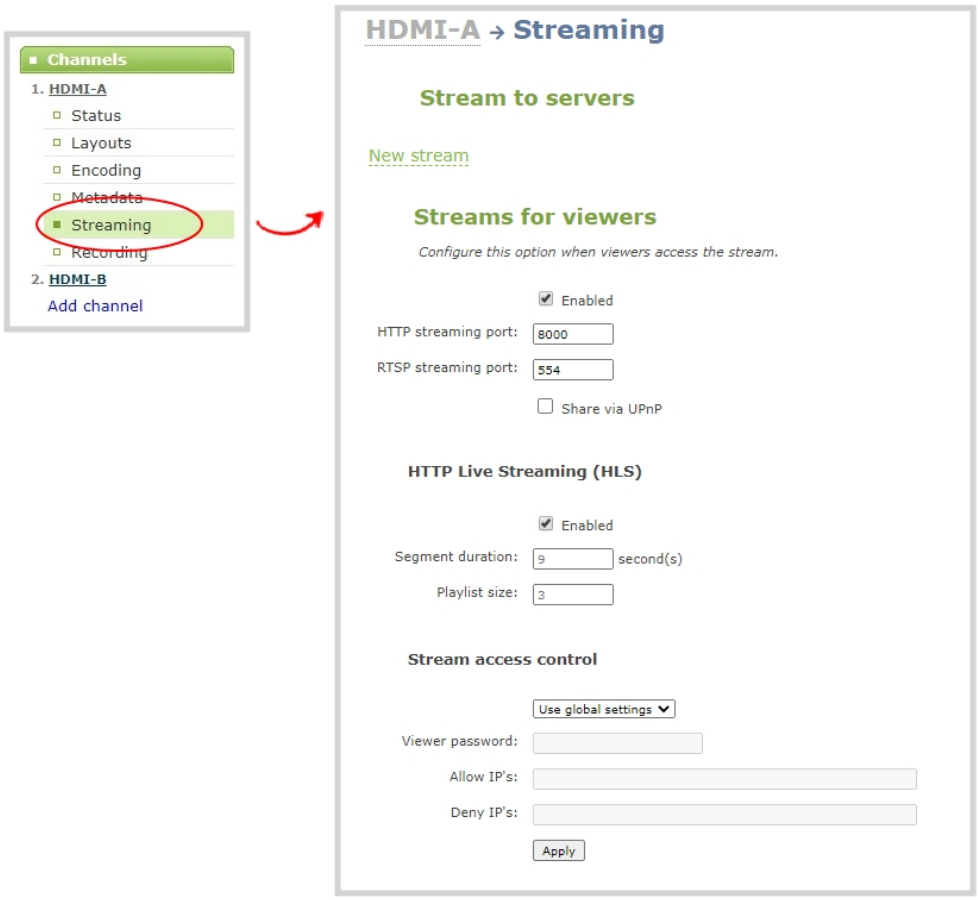
By default, each channel you create is assigned a unique HTTP and RTSP port number.

For RTSP streaming directly to users on your LAN, the only information that's needed to view the broadcast is the URL and the RTSP port number used to stream the broadcast.

HTTP port numbers are used for FLV and MPEG-TS streaming methods.

Set the HTTP and RTSP streaming ports for streaming to viewers on the local network

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming page opens.



3. Set the **HTTP Streaming port** to specify the port used to stream the HTTP broadcast. This value along with the URL is used by viewers to access the FLV and MPEG-TS streams.

> The port number must be higher than 500 for HTTP. In the case of RTSP streaming this value is ignored.

4. Set the **RTSP Streaming port** to specify which port to use when you are streaming live video via RTSP. This value along with the URL is used by viewers to access the broadcast. The default for channel one is 554.
5. Click **Apply**.

Disable and enable direct channel streaming

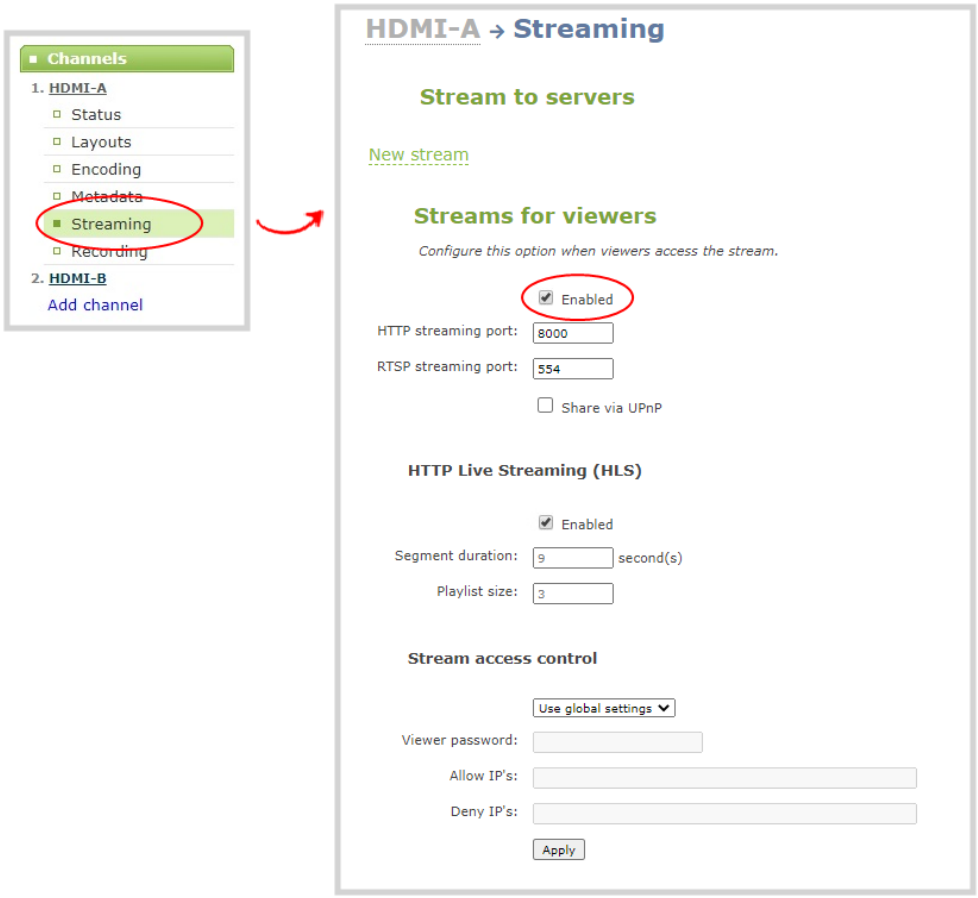
The channel streaming URLs are enabled by default. The URLs are listed on the Status page for the channel, which you can share with viewers. You can disable the channel's streaming URLs from the Streaming configuration page using the Admin panel. When you create a channel, the channel's streaming URLs are enabled by default.

Disabling channel streaming for viewers using their web browser or media player does not disable live streaming to a CDN.

Disabling streams for viewers does disable all viewer formats, including: HTTP/HTTPS, RTSP, and HLS.

Disable or enable the channel streaming URLs using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Streaming**. The streaming page opens.



3. Beneath **Streams for viewers**, uncheck **Enabled** to disable direct streaming of channels to viewers using the channel's streaming URLs. Leave **Enable** checked to allow direct streaming using the channel's URLs.
4. Click **Apply**.

Viewing a channel's live broadcast stream

When you set up a channel, the system automatically generates and displays a list of available live broadcast streams. You can share the channel's stream URLs with people on the same local network as Pearl-2 so they can watch a live broadcast of the channel. All you need to do is provide them the channel's stream URL and log in credentials if you've set one for viewers, see Change user passwords.

To stream video outside your LAN using the channel's live broadcast streams, you must configure port forwarding on your router. Consult with your Network Administrator.

The live broadcast stream URLs for a channel are available from the Channel menu in the Admin panel when you select **Status**. The audio and video codecs configured for the channel affect which live broadcast formats are listed.

Just copy the live broadcast URL and share that with viewers so they can watch the channel stream using a web browser, see View the live broadcast URL using a web browser.

Or choose one of the other channel stream URLs if your viewers prefer to watch using a media player, see View the streaming URL using a media player.

MPEG-TS: Used in broadcast systems sych as DVB, ATSC and IPTV. It is supported by media players such as MPlayer, VLC and KMPlayer.

FLV: Supported on most web browsers and media players. Supports the H.264 standard and analog audio from an external source.

RTSP: Supported by most media players including QuickTime, MPlayer and VLC. Supports H.264, MPEG4, and analog audio from an external source.

RTSP (UDP/TCP): Client chooses UDP or TCP as the prefered protocol.
RTSP (TCP): Use TCP to steam RTSP to the client.

If the channel is configured with 48 kHz audio, some web browsers may not work. In this case, we recommend using one of the channel's other URL formats and viewing the channel steam using a media player instead.

View the live broadcast URL using a web browser

You can share a channel's live broadcast URL with viewers so they can watch your live stream using their favorite web browser. Your viewers must be on the same network as Pearl-2 to watch a live broadcast using the channel's live broadcast URL.

If the channel you're streaming is configured with 48 kHz audio, some web browsers may not work. In this case, we recommend viewing the channel steam using a media player instead.

The live broadcast URL appears in two places in the Admin panel:

- On the channel's status page.
- On the Info page from the Configuration menu.

To locate the IP address for the broadcast, see Directly sharing channel stream URLs with viewers .

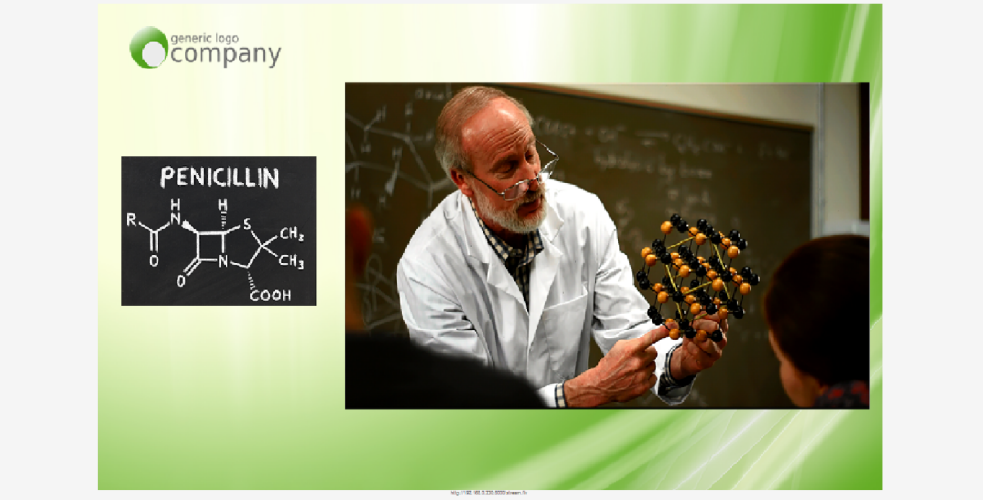
If a viewer password is configured, provide participants with the password to log in, along with the URL of the stream. To set a viewer password, see Change user passwords.

If HTTPS is enabled on Pearl-2, replace *http* with *https* in the URL of the stream.

Share the live broadcast URL with viewers

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Status**. The **Live broadcast** link is listed under **Stream info**. You can copy the Live broadcast URL and share that with your viewers.
3. Alternatively, open the **Info** page to get the live broadcast URL. From the Configuration menu, click **Info** and then click **View** on the far right of the channel you want to share the broadcast URL.

   A page opens displaying the live broadcast and the broadcast URL. Copy the URL and share that with your viewers.



Watch a stream using a web browser and the live broadcast URL

1. From your web browser, enter the IP address of the live broadcast stream.

   If the IP address of the broadcast is 172.20.1.33, then browse to:
   http:// 172.20.1.33/preview.cgi?channel=<channel number>

2. Enter **viewer** as the user name and the password when prompted and press **Enter**. The stream plays in a new tab in your web browser.

View the streaming URL using a media player

You can share a channel's streaming URL with viewers so they can watch your live stream using their favorite media player, like VLC. Your viewers must be on the same network as Pearl-2 to watch a channel stream using a

stream URL.

The different stream types available for channels include: RTSP, MPEG-TS, and Flash streams, see Viewing a channel's live broadcast stream . The URL contains either the IP address of Pearl-2 or the serial number, see

The type of stream URL you provide to your viewers can affect their choice of media player needed to watch the stream.

This procedure assumes that the VLC media player is used.

If a viewer password is configured, provide participants with the password to log in, along with the URL of the stream. To set a viewer password, see Change user passwords .

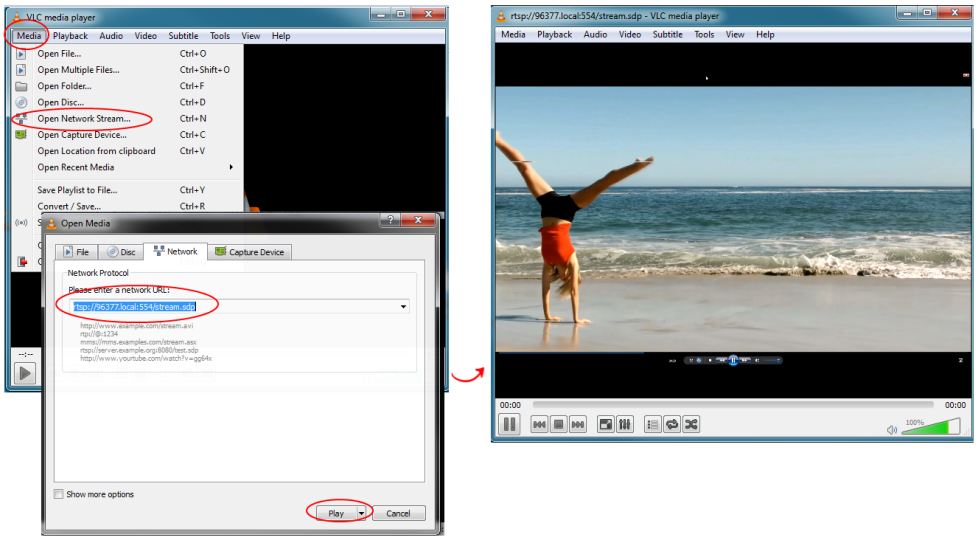
Share the channel's stream URL with viewers

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Status**. You can copy the Live broadcast URL and share that with your viewers.

View the channel's stream URL using a VLC

1. Launch a media player.
2. Click the **Media** tab and select **Open Network Stream** from the drop-down menu.
3. Enter the stream URL. In this example, the serial number method is shown.

```
rtsp://49E7B8E4.local:554/stream.sdp
```



4. Press **Play** to watch the stream in the media player window.

Streaming to servers, CDNs, and other devices

Pearl-2 can stream to CDNs, local media servers, and even to other Pearl-2 devices that are acting as a streaming ingestion point. Pearl-2 supports many streaming protocols. Use the Admin panel to set up individual channels for streaming.

Topics include:

- Set up an RTMP or RTMPS (push) stream
- Set up an SRT stream using caller and listener modes
- Set up an SRT stream using rendezvous mode
- Adjust latency and view the SRT stream status
- Set AES encryption and a passphrase for SRT
- Set up an HLS (push) stream
- Set up an RTSP announce stream
- Start and stop streaming to a CDN

For details to configure multicast streaming, see Multicast streaming. For more information on video encoding configuration, see Configure encoding .

Set up an RTMP or RTMPS (push) stream

Real Time Messaging Protocol (RTMP) is this the most common way to stream to a CDN, including to Facebook Live and YouTube.

Use Real Time Messaging Protocol Secure (RTMPS) on your Pearl devices to encrypt content before it's streamed over a TLS/SSL connection for secure live streaming. When enabled, Pearl-2 will always attempt to validate the digital certificate it receives from the CDN to establish a secure RTMPS connection. The connection will fail if Pearl-2 can't find the CA certificate of your CDN in it's list of certificates.

Pearl-2 has the CA certificates for many of the major CDNs already installed. For RTMPS streaming to work for your particular CDN, or if you're using a proprietary RTMPS server, ensure that your streaming server's CA certificate is uploaded to Pearl-2, see Manage CA and self-signed certificates.

Set up an RTMP or RTMPS stream using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and choose **RTMP push**. The new stream is created using the default name *Stream 1*.
4. Click the stream name to see the stream settings.

5. (Optional) Uncheck **Single touch control** if you don't want this stream to be started and stopped using Single Touch streaming and recording control. This is enabled by default.
6. Enter the **URL** of the ingestion point provided by the CDN or media server.
   - For RTMP push, enter **rtmp** followed by the rest of the URL, for example: *rtmp://<server-ip-address>:<port>/etc...*
   - For RTMPS, enter **rtmps** followed by the rest of the URL, for example: *rtmps://<server-ip-address>:<port>/etc...*
7. Enter the **Stream name** (which also is called a stream key by some CDNs)
8. (Optional) Enter a **User name** and **Password**.

   The CDN provider assigns a user name and password to authenticate the publisher. Contact the CDN provider for your log in credentials. Some CDNs, like YouTube and Facebook Live, do not require you to enter your log in credentials here.
9. (Optional) Rename the stream. Click the current name and enter a different name, then press **Enter**.

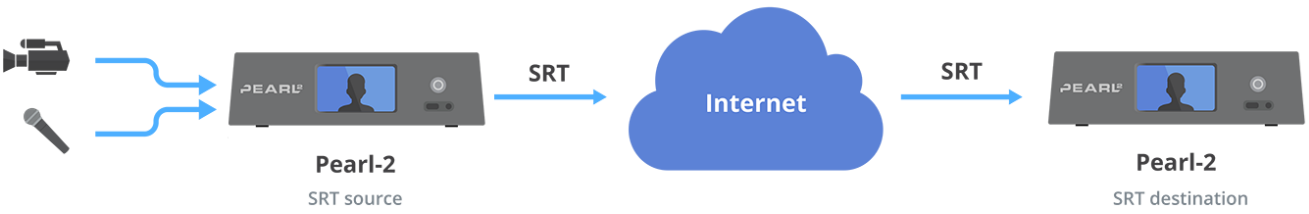
   Refresh your browser if the new stream name doesn't immediately display.
10. Click **Apply**.
11. To start streaming, click **Start** or click **Start all** to simultaneously start this stream and any other streams you have configured for this channel.
12. Click **Delete this stream** at any time to delete the stream.

See Start and stop streaming to a CDN for instructions to control streaming from the touch screen or see Control streaming and recording using Epiphan Live for instructions to use Epiphan Live.

Set up an SRT stream using rendezvous mode

Secure Reliable Transport (SRT) is an open-source streaming protocol that offers quality, low latency streaming to CDNs and other SRT enabled decoders across unreliable Internet connections via UDP.

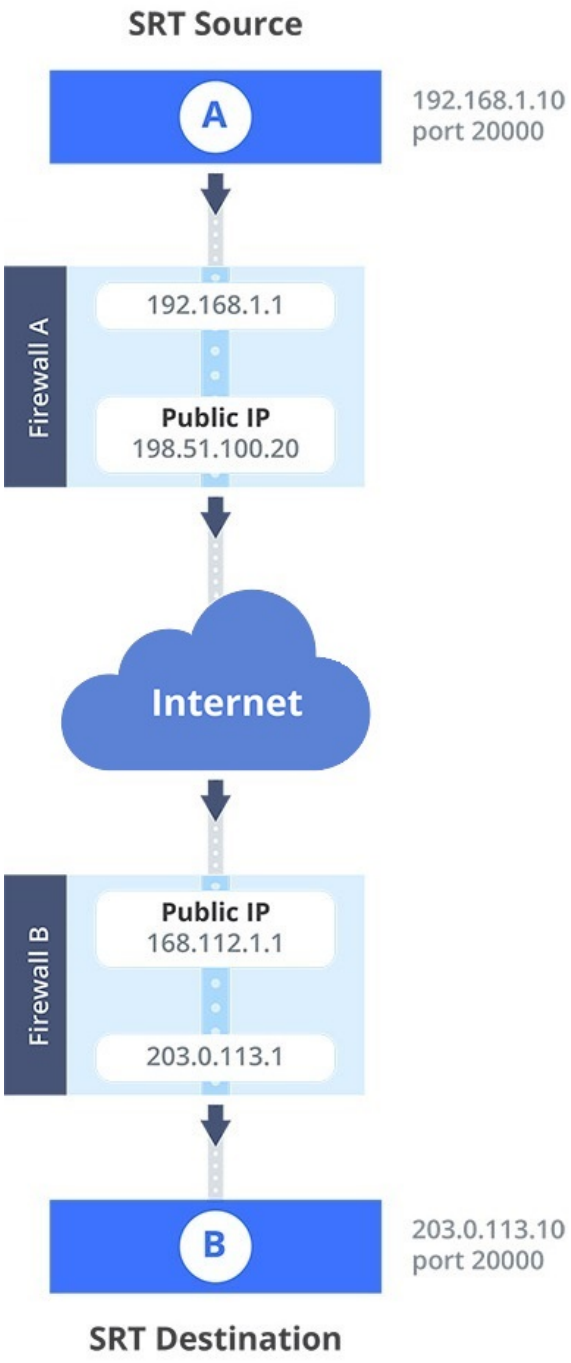
The easiest way to establish a link between the SRT source and destination devices is to use rendezvous mode. In rendezvous mode, both the SRT source and destination device are ready to establish the SRT connection as soon as an SRT stream starts.



Typically, no intervention is needed from your IT administrator to traverse a firewall in rendezvous mode. However, you can switch to SRT caller and listener modes if you experience difficulties streaming through a firewall in rendezvous mode, see Set up an SRT stream using caller and listener modes.

To establish the SRT connection between the source and destination devices in rendezvous mode, both devices must be configured and ready to establish the connection between them. Each must know the IP address of the other device and both must be configured to use the same port for the SRT stream.

In the following example, a Pearl-2 is set up as SRT Source A (192.168.1.10) with port 20000 and another Pearl-2 is set up as SRT Destination B (203.0.113.10) with port 20000.



Source A streams through Firewall A and Firewall B to Destination B, which ingests the SRT stream as a video input with embedded audio. All traffic received at Firewall B that's addressed to 168.112.1.1 on port 20000 passes through the firewall directly to Destination B (203.0.113.10) because of the port number.

What's needed for this setup

- The public IP address of Source A (e.g. 198.51.100.20) and the public IP address of Destination B (e.g. 168.0.113.10).
- The SRT streaming port that Source A is configured to use (e.g. port 20000).
- Configure SRT Destination B to use the same port value as Source A for the SRT stream (e.g. 20000). If the destination device is another Pearl-2, you do this when adding the SRT stream as a video input source using the Admin panel, see Connect an SRT stream as an input.

When you're configuring an SRT stream on Pearl-2, you can also adjust the recovery bandwidth overhead using the Admin panel. This setting defines how much of the stream's total bandwidth is dedicated for the exchange of SRT control and recovery packets between the source and destination. Ensure that the total SRT stream bitrate (i.e. the bandwidth required for the stream plus the recovery bandwidth overhead) is less than the network bandwidth you have available.

Set up Pearl-2 as a streaming source in rendezvous mode using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and choose **SRT push**. The new stream with the default name *Stream 1* is created.
4. Click the stream name to expand the stream settings.
5. In the **Connection mode** field, select **Rendezvous**.
6. Enter the **URL** of the SRT destination (decoder) using the format *srt://<decoder-ip-address>:<port>*, where the *<decoder-ip-address>* and *<port>* values are provided by the CDN, media server, or an SRT decoder device such as a second Pearl-2 at the destination.
7. (Optional) Check Encryption and choose the AES key length if the SRT destination requires AES encryption. These settings must match the encryption settings of the destination device, see Set AES encryption and a passphrase for SRT.
8. (Optional) If the SRT destination has a required security **Passphrase** along with the AES encryption, you can enter that here.
9. (Optional) In the **Latency** field adjust the amount of latency to apply to the stream. The default value is 125 ms.

   We recommend using the default latency and recovery bandwidth overhead values for an initial test stream. After you perform a test stream, you can determine the Quality of Service (QoS) and calculate the latency requirements. To set the SRT stream latency, see Adjust latency and view the SRT stream status.
10. (Optional) In the **Recovery bandwidth overhead** field, adjust the % value of the bandwidth that's dedicate for SRT control and recovery packets. The default value is 25%.
11. (Optional) Rename the stream. Click the current name and enter a different name, then press **Enter**.

Refresh your browser if the new stream name doesn't immediately display.

12. Click **Apply**.
13. When your ready to start streaming, click **Start**

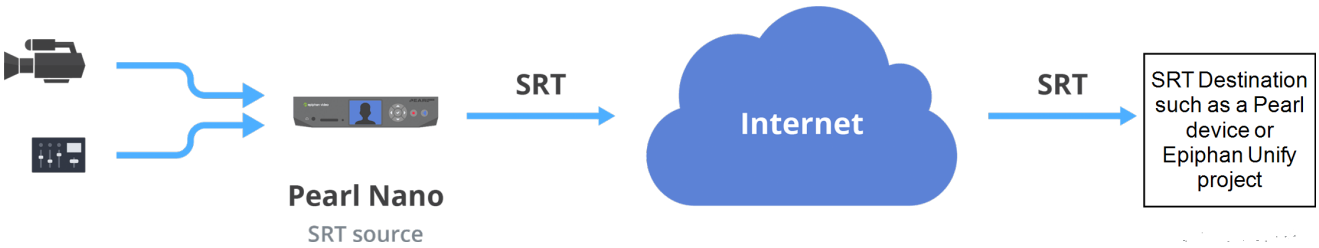
What's next?

If you also need to set up Pearl-2 as an SRT destination and ingest an SRT stream from a remote source, you must add the SRT stream as a input, see Connect an SRT stream as an input.

Set up an SRT stream using caller and listener modes

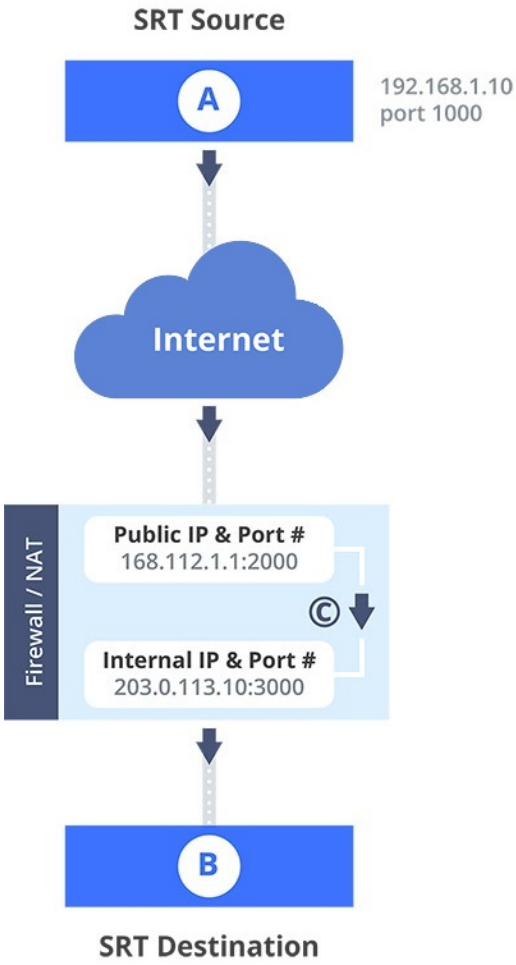
When setting up SRT streaming on Pearl-2, you can configure Pearl-2 as an SRT source encoder and send an SRT stream over the Internet to other SRT destinations (decoders) such as a CDN or another Pearl-2.

Caller and listener modes work together to establish the SRT link between your SRT source and destination device when traversing the firewall is difficult and Rendezvous mode didn't work.



To establish an SRT link between the source and destination devices, ensure that one device is a Listener and the other is a caller. The device you set as the caller (or listener) is arbitrary. If the destination device is set as the listener and is ingesting multiple SRT sources, then all your SRT source devices must be set as callers.

In the following example, Pearl-2 is set up as SRT Source A (192.168.1.10) and another Pearl-2 is setup as SRT Destination B (203.0.113.10). Source A is streaming through a firewall/NAT to Destination B, which ingests the SRT stream as a video input with embedded audio.



The public IP address of the Firewall/NAT is 168.112.1.1 and port 2000 is the designated SRT streaming port. All traffic received at 168.112.1.1 on port 2000 is granted permission to pass through the firewall and is forwarded (C) to Destination B's internal IP address (203.0.113.10) on port 3000.

What's needed for this setup

- The internal IP address of SRT Destination B (e.g. 203.0.113.10).
- The SRT port value that was configured on SRT Destination B using the Admin panel when the SRT stream was added as a video input source using the Admin panel (e.g. port 3000).
- The public IP address of the firewall. An easy way to get the public IP address is to use a web browser and do a Google search for "**What is my IP address**" (e.g. 168.112.1.1).
- The IT administrator in charge of the firewall must open a port for the SRT stream (e.g. port 2000). The port must allow 2-way traffic and route the traffic to the internal IP address and SRT port of Destination B. In this example, traffic received at the firewall's public IP address 168.112.1.1 on SRT port 2000 is routed to 203.0.113.10:3000.

When you're configuring an SRT stream on Pearl-2, you can also adjust the recovery bandwidth overhead using the Admin panel. This setting defines how much of the stream's total bandwidth is dedicated for the exchange of SRT control and recovery packets between the source and destination. Ensure that the total SRT stream bitrate (i.e. the bandwidth required for the stream plus the recovery bandwidth overhead) is less than the network bandwidth you have available.

Set up Pearl-2 as a streaming source in caller/listener mode using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and choose **SRT push**. The new stream with the default name *Stream 1* is created.
4. Click the stream name to see the stream settings.
5. In the **Connection mode** field, select if this Pearl-2 is the caller or a listener.
    a. If **Caller** is selected, do the following:
        i. In the **URL** field, enter the IP address of the SRT destination (decoder) using the format *srt://<decoder-ip-address>:<port>*, where the *<decoder-ip-address>* and *<port>* could be provided by the CDN, media server, or another SRT decoder device.
        ii. (Optional) In the **Source port** field, enter the port number that this Pearl-2 should use for SRT traffic.
    b. If **Listener** is selected, enter the **Port** number that this Pearl-2 should use for SRT traffic. See Network ports used by Pearl-2 to determine available ports.
6. (Optional) In the **Stream ID** field, enter a unique name for this stream.
7. (Optional) Check Encryption and choose the AES key length if the SRT destination requires AES encryption. These settings must match the encryption settings of the destination device, see Set AES encryption and a passphrase for SRT.
8. (Optional) If the SRT destination has a required security **Passphrase** along with the AES encryption, you can enter that here.
9. (Optional) In the **Latency** field adjust the amount of latency to apply to the stream. The default value is 125 ms.

We recommend using the default latency and recovery bandwidth overhead values for an initial test stream. After you perform a test stream, you can determine the Quality of Service (QoS) and calculate the latency requirements. To set the SRT stream latency, see Adjust latency and view the SRT stream status.

10. (Optional) In the **Recovery bandwidth overhead** field, adjust the % value of the bandwidth that's dedicated for SRT control and recovery packets. The default value is 25%.
11. (Optional) Rename the stream. Click the current name and enter a different name, then press **Enter**.

Refresh your browser if the new stream name doesn't immediately display.

12. Click **Apply**.
13. When your ready to start streaming, click **Start**

What's next?

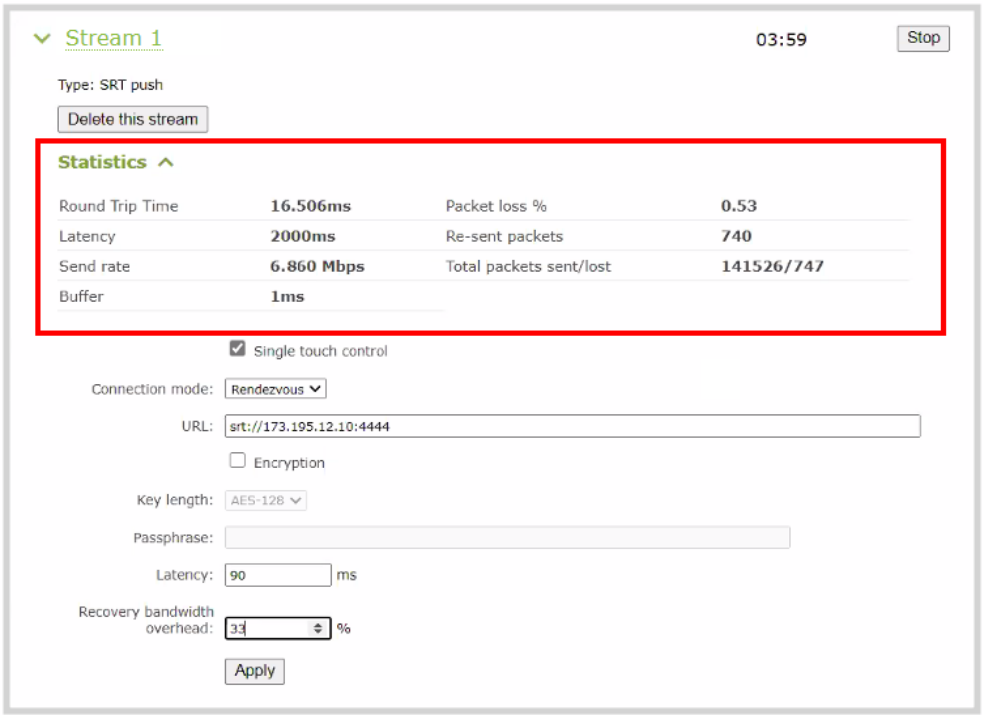
If you also need to set up Pearl-2 as an SRT destination and ingest an SRT stream from a remote source, you must add the SRT stream as a input, see Connect an SRT stream as an input.

Adjust latency and view the SRT stream status

Secure Reliable Transport (SRT) achieves high-quality, low-latency streaming across unreliable Internet connections via UDP packets. If packets are lost in transit to the SRT destination, a request to retransmit the lost packets is sent back to Pearl-2. Using the Admin panel, you can adjust the latency to improve the Quality of Service (QoS) of the stream and reduce the number of dropped packets.

During the SRT stream, you can view the stream statistics using the Admin panel and adjust the amount of latency based on the packet loss % and Round Trip Time (RTT). SRT stream statistics are provided on the streaming configuration page for a channel when Pearl-2 is configured as an SRT source. If Pearl-2 is configured as an SRT destination with an SRT input, then SRT statistics are available on the SRT input configuration page.

The following example shows SRT statistics for an SRT stream. The statistics section appears only while an SRT stream is active. It takes about 30 seconds for the statistics to appear after the SRT connection is established.



You can add from 80 ms to 8000 ms of latency to the SRT stream. Increasing latency gives more time to buffer packets and resend any that got lost in transit to the destination. If the latency value set for the stream is too low

and there is packet loss over the network, retransmission of lost packets will not be possible and the stream quality will suffer.

Latency can be configured at the source and at the destination. SRT uses the highest of the two latency values.

The formula to calculate latency is:

SRT Latency = *RTT Multiplier* × *RTT*

where the recommended range of the *RTT Multiplier* is a value from 3 to 20.

The following table provides guidelines for what values to use when calculating latency. An RTT multiplier value less than 3 is too small for SRT to be effective and a value above 20 indicates a network with 100% packet loss. Ensure the measured **buffer** is less than or equal to the latency value you use.

Table 55 Suggested SRT latency values

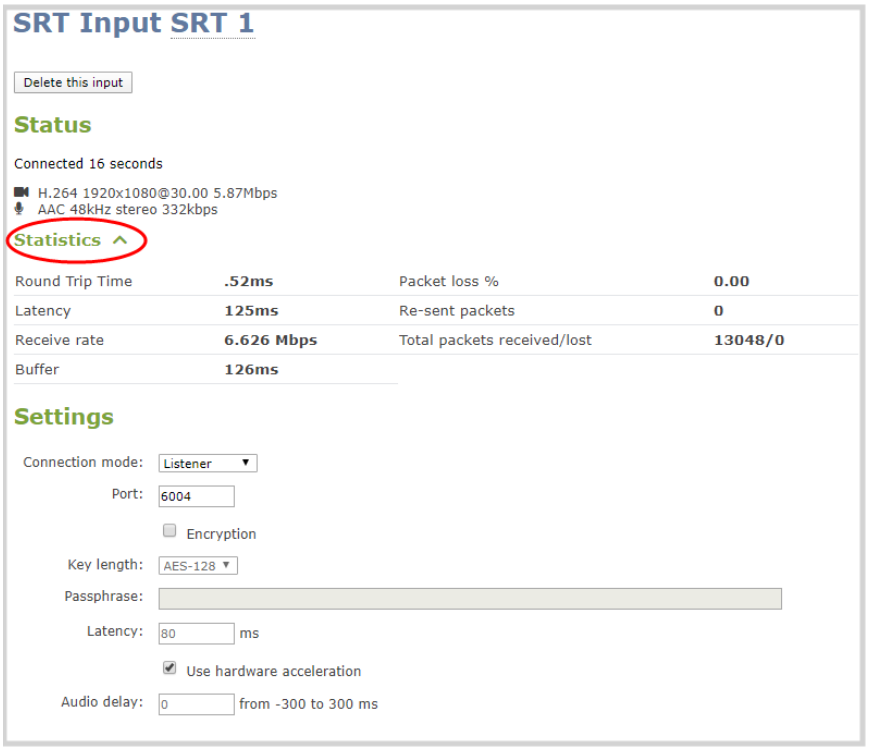
Packet loss %	RTT multiplier	Recovery bandwidth overhead	Minimum SRT latency (for RTT ≤ 20 ms)
% is ≤ 1	3	33	60
% is ≤ 3	4	25	80
% is ≤ 7	5	20	100
% is ≤ 10	6	17	120

These values are from the SRT Deployment Guide. For up-to-date calculations, visit www.srtalliance.org.

For example, if the % of packet loss is 0.53 and the measured RTT is 16.506 ms, the latency calculation is: 49.518 = 3 × 16.506 ms or 50 ms of latency (rounded up).

Adjust latency and recovery bandwidth overhead for an SRT stream using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. View the SRT statistics for the active stream. Do one of the following:
   a. To open the SRT statistics from the **Channel(s)** menu, select the channel with the SRT stream to configure and click **Streaming**. The Streaming configuration page opens. Then select the arrow beside the SRT stream to reveal the SRT stream statistics.
   b. To open the SRT statistics from the Inputs menu, select the SRT input. Then on the SRT input configuration page, select the arrow beside Statistics.



The statistics section only appears while an SRT stream is active.

3. In the **Latency** field, enter a numerical value from 80 ms to 8000 ms.
4. Click **Apply**.

We recommend testing your settings. Start the SRT stream and use the stream statistics to evaluate the effect the latency and recovery bandwidth overhead values have on the packet loss % of the stream.

Set AES encryption and a passphrase for SRT

You can configure your Secure Reliable Transport (SRT) streams to use 128 bits, 192 bits, or 256 bits AES encryption using the Admin panel. You can also assign the SRT stream an alphanumeric passphrase if required. The encryption and passphrase settings on the SRT encoder sending the stream must match the settings on the SRT decoder receiving the stream.

The encryption key length is negotiated between the source and destination devices. The key length of the sender is used to determine the key length that is eventually used to secure the connection, and the receiver obtains the key length from the sender. As long as the passphrases match, the key length will be negotiated.

Set up AES encryption and a passphrase for an SRT stream using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel with the SRT stream to configure and click **Streaming**. The Streaming configuration page opens.
3. Click the arrowhead beside the SRT stream name to reveal the stream settings. In this example, the name of the SRT stream is Stream 1.
4. Check Encryption and choose the **Key length**.
5. In the **Passphrase** field, enter the passphrase using alphanumeric characters (if required). The password must be a minimum of 10 characters and maximum of 79 characters.
6. Click **Apply**.

Set up AES encryption and a passphrase for an SRT input using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, select the SRT input you want to configure. The SRT input configuration page opens.
3. Check Encryption and choose the **Key length**.
4. In the **Passphrase** field, enter the passphrase using alphanumeric characters (if required). Special characters are not supported.
5. Click **Apply**.

Set up an HLS (push) stream

HTTP Live Streaming (HLS) is an adaptive, HTTP-based streaming protocol that sends video and audio content over the network in small, media segments that get reassembled at the streaming destination. Media segments stream over HTTP port 80 or port 443 for HTTPS, which are typically open for network access. As such, the content can easily traverse firewalls with little to no IT involvement.

Pearl-2 can send a single resolution and bitrate HLS stream as an HTTP POST (or HTTP PUT) to HLS ingestion servers and CDNs such as Akamai and YouTube. The default is HTTP POST. Your channels on Pearl-2 must be configured for H.264 and AAC audio codec to stream using HLS. Pearl-2 supports MD5, SHA-256, and SHA-512 hashing algorithms to authenticate the stream.

HLS uses an MPEG2-TS transport stream container with a configurable media segment duration, as well as a configurable playlist size for reassembling the media segments at the ingestion server. Because HLS favors Quality of Service (QoS) over low-latency, lag times that can be high. If a specific media segment size isn't required by the ingestion server, then you can shorten the duration of the media segment to decrease latency. The default segment duration is six seconds.

Using the Admin panel, you can add advanced features like a master manifest, which is an address applied to each individual media playlist in the stream. You can also assign the HLS stream a user name and password. If security and authentication credentials are required to stream to the ingestion server, consult the ingestion server provider.

Important considerations

- Only a single resolution and bitrate stream is supported.
- See Suggested stream settings for the best streaming settings for Pearl-2.
- Fragmented MP4 is not supported.
- If the HLS ingestion server requires a custom user-agent name, add that to the HLS stream in the Advanced settings using the Admin panel and ensure the agent-name is added to the HLS ingestion server's white list. Contact the IT administrator responsible for the ingestion server.
- If the HLS ingestion server requires a user name and password, you can get those credentials from the IT administrator responsible for the ingestion server.

Set up an HLS (push) stream using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and choose **HLS push**. The new stream is created using the default name *Stream 1*. To see the settings, click the stream name.
4. In the **Media Playlist URL field**, enter the URL of the destination server that is ingesting the stream. For example: *http://p-ep721023.i.akamaientrypoin.net/722223/hlsQualification/my_video.m3u8*
5. (Optional) In the **Segment template** field, enter the naming format used for the names of media segments. For example: *chunk-$Number%05d$.ts*
6. (Optional) Enter a **Username** and **Password** if required for this stream. Get this from the ingestion server provider.
7. In the **Method** field, select **POST** or **PUT**. This selection must match the requirements of the ingestion server.
8. In the **Segment duration** field, enter the length of the media segment in seconds. The default duration is six seconds. Fractions and periods are not supported.
9. In the **Playlist size** field, enter the number of .ts segment files in each segment. The default playlist size is six.

10. (Optional) Under **Advanced settings**, you can set the following:
    a. **Master manifest**: Enter the URL (including the master playlist file name) of where Pearl-2 will upload the master manifest file. The master playlist also provides the bitrate, resolution, and codec.
    b. **User-agent**: Enter a user-agent name using alphanumerical characters only if the ingestion server requires a specific value in the user-agent header to allow the incoming stream from this device.
11. Click **Apply**.
12. When you're ready to start streaming this channel, click **Start**.

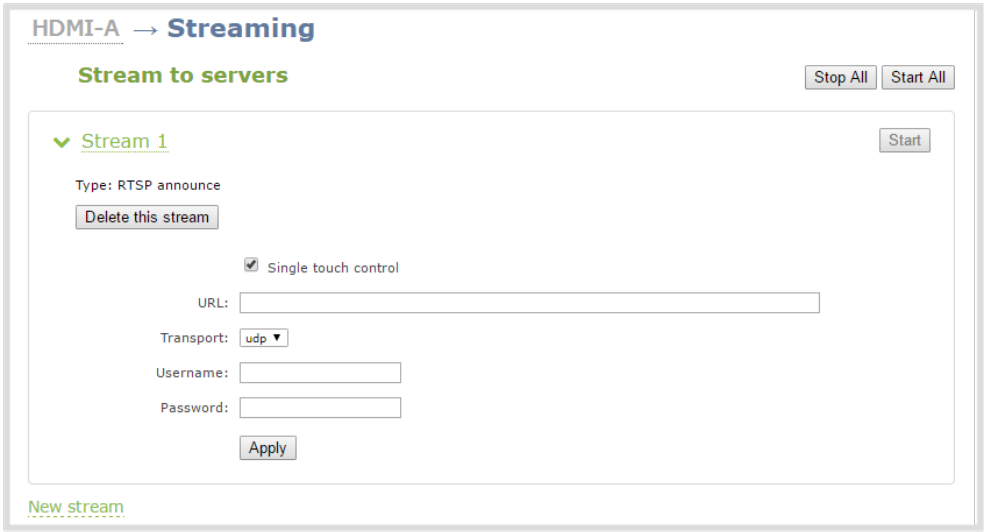
For details on how to start and stop streaming using the touch screen, see Stream a channel using the touch screen. To learn how to start and stop streaming using Epiphan Live, see Control streaming and recording using Epiphan Live. For details about using the Single Touch feature to control your recording and streaming across multiple channels and recorders simultaneously with the touch of a button, see About Single Touch streaming and recording.

Set up an RTSP announce stream

Pearl can stream using RTSP announce. Viewers can copy and paste the URL of the RTSP stream into a media player and watch the stream on their local network. For more information about using RTSP streaming, see Share a live broadcast stream (HTTP, HTTPS, or RTSP).

Setup an RTSP announce stream using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and choose **RTSP announce**. The new stream is created using the default name Stream 1.



4. Click the stream name to see the stream settings.
5. (Optional) To rename the stream, click the current name and type a different name, then press **Enter**.

   Refresh your browser if the new stream name doesn't immediately display.

6. (Optional) Uncheck **Single touch control** if you don't want this stream to be started and stopped using Single Touch streaming and recording control (checked by default).
7. Enter the following parameters:
   - The **URL** of the ingestion point provided by the CDN or media server.
   - Select the **Transport type** as either UDP or TCP. Consult your CDN provider to find out which transport protocols the CDN supports.
   - The CDN **User name** and **Password** (if required).

   The CDN provider assigns a user name and password to authenticate the publisher. Contact the CDN provider for your log in credentials.

8. Click **Apply**.
9. To start streaming, click **Start** or click **Start all** to simultaneously start this stream and any other streams you have configured for this channel.
10. Click **Delete this stream** at any time to delete the stream.

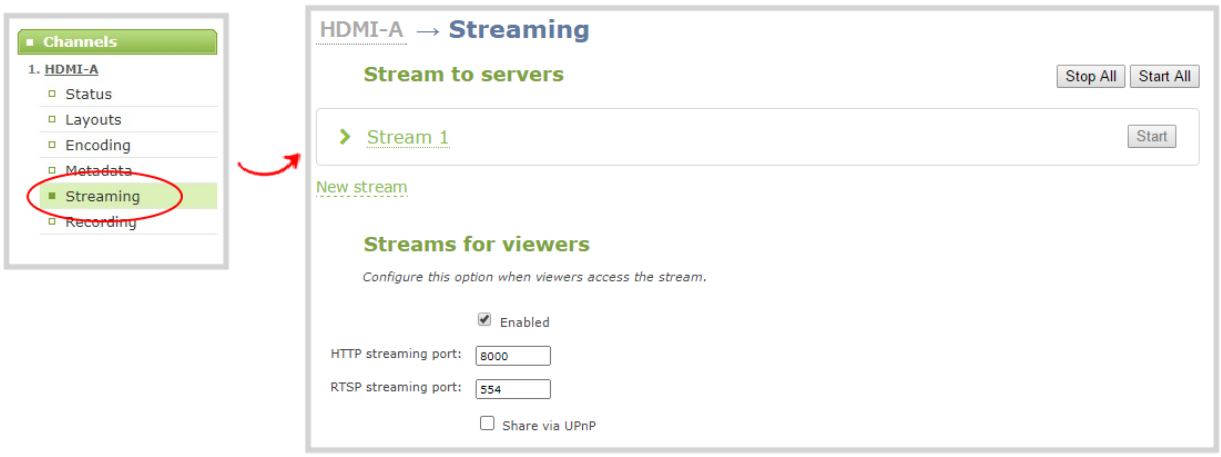
See Start and stop streaming to a CDN for instructions to control streaming from the touch screen or see Control streaming and recording using Epiphan Live for instructions to use Epiphan Live.

Set up a stream to the CDN using an XML profile

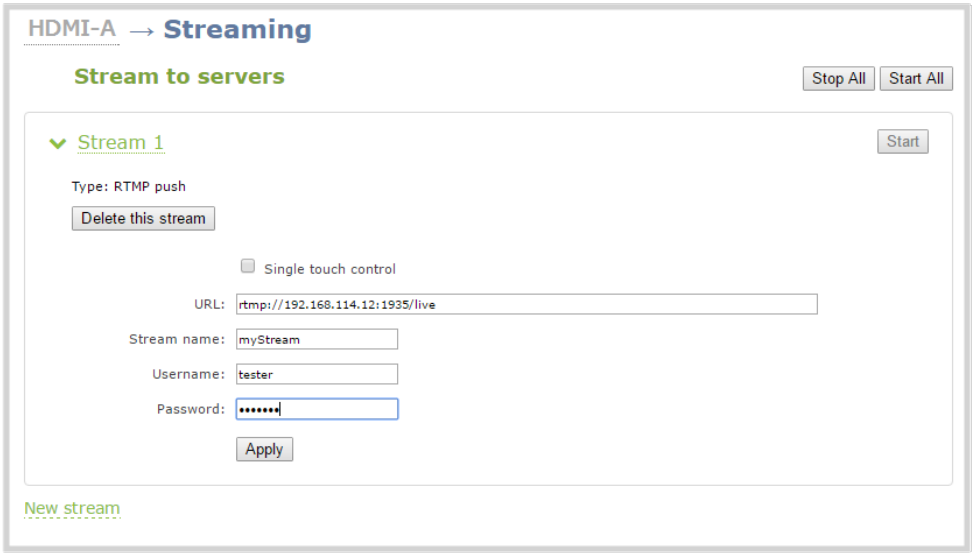
Some CDNs provide an XML file for easy configuration setup. Pearl-2 supports using XML profiles to set a stream.

Set up a stream using an XML profile from the CDN

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select the channel and click **Streaming**. The Streaming configuration page opens.



3. Click **New stream** and select **Use profile XML**.
4. Select the XML file that was provided by your CDN provider, then click **OK**. The new stream is created using the default name Stream 1 and the configuration from the XML file is applied.



5. Click **Apply**.
6. To start streaming, click **Start** or click **Start all** to simultaneously start this stream and any other streams you have configured for this channel.
7. Click **Delete this stream** at any time to delete the stream.

See Start and stop streaming to a CDN for instructions to control streaming from the touch screen or see Control streaming and recording using Epiphan Live for instructions to use Epiphan Live.

Start and stop streaming to a CDN

After your stream to a CDN is configured on the channel, you can start and stop streaming.

Start and stop your stream using:

- the admin panel
- Epiphan Edge
- Epiphan Live. For details to start and stop streaming using Epiphan Live, seeControl streaming and recording using Epiphan Live .
- the touch screen. To learn how to use Single Touch feature to control your recording and streaming across any number of specified channels and recorders simultaneously with the touch of a button, see About Single Touch streaming and recording.

Start and stop streaming using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select a channel and click **Streaming**. The Streaming configuration page opens.

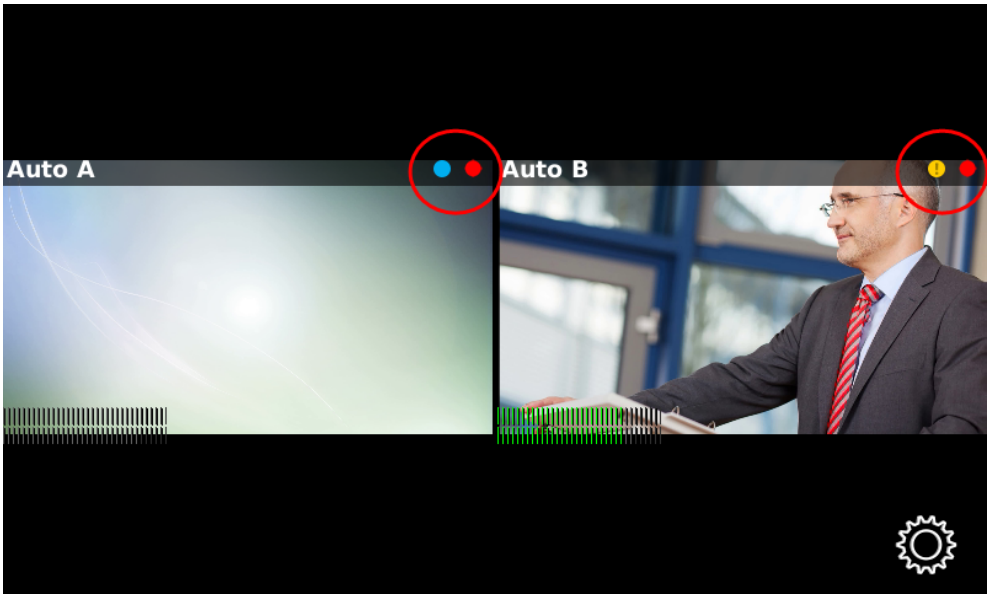
To set up a stream using the Admin panel, click **New stream** and follow the instructions for how to **Streaming to a CDN, multicasting, and streaming to multiple destinations**.

3. Click **Start** at the top right corner to start that stream, or click **Start all** at the top of the page to start streaming all streams that are configured for the channel.
4. Click **Stop** at the top right corner to stop that stream, or click **Stop all** at the top of the page to stop streaming for all streams that are configured for the channel.

Start and stop streaming using the touch screen

You can tell if your channel is streaming from the touch screen on Pearl-2 when you look at the channel view or the Grid view. The following shows an example Grid view.

- A blue dot in the top right corner means the channel is currently streaming.
- A yellow dot with an exclamation mark means a problem with streaming occurred that requires attention.



For details to start and stop streaming using the touch screen, see Stream a channel using the touch screen.

Multicast streaming

You can add multiple multicast streams to a channel in Pearl-2. A multicast stream consists of one stream distributed to many viewers via a multicast-capable network. You can stream to several multicast networks and at the same time, stream to non-multicast CDNs.

Pearl-2 supports multicast streaming to an IP TV or a set-top box playlist using SAP when the stream format is MPEG-TS.

Topics include:

- MPEG-TS streams using RTP/UDP push
- MPEG-TS streams using UDP push
- Multicast streaming using RTP/UDP
- Set up traffic shaping
- Viewing with Session Announcement Protocol (SAP)

MPEG-TS streams using RTP/UDP push

When you configure an MPEG-TS stream using RTP/UDP push, you have the option to enable SAP and multicast over a local network at the same time.

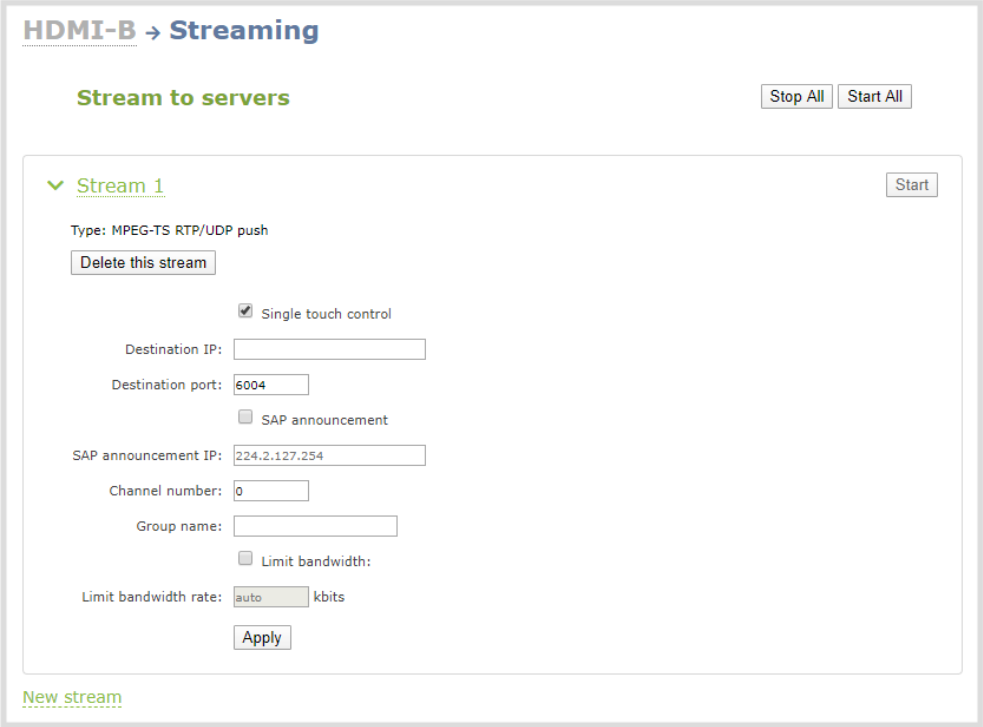
Before configuring your channel for MPEG-TS streaming, ensure the following codecs are configured:

- Video - H.264
- Audio - MP3 or AAC, if audio is configured.

If you're streaming to 10/100 Mbps set-top boxes over Gigabit Ethernet and you notice frames are dropping, you can limit the bandwidth of the stream, see Set up traffic shaping.

Configure a channel for MPEG-TS using RTP/UDP push and enable SAP

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and select **MPEG-TS RTP/UDP push**.



4. Enter the destination multicast IP address where the broadcast can be viewed.

A IPv4 multicast address range is an address between 224.0.0.0 to 239.255.255.255. Contact your System Administrator for the specific address to use.

5. Enter the destination port number through which the media will stream.
6. (Optional) To advertise your stream to a media player over a local network, do the following:
    a. Check **SAP announcement** to enable advertising your stream over a local network. When this is enabled and a multicast IP address is configured, your stream is displayed in the playlist of the local media player.
    b. Enter a multicast IP address in the **SAP announcement IP** field. If your media player is configured to receive multicast streams from an IP address that is different from the default address 224.2.127.254, you may need to contact your system administrator for a specific multicast IP address.
    c. Enter a channel number in the **Channel number** field to identify your stream in the media player. By default, the Channel number is the channel identifier.

        When a channel number value is not specified, viewers cannot select a channel from the set-top box or Smart TV .

    d. Enter a name for a group of streams in the text box next to **Group name**. Since media players simply present a list of available streams, you can organize your streams into multiple folders or in cases where folders are not displayed, use dot separator hierarchy to help your viewers filter out unwanted streams by category.
7. Click **Apply**.
8. Select **Start** when you're ready to start streaming.
9. Select the **Info** menu to see the stream information.

View the MPEG-TS RTP/UDP stream

To view the stream from a media player, open the URL in the media player, for example:

rtp://@ip:port or in the case of the sample configuration in the figure shown above:

rtp://@226.10.24.32:7000

To view the stream when SAP announce has been set and the stream is advertised on a media player, set-top box, or Smart TV, refer to Viewing with Session Announcement Protocol (SAP).

MPEG-TS streams using UDP push

When you configure an MPEG-TS stream using UDP push, you have the option to enable SAP and multicast over a local network at the same time.

Before configuring your channel for MPEG-TS streaming, ensure the following codecs are configured in the encoding section:

- Video - H.264
- Audio - MP3 or AAC, if audio is configured.

To configure MPEG-TS with UDP push and enable SAP:

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and select **MPEG-TS UDP push**.
4. Enter the destination multicast IP address where the broadcast can be viewed.

A IPv4 multicast address range is an address between 224.0.0.0 to 239.255.255.255. Contact your System Administrator for the specific address to use.

5. Enter the destination port number through which the media will stream.
6. (Optional) To advertise your stream to a media player over a local network, do the following:
    a. Check **SAP announcement** to enable advertising your stream over a local network. When this is enabled and a multicast IP address is configured, your stream is displayed in the playlist of the local media player.
    b. Enter a multicast IP address in the **SAP announcement IP** field. If your media player is configured to receive multicast streams from an IP address that is different from the default address 224.2.127.254, you may need to contact your system administrator for a specific multicast IP address.
    c. Enter a channel number in the **Channel number** field to identify your stream in the media player. By default, the Channel number is the channel identifier.

When a channel number value is not specified, viewers cannot select a channel from the set-top box or Smart TV .

    d. Enter a name for a group of streams in the text box next to **Group name**. Since media players simply present a list of available streams, you can organize your streams into multiple folders or in cases where folders are not displayed, use dot separator hierarchy to help your viewers filter out unwanted streams by category.
7. Click **Apply**.
8. Select **Start** when you're ready to start streaming.

View the MPEG-TS UDP stream

To view the stream from a media player, open the URL in the media player, for example:

udp://@ip:port

For example: udp://@226.10.24.32:7000

To view the stream when SAP announce has been set and the stream is advertised from a media player, set-top box or Smart TV, refer to Viewing with Session Announcement Protocol (SAP).

If you're streaming to 10/100 Mbps set-top boxes over Gigabit Ethernet and you notice frames are dropping, you can limit the bandwidth of the stream, see Set up traffic shaping.

Multicast streaming using RTP/UDP

You configure an RTP/UDP (push) stream on Pearl-2 using the Admin panel.

If you're streaming to 10/100 Mbps set-top boxes over Gigabit Ethernet and you notice frames are dropping, you can limit the bandwidth of the stream, see Set up traffic shaping.

Configure a channel to stream using RTP/UDP push

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and select **RTP/UDP push**.
4. Enter the following:
    - Destination multicast IP address.
    - Audio port number through which the audio will stream.
    - Video port number through which the video will stream.

Audio and video use nearby port numbers (<port number>and <port number+2>). The minimum distance between audio and video ports must be 2.

5. Click **Apply**. An SDP file is generated.
6. From the channel's **Status** page, click the SDP file to download it. Provide the SDP file name and location if prompted.
7. Share the file with your viewers and when you're ready to start streaming, select **Start**.

Set up traffic shaping

If you're multicasting to set-top boxes that have 10/100 Mbps interfaces on the same Gigabit Ethernet and you notice frames are dropping, you can limit the bandwidth of the stream using traffic shaping to adapt for the lower bandwidth set-top boxes. Only multicast streams support traffic shaping: MPEG-TS USP, MPEG-TS RTP/UDP, and RTP/UDP.

If traffic shaping was previously setup using the API, we recommend switching to this method of setting traffic shaping using the Admin panel. If traffic shaping is currently setup using Pearl-2's API, see the Technical Notes for your Pearl-2 model for instructions. They're available from the product resources page on the Epiphan.com website.

When traffic shaping is enabled, the default bitrate limit is set to auto. In auto mode, the bitrate is limited to the sum of the channel's configured bitrate plus 4 Mbps and is adjusted to fit within the range of 4 Mbps minimum to 95 Mbps maximum.

You can also set a bitrate limit for the maximum amount of bandwidth that gets streamed using the Admin panel when traffic shaping is enabled. When you do, the streamed video won't exceed the maximum bitrate you set. The valid bandwidth limit bitrate range is 4 Mbps to 95 Mbps. We recommend that you set the bitrate to a value no less than the channel encoding bitrate plus 4 Mbps.

For example, if the bitrate for the channel is set to 10 Mbps in the encoding settings, the minimum value we recommend for the bandwidth limit bitrate is 14 Mbps.

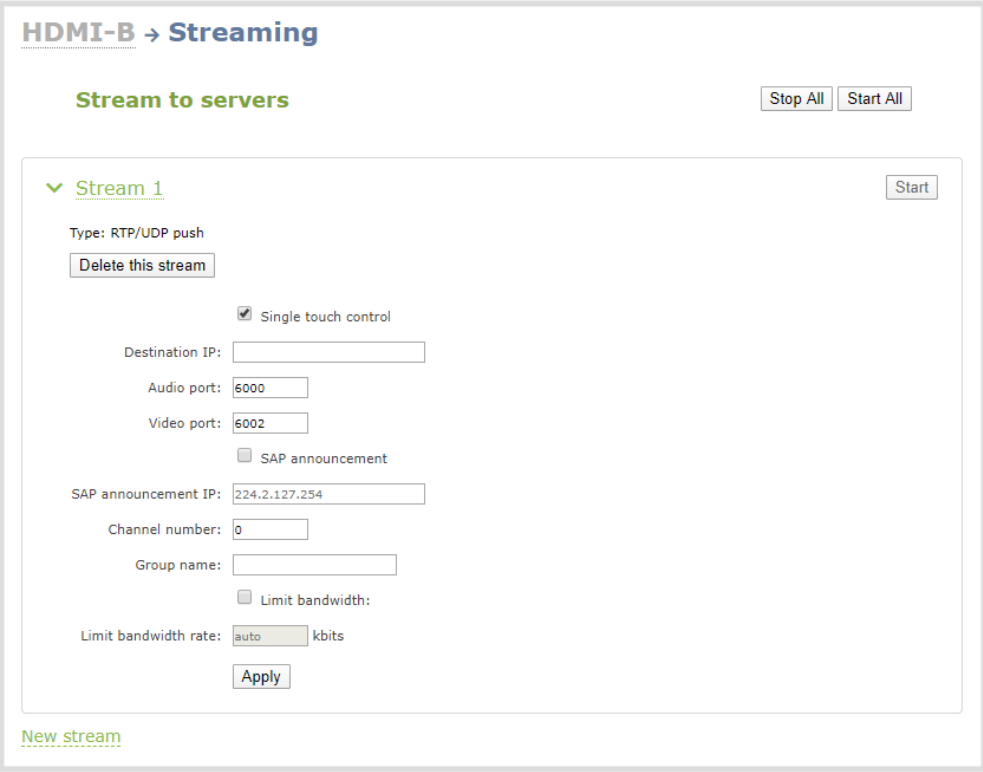
Important considerations

- Traffic shaping works for the local switch. Switches connected to the local switch don't respect the policy.
- If the channel encoding bitrate is set to a value that's less than 4 Mbps and traffic shaping is enabled, the minimum bandwidth limit does not drop below than 4 Mbps.
- If the channel encoding bitrate value is greater than 95 Mbps and traffic shaping is enabled, the maximum bandwidth limit does not exceed 95 Mbps.
- If the bandwidth limit is set to auto and the total of the channel bitrate plus 4 Mbps exceeds 95 Mbps, the maximum bandwidth limit does not exceed 95 Mbps.
- After enabling traffic shaping for a channel using the Admin panel, you can no longer use the Pearl-2 API to clear or configure traffic shaping for that channel. If you currently use the API to configure traffic shaping, see the Technical Notes for your Pearl-2 model for instructions. They're available from the product resources page on the Epiphan.com website.

After traffic shaping is enabled, we recommend that you first test a multicast stream using the auto traffic shaping settings. If your low bandwidth network device is displaying poor video quality, then go ahead and manually set the limit bandwidth bitrate according to the bandwidth of your particular network device.

Set traffic shaping for a multicast stream using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and select a multicasting stream as the type: **MPEG-TS USP**, **MPEG-TS RTP/UDP**, or **RTP/UDP**. The new stream is created with the default name *Stream 1*.
4. Click the stream name to see the stream settings.



5. Check **Limit bandwidth**. The default bitrate is set to **auto**.
6. (Optional) Set the **Limit bandwidth rate** and enter a bitrate value from 4,000 kbps to 95,000 kbps.
7. Click **Apply**.

Viewing with Session Announcement Protocol (SAP)

When SAP Announce is configured for a stream that uses UDP streaming, the stream is advertised over the local network. Local viewers can view the stream using a software or hardware media player. Viewers are presented with a list of available channels, similar to a television menu. Viewers need only click on a stream and the video is streamed to their desktop, mobile or tablet. To configure SAP announce, go to Multicast streaming.

Your stream is advertised by the metadata title, if one was configured; otherwise, the stream is identified by its channel identifier. For a description of how to set the metadata, refer to Add or remove channel metadata.

When browsing from a VLC media player, streams are advertised by their channel identifier and are organized by the group name. When browsing from an XBMC media player, streams are advertised by the stream's metadata title (if configured); otherwise, streams are advertised by their channel identifier.

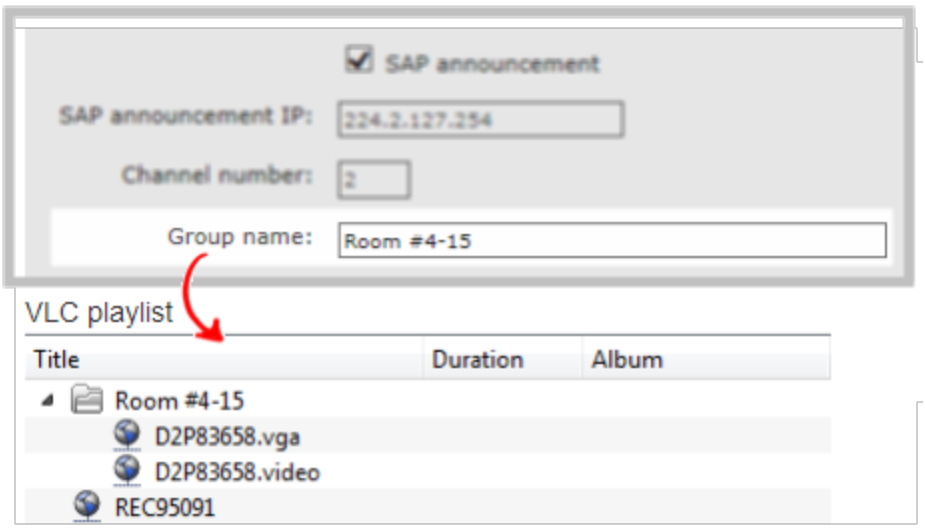
View the Session Annoucement Protocol (SAP) stream

1. Ensure the stream has SAP announcement enabled; otherwise, it is not advertised in the media player's playlist.
2. Ensure the SAP announcement IP is a multicast IP address.

Some media players, for example Exterity receivers, listen for SAP announcements on a specific multicast address 239.255.255.255. If your audience is using Exterity to view your stream, you must change the SAP announcement IP address to 239.255.255.255.

3. Launch a media player and play the streams.
   a. Using VLC, click **View** and select Playlist. The right-hand panel indicates the playlist is empty.
   b. From the side menu, click **Network streams (SAP)**. The playlist is populated with all streams in your network that are SAP announcement enabled. If you specified a Group Name when you configured the publish stream the stream will be listed in folder identified by the group name.
   c. Click on a live stream in the playlist to play the stream.

   This VLC example shows two streams D2P83658.vga and D2P83658.video, which are organized in a folder by their group name.



Streaming NDI

For other NDI resources on the network to see the video resources on Pearl-2, you must start an NDI stream for the channel you want to broadcast on the network.

Topics include:

- About streaming NDI
- Start and stop an NDI stream

To connect an NDI source to Pearl-2, see Connect an NDI source.

About streaming NDI

NDI® (Network Device Interface) is used to transmit low-latency video content over Gigabit networks at broadcast quality with no audio compression. The quality of the video transported over the network is virtually lossless.

Pearl-2 can output any configured channel over the network as a unicast NDI stream. You setup the NDI stream for the channel using the Admin panel. NDI grouping is supported to allow for organizing of individual NDI resources.

You can use NDI on wired and wireless networks; however, NDI video is bandwidth intensive. Depending on the video content, a single 1920×1080@30 fps NDI video source needs about 125 Mbps of dedicated bandwidth.

For NDI to work properly, network ports 49152 to 65535 need to be open for two-way traffic. Contact your network administrator for assistance.

The unicast NDI stream can be ingested by other NDI devices on the network. You can start and stop the NDI output stream using either the Admin panel, the touch screen, or Epiphan Live, see Start and stop streaming to a CDN.

Important considerations

- Pearl-2 can unicast up to two 1920×1080 @ 30 fps NDI output streams at the same time. However, NDI allows receivers to request a lower quality stream. If that happens, Pearl-2 will send two streams: one at the original resolution and a second one at the requested resolution. This can impact the CPU performance of Pearl-2, see Optimum System Load.
- Pearl-2 does not output NDI|HX.
- We recommend having at least 125 Mbps Ethernet for a single 1920×1080 30 fps NDI stream, and between 8 to 20 Mbps for a single 1920×1080 30 fps NDI|HX stream. Keep in mind that a Gigabit Ethernet network will only have between 600 Mbps and 700 Mbps available for practical use. If multiple NDI receivers connect to an NDI stream on Pearl-2, the bandwidth needed for each NDI receiver adds to the total bandwidth consumption.
- After you start an NDI stream on Pearl-2, if NDI detects there are no receivers connected to the stream, Pearl-2 stops broadcasting to conserve bandwidth and resources. However, the Pearl-2 stream can still be discovered on the network.

Pearl-2 can ingest up to three multicast or unicast 1920×1080@30 fps NDI video inputs, up to six 1920×1080@30 fps NDI|HX video inputs, or up to one 4K NDI input to Pearl-2. For more information about NDI inputs, see Connect an NDI source.

Start and stop an NDI stream

NDI® (Network Device Interface) is used to transmit low-latency video content over Gigabit networks at broadcast quality with no audio compression. Pearl-2 supports up to two unicast NDI output streams at 1920×1080@30 fps.

You can assign the NDI stream a unique name using alphanumeric characters. The name appears in parenthesis after the Pearl-2 serial number and three-letter prefix as part of the NDI stream ID as seen by other NDI resources on the network.

For example: **PLTTSG999901** (*name*)

where *name* is the unique alphanumeric name you assign the stream and **PLT** is the three-digit prefix that identifies this as a Pearl-2 system.

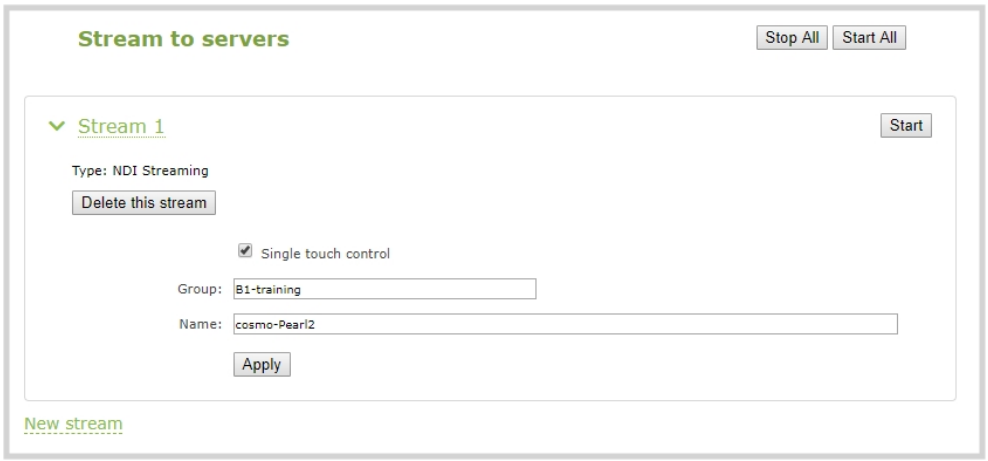
Pearl-2 shows up as an NDI resource to other NDI resources on the network as soon as you start an NDI stream. All NDI devices on the same network as Pearl-2 can access the unicast stream.

Important considerations

- Pearl-2 can unicast up to two 1920×1080 NDI streams simultaneously. However, NDI allows receivers to request a lower quality stream. If that happens, Pearl-2 will send two streams: one at the original resolution and a second one at the lower resolution. This has an impact on the CPU performance of Pearl-2, see Optimum System Load.
- We recommend having at least 125 Mbps Ethernet for a single 1920×1080 30 fps stream using NDI, and between 8 and 20 Mbps for a single 1920×1080 30 fps stream using NDI|HX.

To stream using NDI:

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Streaming**. The Streaming configuration page opens.
3. Click **New stream** and choose **NDI Streaming**. The new stream is created using the default name *Stream 1*.



4. Click the stream name to see the stream settings.
5. (Optional) Uncheck **Single touch control** if you don't want this stream to be started and stopped using Single Touch streaming and recording control. This is enabled by default.
6. Enter a unique *name* for Pearl-2 in the **Name** field. The name you enter appears in parenthesis after the serial number of Pearl-2 and the three-letter prefix. For example: PLTTSG999901 (*name*)
7. (Optional) Enter a **Group** to assign the stream to a specific NDI group (if applicable).

8. (Optional) Rename the stream. Click the current name and enter a different name, then press **Enter**.
9. Click **Apply**.
10. To start streaming, click **Start** or click **Start all** to simultaneously start this stream and any other streams you have configured for this channel.
11. Click **Delete this stream** at any time to delete the stream.

For details on how to start and stop streaming using the touch screen, see Stream a channel using the touch screen. To learn how to start and stop streaming using Epiphan Live, see Control streaming and recording using Epiphan Live. For details about using the One Touch feature to control your recording and streaming across multiple channels and recorders simultaneously with the touch of a button, see About Single Touch streaming and recording.

Streaming to a media player or smart TV

Your Pearl-2 can use SAP to stream to set-top boxes, digital signs, smart TVs and other digital media players.

The following table gives an overview of how this works.

Publishing Options	Use this option to...
SAP	SAP (session announcement protocol) is a protocol for broadcasting multicast session information. You can enable SAP and stream over a local network when MPEG-TS multicast streaming is configured, see Multicast streaming. Media players can see the announcement or can use the multicast SDP file (session description file) directly, see Viewing with Session Announcement Protocol (SAP).

To stream video outside of your LAN, use a CDN or configure port forwarding on your router. Refer to your Network Administrator. Network configuration is beyond the scope of this guide.

Record

Pearl-2 encodes the video and audio it captures. You can stream your content and record it at the same time. You can even stream your switched program using a lower quality stream (i.e. 1280×720 at 2Mbps) and at the same time, make high quality recordings of each of the video inputs at full frame with a high bitrate for future re-use and post-processing.

Recorded files are stored on Pearl-2's hard drive. Plus there are a variety of automatic and manual mechanisms available to download the files.

Topics include:

- About recording
- Record a channel
- Record using Single Touch control on Pearl-2 and Pearl Mini
- Configure recording settings, file size, and type
- Restart recording to a new file
- Recorders
- Manage recorded files
- Automatic file transfers

For instructions on how to use Pearl-2's touch screen to start/stop scheduled recordings and authenticate with a CMS to create unscheduled ad hoc events, see CMS event controls using the touch screen.

For information about recording with Content Management Systems (CMSs), see CMS recording and webcasting control.

About recording

You can record a channel on Pearl-2 as AVI, MOV, MPEG-TS, MP4, or MP4-Fragmented. Easily stop and start recording using any of the following:

Epiphan product	Admin panel	Device screen	Epiphan Edge	Epiphan Live
Pearl Mini and Pearl-2	Yes	Yes (Including single touch feature)	Yes	Yes

If an accidental system shutdown occurs while recording is in progress, your recordings are closed off so they are still playable. Physically unplugging a video source from the input port or otherwise interrupting the signal does not stop recording. A No Signal image is inserted.

Pearl devices also come with APIs so you can setup third party tools to control recording, see the Pearl System API Guide for details.

You can set the maximum recording time or file size limit using the Admin panel. The default recording limits are set to 30 minutes or 500 MB, whichever comes first. When the time or file size limit is reached, the current recording is saved and a new recording file starts automatically without losing any content. When the local drive is full, newer recordings overwrite oldest recordings.

Important considerations

- If recordings are selected for Automatic File Upload (AFU) while AFU is at maximum upload capacity or when AFU is unavailable, the recordings are added to an upload queue. If there is no available space left in the storage medium, new recordings fail and do not overwrite recordings in the AFU queue.
- For information about recording to Content Management Systems (CMSs) like Kaltura and Panopto, see CMS recording and webcasting control.
- **Pearl-2 and Pearl Nano** - If the channel that is recording is an auto channel, a new recording is started if the video input source automatically switches from one video source to another due to signal loss.
- **Pearl-2 and Pearl Mini** - You can also setup multi-track recorders on Pearl-2 and Pearl Mini, see Recorders.
- **Pearl-2 and Pearl Mini** - While actively recording a multiple-channel recorder, a new file is created if an additional video input source is added to the recorder.

Tested media players

Epiphan has tested recordings with the following players. See Troubleshooting Quick Reference for known player issues.

Table 56 Tested Media Players

Operating System	Tested Players
Mac OS	• QuickTime 10.3 • QuickTime 7.6.6+ • VLC 2.2.4 • Playback Pro 2.3.2 • Final Cut Pro 10.3.2 • Adobe Premiere Pro CC 2017
Windows	• QuickTime 7.6.6+ • VLC 2.2.6 • Windows Media player 12+ • Movies & TV (Windows 10) • Adobe Premiere Pro CC 2015
Linux	• MPlayer • VLC 2.2.2

Operating System	Tested Players
HTML 5 Browsers (Windows)	• Google Chrome 37+ (works with MOV and MP4 files using H.264 codec)

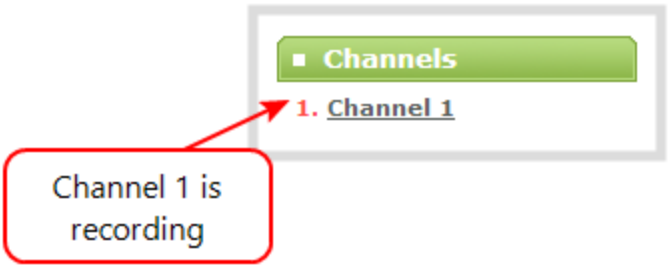
Not all media players and editors support all recording formats, such as the more modern MP4-fragmented format. To playback MOV files created by the Pearl device, we recommend using a newer media player.

Record a channel

Using the Admin panel , you can start and stop recording a channel, as well as configure recording settings for the channel. You can also start and stop recording using Epiphan Edge, or:

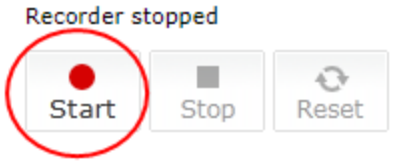
- **Pearl-2 and Pearl Mini** - the touch screen or Epiphan Live

In the Admin panel, the channel number turns red to indicate it's recording. If the system runs out of storage space, the oldest recorded file is deleted to make room for the new recording.



Start and stop recording using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. From the **Channel(s)** menu, select the channel and click **Recording**. The channel recording menu opens.
3. Select **Start** to start recording the channel and select **Stop** when you're done.



If the Start button is not active, there are no active sources for the channel (or recorder on Pearl-2 and Pearl Mini). Check your inputs to ensure signals are working as expected.

Record using Single Touch control on Pearl-2 and Pearl Mini

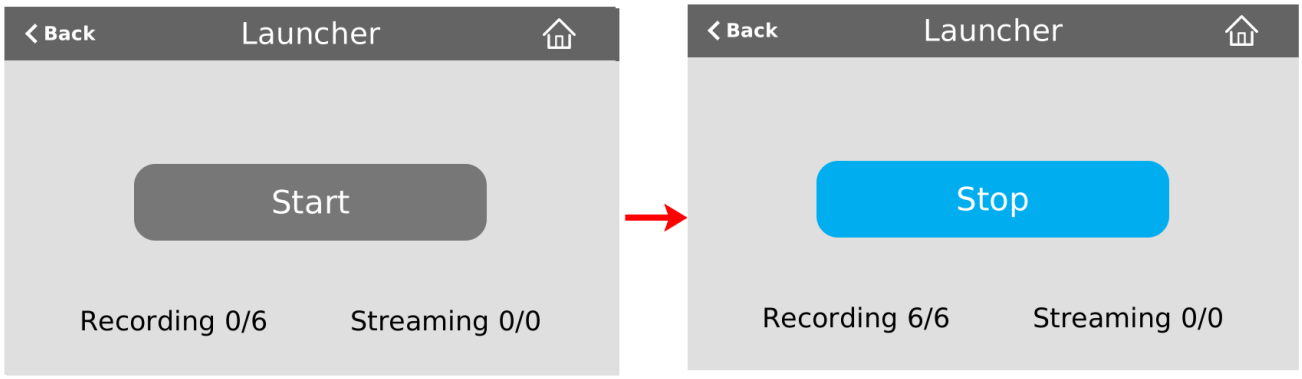
Single Touch recording and streaming control allows you to control your recording and streaming across any number of channels and recorders with one touch of the touch screen. Channels and recorders are enabled for one touch recording by default. For more information, see Single Touch streaming and recording control.

Control recording using Single Touch control

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. Configure your channels and recorders for One Touch control, see Specify channels and recorders for Single Touch recording.
3. Tap the **Single Touch control** icon along the bottom of the touch screen to display the Single Touch control screen.

If the Single Touch control icon is not visible on the touch screen, tap the screen once to activate the control icons. If the control icons are still not visible, they are disabled. see Configure the touch screen.

4. From the Single Touch control screen, tap **Start** to begin recording and tap **Stop** to end recording.



Configure recording settings, file size, and type

Recordings are saved as MP4 files by default. Each channel and recorder also has a file size limit set to 500 MB and the maximum file length set to 30 minutes by default. When a recording reaches the file length of 30 minutes or 500 MB (whichever comes first), the system closes the current recording file and immediately opens a new one. No recorded data is lost.

If you don't know what size to select, do some test recordings to get an idea of the file sizes you can expect. If you want to guarantee the recording lasts to a given time limit, select a file size that is far larger than you saw in your tests.

Important considerations

- You cannot change the recording settings, file size, and type for channels used with Kaltura events.
- The file recording type for a channel you are controlling and recording using Epiphan Edge must be set to MP4 and the maximum file size supported is 500 MB.

The following table describes the recordings configuration settings.

Table 57 Recordings Configuration Settings

Label	Description / Options
Time limit	Specifies the length of time the system waits before the recording file is saved and a new one is started (assuming the size limit has not yet been reached). Values range from 5 minutes to unlimited. The MOV file type on Pearl is limited to a maximum duration of 13h15m, regardless of the value set in the Pearl UI.
Size limit	Specifies the maximum file size a recording can reach before it is saved and a new recording is started (assuming the time limit has not yet been reached).
File type	Specifies the recording file type. Select from AVI, MP4, MP4-Fragmented, MPEG-TS, or MOV. • **AVI**: Generally used for playback on Windows.

Label	Description / Options
	• **MP4**: A progressive version of MP4. Select MP4 for the best compatibility with most video players and editors. Progressive MP4 files are initially recorded as MP4-Fragmented and are converted when the recording ends. If the recording is stopped while in progress or during conversion, the files remain in fragmented MP4 format. You can run the file through **ffmpeg** or another transcoder to convert to the progressive format. • **MP4-Fragmented**: A newer MP4 format. Fixed 10 second intervals. Select MP4-Fragmented for the same file format as releases 3.15.x. Some applications, like Adobe Premiere Pro, don't yet support fragmented MP4. There's no way to tell the difference between MP4 files and MP4-Fragmented files from the file name because both use the .mp4 extension. • **MPEG-TS**:Does not support PCM audio encoding. • **MOV**: A progressive version of MOV. Generally used for playback on Mac OS. This type of MOV has the best compatibility with video players and editors.
Filename prefix	Specifies how the recordings are named. Recording files start with the given prefix followed by the date and time of the recording, which is set by the system. The channel or recorder name is used if no prefix is given. Allowed characters: A-Z, a-z, 0-9, _, , #, -, [], (). Avoid using spaces in recording file names. Use underscores or hyphens to separate words instead.
Automatic file upload	Select this if you want this channel or recorder to be part of any scheduled automatic uploads. See Automatic file transfers for information on automatic uploads.
Single-touch control (Pearl-2 and Pearl Mini)	Record using Single Touch control on Pearl-2 and Pearl Mini

Change the recording configuration using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channel(s) menu, select Recording. The recording page opens.
3.
   - **Pearl-2 and Pearl Mini** - Open the Recording page. Do one of the following:
     - For a channel, select **Recording** from the Channels menu.
     - For a recorder, select a recorder from the Recorders menu.
4. Under Recorder Setup, select **change**. The recorder settings open.

5. Change the default recording file settings.
    - **Time limit**: Select a value from 5 minutes to unlimited.
    - **Size limit**:
        - **Pearl-2** - Select a value from 50 MB to 64 GB.
    - **File type**: AVI, MPEG-TS, MOV, MP4, or MP4-Fragmented.
6. (Optional) Enter a prefix for the recordings. All new recorded files for this channel or recorder will be prefixed using the text you enter.
7. (Optional) Check the check box to exclude this channel (or recorder on Pearl-2 and Pearl Mini) from automatic file uploads, see Automatic file transfers.
8. Click **Apply**.

Restart recording to a new file

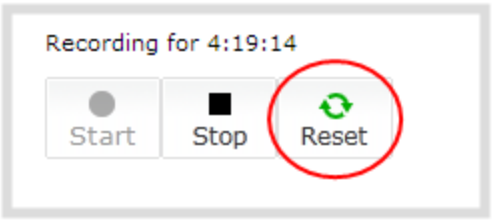
Recordings are automatically saved to a file and a new recording is started when:

- The recording reaches the configured time or size limit.
- The channel (or recorder on Pearl-2 and Pearl Mini) name is changed.
- Changes are made to the stream if recording and streaming the channel.

You can manually force a recording that's in progress to save to a file and continue recording in a new file from that point forward without any loss of content. This is useful if you need to download a recording since you cannot download recordings that are in progress.

Restart recording to a new file using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. **Pearl-2 and Pearl Mini** - Open the Recording page. Do one of the following:
    - For a channel, select **Recording** from the Channels menu.
    - For a recorder, select a recorder from the Recorders menu.



3. Select **Reset** to stop the current recording and start a new recording.
4. Refresh the page to see the updated list of recordings.

Recorders

Using recorders with Pearl-2 or Pearl Mini, you can record multiple channels together in a single multi-track file.

Recording multiple channels at the same time ensures that all your recordings start and stop at the same time. After recording stops, you can automatically use one of the system's file synchronization methods to copy the recordings off the server, or you can use our built-in tool to split the file into individual tracks for post-processing.

For important considerations about file size limits when creating multiple recorders, see Configure recording settings, file size, and type.

We do not recommend using Recorders for manual (ad hoc) recordings to the Kaltura Content Management System (CMS), see About Kaltura recording and webcasting.

Topics include:

- Add a recorder
- Select channels to record
- Modify a recorder

To change recording settings, such as the file size limit, type, or to add a custom prefix to the file name, see Configure recording settings, file size, and type.

You only need to create recorders for multi-track recordings. For single channel recordings, see **Record a channel**.

Add a recorder

Each channel has its own built-in recorder which you access from the channel's Recording page. However, if you want to record several channels simultaneously to a multi-track file, you need to add a recorder using the Admin panel.

Each new recorder is automatically assigned a number, for example: Recorder 1, Recorder 2, etc. and is set to record all configured channels by default.

For important considerations about file size limits when creating multiple recorders, see Configure recording settings, file size, and type.

Add a recorder using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Recorders menu, click **Add recorder**.

Select channels to record

When you create a new recorder, it records all the channels configured on the Pearl device in the single multi-track file by default. If you create new channels, they are automatically added to the recorder. You can choose which channels the recorder includes in the multi-track file using the Admin panel.

Select the channels recorded by a recorder using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Recorders menu, select a recorder. The recorder configuration page opens.
3. Click **change** next to the list of channels to record.
4. Check the boxes next to the channels you want to include, and click **Apply**.

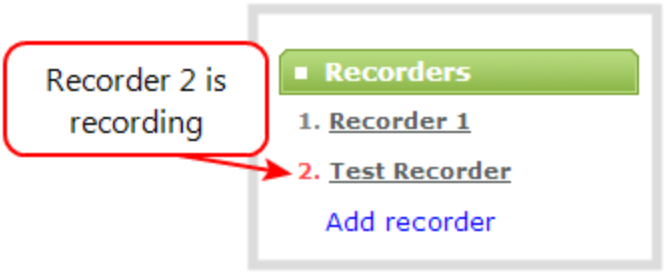
Channels with no active video source are displayed in italics. You can include these channels in your channel selections for the recorder.

Start and stop a recorder

You can start and stop recorders from the recorder's configuration page using the Admin panel.

You can also start and stop recorders using the One Touch control feature (see Record using Single Touch control on Pearl-2 and Pearl Mini) and using Epiphan Live (see Record a channel using the touch screen).

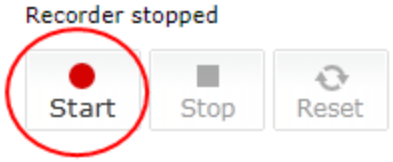
The recorder number turns red to indicate it is recording. If the system runs out of storage space, the oldest recorded file is deleted to make room for the new recording.



You can have multiple recorders and multiple channels recording all at the same time. The number of channels being recorded is shown below the Start and Stop buttons on the recorder's configuration page. To select which channels to include in the recorder, see Select channels to record.

Start and stop a recorder using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. From the Recorders menu, select a recorder. The recorder configuration page opens.
3. Click **Start** to begin recording and click **Stop** to end recording.



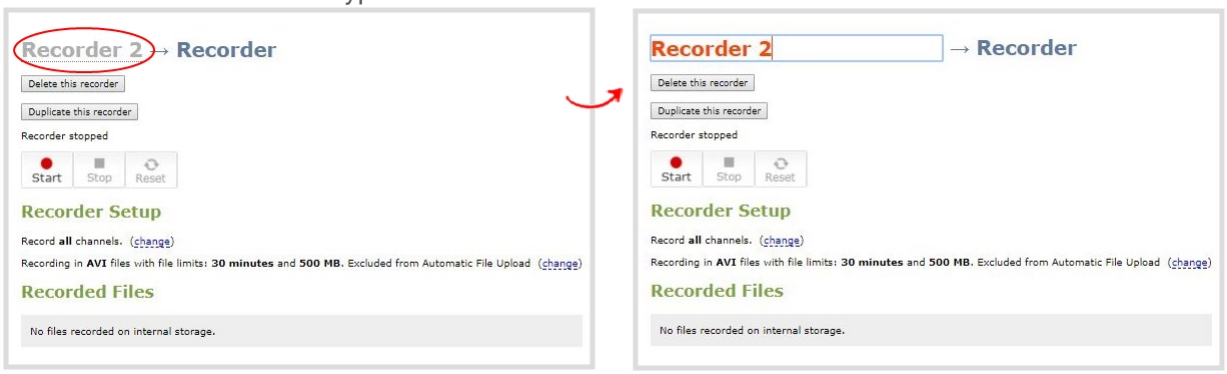
You can navigate away from the page without affecting the recording.

Rename a recorder

Rename a recorder using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Recorders menu, select a recorder. The recorder configuration page opens.

3. Click the recorder name and type the new name for the recorder.



4. Press **Enter** to save the new name.

You must press Enter to save the recorder name change.

Duplicate a recorder

You can duplicate any recorder you've created. All settings in the recorder you duplicate are recreated.

Duplicate a recorder using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Recorders menu, select a recorder. The recorder configuration page opens.

3. Click **Duplicate this recorder** . The duplicate recorder is created and assigned the next recorder number in your list of recorders.

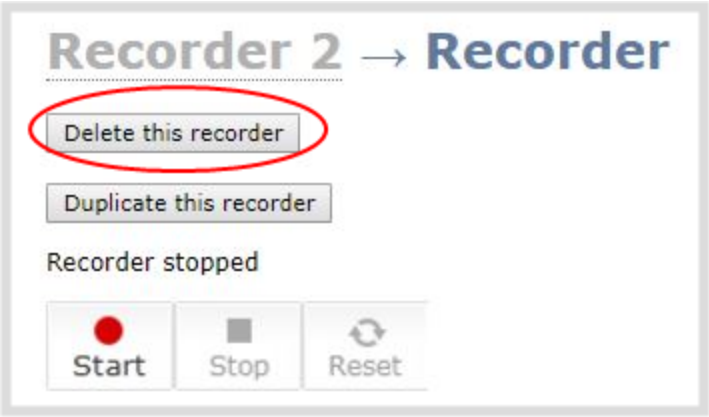
Delete a recorder

When you no longer need a recorder, you can delete it.

Deleting a recorder deletes all the recorded files for the recorder. Be sure you have a copy of any important recorded files before proceeding.

Delete a recorder using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Recorders menu, select a recorder. The recorder configuration page opens.



3. Click **Delete this recorder** and click **OK** when prompted.

Manage recorded files

Your recordings are stored on the Pearl-2 system's internal hard drive. Although there's a lot of space on the hard drive, it's good practice to remove old recordings to free up space before the drive if full. If there's no more free space for new recordings, new recordings will overwrite the oldest recordings on the hard drive.

There are a variety of ways to automatically transfer files from the system to local network storage. You can also manually select individual recordings to transfer or delete using the Admin panel.

For information about automatic file transfers, see Automatic file transfers.

Manage the recordings for a channel (or recorder on Pearl-2 and Pearl Mini) using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. **Pearl-2 and Pearl Mini** - Open the Recording page. Do one of the following:
   - For a channel, select **Recording** from the Channels menu.
   - For a recorder, select a recorder from the Recorders menu.
3. All recordings are listed and sorted by date.

   Files that are part of the same recording session are listed one after another. Three dots appear between files of different recording sessions. The file currently being recorded (if applicable) is shown at the top of the list. It cannot be modified or downloaded until it has finished recording.
4. If there are no recordings, a message indicates there are no recorded files for this channel or recorder.

- To *download an individual file*, select the recording filename to download it.
- To *download multiple files*, select the check box next to the recordings to download and then click **Download Selected**. The files are download as a .zip file containing the selected recordings.
- To *rename a recorded file*, select the edit icon next to the file name you want to change. Type the new file name and press **Enter** using your keyboard.

The Admin panel keeps track of the filename extension (i.e. .avi) so you do not need to include it when renaming the file.

- To *delete a single recording*, click the X icon to the right of a recording and click **OK** when prompted.
- To *delete multiple recordings*, check the check box beside the recordings you want to delete, then click **Delete Selected**. Click **OK** when prompted.
- To *delete all recordings* for the channel (or recorder on Pearl-2 and Pearl Mini), click **Delete All** and click **OK** when prompted.

The list may not update immediately. You can refresh the list by reloading the Recording page (for channels) or the recorder settings page (for recorders).

For information about automatic file transfers, see Automatic file transfers.

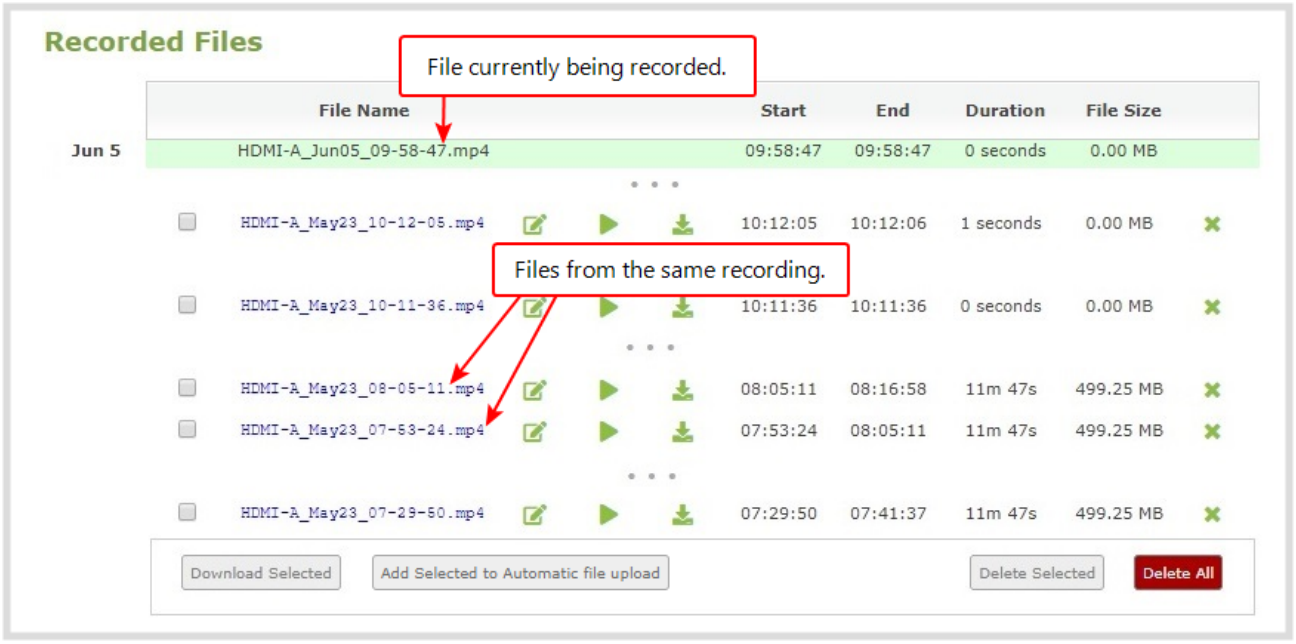
View list of recorded files

You can view all the recordings for a channel using the Admin panel.

Recordings for the Pearl-2 and Pearl Mini are stored for each channel and each recorder separately. You can also view the list of recordings using Epiphan Live in the section called Your recordings.

View the recordings for a channel (or recorder on Pearl-2 and Pearl Mini) using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. **Pearl-2 and Pearl Mini** - Open the Recording page. Do one of the following:
   - For a channel, select **Recording** from the Channels menu.
   - For a recorder, select a recorder from the Recorders menu.
3. All recordings are listed and sorted by date.



Files that are part of the same recording session are listed one after another. Three dots appear between files of different recording sessions. The file currently being recorded (if applicable) is shown at the top of the list. It cannot be modified or downloaded until it has finished recording.

4. If there are no recordings, a message indicates there are no recorded files for this channel or recorder.

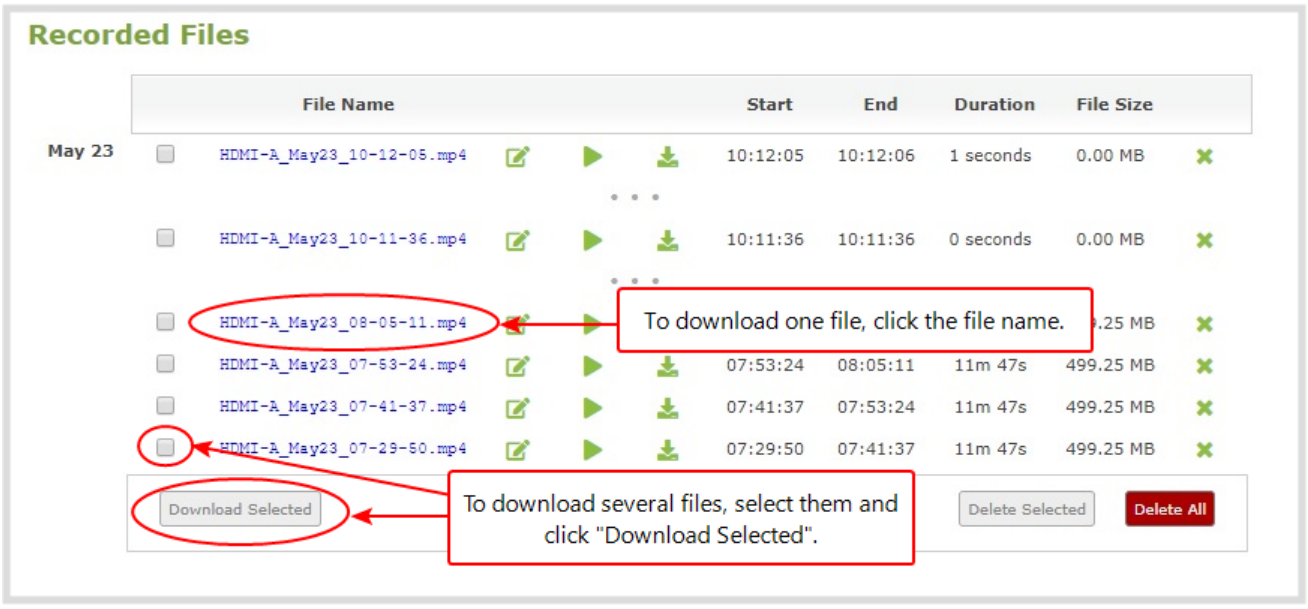
Download recorded files manually

You can manually download recordings using the Admin panel. Files you download are saved to your connected admin computer.

This feature is not available using the local console on Pearl-2.

Download recordings to your admin computer using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. **Pearl-2 and Pearl Mini** - Open the Recording page. Do one of the following:
   - For a channel, select **Recording** from the Channels menu.
   - For a recorder, select a recorder from the Recorders menu.



3. All recordings are listed and sorted by date. Do one of the following:
    a. To download an individual file, select the recording filename to download it.
    b. To download multiple files, select the check box next to the recordings to download and then click **Download Selected**. The files are download as a .zip file containing the selected recordings.

What's next?

To free up space for new recordings, consider deleting recordings off of Pearl-2, see Delete recorded files.

Join recorded files together

After recording files on Pearl-2, you can join two or more files together. This is useful when a recording exceeds the maximum recording time limit and the recording is split into multiple files. You can use the third-party tool called ffmpeg to join the files.

Download ffmpeg from the Internet and join multiple recorded files

1. Download the files that you need from Pearl-2 and make sure you have the right paths and file names. For example:

    C:\Users\JoesComputer\downloads\Program_A_May11_16-24-56.avi

2. Use the command **ffmpeg -i** to specify the input file. For example:

    ffmpeg -i C:\Users\JoesComputer\downloads\Program_A_May11_16-24-56.avi

3. Repeat the process and specify the file you want to join to the first file. You can keep adding as many files as you want to join together. For example, specifying a second file looks like this:

    ffmpeg -i C:\Users\JoesComputer\downloads\Program_A_May11_16-24-56.avi -i C:\Users\JoesComputer\downloads\Program_A_May11_12-26-14.avi

4. Use the **-c copy** command to specify the output file. After the command, type in the location, file name and file extension that you want for the concatenated file. The full line looks like this:

    ffmpeg -i C:\Users\JoesComputer\downloads\Program_A_May11_16-24-56.avi **-i** C:\Users\JoesComputer\downloads\Program_A_May11_12-26-14.avi **-c copy** C:\Users\JoesComputer\Desktop\Concatenated_File.avi

5. After completing the process, you will be able to access your new file in the location you specified. The file moves straight from the first video into the second without a pause.

You can this process to join multiple files; however, the more files you join, the greater the chance that some audio desychronization can occur between the clips.

Extract tracks from a recording

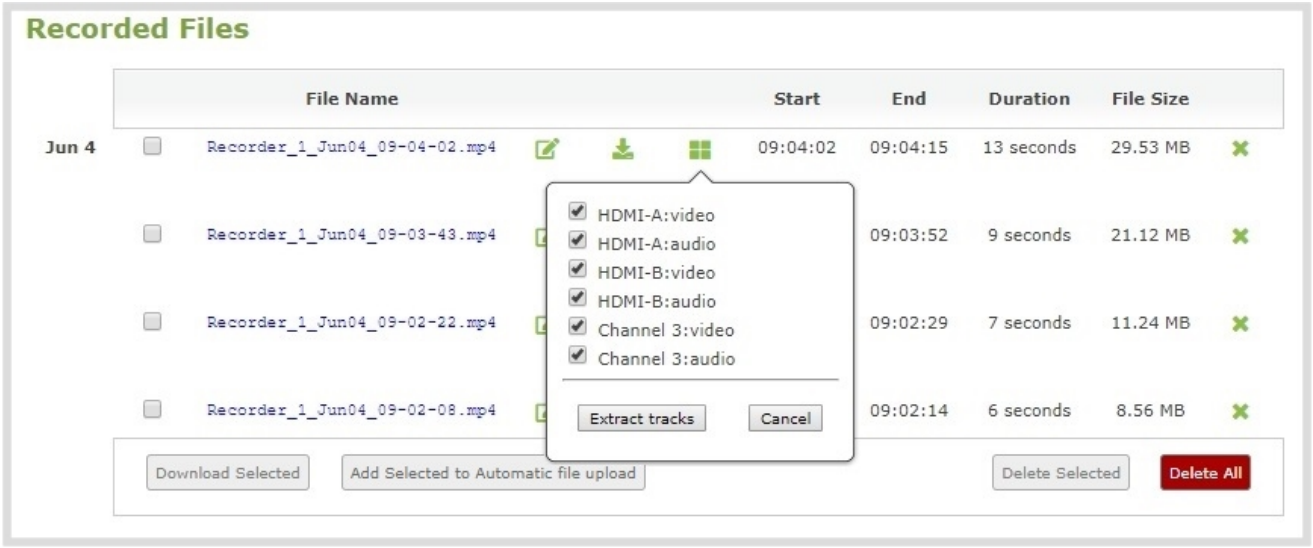
Recorders combine multiple channels and audio sources together in a single multi-track file. You can create a copy of a recording using only select tracks. This feature is supported for .AVI, .MP4 and .MOV recordings only. MPEG-TS does not support track extraction.

Specific track versions of recorded files are not included in any automatic file transfers and need to be downloaded manually. Click the extracted track filename to manually download, see Download recorded files manually.

It's good practice to check that there's enough storage space for the extracted files before you start this procedure. To check how much internal storage space is available on Pearl-2, see Storage capacity and maintenance.

Create a duplicate recording file with only select tracks using the Admin panel

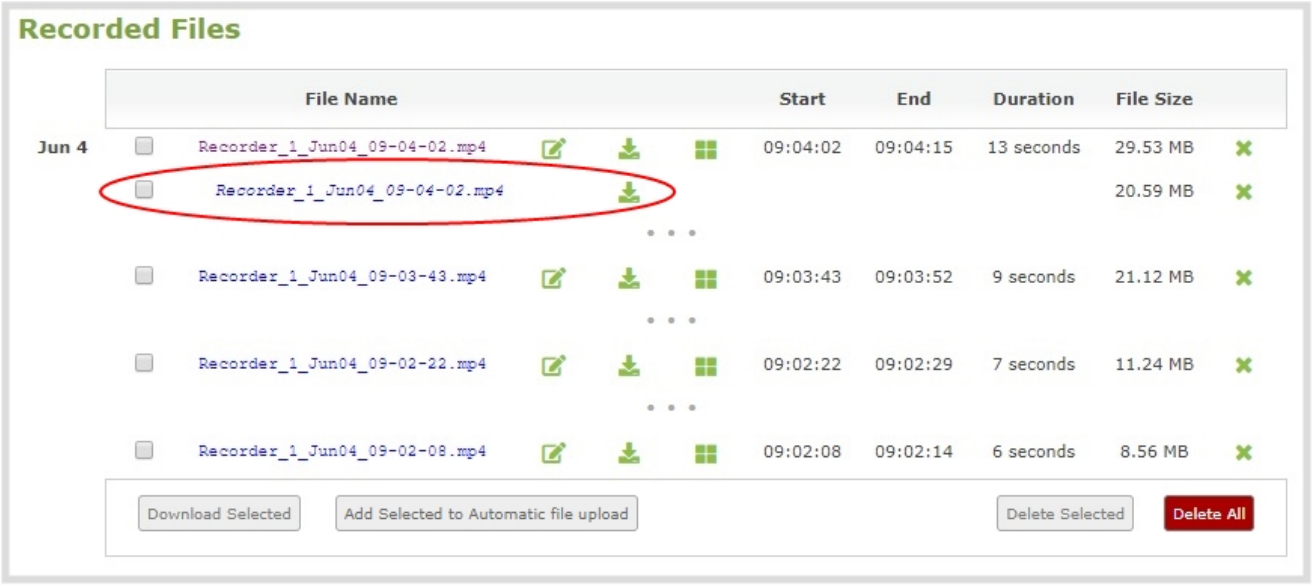
1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. From the Recorders menu, select a recorder. The recorder page appears.
3. Click the multi-track icon beside the recording. A list of tracks appears.



4. Select the tracks you want to extract.

Tip: To deselect all tracks, click the check box for the top track, then hold SHIFT and click the check box for the bottom track.

5. Click **Extract tracks**. A copy of the recording is created with only the selected tracks.



Only one copy is saved per original recording. If you create a second copy, it will overwrite the previous one. Download the extracted copy of the recording with your chosen tracks to preserve it.

Rename recorded files

Recordings are named based on the file name prefix specified during configuration. You can change the recording file name using the Admin panel. You can also change the default name that Pearl-2 assigns to recordings, see Configure recording settings, file size, and type for information about setting file name prefixes.

Rename a recording using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. Open the Recording page. Do one of the following:
   a. To view files recorded for a channel, select a channel from the Channels menu and click **Recording**.
   b. To view files recoded for a recorder, select a recorder from the Recorders menu.
3. All recordings are listed and sorted by date. Select the edit icon next to the file name you want to change.

4. Type the new file name and press **Enter** using your keyboard.

The Admin panel keeps track of the filename extension (i.e. .avi) so you do not need to include it when renaming the file.

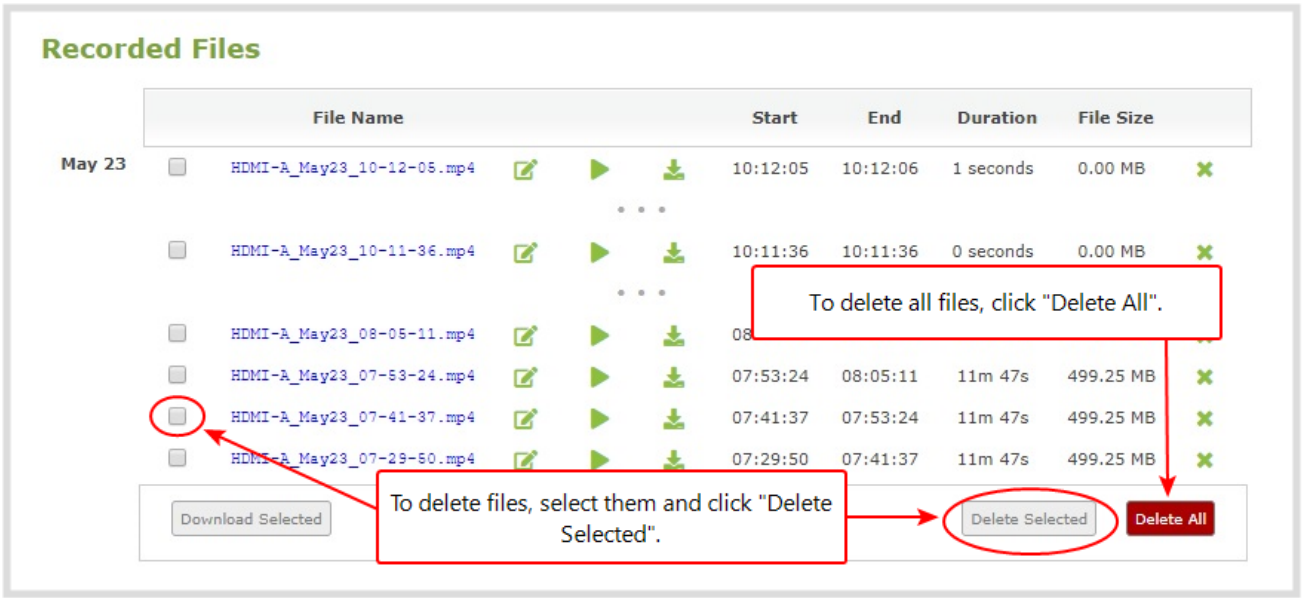
Delete recorded files

You can delete recordings using the Admin panel. You can delete one file at a time, select multiple files for the channel or recorder and delete those, or you can delete all recordings for the channel or recorder.

Deleted recordings cannot be recovered.

Delete recordings using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. Open the Recording page. Do one of the following:
   a. To view files recorded for a channel, select a channel from the Channels menu and click **Recording**.
   b. To view files recoded for a recorder, select a recorder from the Recorders menu.



3. All recordings are listed and sorted by date. Do one of the following:
    a. To delete a single recording, click the X icon to the right of a recording and click **OK** when prompted.
    b. To delete multiple recordings, check the check box beside the recordings you want to delete, then click **Delete Selected**. Click **OK** when prompted.
    c. To delete all recordings for the channel or recorder, click **Delete All** and click **OK** when prompted.

The list may not update immediately. You can refresh the list by reloading the Recording page (for channels) or the recorder settings page (for recorders).

Automatic file transfers

Pearl-2 can be configured to automatically upload recordings from local storage to a network storage location or an attached USB drive. This is called Automatic File Upload, or AFU for short. You can schedule automatic file uploads for a time and day that's most convenient for your workflow.

Topics include:

- About Automatic File Upload (AFU)
- Set channels and recorders to include in AFU
- Enable AFU, schedule, and set options
- Configure AFU to FTP server parameters
- Configure AFU to SFTP server parameters
- Configure AFU to RSync server parameters
- Configure AFU to CIFS server parameters
- Configure AFU to SCP client parameters
- Configure AFU to AWS S3 parameters
- Configure AFU to WebDav server parameters
- AFU or copy to USB

To manage the AFU queue and view the AFU upload logs:

- Add recordings to an AFU queue
- Manage the AFU queue
- View AFU and file transfer progress
- Manage USB file transfer queue
- View the AFU log

About Automatic File Upload (AFU)

Pearl-2 can automatically upload recorded files to an accessible off-system storage location. You can set the file transfer to happen after a set amount of time or after the file completes recording.

There are additional settings to help you manage your AFU recordings and avoid file name collisions at the AFU server side. You can:

- Automatically create a folder for your recorded files using the channel or recorder name.
- Save recordings to a folder that's labeled using Pearl-2's serial number.

Automatic File Upload (AFU) is not enabled by default. You must enable this feature for a channel or recorder that you want included in automatic file transfers. A log file of all file transfers is created that you can view anytime from the Admin panel.

The following types of off-system storage are supported for AFU:

- FTP/SFTP
- RSync
- CIFS
- SCP
- Amazon Web Server 3 (AWS S3)
- WebDav
- USB Drive

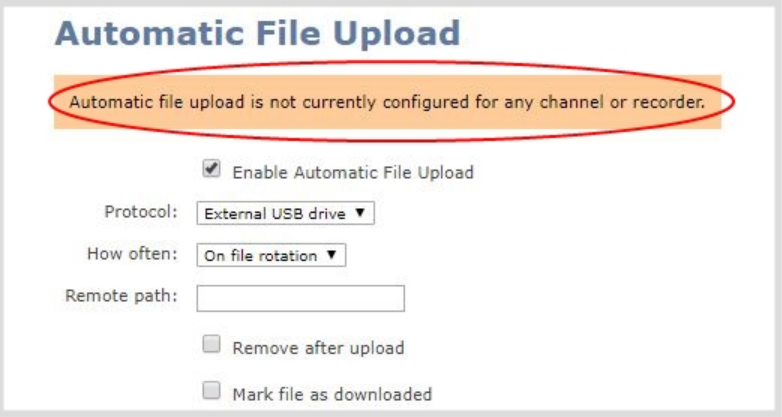
Important considerations

- Only **one** type of AFU can be used for all file transfers from the same channel or recorder.
- Automatic File Upload (AFU) is not available while Content Management System (CMS) is enabled on Pearl-2.
- Files are automatically uploaded only once. New recordings created during later sessions do not overwrite files that were previously uploaded. A new file is uploaded.
- If the connection is lost during the transfer, the transfer automatically restarts when the connection is reestablished.
- If recorded files are selected for upload while the AFU is at maximum upload capacity or when the AFU is unavailable, they are added to an upload queue. Files and their relevant information are displayed in a list and are uploaded when the upload capacity becomes available.
- If recordings are selected for Automatic File Upload (AFU) while AFU is at maximum upload capacity or when AFU is unavailable, the recordings are added to an upload queue. If there is no available space left, new recordings fail and do not overwrite recordings in the AFU queue.

Set channels and recorders to include in AFU

When configuring automatic file upload (AFU), you need to tell the system which channels and recorders you want included in the upload schedule. If no channels or recorders are configured as a part of AFU, the following message appears in the Automatic File Upload configuration page.

You must enable Automatic File Upload (AFU) for the channel before you can include channel recordings in the upload schedule. If AFU is not enabled for the channel, the following message appears in the Automatic File Upload configuration page.



Set a channel or recorder to include in the AFU schedule using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. Click **Recording** in the Channel(s) menu.
   - **Pearl-2 and Pearl Mini** - For a recorder, select a recorder from the Recorders menu.
3. Under **Recorder Setup**, select **change**. The recorder settings open.
4. Check **Automatic file upload** and click **Apply**.

What's Next

After you've enabled AFU for your channels and recorders, enable AFU and configure the AFU settings for the location type (i.e. FTP, USB, AWS, etc).

Enable AFU, schedule, and set options

After the channels and recorders you want to include in your Automatic File Upload (AFU) are selected, you can enable AFU and schedule when and where you want the recorded files to upload. To select channels and recorders to include in AFU, see Set channels and recorders to include in AFU .

By default, recorded video files are uploaded as soon as recording stops. However, you can schedule file uploads to only occur during a specific period of time every 24-hours. Recordings that end within the configured time period automatically upload right away. Recordings that end outside the upload time period are queued up and upload when the scheduled upload time period is reached.

To use AFU scheduling with a CMS, make sure to select a start and end time that provides enough upload time for all the files to upload to the CMS.

If you want to use the reset button to force the current recording to close and open a new one or want to limit the recorded file size, see Configure recording settings, file size, and type.

Recorded files saved before automatic file upload is configured are not included as part of the automatic upload.

The following table describes the AFU options.

Table 58 AFU options

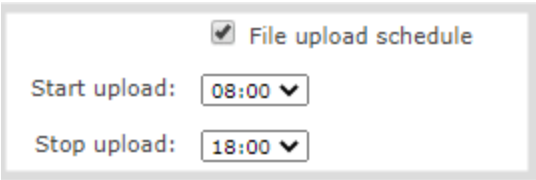
Option	Description
Remote path	If no remote path is specified, the files are copied to the root folder of the destination file system.
Remove after upload	Delete files from local storage on Pearl-2 when the upload completes.
Mark file as downloaded	Change the color of the file in the recording list to show the files are downloaded. This only applies if the files are not deleted after upload is complete.
Create a subfolder for each channel	Save the downloaded files into a folder using the channel name (or recorder name on Pearl-2 and Pearl Mini).
Create a subfolder for device	Save the downloaded files into a folder using the serial number of Pearl-2.

Enable AFU and set a schedule or AFU options using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Automatic File Upload**. The Automatic File Upload configuration page opens.

If your screen does not indicate that AFU is enabled for at least one channel or recorder, return to Set channels and recorders to include in AFU .

3. Check **Enable Automatic File Upload**.
4. (Optional) Enter a remote path. If no path is specified, the files are copied to the root folder of the destination file system.
5. (Optional) Check any optional parameter to select it. For example, you can check **Mark file as downloaded** and **Create a subfolder for each channel**.
6. To schedule AFU, check **File upload schedule** and select a start time and an end time in the **Start upload** and **Stop upload** fields to define the automatic file upload period.



7. Click **Apply**.

If AFU to your server fails, check the server configuration and permissions.

Configure AFU to FTP server parameters

You can automatically upload recordings to an FTP server when you select FTP as the AFU protocol transfer type using the Admin panel.

The following table describes the parameters to configure for AFU to an FTP server.

Table 59 FTP Automatic Upload Configuration Parameters

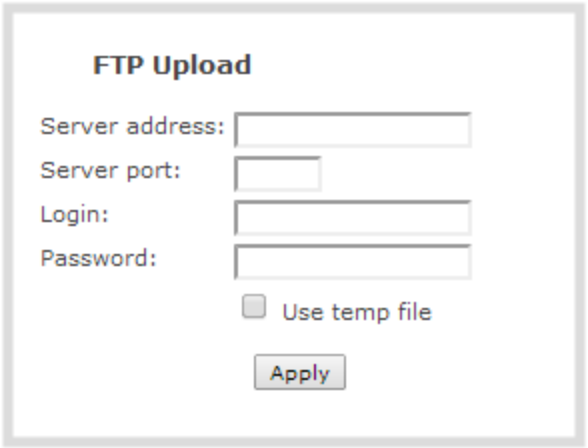
Name	Description
Server address	The IP address (or fully qualified domain name) of the FTP server.
Server port	The port used by the target FTP server. Standard port is 21.
Login	User name for the FTP server.
Password	Password for the FTP user.
Use temp file	Causes files to be named with .part extension on the server during active upload. When the upload completes, the file is renamed to the appropriate extension (.mov, .mp4 or .avi).

Prerequisites

- Channels and/or recorders are already added for AFU, see Set channels and recorders to include in AFU.
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.

Configure AFU upload to an FTP server using the Admin panel

1. From the Automatic File Upload configuration page, select **FTP Client** as the protocol transfer type.



2. Specify the target **Server address**. If your system is configured with DHCP or has a valid DNS configuration (see Configure DHCP), you can use the server's fully qualified domain name instead of the IP address.
3. Specify the **Server Port** used for the target FTP server. The standard port is 21.
4. Enter the FTP account username in the **Login** field.
5. Enter the FTP account password in the **Password** field. The characters are masked with dots.
6. Select **Use temp file** to name files with a temporary filename extension (.part) on the server until upload is complete.
7. Click **Apply**.

Configure AFU to SFTP server parameters

You can automatically upload recordings to a secure FTP (SFTP) server when you select SFTP as the AFU protocol transfer type using the Admin panel.

The following table describes the parameters to configure AFU to an SFTP server.

Table 60 SFTP Automatic Upload Configuration Parameters

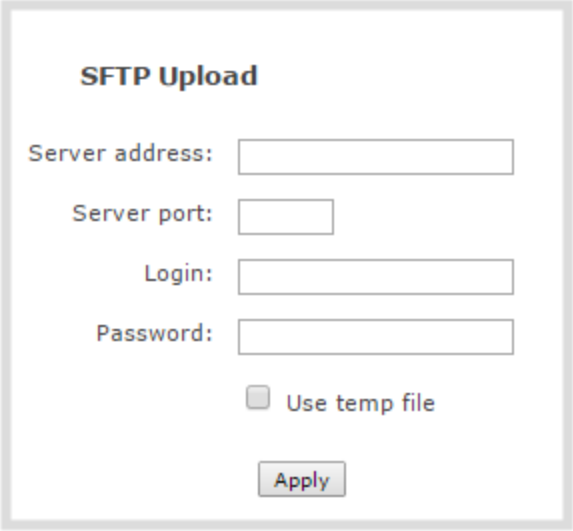
Name	Description
Server address	The IP address or fully qualified domain name of the SFTP server.
Server port	The port used by the target SFTP server. Standard port is 22.
Login	Username for the SFTP server.
Password	Password for the SFTP user.
Use temp file	Causes files to be named with .part extension on the server during active upload. When the upload completes, the file is renamed to the appropriate extension (.mov, .mp4 or .avi).

Prerequisites

- Channels and recorders are already added for AFU, see Set channels and recorders to include in AFU .
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.

Configure AFU upload to an SFTP server using the Admin panel

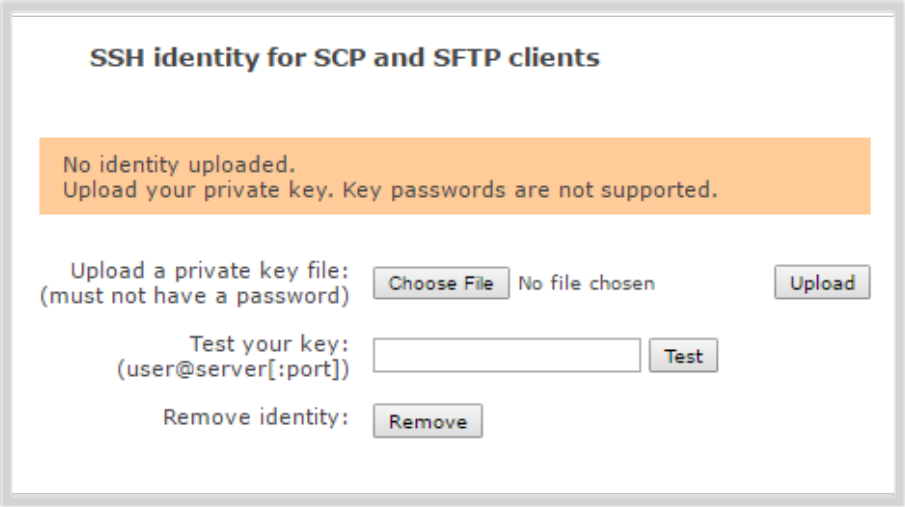
1. From the Automatic File Upload configuration page, select **SFTP Client** as the protocol transfer type.



2. Specify the target **Server address**. If your system is configured with DHCP or has a valid DNS configuration (see Configure DHCP), you can use the server's fully qualified domain name instead of the IP address.
3. Specify the **Server Port** used for the target SFTP server. The standard port is 22.
4. Enter the SFTP account username in the **Login** field.
5. Enter the SFTP account password in the **Password** field. The characters are masked with dots. Alternatively, you can choose to use a private key instead of a password for authentication.
6. Select **Use temp file** to name files with a temporary filename extension (.part) on the server until upload is complete.

For secure file transfer, you can upload an SSH identity for Pearl-2. This key must be trusted by the destination server. Details for generating the key and setting up this trust are beyond the scope of this document.

7. (Optional) Set up SSH identity for SCP and SFTP clients. If no identity is uploaded, or to upload a new identity (overwrites the old identity):



   a. Click **Choose File** and navigate to select the private key file from your hard drive, then click **Open**.
   b. Click **Upload** to upload the file.

> The system accepts RSA keys for SSH-1; DSA, ECDSA, EC25519 and RSA for SSH-2. Keys must be in **OpenSSH** format.

   c. (Optional) Use the **Test your key** field to test your uploaded key against the secure server.
8. Click **Apply**

Configure AFU to RSync server parameters

You can automatically upload recordings to an RSync server when you select RSync as the AFU protocol transfer type using the Admin panel.

The following table describes the parameters to configure for AFU to an RSync server.

Table 61 RSync Automatic File Upload Configuration Parameters

Name	Description
Server address	The IP address (or fully qualified domain name) of the RSync server.
Server module	The name of the shared folder on the RSync server.
Login	Username for the RSync server.
Password	Password for the RSync user.

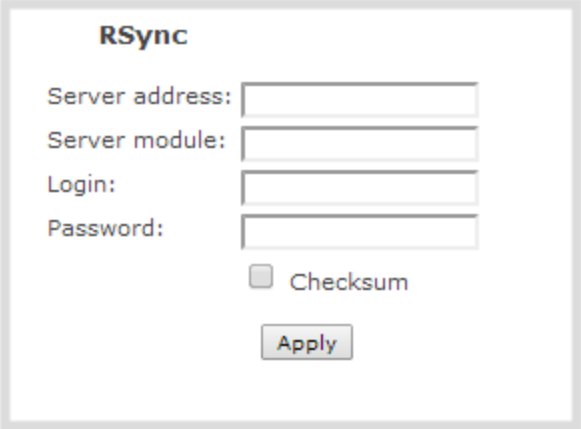
Name	Description
Checksum	Select to enable checksum checking during file transfer. This increases the time taken to transfer, but also increases reliability of the transfer.

Prerequisites

- Channels and recorders are already added for AFU, see Set channels and recorders to include in AFU .
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.

Configure AFU upload to an RSync server using the Admin panel

1. From the Automatic File Upload configuration page, select **RSync Client** as the protocol transfer type.



2. Specify the target **Server address**. If your system is configured with DHCP or has a valid DNS configuration (see Configure DHCP), you can use the server's fully qualified domain name instead of the IP address.
3. Specify the **Server module**. This is the name of the shared folder on the server. If needed, request this value from your network administrator.
4. Specify a username for the RSync Server in the **Login** field. The user must have write permissions for the module.
5. Specify the password for the user in the **Password** field; the value is masked by dots.
6. (Optional) Select the **Checksum** check box to add a checksum validation to the transfer between the system and the recipient server.
7. Click **Apply**.

Configure AFU to CIFS server parameters

You can automatically upload recordings to a CIFS server (also known as SMB or samba) when you select CIFS as the AFU protocol transfer type using the Admin panel. SMB2 and SMB3 are supported.

The following table describes the parameters to configure AFU to a CIFS server.

Table 62 CIFS Automatic File Upload Configuration Parameters

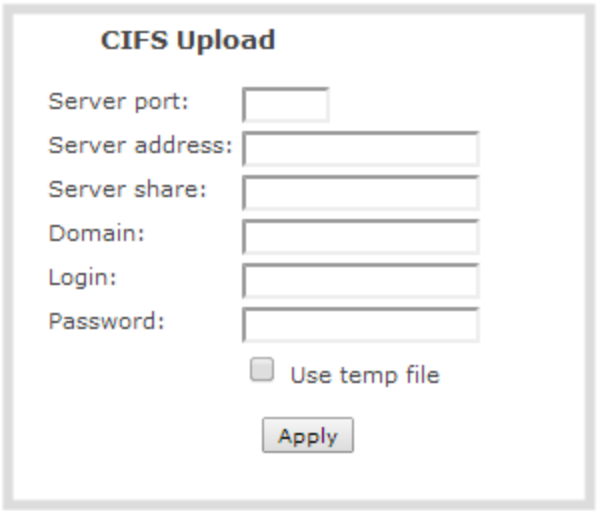
Name	Description
Server Port	The CIFS server port. Leave blank to use the default port, or enter the port used for your CIFS server.
Server address	The IP address (or fully qualified domain name) of the CIFS server.
Server share	The name of the shared folder on the CIFS server.
Domain	The CIFS server's Windows domain or Work Group name . Needed if the server is part of Active Directory or a Domain Controller.
Login	Username for the CIFS server.
Password	Password for the CIFS user.
Use temp file	Causes files to be named with .part extension on the server during active upload. When the upload completes, the file is renamed to the appropriate extension (.mov, .mp4, .ts or .avi).

Prerequisites

- Channels and recorders are already added for AFU, see Set channels and recorders to include in AFU .
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.

Configure AFU upload to a CIFS server using the Admin panel

1. From the Automatic File Upload configuration page, select **CIFS Client** as the protocol transfer type.



2. Specify the target **Server address**. If your system is configured with DHCP or has a valid DNS configuration (see Configure DHCP), you can use the server's fully qualified domain name instead of the IP address.
3. Enter the target **Server port**, if you have configured the server to use something non-standard. Leave this value blank to use the default port.
4. Specify the **Server share**. This is the CIFS share name or the name of the shared folder on the server. If needed, request this value from the network administrator.
5. If the system is in a different domain than the server or if it is part of Active Directory, enter the **Domain name** of the CIFS server.
6. Specify a username for the CIFS Server in the **Login** field. The user must have write permissions for the share folder.
7. Specify the password for the user in the **Password** field; the value is masked by dots.
8. Select **Use temp file** to name files with a temporary filename extension (.part) on the server until upload is complete.
9. Click **Apply**

Configure AFU to SCP client parameters

You can automatically upload recordings to an SCP (secure copy) client when you select SCP as the AFU protocol transfer type using the Admin panel.

The following table describes the parameters to configure AFU to an SCP client.

Table 63 SCP Automatic Upload Configuration Parameters

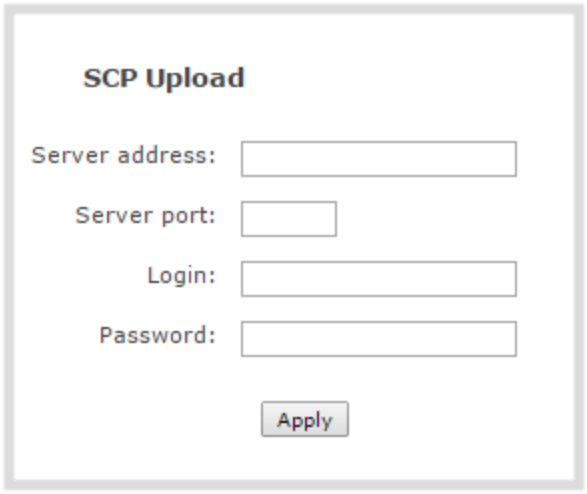
Name	Description
Server address	The IP address (or fully qualified domain name) of the destination server.
Server port	The SCP port used by the target server. Standard port is 22.
Login	Username for the SCP server.
Password	Password for the SCP user.

Prerequisites

- Channels and recorders are already added for AFU, see Set channels and recorders to include in AFU .
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.
- Ensure there is adequate space on the destination device, if space may be an issue disable the AFU option 'Remove after upload' to avoid accidental deletion of files.

Configure AFU upload to an SCP client using the Admin panel

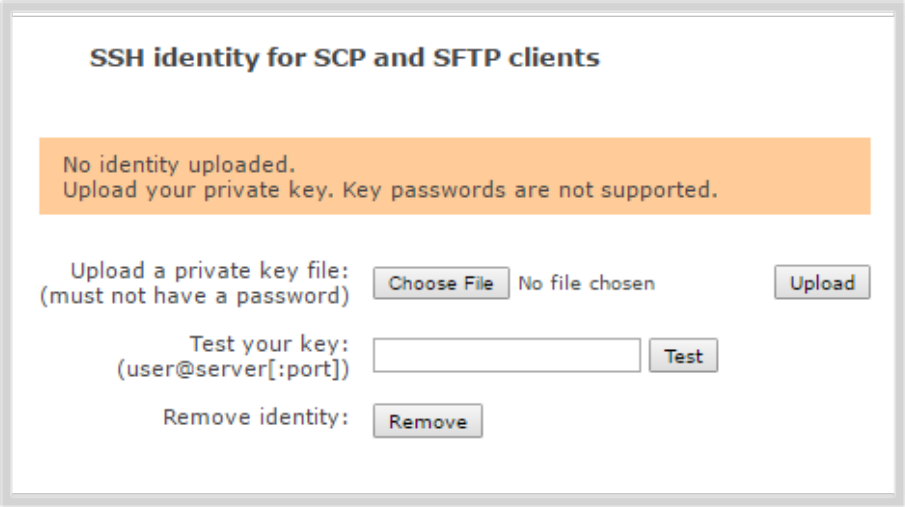
1. From the Automatic File Upload configuration page, select **SCP Client** as the protocol transfer type.



2. Specify the target **Server address**. If your system is configured with DHCP or has a valid DNS configuration (see Configure DHCP), you can use the server's fully qualified domain name instead of the IP address.
3. Specify the **Server Port** used for the destination SCP server. The standard port is 22.
4. Enter the SCP account username in the **Login** field.
5. Enter the SCP account password in the **Password** field; the characters are masked with dots. (Alternatively you can choose to use a private key instead of a password for authentication.)

> For secure copy you can upload an SSH identity for your Pearl-2. This key must be trusted by the destination server. Details for generating the key and setting up this trust are beyond the scope of this document.

6. (Optional) Set up SSH identity for SCP and SFTP clients. If no identity is uploaded, or to upload a new identity (overwrites the old identity):



   a. Click **Choose File** and navigate to select the private key file from your hard drive, then click **Open**.
   b. Click **Upload** to upload the file.

> The system accepts RSA keys for SSH-1; DSA, ECDSA, EC25519 and RSA for SSH-2. Keys must be in **OpenSSH** format.

   c. (Optional) Use the **Test your key** field to test your uploaded key against the secure server.

7. Click **Apply**

Configure AFU to AWS S3 parameters

You can automatically upload recordings to an Amazon Web Server (AWS) when you select AWS S3 as the AFU protocol transfer type using the Admin panel.

The following table describes the parameters to configure AFU to a bucket on Amazon Simple Storage Solution (S3).

Table 64 AWS Automatic Upload Configuration Parameters

Name	Description
AWS Region Code	The geographical region of the AWS server that contains the bucket you want to upload to, e.g. us-east-2.
Bucket	The id of the data storage container you created in Amazon S3 for the recorded live streaming files.
Access Key Id	The Access Key ID is part of your access key for your AWS account and is a required parameter, i.e. GAKSOSIFDONN2EXAMPLE.

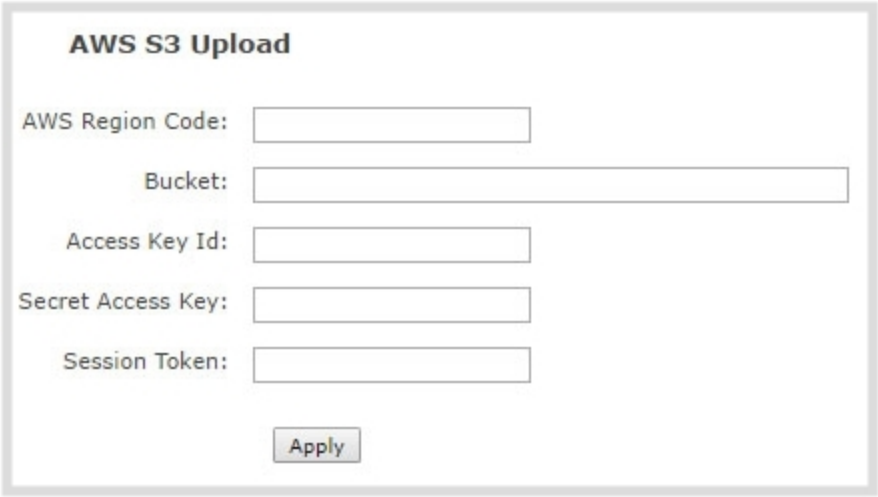
Name	Description
Secret Access Key	The Secret Access Key is part of your access key for your AWS account and is a required parameter, i.e.bHaprXUenFEMI/K6MANVG/cPxDfiBYEXAMPLEKEY.
Session Token	The temporary security token provided by the AWS Security Token Service (STS) that allows access to your AWS account for authorized users.

Prerequisites

- You must have read and write privileges for your AWS account before you can setup AFU to upload to an AWS S3 location. You also need the AWS Access Key ID and Secret Access Key.
- Channels and recorders are already added for AFU, see Set channels and recorders to include in AFU.
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.

Configure AFU upload to AWS S3 using the Admin panel

1. From the Automatic File Upload configuration page, select **AWS S3 Client** as the protocol transfer type.



2. Specify the **AWS Region Code** and the data storage **Bucket** where you want to upload the file.
3. Enter your AWS **Access Key Id** and **Secret Access Key** to authenticate access to the AWS S3 data storage bucket.

   Failure to provide these values could result in content loss if **Remove after uploading** is selected.

4. In the **Session Token** field, enter the temporary token you got from the AWS Security Token Service (STS).
5. Click **Apply**.

Configure AFU to WebDav server parameters

You can automatically upload recordings to a WebDav server when you select WebDav as the AFU protocol transfer type using the Admin panel.

The following table describes the parameters to configure AFU to a WebDav server.

Table 65 WebDav Automatic Upload Configuration Options

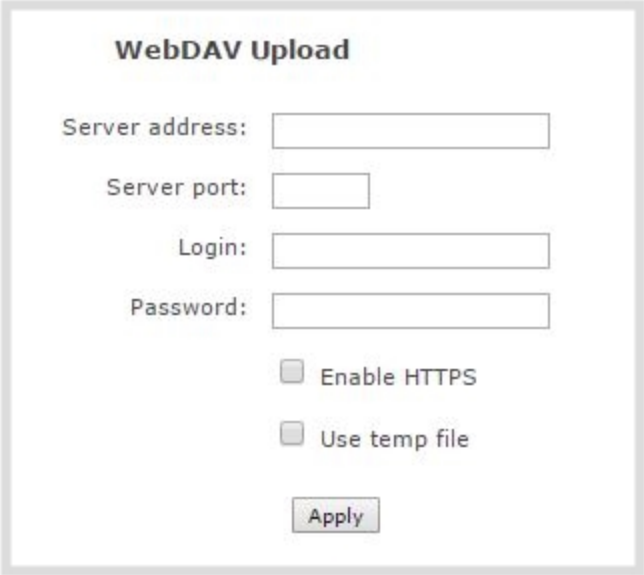
Name	Description / Options
Server address	The IP address (or fully qualified domain name) of the FTP server.
Server port	The port used by the target WebDav server. Standard port is 21.
Login	Username for the WebDav server.
Password	Password for the WebDav user.
Enable HTTPS	Select if you need to use a secured HTTPS link to the WebDav server.
Use temp file	Causes files to be named with .part extension on the server during active upload. When the upload completes, the file is renamed to the appropriate extension (.mov, .mp4 or .avi).

Prerequisites

- Channels and recorders are already added for AFU, see Set channels and recorders to include in AFU .
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.

Configure AFU upload to a WebDav server using the Admin panel

1. From the Automatic File Upload configuration page, select **WebDav Client** as the protocol transfer type.



2. Specify the target **Server address**. If your system is configured with DHCP or has a valid DNS configuration (see Configure DHCP), you can use the server's fully qualified domain name instead of the IP address.
3. Specify the **Server Port** used for the target WebDav server. The standard port is 21.
4. Enter the FTP account username in the **Login** field.
5. Enter the FTP account password in the **Password** field. The characters are masked with dots.
6. Select **Enable HTTPS** if you need a secure HTTPS link to the WebDav server.
7. Select **Use temp file** to name files with a temporary filename extension (.part) on the server until upload is complete.
8. Click **Apply**.

AFU or copy to USB

The Pearl device has USB 3.0 ports (a single port on Pearl Nano) that you can use to copy recordings to external USB flash drives or hard drives. Use this to conveniently provide speakers with a copy of their presentation before they leave the presentation venue.

A USB port is available on the back panel of the Pearl device. Pearl-2 and Pearl Mini have an additional USB port on the front.

The USB storage device must be formatted with one of the following file systems:

- FAT16
- EXT2
- NTFS
- FAT32
- EXT3
- XFS
- EXT4

We recommend you only connect one USB device to a Pearl device at a time. Only one copy or move to USB operation is permitted at a time, even though the UI may appear to let you start a second one. Please wait until the first is complete before starting a new operation.

To view AFU and monitor file transfer progress, see View AFU and file transfer progress.

Topics include:

- Automatic File Upload to a USB storage device
- One-time copy all recordings to USB storage device
- Manually copy recordings to USB
-
- Manage USB file transfer queue
- Manage USB drive

AFU to a USB storage device

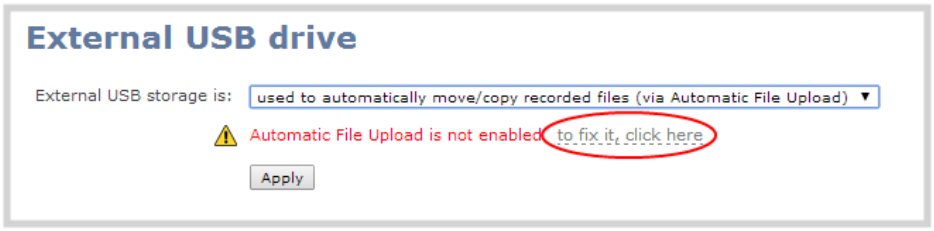
Transfer recordings to a USB storage device automatically when you select an external USB device as the AFU protocol transfer type using the Admin panel.

Prerequisites

- A properly formatted USB device must be connected to a USB port on the Pearl device.
- Channels and/or recorders are already added for AFU, see Set channels and recorders to include in AFU.
- AFU is enabled and the parameters configured, see Enable AFU, schedule, and set options.

Configure AFU upload to a USB storage device using the Admin panel

1. From the Automatic File Upload configuration page, select **External USB Drive** as the protocol transfer type. If your Automatic File Upload setting conflicts with your new USB device setting, a message is displayed. Click the **fix it** link and click **Apply**.



The fix it link disables any other type of automatic file upload you have configured. When you are done with USB uploads, return to the **Automatic File Upload** configuration page and reconfigure your AFU settings.

2. (Optional) Select **Create a subfolder for each channel** to have recordings organized by channel.
3. Click **Apply**.

Do a one-time move/copy all recordings to USB storage device

When one-time move/copy of files is configured, the Pearl device automatically starts copying files as soon as you connect a USB storage device to the USB port.

Newest recordings are copied first. Files continue copying over until one of the following events occur:

- all files are copied
- the specified maximum number of files are copied
- the target drive runs out of storage space

File that are currently recording do not transfer until recording ends.

The following table describes the options available for a one-time move/copy of recordings to a USB storage device.

Table 66 One-Time Move/Copy File Transfer Options

Name	Description
create subfolder with serial number (<serial>)	If checked, the transfer process creates a sub-folder with the system's serial number on the USB drive. This is useful if you are using the same drive to collect recordings from multiple systems and want to know which system they came from.
create subfolder for each channel	If checked, the transfer process creates a sub-folder for each channel and recorder (within the subfolder for the serial number, if that option is also selected). Files are copied to their respective folders.
remove after copying	If checked, the file(s) are removed after being copied to the USB drive. Checking this box makes the transfer a move instead of a copy.
mark file as downloaded	If checked, the files that are downloaded are marked with a downloaded icon when viewing file lists. This has no effect if remove after copying is checked.
ignore already downloaded files	If checked, files that were previously downloaded or marked as downloaded are not included in subsequent downloads.

If your USB drive has no activity indicator to let you know when the transfer is complete, select the one-time move/copy option to **remove after copying** or **mark the file as downloaded** so that you know when the transfer has finished.

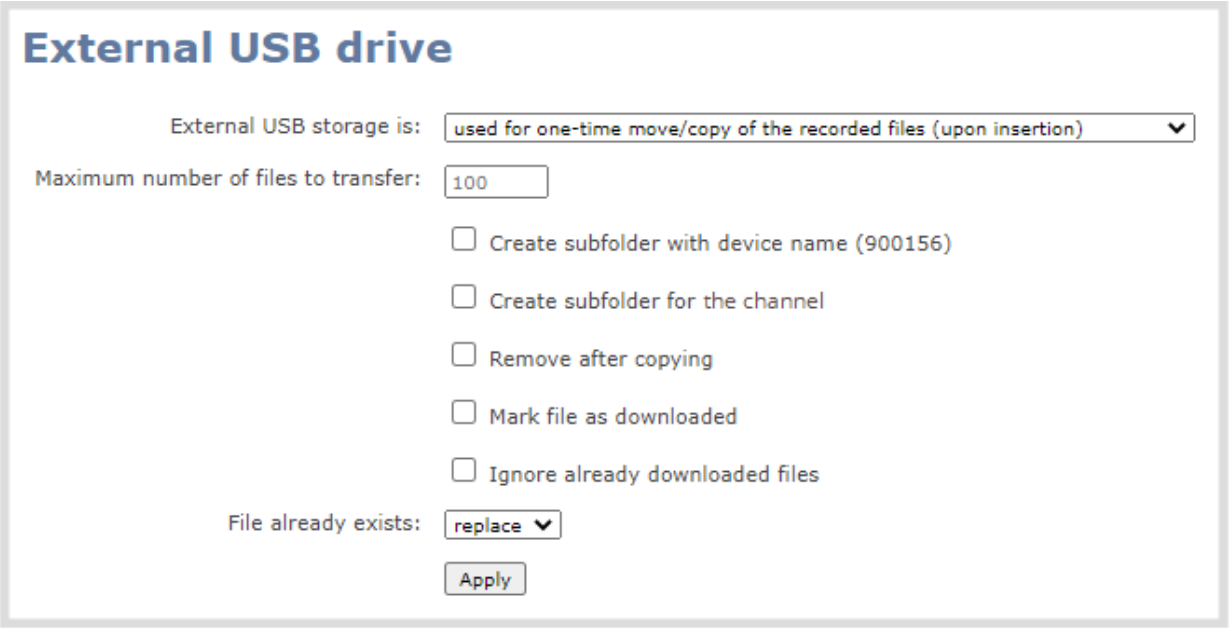
Prerequisites

- A properly formatted USB device not connected to a USB port on Pearl-2.

Configure a one-time copy of all recorded files to a USB storage device using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.

2. From the Configuration menu, select **External USB Drive**. The External USB Drive configuration page opens.
3. Select **used for one-time move/copy of the recorded files (upon insertion)**.



If a conflict is reported regarding the Automatic file upload settings, click **Fix it** or go to the Automatic File Upload configuration page and either disable automatic file upload or switch to a non-USB based upload type.

4. Check the options you want to use for the one-time move/copy file transfer and click **Apply**.
5. Insert the USB storage device into the USB port on Pearl-2. File transfer starts automatically.
6. Follow the steps to AFU or copy to USB when the activity light on the USB storage device stops flashing. If your USB device doesn't have activity indicators:
    a. Check the **Recording** list for each channel and the **Recorded Files** list for each recorder to verify if there are files that have yet to be copied.
    b. AFU or copy to USB when you are satisfied all files have been copied, or if you notice the USB storage device is out of space, see View available USB storage space.

Manually copy recordings to USB storage device

You can manually copy recordings to a USB storage device that is connected to Pearl-2. This procedure is separate from automatic file upload and does not need any pre-configuration in the automatic file upload page.

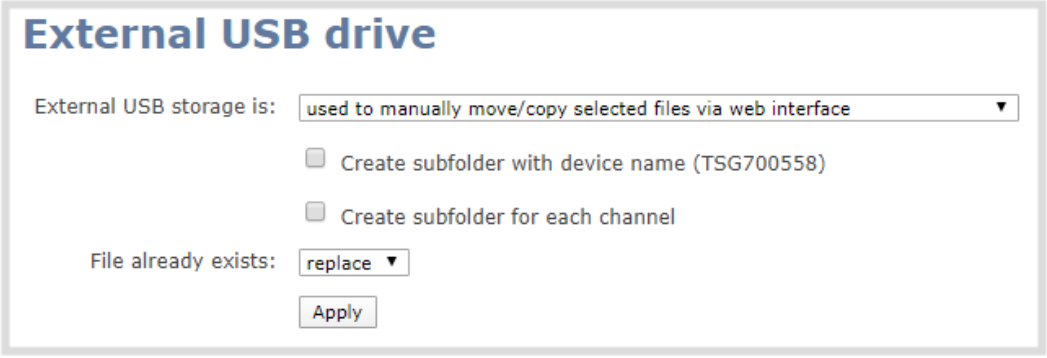
The following table describes the options available when manually copying recordings to a USB storage device.

Table 67 One-Time Move/Copy File Transfer Options

Name	Description
create subfolder with serial number (<serial>)	If checked, the transfer process creates a sub-folder with the system's serial number on the USB drive. This is useful if you are using the same drive to collect recordings from multiple systems and want to know which system they came from.
create subfolder for each channel	If checked, the transfer process creates a sub-folder for each channel and recorder (within the subfolder for the serial number, if that option is also selected). Files are copied to their respective folders.
File already exists	Choose the action to take if a file with the same name already exists in the copy location: • replace (default) • skip • rename

Manually copy recorded files to a USB device using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **External USB Drive link**. The External USB Drive configuration page opens.
3. Select **used to manually move/copy selected files via the Admin panel** and click **Apply**.

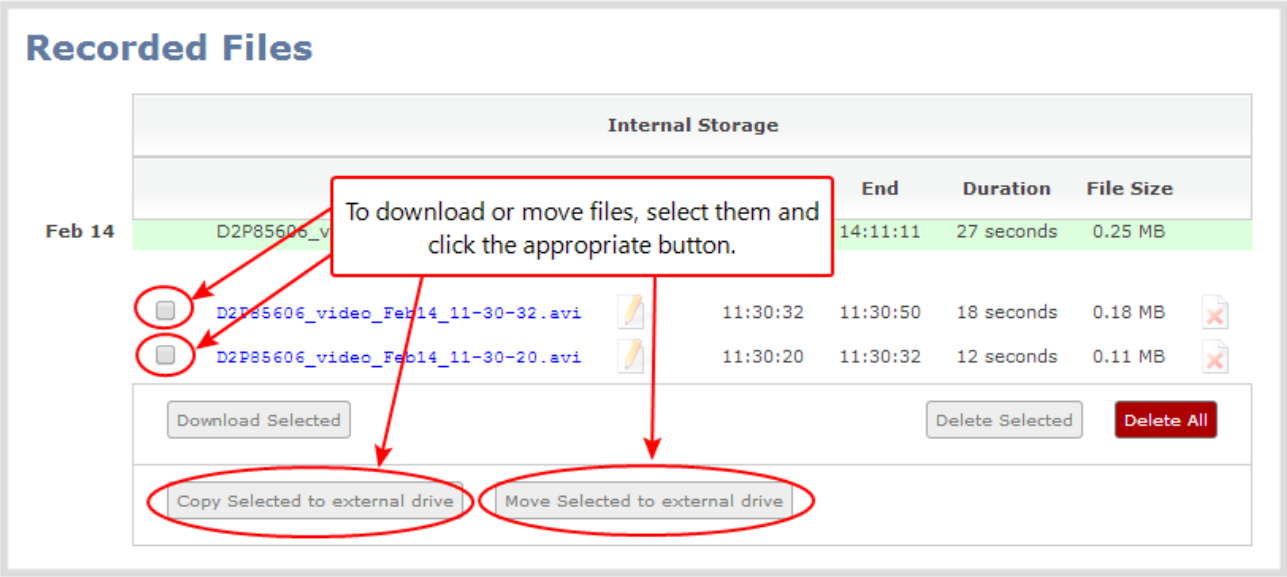


If a conflict is reported regarding the Automatic file upload, click **Fix it** or go to the Automatic File Upload configuration page and disable automatic file upload or switch to a non-USB based upload type.

4. Insert your USB storage device into an available USB port on Pearl-2 and do one of the following:
   a. To download files for a specific channel, click **Recording** from the Channels menu.
   b. To download files for a recorder, select a recorder from the Recorders menu.

5. Check the files you want to download and do one of the following:
   a. Click **Copy Selected to external drive** to copy the files to the USB drive.
   b. Click **Move Selected to external drive** to move the files and delete them off of Pearl-2.

   In this example, the first file is currently recording and cannot be downloaded.



6. Follow the steps to Safely eject USB storage device when you're done.

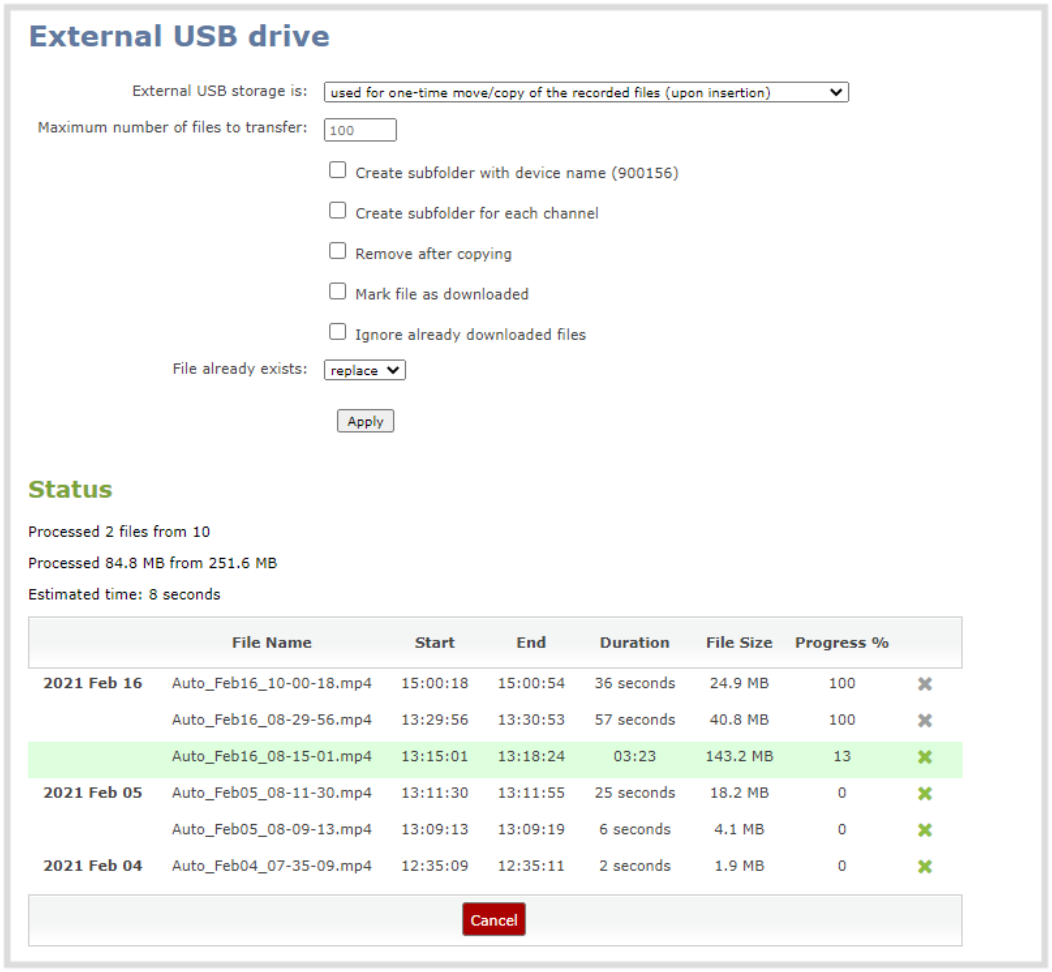
View file transfer status and cancel file copy to a USB device

During a file transfer to an External USB drive, you can monitor the file transfer progress and cancel the file transfer using the Admin panel. You can only cancel the transfer of a file while it is in progress.

For other options to view the USB file transfer progress, see View AFU and file transfer progress.

View file transfer to USB device status and cancel using the Admin panel

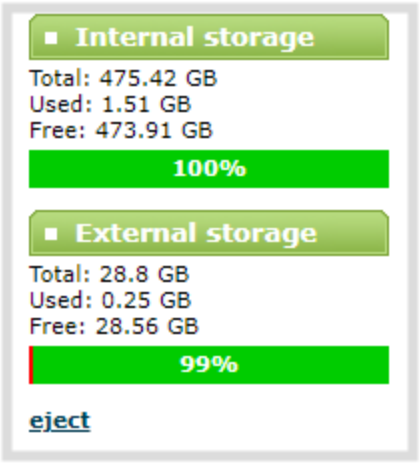
1. While the file transfer is in progress, select **External USB Drive link** from the Configuration menu in the Admin panel. The External USB Drive configuration page opens.
2. View the current file transfer status under the **Status** section. To cancel the current file transfer, select **Cancel** and confirm when prompted. The option to cancel only appears while the file transfer is in progress. The file that is highlighted in green is currently being transferred.



View available USB storage space

When you insert a USB storage device into a USB port and select an **External USB Drive** action other than **ignored** (i.e. manual copy, automatic copy, etc), the total and free space are calculated and displayed in the Admin panel.

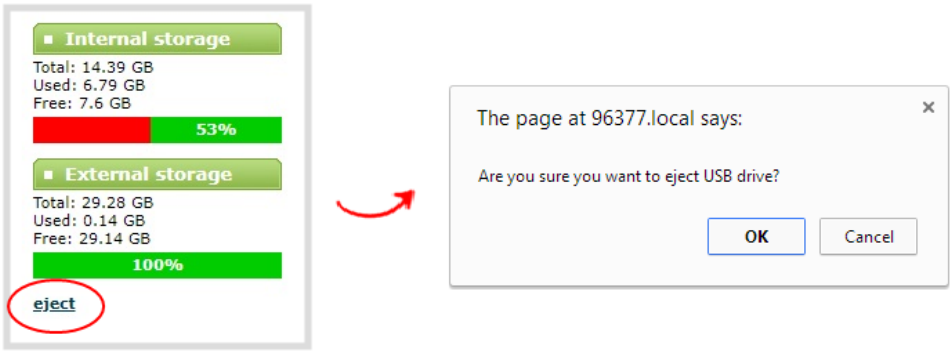
When you insert your USB storage device into an available USB port, an External storage usage information tab appears at the bottom of the menus panel in the Admin panel.



Safely eject the USB storage device

When you're done saving recordings to the USB storage device, you can safely eject it using the link at the bottom of the Admin panel page.

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. At the bottom of the menus panel, click **eject** and click **OK** when prompted.



It's now safe to disconnect the USB storage device from Pearl-2.

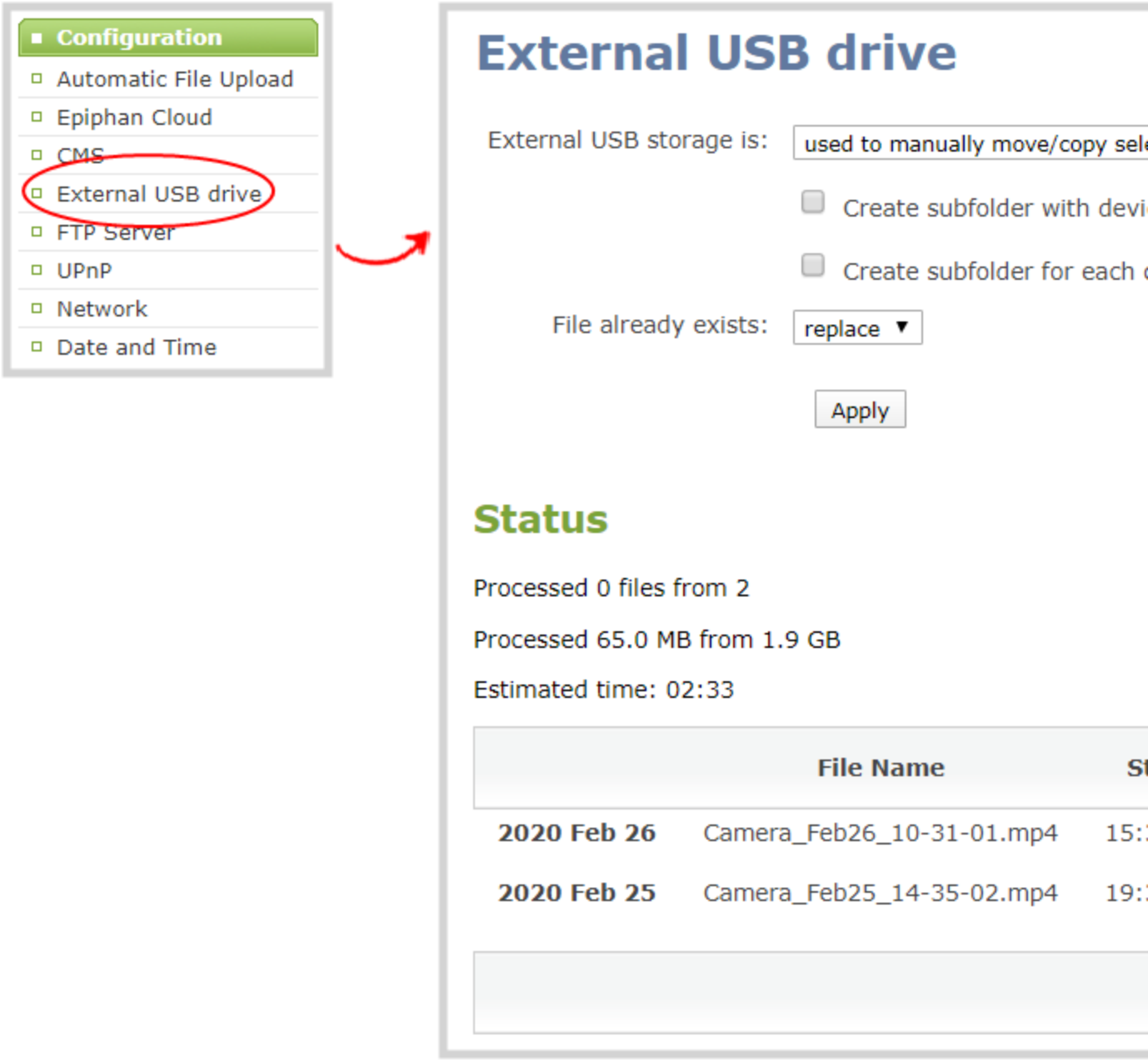
Manage USB file transfer queue

You can view USB file transfer information, delete files in the USB file transfer queue, and cancel USB file uploads using the Admin panel.

Information such as the file name and size, start time, duration, and progress are displayed. A history of file transfers displays until either Pearl-2 is restarted or the list is manually cleared. External USB storage must be configured for the USB file transfer status to display.

View USB file transfer status, delete files in the queue, or cancel file uploads using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **External USB Drive**. The External USB Drive configuration page opens. If there are files to be uploaded, they appear in the queue.



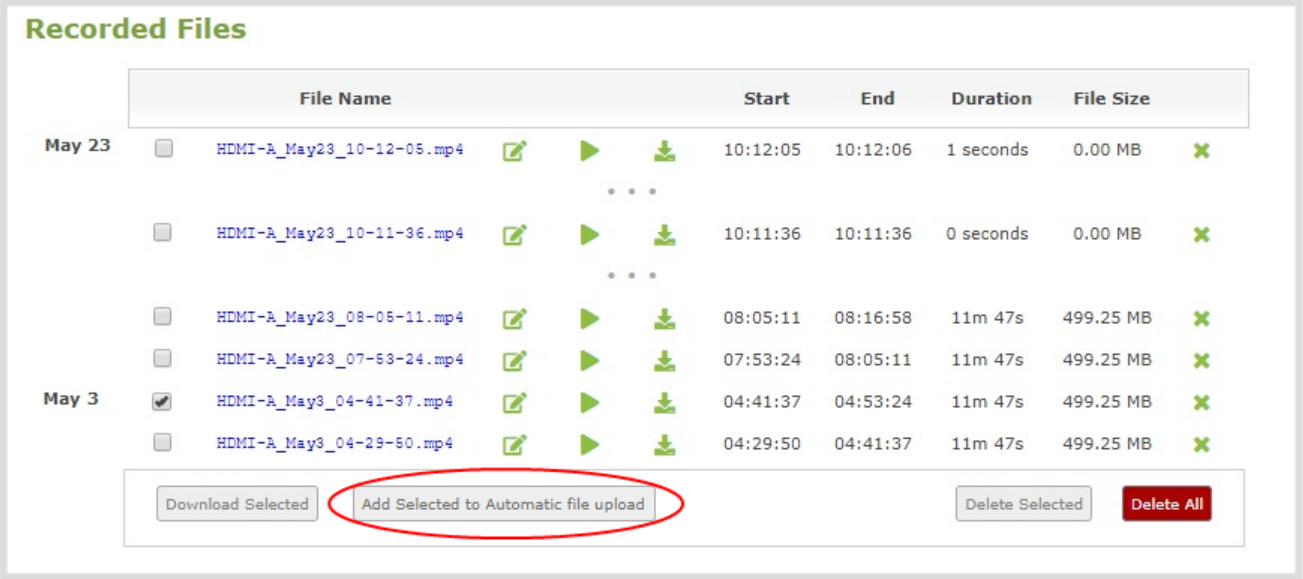
3. To remove a file from the USB transfer queue, click **X** beside the file you want to remove.
4. To cancel the current USB file transfer that's in progress and remove all files that are currently waiting in the USB transfer queue, click **Cancel**.

Add recordings to an AFU queue

You can add previously recorded files to an AFU queue using the Admin panel. Before you can add a previously recorded file, the channel must be enabled for AFU and at least one new recording must have been queued.

Add an existing recording to an AFU queue using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. Find the recordings by channel or by recorder and select the files you want to add to the AFU queue.
3. Select **Add Selected to Automatic file upload**.



View the AFU log

A log is kept of automatic file uploads. You can view the AFU log using the Admin panel, If you want to view the AFU status, see View AFU and file transfer progress.

View the AFU log using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Automatic File Upload**. The Automatic File Upload configuration page opens.
3. Click **Show log of automatic file upload**. The log page opens. If no logs are present, the page is blank.
4. Click the browser's back button when you are done.

Manage the AFU queue

The Automatic File Upload (AFU) queue displays a list of recorded files waiting to be uploaded. You can view the AFU queue and remove files from the queue using the Admin panel. Automatic File Transfer must be configured for the AFU queue to display.

For other options to view AFU and file transfer progress, see View AFU and file transfer progress.

Emptying the AFU queue does not cancel an AFU transfer.

View the AFU queue and remove files from the queue using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Automatic File Upload**. If there are files to be uploaded, they appear in the queue.
3. To remove a file from the AFU queue, click **X** beside the file you want to remove.
4. To remove all files that are currently waiting in the AFU queue, click **Empty Queue**.

Integration

Pearl devices are fully integrated with Kaltura, Panopto, and YuJa Content Management Systems (CMSs). Learn to use the Admin panel to set up and manage your Pearl device with these Content Management Systems, as well as how to record and stream.

Topics include:

- Kaltura registration
- Kaltura recording and webcasting setup
- Panopto registration
- Panopto recording and webcasting setup
- CMS recording and webcasting control
- YuJa setup

For information about using the Pearl device RS-232 and HTTP/HTTPS APIs, see the Pearl System API Guide.

Kaltura registration

The Pearl-2 is fully integrated with Kaltura Content Management Systems (CMSs) for a seamless video recording and webcasting experience. After it is registered, it appears as a resource in Kaltura's MediaSpace and can be selected for scheduled recordings and webcasts, as well as be used for unscheduled ad hoc events that you can create using the Admin panel (or from Pearl 2 and Pearl Mini's touch screen). Registering it as a resource with the Kaltura Content Management System (CMS) only needs to be done once.

Topics include:

- Enable CMS and register with Kaltura
- Disable or deregister from Kaltura
- Change the resource name used for Kaltura
- Reassign a registered resource

After Kaltura is registered, proceed to check the VOD and webcasting event settings and set up authentication for ad hoc events. See Kaltura recording and webcasting setup.

Enable CMS and register with Kaltura

When CMS is enabled, use the Admin panel to register Pearl-2 as an encoder resource for Kaltura. After Pearl-2 is registered, you can assign it a unique name that appears in the list of resources when creating an event in Kaltura's MediaSpace. The default name includes the serial number of Pearl-2 to ensure the name is unique.

If more than two other resources are already registered with the same name, you're prompted to choose a different name and try to register Pearl-2 again. If only one resource is registered with the same name, you're

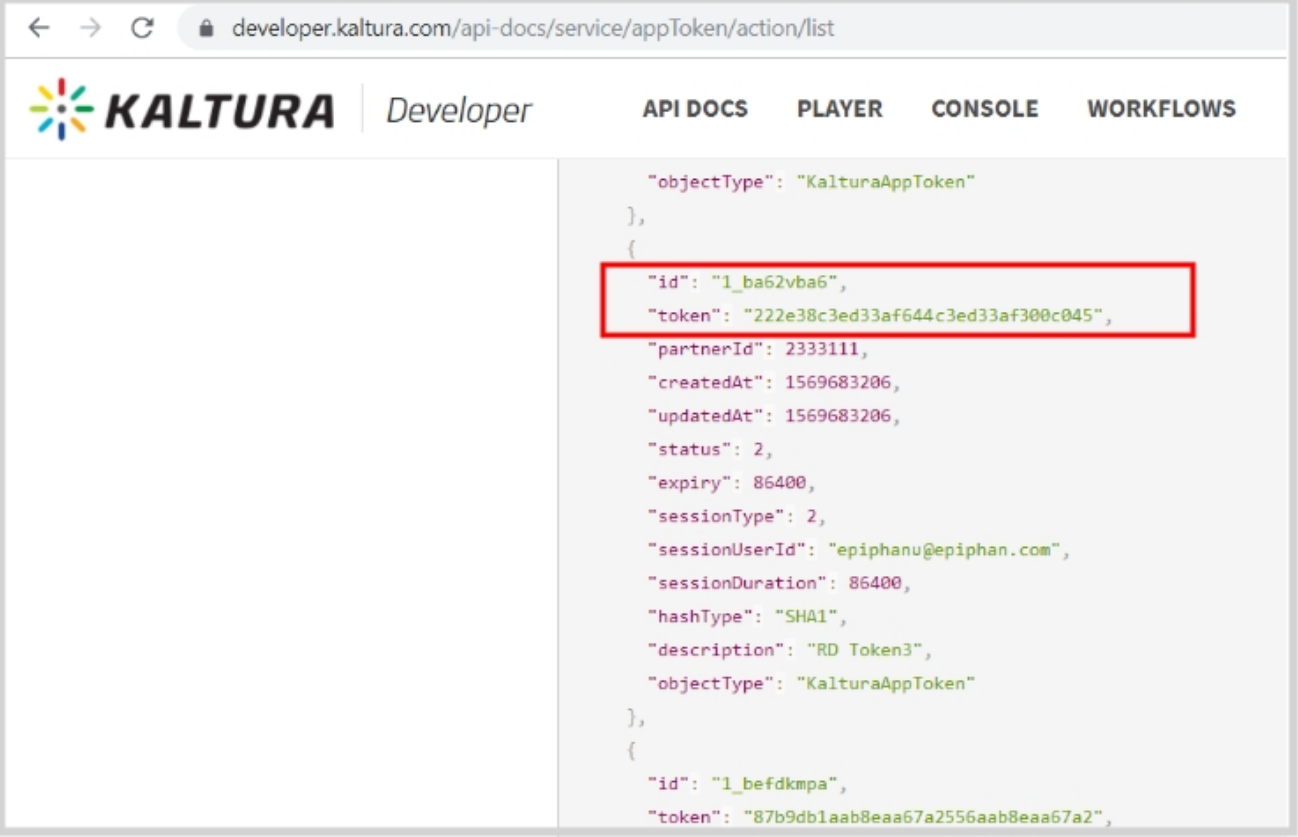
prompted to take over the events for that other resource. If you do, Kaltura transfers all scheduled events from that other device over to Pearl-2. For more information, see Reassign a registered resource.

It may take some time for Kaltura to display a newly registered resource, depending on how busy the Kaltura system is when you register.

There are two methods to register your Pearl-2:

- Using your Kaltura partner ID and administrator secret
- Using an application token and the token ID

A Kaltura application token can be created from the Kaltura developer website: www.developer.kaltura.com



There are two types of Kaltura application tokens you can use with Pearl-2: an administrative session type and a user session type. With an administrative session token, Pearl-2 uploads event recordings to the respective event owner's account in Kaltura as expected.

A user session token requires the following permissions:

```
KMC_ACCESS,KMC_READ_ONLY,BASE_USER_SESSION_PERMISSION,WIDGET_SESSION_
PERMISSION,CONTENT_INGEST_BASE,CONTENT_INGEST_UPLOAD,CONTENT_MANAGE_
```

```
BASE,cuePoint.MANAGE,CONTENT_MANAGE_SCHEDULE,CAPTURE_DEVICE_
PERMISSION,CONTENT_INGEST_REFERENCE_MODIFY,disableentitlement
```

Important considerations for user session application tokens

- Pearl-2 uploads all events (scheduled and ad hoc) to the user account ID associated with the user token.
- All event recordings (scheduled and ad hoc) upload to the Kaltura account of the user who created the event if there is no user ID associated with the token.
- Do not include a creation date for the user session token. A creation date in the token causes Pearl-2 to upload events only to the token creator. It also restricts login using Pearl-2 and Pearl Mini's touch screen to only the token creator.

Before you begin, you should already have:

- A Kaltura instance created
- Either of the following:
  - Your Kaltura partner ID and administrator secret
  - Your application token ID and token value

Enable Pearl-2 as a resource and register with Kaltura using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. From the **Choose CMS** drop down, select **Kaltura** and then click **Apply**.
4. In the Authorization method field, select the authorization method and do one of the following:
   a. If you select **Administrator secret**, enter your Kaltura **Partner ID** and **Administrator secret** that you got from Kaltura.
   b. If you select **Application token**, enter the application **Token ID** and **Token value** .

   Ensure the **Token hash type** matches the hash type set in the application token. The default is **SHA1**.
5. (Optional) Change the **Resource name** that appears for this device in Kaltura. The default resource name includes the serial number of Pearl-2.
6. Click **Register device**.

Pearl-2 and Pearl Mini - A calendar icon appears on the touch screen of Pearl-2 to show that Pearl is in CMS mode, see CMS event controls using the touch screen.

What's next

Choose which Pearl-2 channels you want this resource to record, assign the channel to use for webcasting, setup authentication for ad hoc events, and specify default ad hoc event parameters. See Kaltura recording and webcasting setup.

Disable or deregister from Kaltura

You can disable CMS using the Admin panel and still select Pearl-2 as a resource using Kaltura MediaSpace. However, the events schedule won't synchronize on Pearl-2 and any events that are scheduled to start while CMS is disabled do not start on Pearl-2. If CMS is re-enabled on Pearl-2 before the event is scheduled to end, that event will start automatically after the events schedule is refreshed on Pearl-2, see View scheduled CMS events and history.

Existing events that are already associated with the device do not lose their association when CMS is disabled. As soon as you re-enable Kaltura CMS on Pearl-2, you can record and stream events as usual. CMS is disabled by default.

Deregistering removes Pearl-2 from Kaltura's list of resources and any existing events that were associated with that resource lose their association. You must select a new resource for those events using MediaSpace.

Content Management Systems (CMSs) can change channel settings automatically. After disabling CMS on Pearl-2, check your channel settings or apply a configuration preset to restore your channel to known values.

Important considerations

- You cannot start ad hoc (manual) Kaltura events when CMS is disabled or when Pearl-2 has been deregistered.
- When CMS is disabled or Pearl-2 is deregistered, existing scheduled events that are associated with the device do not record or stream.
- If Pearl-2 is deregistered, existing events associated with that device lose the association. You must select a new resource for those events.
- Ensure the deregistered Pearl-2 entry in the list of encoder devices on Kaltura disappears before registering again if using the same device name.
- Do not disable CMS while an event is in progress.

Disable Pearl-2 as a resource or deregister from Kaltura using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. To disable CMS, select **none** from the **Choose CMS** drop down and then click **Apply**.
4. To deregister Pearl-2, click **Deregister device**.

The calendar icon disappears from Pearl Mini and Pearl-2's touchscreen when CMS is disabled or deregistered.

Change the resource name used for Kaltura

Using the Admin panel, you can change the resource name that's assigned to Pearl-2 while it's registered with Kaltura.

Each Pearl-2 is assigned a unique resource name that includes the serial number of the device by default. You can transfer scheduled VOD and scheduled webcasting events from one resource to another by assigning Pearl-2 the same resource name as another resource.

When a resource with the same name is already registered in Kaltura, a warning message appears when you try to apply the new resource name to Pearl-2.

- If there's only one other registered resource with that name, you're prompted to choose whether or not to take over the events for that other resource. If you do take them over, Kaltura transfers all scheduled events from that other device over to Pearl-2.
- If more than two other resources are already registered with the same resource name in Kaltura, the name change fails. You're prompted to choose a different resource name and try again.

Change Pearl-2 resource name using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Change the **Resource name** and click **Apply**.

Reassign a registered resource

Every encoder you register with Kaltura has a unique resource name. To swap out one Pearl-2 with another one, you can simply reassign the existing Pearl-2 resource name to the replacement Pearl-2.

Assigning Pearl-2 the same resource name when you register the encoder transfers all the existing schedules and recordings over to the replacement Pearl-2. When a resource tries to register using the same name as another device, a warning message appears and you're asked whether or not you want to take over from the other resource.

- If there's only one other registered resource with that name, you're prompted to choose whether or not to take over the events for that other resource. If you do take them over, Kaltura transfers all scheduled events from that other device.
- If more than two other resources are already registered with the same resource name in Kaltura, registration fails. You're prompted to choose a different resource name and to try registering Pearl-2 again.

This works well when you want to change the encoder in a room but retain all the existing schedules and recordings that are associated with the encoder for that room.

Alternatively, you can avoid having to register the replacement Pearl-2 with Kaltura. If you apply a configuration preset to set up the replacement Pearl-2 with the settings from the currently registered Pearl-2, the replacement Pearl-2 assumes the identity of the registered resource. For more information about configuration presets, see About configuration presets.

Using a configuration preset can result in two Pearl-2 resources with the same identity, which can effect recording and the content that's uploaded to Kaltura for scheduled events. Power down, disconnect from the network, and consider performing a factory reset on one of the Pearl-2 resources to remove the possibility of having duplicate resources.

If you've performed a factory reset that resulted in an orphaned Kaltura resource registration, you can perform this procedure to reregister your Pearl-2 using the same resource name to take over the resource instance that is still registered in Kaltura.

Before you begin, you should already have:

- A Kaltura instance created
- Access to the Kaltura Management Console (KMC)
- Your Kaltura partner ID
- Your Kaltura administrator secret

Enable Pearl-2 as a resource and register with an existing resource name using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. From the **Choose CMS** drop down, select **Kaltura** and then click **Apply**.
4. Enter your **Partner ID** and **Administrator secret** that you got from Kaltura.
5. Change the **Resource name** to the resource name of the Pearl-2 you are replacing and click **Register device**.
6. When you're prompted to take over the events from the existing resource with that same name, click **Yes**.

Kaltura recording and webcasting setup

Your Pearl device appears as an available resource as soon as the device is registered with Kaltura. Connect multiple audio and video sources directly to the Pearl device and assign them to separate channels. Each channel you configure on the Pearl device is treated as a separate video source.

The channel you set up on Pearl Nano is treated as a single video source.

For more information about using the auto channel feature, creating channels or using custom layouts, see What is a channel?.

Topics include:

- About Kaltura recording and webcasting
- Kaltura settings
- Select channels for Kaltura VOD events

- Select a channel and URLs for Kaltura webcasting events
- Set Kaltura ad hoc event parameters
- Set the extend Kaltura CMS event interval
- Change the events schedule refresh interval
- Use RTMPS for a Kaltura webcasting event

About Kaltura recording and webcasting

Pearl devices support scheduled events, recurring events, and unscheduled ad hoc recordings and webcasts. After the Pearl device is registered, Kaltura users can simply assign the Pearl device as a resource when setting up an event using MediaSpace.

Scheduled events start and end automatically. No manual intervention is required. After the event ends, the recording automatically uploads. Back up recordings for each channel are also saved locally on the Pearl device.

If the network connection or the CMS goes down during an event, the Pearl device continues to record locally and uploads the recording when network connectivity resumes. Depending on how busy the Kaltura CMS system is when the files upload, it may take some time for the files to appear in Kaltura's media lists.

You can start and stop events earlier than the scheduled time using the Admin panel or the device screen.

Starting or stopping a scheduled VOD event before the scheduled start or stop time does not change the event in to an ad hoc event.

Pearl administrators can:

- Create ad hoc events, see Create ad hoc events using the Admin panel.
- Set ad hoc event parameters.
- View the Events page to see all upcoming scheduled sessions and completed sessions, see View scheduled CMS events and history.
- Change how often Pearl-2 polls Kaltura for an updated list of Events.
- Download local recordings for each channel, see Recover channel backup recordings.
- Start and stop scheduled events before the scheduled time, see Start/stop scheduled CMS events using the Admin panel.
- Extend scheduled events, see Extend or pause CMS recordings and webcasts
- Change the extend event button time allotment in 5, 10, and 15 minute intervals, see Set the extend Kaltura CMS event interval.

General information

- The Pearl device must be registered with Kaltura to record and stream Kaltura events, see Enable CMS and register with Kaltura.

- Scheduled events have priority over ad hoc events. If an ad hoc event is still in progress when it's time to start a scheduled event, the ad hoc event is stopped and the scheduled event starts.
- Scheduled events automatically start recording locally on the Pearl device even If the network is down or Kaltura is unavailable. After the session ends, the locally recorded files upload automatically to your Kaltura media list when the network link to Kaltura is re-established.
- After the event ends, it may take a while for content to show up in Kaltura's media lists, depending on how busy the Kaltura CMS system is at that time.
- The recorded event must be a minimum of 2 minutes long for Kaltura to process the video.
- The Kaltura Editor does not open recorded events that are less than a minute long.
- If the network connection is lost during a file upload to Kaltura, the transfer automatically restarts when the network connection re-establishes.
- If the Pearl device loses power while a scheduled event is being recorded, the recording stops. If the Pearl device is powered back on before the scheduled end time for the event, recording of the scheduled event restarts automatically and a second set of files are created. When the event ends, both files automatically upload to Kaltura.
- If the Pearl device was unavailable on the network or powered down and misses a scheduled event, the status of that event appears as **Skipped** on the Events page in the Admin panel.
- If the time and zone settings of the Pearl device are out of synchronization with Kaltura's scheduling server, an error appears on the Events page and you're prompted to reconfigure the time settings on the Pearl device, see Configure date and time.
- Do not use Single Touch recording control, AFU or configure recording file size, type and other channel recording settings when CMS is enabled on Pearl-2.
- If you modify a particular recurring lecture capture plus live webcasting event (e.g. a VOD + Live Stream event in a recurring series), Kaltura excludes that event from the recurring series and the webcast doesn't stream. That's because the RMTP URLs for the modified event looses it's mandatory tokens. However, the recurring Kaltura event does record as scheduled and other events in the series are not affected. **Workarounds**: To regenerate the RTMP tokens for a live event, go to MediaSpace, find the modified live event entry and uncheck the Live event checkbox - and save. Then re-check it and save the event again. Alternatively, you can go to the Kaltura Management Console (KMC), find the modified live event entry and then, in the Live stream tab, click **Re-generate Stream Token**.
- Do not schedule recordings that are longer than the capacity of Pearl-2 to store the recording on the local drive.

Default Kaltura encoding settings are applied automatically to the channel when Kaltura is enabled, which override the existing encoding settings. If you manually change the encoding settings using the Admin panel after Kaltura is enabled, the settings revert back to the default Kaltura settings when a scheduled or ad hoc event starts.

Pearl-2 and Pearl Mini information

For events with multiple sources, the recording for each source is uploaded to Kaltura and appears as a single, multi-view entry in the Kaltura media list with each source (i.e. view) listed as a separate "child" sub-entry. The

name of each file includes the name of the channel plus the date and time the file was recorded. For example: **Channel 1_May23_10-12-05**

We recommend that you configure the channel that is selected as the main entry as well as the other channels in a multi-view scheduled VOD event to include all audio sources. Audio is taken from the channel configured as the main entry in the Kaltura CMS.

With Pearl-2 and Pearl Mini, you can:

- Use multiple channels to get multiple views for a Kaltura event. Each channel is treated as a separate video source. Using the Admin panel, Pearl administrators can choose channels on Pearl-2 for multiple source recordings. For webcasting, you can select only one channel at a time.
    - For example, if you have a main camera and a presentation laptop that you want to capture as a multiple source recording, you'd create two channels on Pearl-2: one for the main camera and another one for the presentation laptop. To learn how to create a channel or to use the Auto channels, see Channel configuration.
- Set the video source that is used as the default main entry. The channel selected as the main entry becomes the default view that people see when watching the VOD, as well as the main view (i.e. the large screen) for PiP.
- Set which Pearl-2 channels are used for scheduled and ad hoc recordings and webcasts.
- Set the channel used for scheduled and ad hoc webcasts.
- Display the Channel view on Pearl-2's touch screen, see Channel monitoring using the touch screen or monitor channels using the Admin panel. You can also monitor channels directly on the Events screen using the touch screen, see View scheduled CMS events and history.

To use the touch screen on Pearl-2 to start, stop, and create events, see CMS event controls using the touch screen.

Kaltura settings

The following list of features is available once your Pearl device has been registered with Kaltura.

VOD event channels

- **Channel** - Select a channel for VOD.
- **Enabled** - Select to enable the channel.
- **Main entry** - Select which channel will be the main entry (only one can be selected).

Live-stream event channel

- **Channel** - Select a channel to be live-streamed.
- **Secure streaming** - Select to send an RTMPS (instead of RTMP) stream.
- **Backup stream** - Select to enable a backup stream, the select the **Ad hoc event backup stream** from the dropdown list.

- **Ad hoc event primary stream** - Select a primary stream. If **Auto** is the only available option, then no additional streams are configured for the channel.
- **Ad hoc event backup stream** - Once Backup stream has been enabled, select a backup stream. If **Auto** is the only available option, then no additional streams are configured for the channel.

Unscheduled ad hoc event details

- **Session title** - Assign a default title for ad hoc events. Default variables specify the current date and time as the title using the format **yyy-mm-dd hh:mm**. This default title can be changed when an ad hoc event is created.
- **Event owner** - Assign an owner to ad hoc events created using the Pearl device.
- **Owner suffix** - Enter a suffix to be automatically applied to the Event owner field when users authenticate with Kaltura from the Pearl device. For example, if the owner account is *wilson@myorg.com*, enter the suffix *@myorg.com* here so that the user only needs to enter *wilson* to authenticate.
    - For Pearl Nano, you must authenticate from the Admin panel.
- **Description** - The description of the uploaded media that appears in Kaltura.
- **Tags** - Assign tags to the uploaded media for use by Kaltura. To assign multiple tages, separate the tags with a ",".
- **Categories** - Assign Kaltura categories to the uploaded media. To assign a nested category to the uploaded media, use the ">" symbol (with no spaces) between categories. To assign multiple categories, separate the categories with a ",". For example: Recordings>Tutorials>Biology1000, Recordings>Tutorials>Chemistry1000
- **Duration** - Assign a default duration for ad hoc events. This value can be changed when an ad hoc event is created.
- **Automatically logout** - Automatically logs out the ad hoc event creator when the ad hoc event ends. This is disabled by default.
    - For the Pearl 2 and Pearl Mini, automatic logout only works if the touch screen was used to create the ad hoc event.

Upload schedule

These settings are optional - they are not required for deployment.

- **File upload schedule** - Select the check box to enable scheduled file uploads.
- **Start upload** - Select a start time for file uploads
- **Stop upload** - Select a finish time for file uploads.

Click **Apply** when you have configured your upload settings.

Advanced

These settings are optional - they are not required for deployment.

- **Kaltura groups** -Provide Kaltura admin owner privileges to members of a Kaltura group for any Kaltura events created on this device. Now when you create a new event, you can select a Kaltura Group as an Admin owner, so the group will have Kaltura admin owner privileges to the uploaded file.

  Pearl admin will only display groups created prior to this login session. If groups were created during the login session, log out and log in again to refresh the groups.

- **Kaltura monitoring dashboard** - Select to allow Pearl devices to be visible in Kaltura's **My Dashboard**. For more information on Kaltura's **My Dashboard** feature, contact your Kaltura administrator.

Select channels for Kaltura VOD events

You can select which Pearl-2 channels are included in scheduled and ad hoc recordings using the Admin panel. Each channel that is configured on Pearl-2 is treated as a separate video source for all VOD events. Using multiple channels is how you record multiple views for a scheduled or ad hoc VOD event.

For example, if you have a main camera and a presentation laptop that you want to capture as a multi-source recording, you'd create two channels on Pearl-2: one for the main camera and another one for the presentation laptop.

Set up your channels before performing this task. To learn how to create a channel, see Create a channel.

The main entry is the default view that people see when they are watching, as well as the main view (i.e. the large screen) for PiP. The main view, VOD metadata, and edits like trimming the VOD can be done later in Kaltura after the recording has uploaded.

Important consideration

- Ensure that all the same audio sources are selected for each channel if a multi-view event with multiple channels is configured.

Select channels for Kaltura VOD events using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.

3. Under **VOD event channels**, check the channels to include.
4. (Optional) Select a different **Main entry** channel for multi-view recordings.
5. Click **Apply** at the bottom of the page.

Failing to apply the changes could result in recording unwanted channels.

Select a channel and URLs for Kaltura webcasting events

You can select which Pearl-2 channel is used for scheduled and ad hoc webcasting events. Optionally, you can stream the event to a secondary backup stream URL.

When a webcasting event is scheduled in Kaltura or started from Pearl-2 as an unscheduled ad hoc event, the stream URL and other event settings are sent to Pearl-2. The Kaltura ingestion settings are applied automatically to Pearl-2.

When you create a Kaltura webcasting event on Pearl-2, you have the option to use the primary and backup URLs supplied by Kaltura for the stream or to choose a stream destination that is created locally for the channel on Pearl-2. Alternative streaming destinations must already be configured for the channel being webcast. Select the **Auto** option to use the primary and backup URLs supplied by Kaltura. Auto is the default setting.

Ensure that you have selected the channel on Pearl-2 that you want to use for your scheduled webcasting event well in advanced of the event start time. The first channel on Pearl-2 is selected by default.

When it's time for the scheduled webcasting event to start, Pearl-2 automatically sends an RTMP (or RTMPS) stream to the primary URL associated with that event. If you've enabled the backup stream, Pearl-2 sends an RTMP stream to both the primary URL and the secondary backup URL associated with that event. If the primary URL stream fails for any reason, Kaltura automatically switches over to the backup URL.

The channel you're streaming should have at least one layout, see Create a channel. For the correct encoding settings to use for the channel, see Kaltura's requirements.

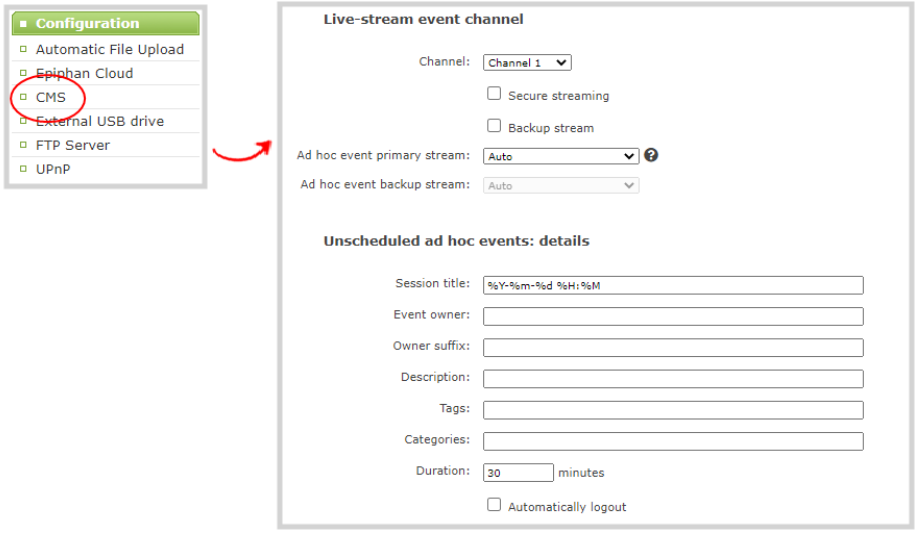
During the webcast, you can switch layouts using Pearl-2 for a more dynamic live broadcast. For information about creating layouts for a channel and switching, see: Custom layout configuration.

Important considerations

- Ensure that the same audio sources are selected on each layout if the channel is configured with multiple layouts for live switching.

Select channels and URLs for scheduled webcasting events using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Live-stream event channel**, select the channel you want to stream.
4. (Optional) Select an **Ad hoc event primary stream** from the drop-down list or select **Auto** to use the primary URL from Kaltura. If **Auto** is the only available option, then no additional streams are configured for the channel.
5. (Optional) Check **Backup stream** and select an **Ad hoc event backup stream** from the drop-down list. Select **Auto** to use the backup URL from Kaltura. If **Auto** is the only available option, then no additional streams are configured for the channel.
6. Click **Apply** at the bottom of the page.



Set Kaltura ad hoc event parameters

For ad hoc events, you can enter the metadata to associate with the uploaded media using the Admin panel. However, you can modify the metadata at any time using the Kaltura Management Console (KMC) after the content is uploaded.

Pearl-2 and Pearl Mini - The same channels that you select for scheduled VOD events using the Admin panel are the channels that are recorded for ad hoc events, see Select channels for Kaltura VOD events . Similarly, the channel you selected for scheduled webcasts is used for ad hoc webcast events, see Select a channel and URLs for Kaltura webcasting events.

Table 68 Kaltura ad hoc event parameters

Item	Description
Session title	This assigns a default title for ad hoc events. Default variables specify the current date and time as the title using the format **yyy-mm-dd hh:mm**. This default title can be changed when an ad hoc event is created.
Event owner	This assigns an owner to ad hoc events created using the Pearl device. The owner you enter here appears on the Login screen by default and can be overwritten when authenticating from Pearl-2 or Pearl Mini.
Owner suffix	Enter a suffix to be automatically applied to the Event owner field when users authenticate with Kaltura from the Pearl device (the Pearl Nano must use the Admin panel). For example, if the owner account is *wilson@myorg.com*, enter the suffix *@myorg.com* here so that the user only needs to enter *wilson* to authenticate.
Description	The description of the uploaded media that appears in Kaltura.
Tags	Assign tags to the uploaded media for use by Kaltura.
Categories	Assign Kaltura categories to the uploaded media. To assign a nested category to the uploaded media, use the ">" symbol (with no spaces) between categories. For example: Recordings>Tutorials>Biology1000 To assign multiple categories, separate the categories with a ",". For example: Recordings>Tutorials>Biology1000, Recordings>Tutorials>Chemistry1000
Duration	Assign a default duration for ad hoc events. This value can be changed when an ad hoc event is created.
Automatic logout	Automatically logs out the ad hoc event creator when the ad hoc event ends if the touch screen was used to create the ad hoc event. This is disabled by default.

Important considerations

- Before you start recording, we recommend that you enter the event parameters you want associated with ad hoc events using the Admin panel. However, users can modify or add this metadata later using the

Kaltura Management Console.

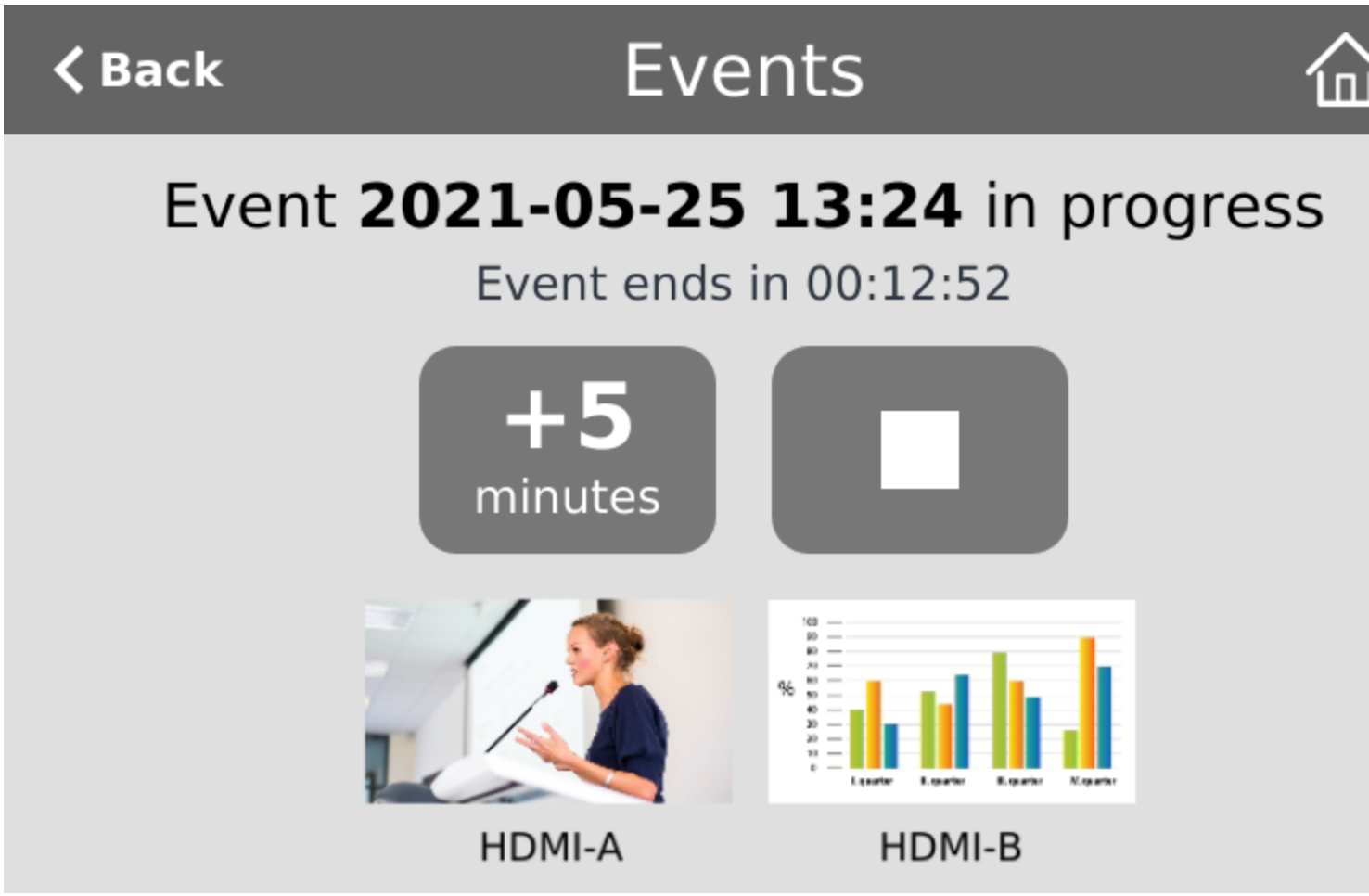
- CMS must be enabled and the Pearl device registered with Kaltura to create ad hoc events.

Set default ad hoc event parameters using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Unscheduled ad hoc events**, enter the information you want associated with this ad hoc event and click **Apply** at the bottom of the page.

Set the extend Kaltura CMS event interval

A button on the device screen lets users extend the length of an event that is in progress. By default, the event is extended in 5 minute intervals each time the button is tapped. Using the Admin panel, you can set the amount of time the event is extended to 5, 10, or 15 minute intervals. Events cannot be extended beyond the start of the next scheduled event.



Set the extend Kaltura CMS event interval using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Advanced**, select the **Extend event** time interval from the drop down list and click **Apply**.

Change the events schedule refresh interval

Using the Admin panel, you can change how frequently to poll Kaltura for the latest event information to refresh the events listed on the Events page. The default interval is once every 3600 seconds (1 hour).

Requesting updated information too frequently can impact performance. We recommend setting an interval of no less than 120 seconds (once every 2 minutes). The longest interval supported is 604800 seconds (once a week).

Change how often Pearl-2 polls Kaltura for the latest event information

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Advanced**, enter the Schedule refresh interval in seconds or choose a value from the drop down list. Click **Apply** at the bottom of the page.

Use RTMPS for a Kaltura webcasting event

The Pearl device sends an RTMP stream to the primary URL associated with the webcasting event, or to both the primary URL and the secondary backup URL if you've enabled the backup stream. For more information, see:

- **Pearl-2 and Pearl Mini** - Select a channel and URLs for Kaltura webcasting events.

You can configure Pearl device to send an RTMPS stream instead using the Admin panel.

Configure Pearl device to send an RTMPS stream using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Live-stream event channel**, check **Secure streaming** and click **Apply**.

Panopto registration

Pearl-2 is fully integrated with Panopto Content Management Systems (CMSs) for a seamless video recording and webcasting experience. After a simple registration process, Pearl-2 is available for your CMS users to select as a remote recorder resource or capture device for scheduled, recurring, and ad hoc events. Completed

recordings automatically upload to the CMS. Registering Pearl-2 as a remote recorder for Panopto only needs to be done once.

Topics include:

- Enable CMS and register with Panopto
- Disable CMS and disconnect from Panopto

After Pearl-2 is registered, proceed to create URL redirects for Pearl-2, setup authentication for ad hoc events, and select default settings. See Panopto recording and webcasting setup.

Enable CMS and register with Panopto

Use the Admin panel to register Pearl-2 as a remote recorder for scheduled, recurring, and ad hoc recordings and webcasts. When you register Pearl-2, a default name is assigned that includes the serial number of Pearl-2. This name appears in the list of remote recorders in Panopto. You can change the remote recorder name using the Admin panel.

Before you begin, you need:

- Your Panopto service URL, for example: `https://<myorg>.hosted.panopto.com/`
- A Panopto-generated registration key for the remote recorder.
- The Epiphan API key from Panopto is required for on-premise versions of Panopto version 6 or earlier. Contact Panopto support for assistance to install the Epiphan API key.

Important considerations

- You create a registration key in Panopto from **System > Remote Recorders** when you click **Manage registration keys**. Record the key somewhere safe before closing the screen in Panopto. The key cannot be retrieved after the screen is closed. If you lose the registration key, you must create a new one to register Pearl-2 as a remote recorder.
- Scheduled recordings are associated to a remote recorder using the registration key and not the device name.
- If you disconnect Pearl-2 and register again using a different registration key, the scheduled sessions previously associated with the original key do not migrate over.
- If you're using the on-premise version of Panopto version 6 or earlier, you must manually add the API key for Pearl-2. Contact Panopto support for assistance.
- If you are unable to register Pearl-2, contact your Panopto administrator or Epiphan support.

Enable Pearl-2 as a remote recorder and register with Panopto using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration page opens.
3. From the **Choose CMS** drop down, select **Panopto** and then click **Apply**.

4. Enter the Panopto **Service URL**, **Registration key**, and optionally enter a **Device name** you want to appear in Panopto for this device, then click **Apply** at the bottom of the page. The Status updates to Connected.

> Changing Panopto's device name for Pearl-2 does not change the name that is assigned to Pearl-2 in the Device info fields, see Configure device info, name, description, and location

What's next?

For Panopto, proceed to create URL redirects for Pearl-2, setup authentication for ad hoc events, and select default settings. See Panopto recording and webcasting setup.

> An API client ID with two URL redirects are required to enable authentication on Pearl-2, see Set up Panopto authentication for ad hoc events

Disable CMS and disconnect from Panopto

When you use the Admin panel to disable CMS on Pearl-2, the remote recorder disconnects from Panopto. As long as Pearl-2 is still registered, you can create new scheduled sessions in Panopto for this remote recorder, but the events schedule won't synchronize until CMS is re-enabled.

If CMS is re-enabled on Pearl-2 before a VOD session is scheduled to end, recording starts automatically on Pearl-2 when the connection to Panopto is re-established. However, when the start of a scheduled webcasting event is missed, the stream does not automatically start when the connection is re-established. A new webcasting event should be created.

Revoking the registration key and deleting Pearl-2 as a remote recorder is performed in Panopto, see Panopto's documentation for instructions. If you delete Pearl-2 in Panopto, all scheduled and recurring events that were associated with Pearl-2 are permanently deleted.

> Content Management Systems (CMSs) can change channel settings automatically. After disabling CMS on Pearl-2, it's good practice to check your channel settings or apply a configuration preset to restore your channel to known values.

Important considerations

- You cannot start unscheduled ad hoc events when CMS is disabled on Pearl-2.
- Sessions that are scheduled to start while CMS is disabled on Pearl-2 do not start on Pearl-2.
- Scheduled webcasting events do not start if Pearl-2's connection to Panopto is not available.
- Deleting Pearl-2 in Panopto permanently deletes future scheduled and recurring sessions associated with that remote recorder.
- Do not disable CMS while an event is in progress.

Disconnect Pearl-2 from Panopto using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. To disconnect Pearl-2, select **none** from the **Choose CMS** drop down and then click **Apply**.

Panopto recording and webcasting setup

Pearl-2 appears as an available resource as soon as the device is registered with Panopto. Next, set up authentication for ad hoc events to create ad hoc events from Pearl-2.

For more information about channels, see What is a channel?.

After that, you're ready to select video sources for multiple source recordings and webcasts. Video sources must be connected to Pearl-2 and assigned to a channel. Each channel configure on Pearl-2 is treated as a separate video source for multiple source events in Panopto.

Topics include:

- About Panopto recording and webcasting
- Set up Panopto authentication for ad hoc events
- Set Panopto ad hoc event parameters
- Set the extend Panopto CMS event interval
- Enable mute and display image on pause
- Disable low disk space Panopto alerts

About Panopto recording and webcasting

The Pearl device supports scheduled events, recurring events, and unscheduled ad hoc recordings and webcasts. Scheduled events start and end automatically. No manual intervention is required. After the event ends, recorded files automatically upload to the event owner's folder in Panopto. Backup recordings are also saved locally on Pearl Nano. If the network connection or the CMS goes down during an event, Pearl device continues to record locally and uploads the recording when network connectivity resumes.

Administrators can:

- Set up Panopto authentication for ad hoc events, see Set up Panopto authentication for ad hoc events.
- Set Panopto ad hoc event parameters, Set Panopto ad hoc event parameters.
- Change the extend event button time allotment in 5, 10, and 15 minute intervals, see Set the extend Panopto CMS event interval.
- Enable muting audio and displaying an event paused image when an event is paused, see Extend or pause CMS recordings and webcasts.
- Disable low disk space alert sent from Pearl-2, see Disable low disk space Panopto alerts.

- Create ad hoc events, see Create ad hoc events using the Admin panel.
- View the Events page to see all upcoming scheduled sessions and completed sessions, see View scheduled CMS events and history.
- Download local recordings for a channel, see Recover channel backup recordings.
- Start and stop scheduled events before the scheduled time, see Start/stop scheduled CMS events using the Admin panel.
- Extend and pause scheduled events, see Extend or pause CMS recordings and webcasts

General Information

- Starting or stopping a scheduled VOD event before the scheduled start or stop time does not change the event into an ad hoc event.
- Pearl-2 must be registered with Panopto to record and stream Panopto events, see Enable CMS and register with Panopto.
- The maximum allowed bitrate for webcasts in Panopto is 2.5 Mbps, regardless of what bitrate is actually set for the target resolution of the remote recorder in Panopto. For example, when creating a scheduled webcasting event in Panopto, if you set the target resolution to a quality of 1920 x 1080 60 fps Bitrate: 4000 kbps, Pearl-2 streams the event at the maximum bitrate of 2500 kbps.
- Scheduled events have priority over ad hoc events. If an ad hoc event is still in progress when it's time to start a scheduled event, the ad hoc event is stopped and the scheduled event starts.
- Scheduled VOD events automatically start recording locally on Pearl-2 even If the network is down or Panopto is unavailable. After the session ends, the locally recorded files upload automatically to your folder in Panopto when the network link to Panopto is re-established.
- Scheduled webcasting events do not start if Pearl-2's connection to the CMS is not available.
- If the network connection is lost during a file upload to Panopto, the transfer automatically restarts when the network connection re-establishes.
- If Pearl-2 loses power while a scheduled event is being recorded, the recording stops. If Pearl-2 is powered back on before the scheduled end time for the event, recording of the scheduled event restarts automatically and a second set of files are created. When the event ends, the files are uploaded to Panopto.
- If Pearl-2 was unavailable on the network or powered down and misses a scheduled event, the status of that event appears as **Skipped** on the Events page in the Admin panel.
- Do not use AFU or configure recording file size, type and other channel recording settings when CMS is enabled on Pearl-2.
- For ad hoc events, Pearl-2 ignores a user's presets that are set in Panopto. As a result, ad hoc recordings automatically upload to the user's default folder as originally assigned by Panopto.
- Channel encoding settings you make on Pearl-2 are overridden by the default encoding settings the system uses to record to Panopto.

For Panopto VOD events, if you manually stop a scheduled VOD event before the scheduled end time when Pearl-2 doesn't have network connectivity, Pearl-2 uploads the completed event's

recording when network connectivity resumes. However, Panopto does not recognize that the event has ended. The event remains in the In Progress state in Panopto and you must wait until the original event's scheduled end time before creating a new event using that Pearl-2.

Encoding settings

Default Panopto encoding settings are applied automatically to the channel when Panopto is enabled, which override the existing encoding settings. If you manually change the encoding settings using the Admin panel after Panopto is enabled, the settings revert back to the default Panopto settings when a scheduled or ad hoc event starts.

You can change the channel resolution in Panopto when creating a new scheduled or recurring session. Pearl-2 also supports Panopto device templates so you can quickly set up your Pearl-2 remote recorder when you create a new event.

Pearl-2 and Pearl Mini information

- Each Pearl-2 channel is treated as a separate video source that Panopto users can select when scheduling an event in Panopto.
- Do not use the Single Touch recording control when CMS is enabled.
- You can start and stop events earlier than the scheduled time, as well as pause an event using either the Admin panel or the touch screen on Pearl-2, as well as create ad hoc events.
- Use multiple Pearl-2 channels to get multiple views for a Panopto event. Each channel is treated as a separate video source. Using the Admin panel, Pearl-2 administrators can configure channels on Pearl-2 for multiple source recordings and separate channels for webcasts.
    - **Pearl-2** - configure up to six channels
    - **Pearl Mini** - configure up to three channels
    - For example, if you have a main camera and a presentation laptop that you want to capture as a multiple source recording, you'd create two channels on Pearl-2: one for the main camera and another one for the presentation laptop. To learn how to create a channel or to use the Auto channels, see Channel configuration.
- If you choose more than four Pearl-2 channels for a webcast in Panopto, then Panopto arbitrarily chooses a maximum of four channels to webcast.
- For ad hoc events, the default name of the multi-view file includes the date and start time of the event. For example: **2019-07-15 08:00**. A more intuitive name can be entered when the ad hoc event is created.
- To use the touchscreen on Pearl-2 to start, stop, pause, and create events, see CMS event controls using the touch screen.
- To monitor a channel during an event, you can display the Channel view on Pearl-2's touch screen, see Channel monitoring using the touch screen or monitor channels using the Admin panel. You can also monitor channels directly on the Events screen using the touch screen, see View scheduled CMS events and history. It's also possible to see a live preview of the channels and the audio level from the remote recorder page in Panopto.

- For multiple-source Panopto events that are manually stopped or have ended, if you use the Admin panel to delete a locally saved recording for any channel on Pearl-2 that hasn't yet uploaded to Panopto as part of the multiple-source event, that event remains in the In Progress state indefinitely in Panopto.
- **Pearl Mini only** - To record a scheduled session at 1920×1080@30 fps, you must select 1920×1080@60 fps for the remote recorder in Panopto when you create the scheduled session.

Set up Panopto authentication for ad hoc events

Panopto users can create unscheduled ad hoc events directly from the touch screen on Pearl-2 or using the Admin panel. You can set up Pearl-2 to allow users to authenticate using their local Panopto login credentials, their credentials for a third-party LMS integrated with Panopto (like Canvas), and SAML 2.0 credentials if configured on Panopto.

The Pearl device uses a JavaScript web application to negotiate authentication with Panopto. You must create a new API client ID and add two URL redirects in Panopto for ad hoc event authentication to work.

- One API client URL redirect is for Pearl-2.
- The other API client URL redirect is for the web-based Admin UI.

An API client ID and both URL redirects are required to enable ad hoc authentication on Pearl-2.

Before you begin, you need:

- Admin access to Panopto.
- A Pearl-2 remote recorder that's registered with Panopto.

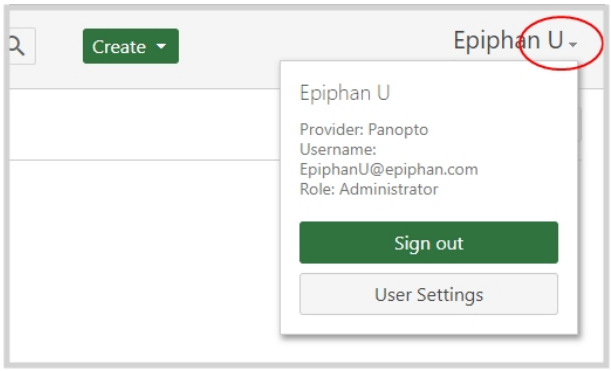
Important considerations

- Record all API client IDs and secret keys that are generated in Panopto somewhere safe. The ID and key cannot be retrieved after the screen is closed and must be regenerated if lost.
- You can use the same API Client ID to enable ad hoc authentication on multiple Pearl-2 systems; however, you must create a separate API client URL redirect for the web-based Admin UI of each individual Pearl-2 device.
- Third-party application authentication for ad hoc events is only supported for Panopto.

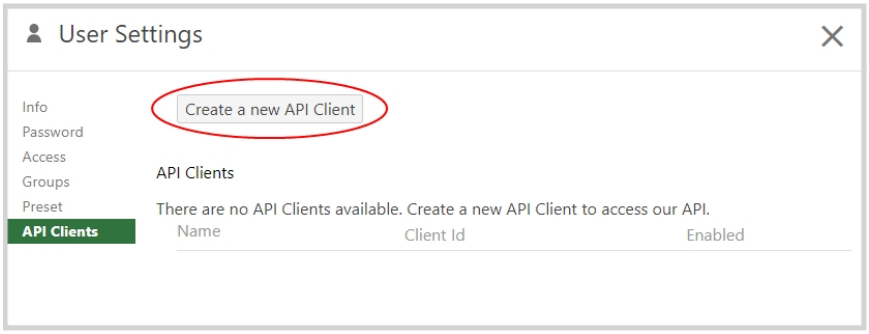
Enable ad hoc authentication on Pearl-2

1. Login to Panopto as an administrator.
2. In the header bar, click the arrow beside your user name and select **User Settings**. The User Settings

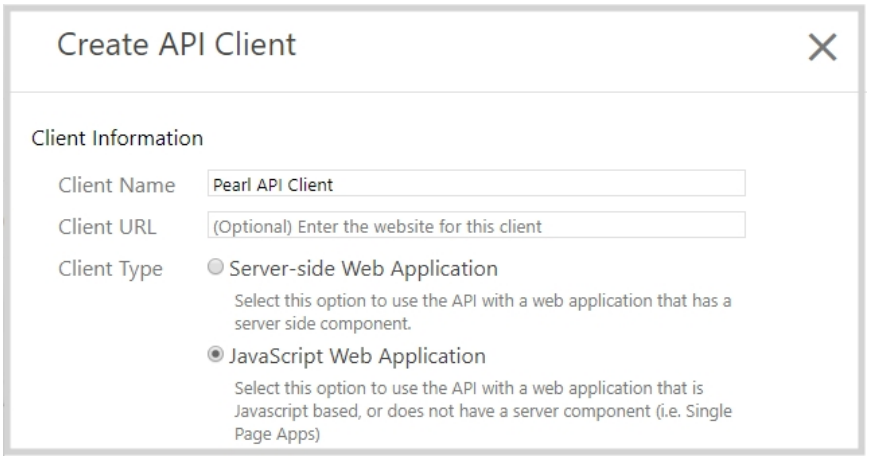
page opens.


Create
Epiphan U
Epiphan U
Provider: Panopto
Username:
EpiphanU@epiphan.com
Role: Administrator
Sign out
User Settings

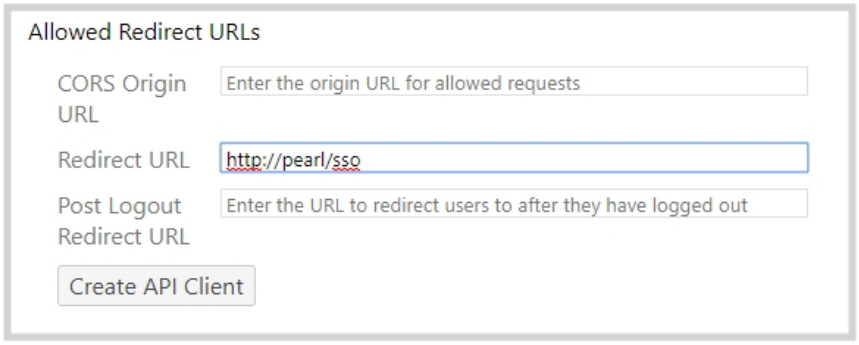
3. Create the API Client ID and URL redirect for Pearl-2. Do the following:
    a. From the User Settings page, click **API Clients**, and then click **Create a new API Client**. The Create API Client page opens.



    b. From the Create API Client page, enter a unique name for the Pearl-2 API client in the **Client Name field**. If a client already exists in Panopto with that name, choose a different name.

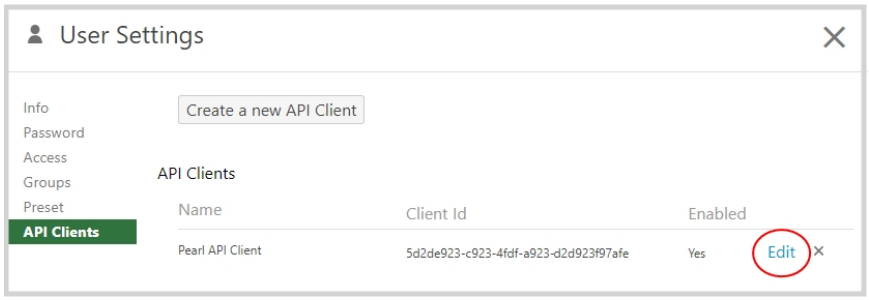


    c. In the **Client Type** field, select JavaScript Web Application. .
    d. **Pearl-2 and Pearl Mini only** - In the **Redirect URL** field, enter `http://pearl/sso` and then click **Create API Client**.



    e. On the **New API Client created** pop-up, record the Client ID and the Client Secret for future reference, and then click **OK**. The new Pearl API Client appears in your list of API clients.

4. Add a URL redirect for the web-based Admin panel to the Pearl API Client. Do the following:
    a. From the User Settings page under API Clients, click **Edit** beside the **Pearl API Client** that you just created.



    b. In the Allowed Redirect URLs field, enter `http://<device_ip>/admin/events` where `<device_ip>` is the IP address of Pearl-2.

> If Pearl-2 is configured for https, enter `https://` instead of `http://`.

    c. In the URL Type field, select **Redirect URL**.
    d. Click **Add URL**. The Admin panel URL redirect appears in the Allowed URL list.
5. Login to the Admin panel as **admin**, see Connect to the Admin panel.
6. From the Configuration menu, click **CMS**. The Content management system configuration page opens.
7. In the **Unscheduled ad hoc events** section, enter the Pearl-2 **API client id** that was generated earlier, and then click **Apply**.

Set Panopto ad hoc event parameters

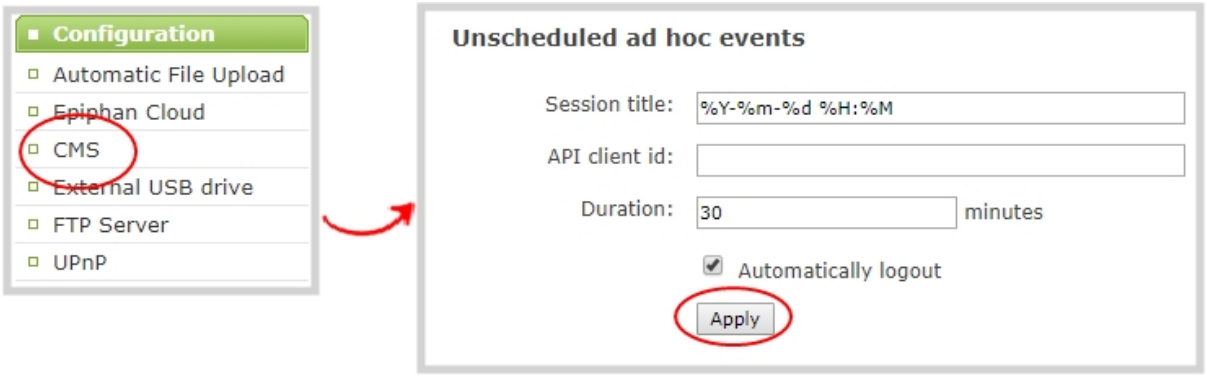
Using the Admin panel, you can set parameters that are associated with ad hoc events, including:

- **Session title**: This assigns a default title for ad hoc events. Default variables specify the current date and time as the title using the format **yyy-mm-dd hh:mm**. This default title can be changed when an ad hoc event is created.
- **API client id**: This is the API client ID that was generated for ad hoc event authentication, see Set up Panopto authentication for ad hoc events.
- **Duration**: Assign a default duration for ad hoc events. This value can be changed when an ad hoc event is created.
- **Automatic logout**: Automatically logs out the ad hoc event creator when the ad hoc event ends if the touch screen was used to create the ad hoc event.

> Pearl-2 must be connected to Panopto for this procedure to work.

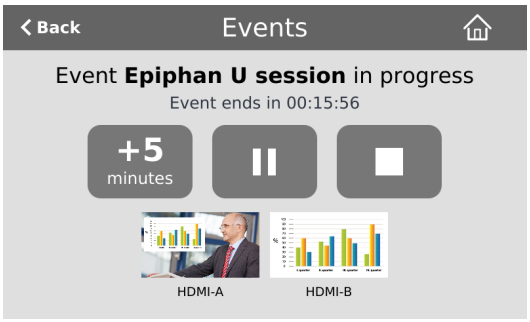
Enter Panopto ad hoc event parameters using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Unscheduled ad hoc events**, enter the information you want associated with this ad hoc event and click **Apply**



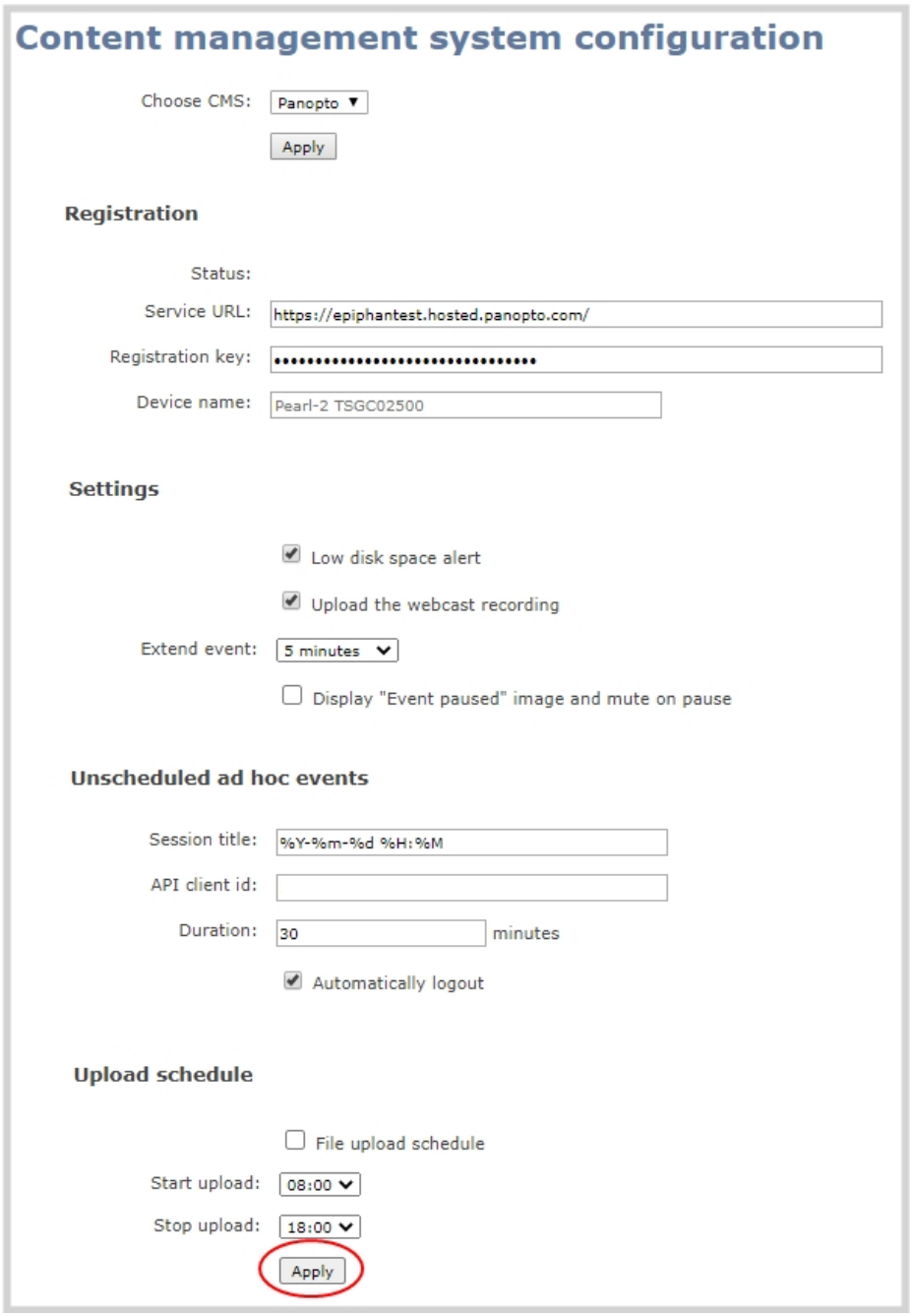
Set the extend Panopto CMS event interval

A button on the front screen lets users extend the length of an event that is in progress. By default, the event is extended in 5 minute intervals each time the button is tapped. Using the Admin panel, you can set the amount of time the event is extended to 5, 10, or 15 minute intervals. Events cannot be extended beyond the start of the next scheduled event.



Set the extend Panopto CMS event interval using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Settings**, select the **Extend event** time interval from the drop down list and click **Apply**.



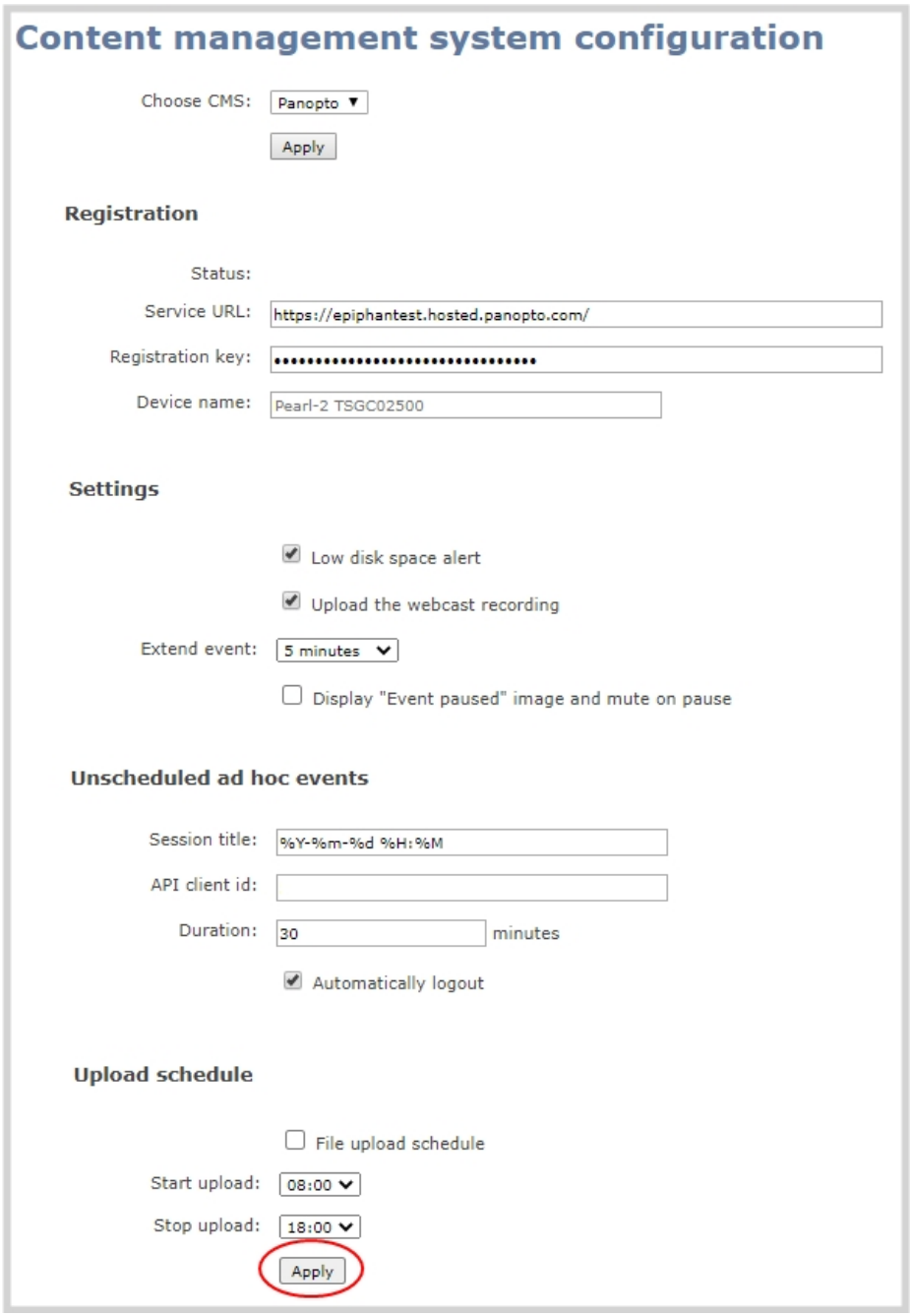
Enable mute and display image on pause

Using the Admin panel, you can set up Pearl-2 to automatically mute the audio and display an event paused image while a Panopto event is paused.

Pearl-2 records and uploads the full event to Panopto for processing. After the event is uploaded, Panopto removes the paused segments from the final recording. However, Panopto does not remove paused segments from webcasts. The complete webcast recording including the time the event was paused is retained.

Enable mute and display image on pause using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Settings**, check **Display "Event paused" image and mute on pause**, then click **Apply** at the bottom of the page.

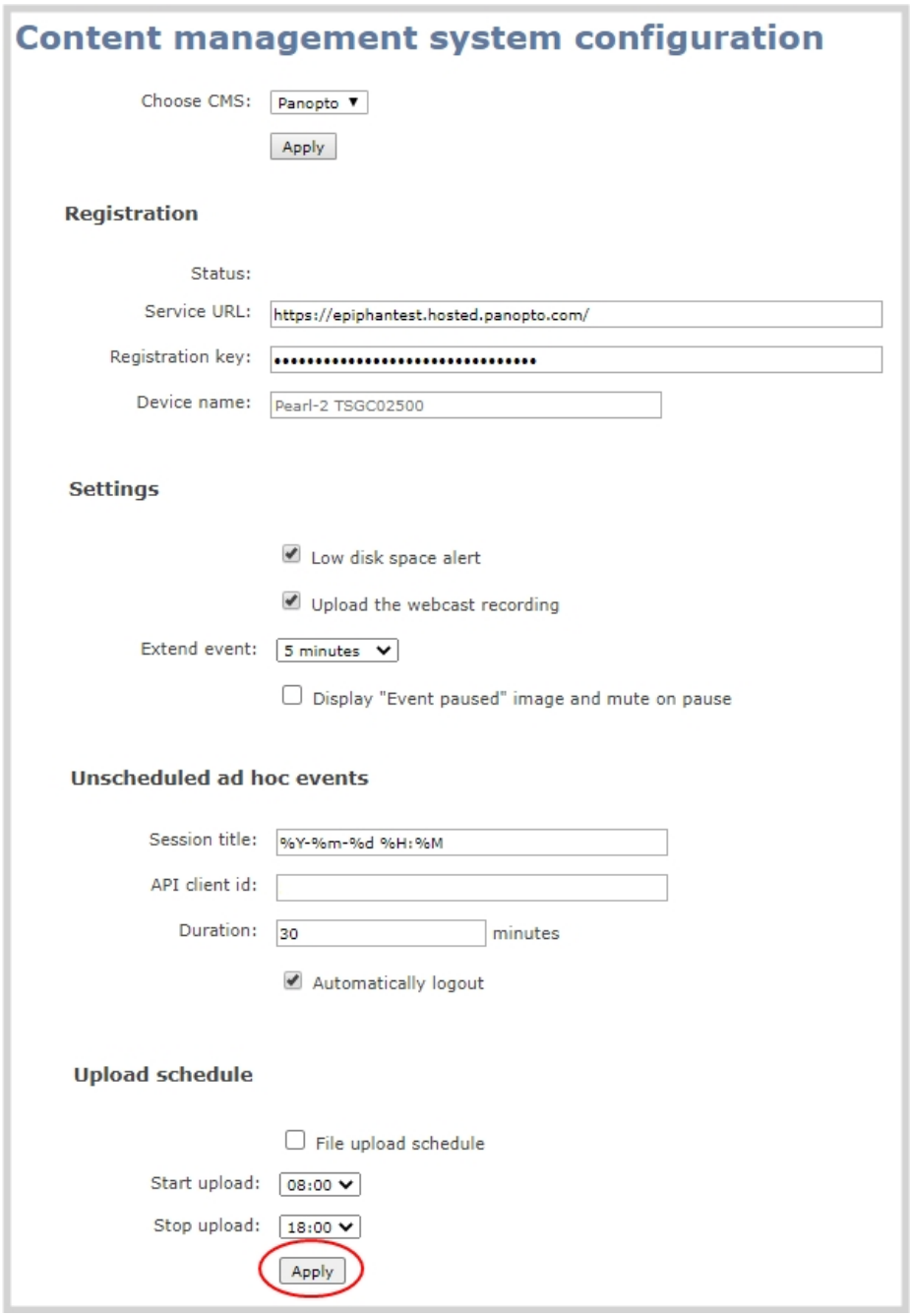


Disable low disk space Panopto alerts

Pearl-2 sends a low disk space alert to Panopto when the amount of internal storage space on the device is low. You can disable the low disk space alerts that Pearl-2 sends to Panopto using the Admin panel and enable it again at any time.

Disable low disk space Panopto alerts using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration page opens.
3. Under **Settings**, uncheck **Low disk space alert** and click **Apply** at the bottom of the page to disable sending these alerts to Panopto.



4. To enable this feature again, simply check **Low disk space alert** and click **Apply**.

YuJa setup

Pearl-2, Pearl Mini, and Pearl Nano hardware encoders integrate directly with YuJa. Once paired, Pearl can access your YuJa calendar to automatically start and stop recordings or streams at scheduled times.

Pearl automatically pushes event recordings to YuJa, minimizing administration time and ensuring your content makes it to the right place.

For more information see:

- YuJa known issues
- YuJa registration
- YuJa settings
- Creating, modifying, and deleting YuJa events
- Set the extend YuJa CMS event interval
- View YuJa events
- Accessing YuJa recordings

For additional information on YuJa, see YuJa's support page.

YuJa known issues

This section includes known issues or limitations that affect YuJa functionality or usability and ways that you can work around these limitations.

- If you delete a profile that is linked to a future event, Pearl will remember the profile's settings and apply them regardless of deletion. Instead, remove the profile from the event in YuJa before deletion.
- If the Pearl admin is taking a long time to load or apply YuJa settings, the YuJa server may be unavailable. The Pearl admin page may provide inaccurate information or no message at all. If you have trouble establishing a connection between your Pearl device and YuJa, contact Epiphan support.
- YuJa Video Platform may not always show accurate Pearl device connectivity status.
- Profiles may not be reflected accurately in YuJa previews. The YuJa preview may seem incorrect. However, YuJa streaming/recording will work as intended.
- If you rename your Pearl device in the YuJa interface, this name will not be updated in the Pearl admin or on the Pearl device.
- If you start an event early in YuJa using any Pearl interface and then extend the event, the event appears to extend but ends at the originally scheduled ending time.

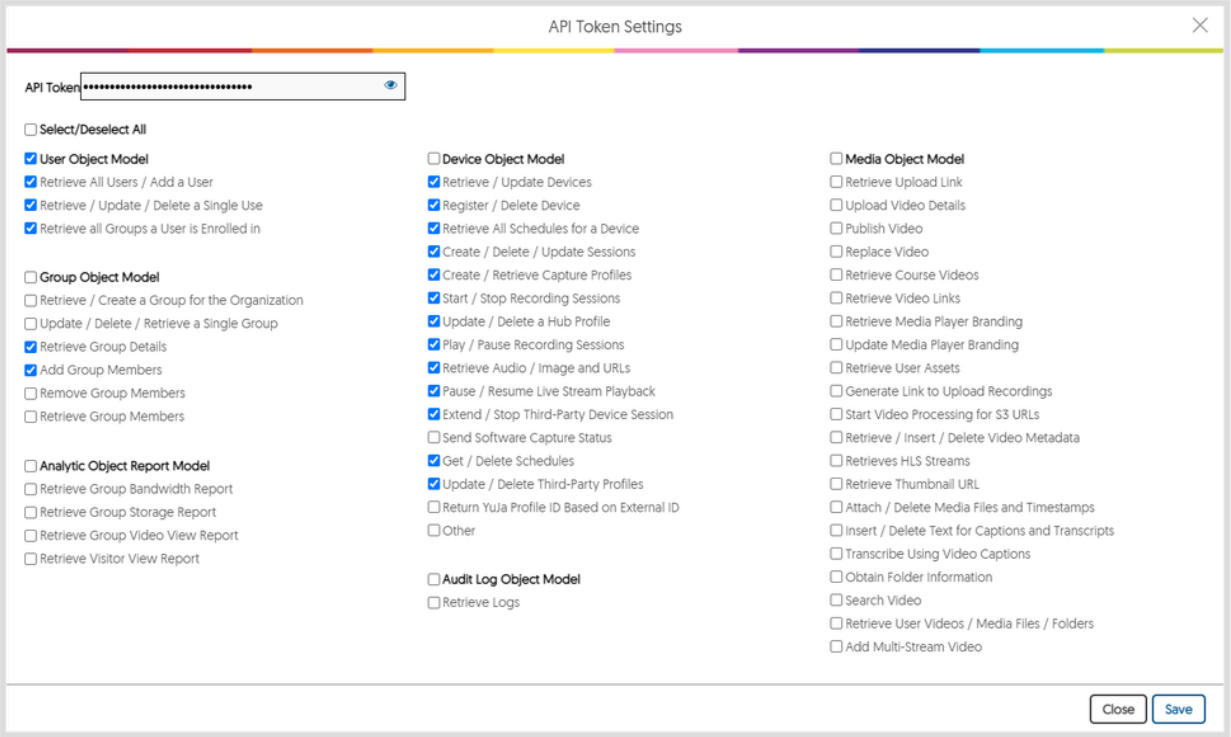
YuJa registration

Pearl devices are fully integrated with YuJa for a seamless video recording and webcasting experience. After your Pearl device is registered, it appears as a resource in YuJa's device list and can be selected for scheduled recordings and webcasts. Registering a Pearl device with YuJa only needs to be done once.

To register your Pearl device with YuJa:

1. Log in to the Admin panel as **admin**. For more information, see Connect to the Admin panel.
2. Click **CMS** in the **Configuration** panel.

3. Select **YuJa** in the **Choose CMS** dropdown. Click **Apply**.
4. When integrating YuJa with Pearl-2 you'll need an authentication token. In YuJa this is also called an API Token. For information on finding the API Token in YuJa, contact your YuJa administrator.
    - When generating an API token ensure that it has at least the same permissions as in the image below or the integration will not work correctly,



5. Enter the following information into the **YuJa settings** section of the page:
    - **YuJa Service URL**: This is your organization's unique URL for YuJa. It will look like this:

      https://your-organization.yuja.com/

      For more information on your YuJa Service URL, contact your YuJa administrator.
    - **Authentication token**: This is a randomly generated series of numbers and letters provided by YuJa that is mentioned in the previous step. In YuJa it is called an API Token. Copy and paste an API Token in here.
    - **User ID Type**: Select **Username**
    - **User ID**: Enter your YuJa user name.
    - **Device name**: Label your Pearl device something that will make sense when you (and others) read it in YuJa. For example, "Biology Lab 1" or "Classroom 237".
6. Click **Apply**. If the information was entered successfully, the **Status** will update to **Registered**.

Once your Pearl device is registered with YuJa, YuJa will recognize your Pearl device and it will appear in the YuJa list of devices. After registering your product, see YuJa settings to configure the Pearl device for YuJa.

To deregister your Pearl device from YuJa, click **Deregister device** in the **YuJa settings** section.

YuJa settings

The following list of features is available once your Pearl device has been registered with YuJa. For more information on registering your Pearl device, see YuJa registration.

If you select Motion JPEG encoding, it will be overridden. Contact your YuJa administrator to ensure your Pearl channels are correctly configured for YuJa.

YuJa profiles

Profiles tell Pearl which channels will be recorded and/or streamed for a scheduled YuJa event.

For example, your Pearl 2 may have a channel connected to a laptop called **Slides** and a channel called **Camera**. YuJa can capture up to three channels simultaneously, or a single channel.

Click **+ Create new** to create a new profile or **Select a profile** from the list.

Profile configuration

- **Profile name** - Enter the name for the profile.
- **Channel configuration** - Select which channels will be recorded and/or streamed when this profile is used for a scheduled event.
- **Live streaming** - Enable or disable live streaming for this profile. When live streaming is enabled for this profile, the selected channel(s) will be live streamed when this profile is selected for a scheduled event.

Click **Apply** when you have configured your profile.

All channels that are live streamed for an event are also recorded locally and uploaded to YuJa when the event ends.

Upload Settings

These settings are optional - they are not required for deployment.

- **File upload schedule** - Select the check box to enable scheduled file uploads. If enabled, locally recorded files will only be uploaded to YuJa between the start and stop upload times.
- **Start upload** - Select a start time for file uploads
- **Stop upload** - Select a finish time for file uploads.

Click **Apply** when you have configured your upload settings.

YuJa events must be scheduled in YuJa. To view YuJa events in the Pearl admin panel, click **Events** and look under **Scheduled events**.

Creating, modifying, and deleting YuJa events

Once a Pearl device is registered with YuJa, scheduled events can be created, modified, and deleted.

All creation, modification, and deletion of YuJa events must be done from the YuJa interface. To learn more about creating, modifying, and deleting events in YuJa, contact your YuJa administrator.

Once an event has been created in YuJa, view the event in the Pearl Admin panel by clicking **Events** in the navigation pane.

Once an event is scheduled in YuJa, click **Refresh schedule** in the Pearl Admin panel and the event will appear. Alternatively, wait five minutes for the Pearl device to automatically refresh and pull scheduled events from YuJa.

Do not restart your Pearl device during a YuJa scheduled event.

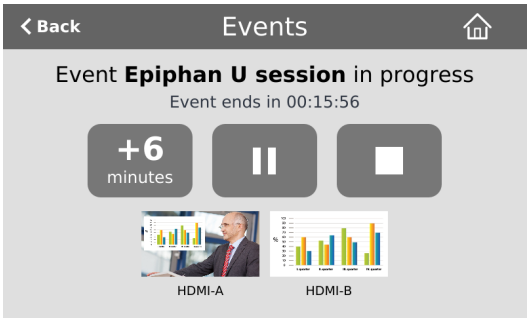
Accessing YuJa recordings

All YuJa recordings are automatically uploaded to YuJa. For more information on accessing the recordings, contact your YuJa administrator.

The Pearl device's Automatic File Upload (AFU) feature is not available when the Pearl device is registered to YuJa.

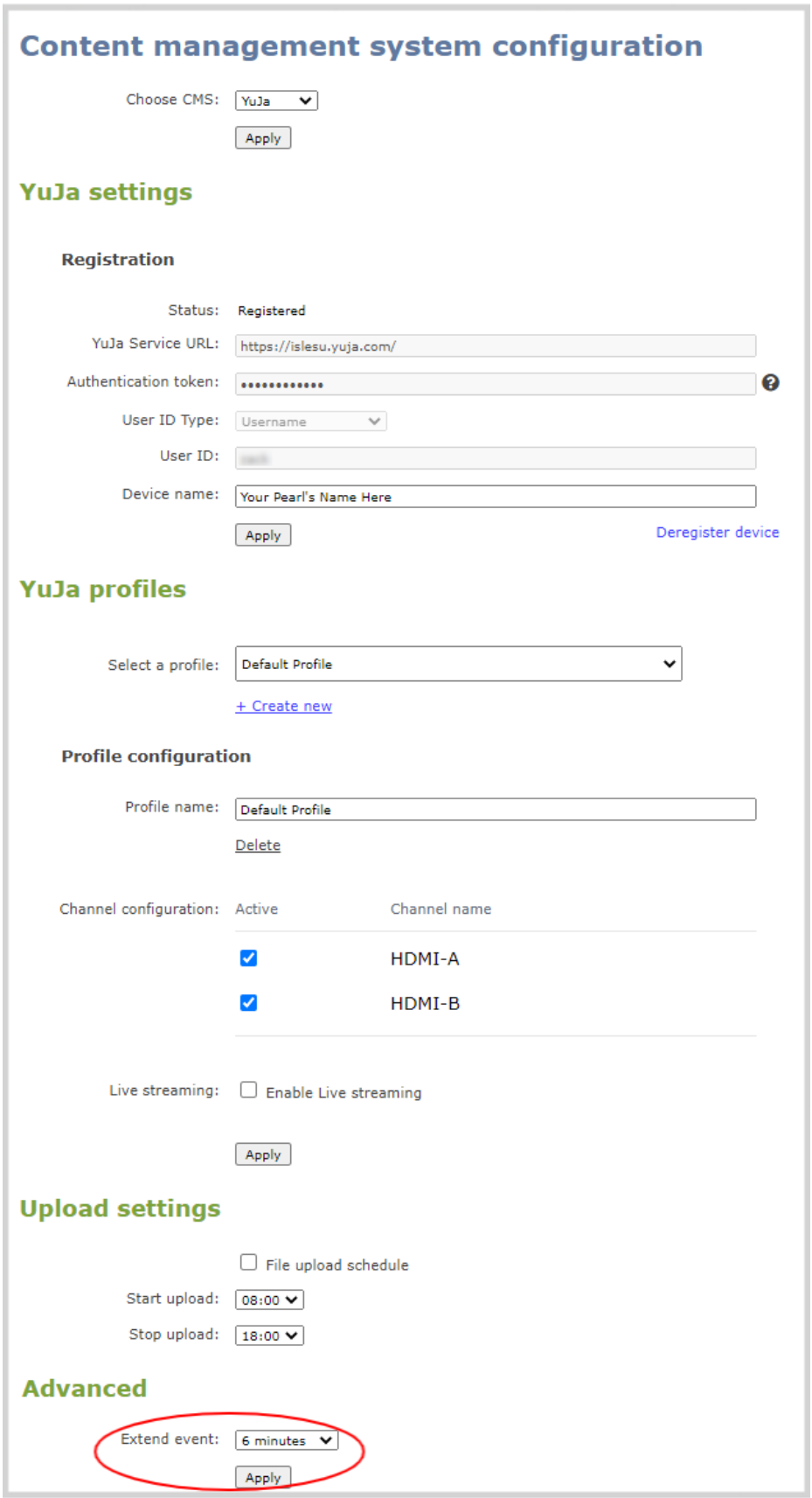
Set the extend YuJa CMS event interval

A button on the front screen lets users extend the length of an event that is in progress. By default, the event is extended in 6 minute intervals each time the button is tapped. Using the Admin panel, you can set the amount of time the event is extended to 6, 10, or 15 minute intervals. Events cannot be extended beyond the start of the next scheduled event.



Set the extend YuJa CMS event interval using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Settings**, select the **Extend event** time interval from the drop down list and click **Apply**.


Content management system configuration
Choose CMS: YuJa
Apply
YuJa settings
Registration
Status: Registered
YuJa Service URL: https://islesu.yuja.com/
Authentication token: ••••••••••••
User ID Type: Username
User ID:
Device name: Your Pearl's Name Here
Apply
Deregister device
YuJa profiles
Select a profile: Default Profile
+ Create new
Profile configuration
Profile name: Default Profile
Delete
Channel configuration: Active Channel name
HDMI-A
HDMI-B
Live streaming: Enable Live streaming
Apply
Upload settings
File upload schedule
Start upload: 08:00
Stop upload: 18:00
Advanced
Extend event: 6 minutes
Apply

View YuJa events

There are several ways to view YuJa events linked to your Pearl device:

- **Pearl Admin panel** - Log in to the Pearl Admin panel as admin, then click **Events** in the Pearl Admin navigation pane.
- **Epiphan Cloud -** Log in to Epiphan Cloud, then click **Events** in the Epiphan Cloud navigation pane.
- **Pearl device screen** - Select the **Events** screen on your Pearl device's touch screen or front screen to display any upcoming YuJa events and any YuJa event in progress.
- **MultiViewer** - Enable CMS events for MultiViewer and MultiViewer will display event name, time left before event start, and current event details.
- **YuJa** - Contact your YuJa administrator to view YuJa events.

CMS recording and webcasting control

Pearl-2 appears as an available resource as soon as the device is registered with your CMS and records scheduled events, recurring events, and unscheduled ad hoc events for Kaltura and Panopto CMSs. Connect multiple audio and video sources directly to Pearl-2 and record content from HD cameras, document cameras, HDMI output from computers, and even digital microscope cameras.

Scheduled events start and end automatically. No manual intervention is required. After the event ends, recorded files automatically upload to the CMS. If the network connection or the CMS goes down during an event, it records locally on Pearl-2 and uploads automatically when network connectivity resumes. You can manually control recording and webcasting using the Admin panel or the device screen. Back up recordings are easily recovered using the Admin panel.

Do not schedule recordings that are longer than the capacity of Pearl-2 to store the recording on it's local drive.

Do not remove your storage device from the Pearl device during a recording.

Topics include:

- Set up a CMS start screen
- Start/stop scheduled CMS events using the Admin panel
- Stop/start scheduled CMS events using the touch screen
- Extend or pause CMS recordings and webcasts
- Create ad hoc events using the Admin panel
- Create ad hoc events using the touch screen
- Log out of an ad hoc session

- Schedule when CMS event recordings upload
- Recover channel backup recordings

For important considerations before recording or webcasting to a CMS, see About Kaltura recording and webcasting and About Panopto recording and webcasting.

Set up a CMS start screen

You can use the Admin panel to set the Pearl device to show the Content Management System (CMS) Events screen on the Pearl device screen at start up. You can also lock the start screen to restrict access to any other screen. Locking the start screen is useful when operating the Pearl device in public spaces, classrooms, and unmanned kiosks.

To access the touch screen configuration page (front screen configuration page on Pearl Nano), click **Touch Screen** (**Front Screen** for Pearl Nano) in the navigation pane of the Admin panel.

The start screen options for CMS event control are:

- **Default**: The CMS Events screen appears automatically on the device screen when CMS is enabled and there's an upcoming scheduled event. On Pearl-2 or Pearl Mini you can also tap the calendar icon at the bottom of the touch screen.
- **Content Management System**: The CMS Events screen displays automatically on the device screen when you power on the Pearl device. Operators can still navigate to other screens using the device screen.
- **Start screen locked mode**: The CMS Events start screen is the only screen that displays on the screen of the Pearl device. Operators cannot navigate to other screens.

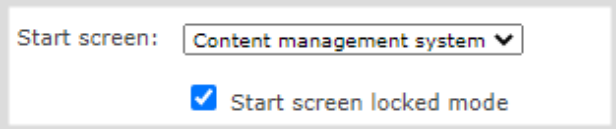
If no 4-digit PIN set when the start screen is in locked mode, you can access the CMS Events start screen right away. However, you cannot access any other screens.

If you set a 4-digit PIN when the start screen is in locked mode, a lock appears in the top right of the start screen. You must enter the PIN to unlock the CMS Events start screen and access the other screens. When you return to the CMS Events start screen, Pearl device automatically locks itself and you must re-enter the 4-digit PIN to unlock the screen.

To learn more about the CMS Events screen, see CMS event controls using the touch screen.

Setup a CMS Events start screen using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Touch Screen** (**Front Screen** on Nano). The **Touch Screen/Front Screen** configuration page opens.
3. From the **Start screen** drop-down menu, select **Content Management System**.
4. (Optional) Check **Start screen locked mode** and set a 4-digit PIN. For more information about setting a PIN, see Set a PIN security code.



5. Click **Apply**.

If you chose **Content Management System**, the Pearl device screen automatically refreshes to display the CMS Events screen.

Start/stop scheduled CMS events using the Admin panel

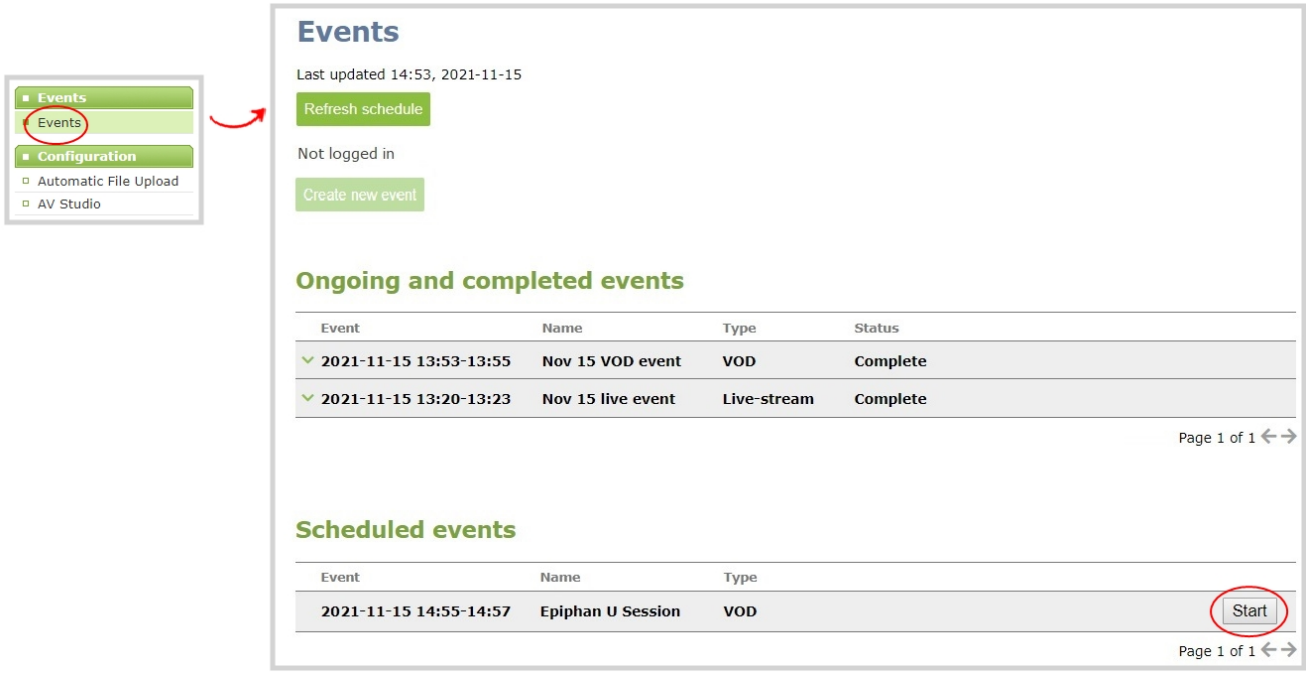
You can start scheduled CMS events from the Events menu using the Admin panel and stop events before their scheduled end time. After an event ends, the recorded video files upload automatically to the CMS.

Important considerations

- If you manually stop a scheduled Panopto VOD event before the scheduled end time when the Pearl device doesn't have network connectivity, the Pearl device uploads the completed event's recording when network connectivity resumes. However, Panopto does not recognize that the event has ended. The event remains in the In Progress state in Panopto and you must wait until the original event's scheduled end time before creating a new event using that Pearl device.
- For multiple-source Panopto events that are manually stopped or have ended, if you use the Admin panel to delete a locally saved recording for any channel on Pearl 2 or Pearl Mini that hasn't yet uploaded to Panopto as part of the multiple-source event, that event remains in the In Progress state indefinitely in Panopto.
- Do not power down a Pearl device while a scheduled webcast event is in progress. The webcast ends but the RTMP stream that was created automatically on the Pearl device is not deleted from the channel's Streaming page. Use the Admin panel to manually delete the webcast stream instance from the channel's Streaming page.

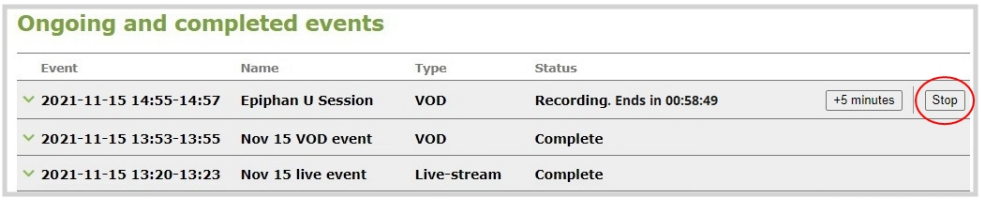
Start a scheduled CMS event using the Admin panel

From the Admin panel, select the Events menu and click **Start** beside the scheduled event on the Events page.



Stop a scheduled CMS event using the Admin panel

Under **Ongoing and completed events**, a **Stop** button appears beside the event while the event is recording. You can select that to stop the event before the scheduled end time.



TIP: In the Admin panel, you can click **Refresh schedule** at any time to manually update the events listed on the Events page.

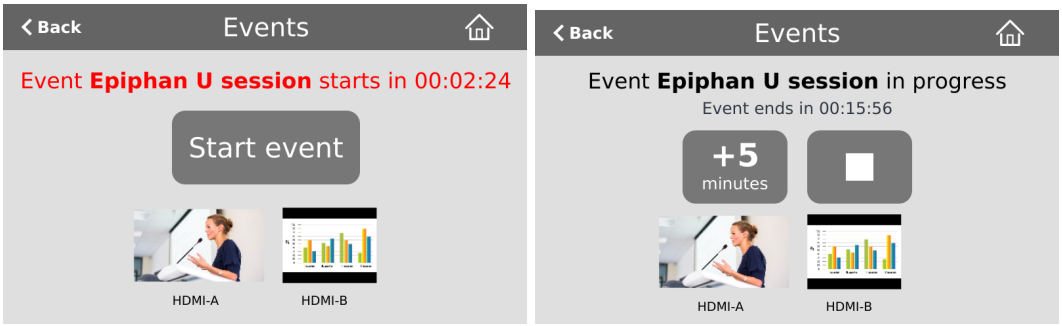
After the event ends, it may take a while for content to show up in Kaltura's media lists, depending on how busy the Kaltura CMS system is at the time.

Stop/start scheduled CMS events using the touch screen

You can use Pearl 2 or Pearl Mini's touch screen to manually start scheduled events up to thirty minutes before the scheduled start time. A calendar icon appears when CMS is set up on the Pearl device.

From the touch screen, tap the calendar icon to display the Events screen or wait for the Events screen to appear automatically about five minutes before the event starts.

Tap **Start event** to start recording or webcasting right away. When you're done, tap the **square** stop event button or just wait for the event to stop automatically at the scheduled time. After you confirm your selection, the event recording uploads automatically to your CMS.



If there's more than five minutes before the next scheduled event, a **Create event** button for ad hoc events appears beside the **Start event** button. For more about the different Events screens, see CMS event controls using the touch screen.

Important information

- The Pearl device must already be registered with your CMS to appear listed as a remote recorder resource in the CMS. Contact your CMS administrator responsible for setting up hardware encoders for your organization if the Pearl device isn't listed as a resource or the calendar icon does not appear on the touch screen.
- For Kaltura, each channel on the Pearl device corresponds to a separate video source, which are treated as separate views for multi-view recordings.
- For Kaltura, the channel used for live streaming is pre-configured by the Pearl administrator.
- The number of channels on the Pearl device are pre-configured by the Pearl administrator. However, you can physically connect different video sources to the video inputs on Pearl device.
- Panopto users can choose which channels on the Pearl device to include when scheduling a multiple source recording or webcast in Panopto.
- Only Pearl administrators can create or delete channels on the Pearl device.

- The primary and secondary video sources you select in Panopto correspond to individual channels configured on the Pearl device. Panopto users select the resolution for each video source in Panopto when a new scheduled or recurring session is created. The encoding settings are applied automatically to the channels on the Pearl device.
- After the event ends, recordings automatically upload to the CMS. It may take a while for content to show up in Kaltura's media lists, depending on how busy the Kaltura CMS system is at that time. Recordings are associated with the user account that scheduled the event.
- If network connectivity is lost during a scheduled VOD event, the Pearl device continues to record the event locally. When network connectivity re-establishes and the event ends, the recording uploads to the CMS as expected.
- See your Pearl administrator if you need to add or remove channels on the Pearl device. For information about Pearl device administration and control using the Admin panel, see Integration.

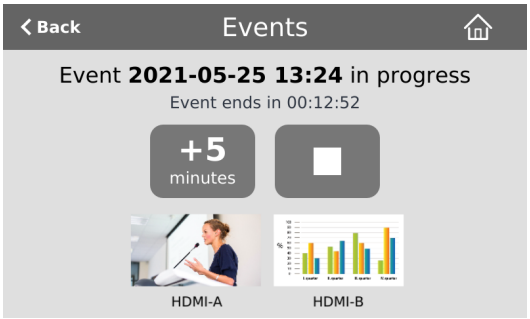
For Panopto VOD events, if you manually stop a scheduled VOD event before the scheduled end time when the Pearl device doesn't have network connectivity, the Pearl device uploads the completed event's recording when network connectivity resumes. However, Panopto does not recognize that the event has ended. The event remains in the In Progress state in Panopto and you must wait until the original event's scheduled end time before creating a new event using that Pearl device.

Extend or pause CMS recordings and webcasts

You can extend an active scheduled or ad hoc event using the Pearl device's front screen or the Admin panel. The extend event button can be configured to add 5, 10, or 15 minutes to the event each time it is selected, or 6, 10, or 15 in the case of YuJa. See Set the extend Kaltura CMS event interval, Set the extend Panopto CMS event interval, or Set the extend YuJa CMS event interval, depending on the integrated CMS.

The option to extend the event appears on the Events screen while the event is in progress. Events cannot be extended beyond the start of the next scheduled event.

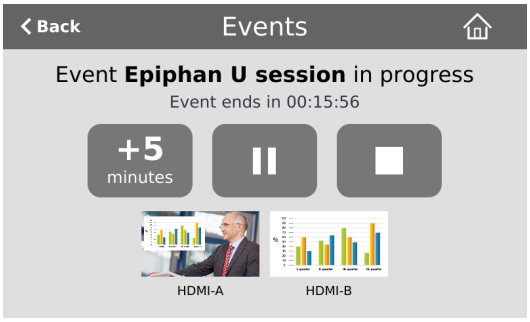
On the Pearl-2 and Pearl Mini, tap the button to add the specified amount of time to the current event.



For Panopto and YuJa events, you can also pause active recordings and webcasts from the Pearl device screen or using the Admin panel. An extra pause button appears on the Events screen. For Panopto you can also set up

your Pearl device to mute the audio and display an event paused image to let your viewers know the event is paused, see Enable mute and display image on pause.

If **mute on pause** and the on-screen **pause illustration** are not enabled on your Pearl device, your viewers watching the stream can see and hear the live webcast while the event is paused, as well as in the recording in Panopto.



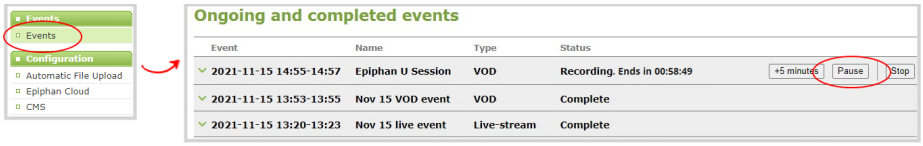
Important information

- The Pearl device records and uploads the full event to Panopto, or YuJa, for processing. After the event is uploaded, the CMS platform removes the paused segments from the final recording. However, Panopto and YuJa do not remove paused segments from webcasts. The complete webcast recording including the time the event was paused is kept.
- If audio doesn't mute and an event paused screen doesn't appear, you must enable that feature using the Admin panel, see Enable mute and display image on pause.

Extend or pause an event using the Admin panel

1. From the Admin panel, select the Events menu and then click the button to extend the current event. In this example, the button adds **+5 minutes** each time it is pressed.

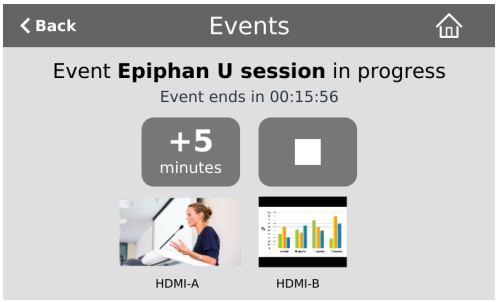
2. If this is a Panopto, or YuJa, event, you can select **Pause** to pause the current event. When paused, the button changes to Resume. When you're ready to continue, select **Resume**.



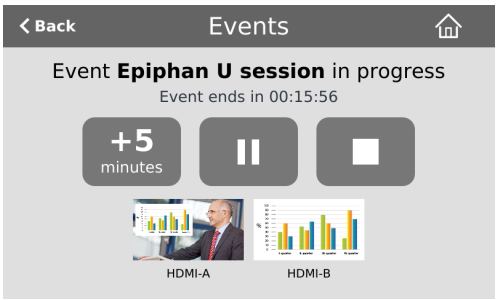
Extend or pause an event using the touch screen on Pearl-2 or Pearl Mini

1. From the touch screen, tap the calendar icon to display the Events screen.

2. Tap the button to extend the current event. In this example, the button adds **+5 minutes** each time it is tapped.



3. If this is a Panopto, or YuJa, event, you can select **Pause** to pause the current event. When paused, the button changes to Resume. When you're ready to continue, select **Resume**.



Create ad hoc events using the Admin panel

You can create and start an ad hoc recording or webcast using the Admin panel. Your Pearl device must be registered with your CMS to create ad hoc events, seeIntegration .

You must authenticate using your CMS login credentials before you can enter the ad hoc event details and start the event. Contact your CMS administrator if authentication fails and login is denied.

User accounts must be defined on the CMS itself and not a subsidiary system such as an LMS.

Kaltura event details

Table 69 Kaltura ad hoc event details

Item	Description
Event owner	The event owner will be the email connected to your Kaltura account.
Full name	The full name associated with the Kaltura account.
Admin owner	Select a Kaltura user group from the drop down list. The groups listed here are groups that the event creator is a member of. Kaltura groups must be enabled from the Kaltura settings page. For more information, see Kaltura settings.
Session title	Enter a unique name for the ad hoc event. If no name is entered, a default event consisting of the current date and time is applied. For example: 2019-07-04 13:22
Description	Enter a description of the event.
Tags	Add Kaltura search tags separated by commas. For example: tag1, tag2, tag3.
Category	Add a Kaltura category.
Duration	Select the event duration in minutes from the drop down list or enter a value using your keyboard. Select a value from 5 to 240 minutes or enter a value using your keyboard.
Event type	Choose either VOD (Video on Demand), Live-stream, or VOD + Live-stream as the ad hoc event type.

Panopto event details

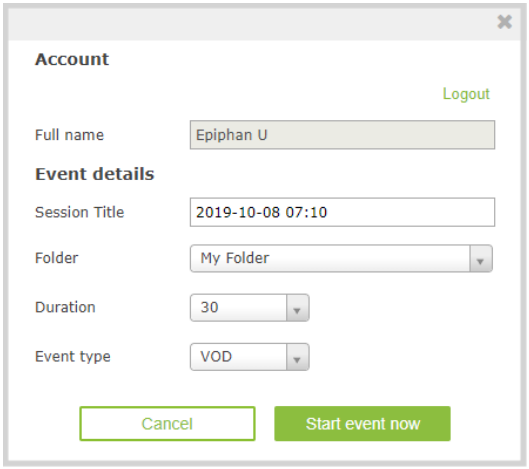
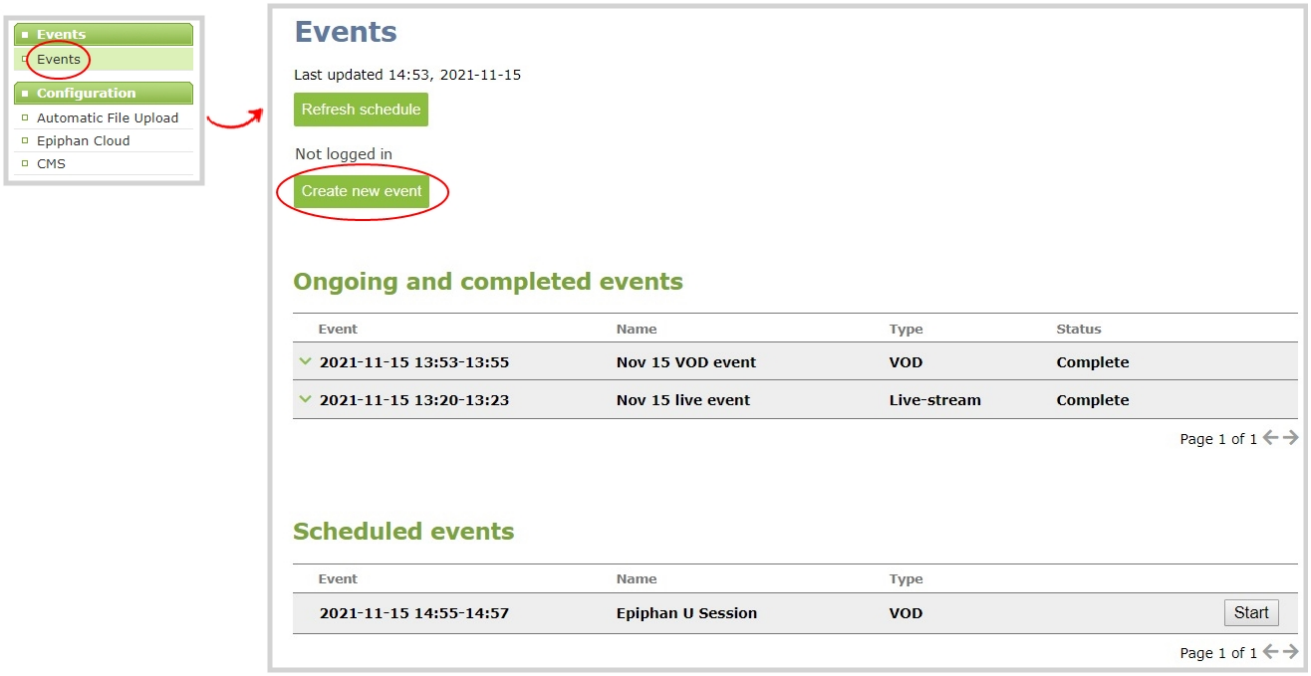


Table 70 Panopto ad hoc event details

Item	Description
Session title	Enter a unique name for the ad hoc event. If no name is entered, a default event consisting of the current date and time is applied. For example: 2021-07-04 13:22
Folder	Select the folder in Panopto where you want the recorded file to upload. Your Panopto MyFolder is the default folder. For ad hoc events, the Pearl device ignores a user's presets that are set in Panopto. As a result, ad hoc recordings automatically upload to the user's default folder as originally assigned by Panopto.
Duration	Select the event duration in minutes from the drop down list or enter a value using your keyboard. Select a value from 5 to 240 minutes or enter a value using your keyboard.
Event type	Choose either VOD or Live-stream as the ad hoc event type.

Create an ad hoc event using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Events menu, click **Events**. The Events page opens.



3. Click **Create new event**. A pop-up window appears.
    a. For Kaltura: In the Event owner field, enter your Kaltura user ID as your CMS login credentials, then click **Login**. After you're authenticated, your user name appears in the **Full name** field and you can enter the ad hoc event details.
    b. For Panopto: Enter your Panopto CMS user name and password in the login window, then click **Sign in**. In the events details pop up, your user name appears in the **Full name** field and you can enter the ad hoc event details.

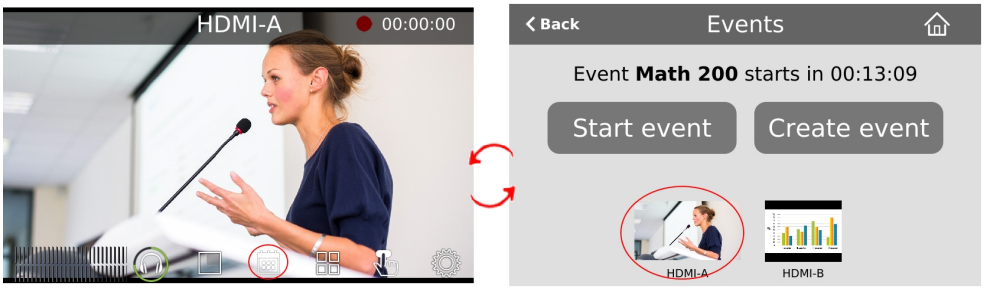
    If you get the login error that your account is not active, your CMS has blocked your account. If login to the CMS is denied, the account you entered may not exist or may not have access rights to create an ad hoc event using Pearl device. Contact your CMS administrator for CMS related login and account issues.

4. Click **Start event now** when you're ready to start recording or Live-streaming. Or click **Cancel**.

    When you're done creating ad hoc events, it's good practice to log out of the CMS so that nobody can use your CMS account to create events using the Admin panel, see Log out of an ad hoc session.

Create ad hoc events using the touch screen

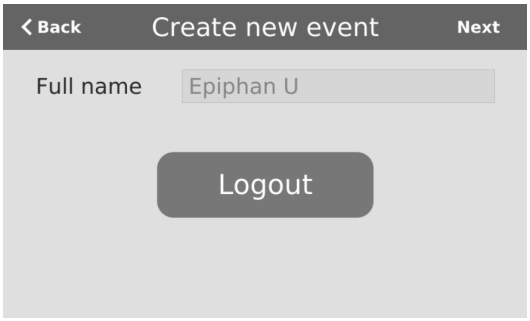
You can create unscheduled ad hoc recordings and webcasts directly from Pearl-2 or Pearl Mini's touch screen using the Events screen. To manually display the Events screen, just tap the Calendar icon that appears along the bottom of the Channel view. Tapping a thumbnail takes you back to the Channel view where you can monitor a live preview of the video source and check the audio VU meters. For more about the Channel view, see **The touchscreen channel view**.



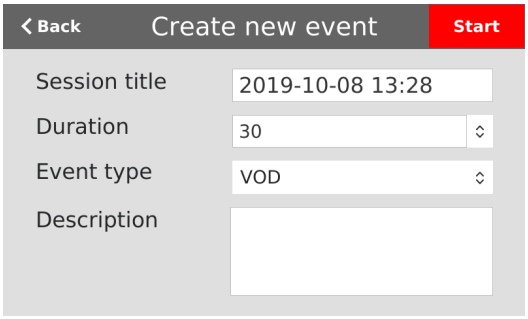
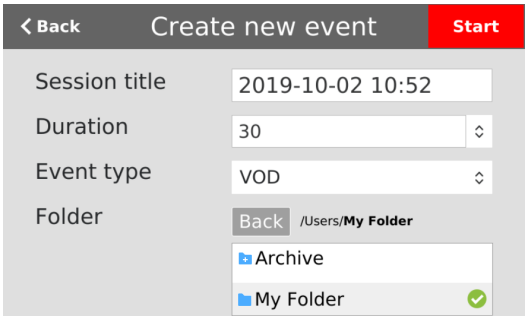
In this example, the scheduled event **Math 200** starts in about 13 minutes. To create an ad hoc event, tap **Create event** and login using your CMS login credentials.

If you get the login error that your account is not active, your CMS has blocked your account. If login to the CMS is denied, the account you entered may not exist or may not have access rights to create an ad hoc event using the Pearl device. Contact your CMS administrator for CMS related login and account issues.

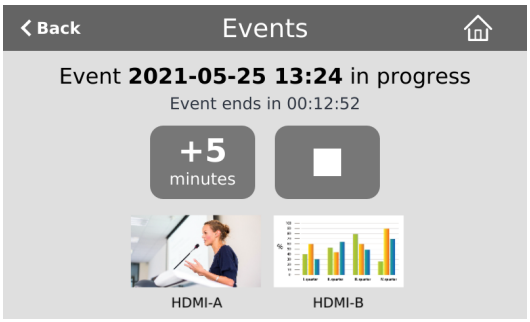
Once you're logged in, you can choose to either log out and return to the Events screen or continue. Tap **Next** to continue.



On the next screen, tap in any field to change the title and event details. The current date and time is the default session title. Depending on which CMS you use, different fields are visible. Swipe the screen to see more event details.

Kaltura event details screen	Panopto event details screen
	

Tap **Start** when you're ready to start the event. When you're done, tap the **square** stop even button and confirm your selection when prompted. The recording automatically uploads to your CMS.



After your event ends, you remain logged in for one hour. To prevent someone else from starting an ad hoc event using your account, you should manually logout using the touch screen. Tap **Create event** from the Events screen to return to the Logout screen.

Important considerations

- Authentication credentials must be set up by your CMS administrator before you can login to your CMS and create ad hoc events from the touch screen on Pearl device.

- For Kaltura, you can use your Kaltura user ID or a valid Kaltura email address to authenticate and create ad hoc events from the touch screen on Pearl device.
- You cannot start an ad hoc event if it's within five minutes of a scheduled event's start time. The Create event button does not display.
- Scheduled events have priority over ad hoc events. If an ad hoc event is still in progress when it's time to start a scheduled event, the Pearl device gracefully stops the ad hoc event and automatically starts the scheduled event. The ad hoc recording automatically uploads to the CMS.
- For ad hoc events to work, the user must have an account with their Content Management System (CMS) so they can login using Pearl device's touch screen. CMS must also be set up on the Pearl device and the Pearl device must be registered with the CMS. If you don't see a calendar icon in the Channel view of the touch screen, contact your CMS administrator responsible for setting up hardware encoders to confirm that the Pearl device is properly registered as a remote recorder resource.
- For Kaltura, only Pearl administrators can configure channels for ad hoc events using the Admin panel, see Integration.
- For Panopto, each channel that is configure on Pearl device is treated as a separate video source for multi-source ad hoc events.
- For Panopto ad hoc events, the Pearl device ignores a user's presets that are set in Panopto. As a result, ad hoc recordings automatically upload to the user's default folder as originally assigned by Panopto.
- The maximum event duration using the touch screen is 600 minutes (10 hours); however, do not enter a duration that produces a recording that's larger than the capacity of the local storage available on the Pearl device.
- Separate back up recordings of each channel are automatically saved on Pearl device. Contact your Pearl administrator for the availability of back up recordings.

Log out of an ad hoc session

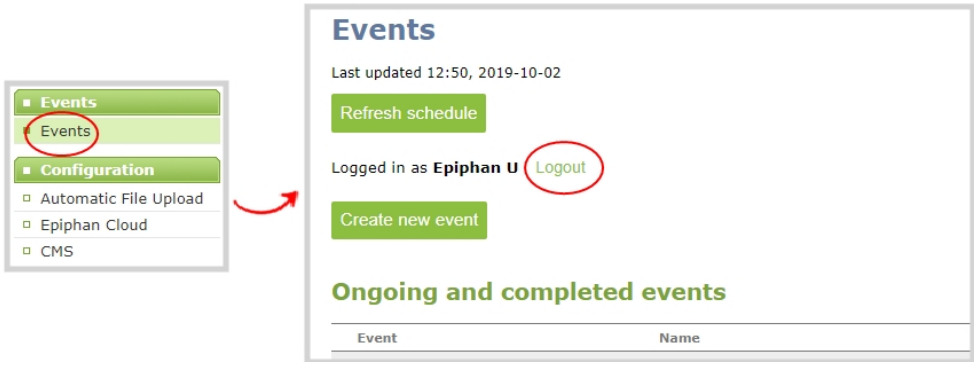
If you start an unscheduled ad hoc event from the touch screen of Pearl-2 or Pearl Mini, you're automatically logged out after the ad hoc event ends. If your Pearl administrator has not enabled the automatic logout feature, then your login session stays active for one hour after the event ends.

For Panopto ad hoc events that you start using the web-based Admin panel, Panopto preserves your login credentials after the ad hoc event ends. To avoid someone else from using your account to create ad hoc Panopto events from the Admin panel, you must manually logout after you're ad hoc event ends and close your session with the Panopto server. Alternatively, you can use an incognito/private browser session with the Admin panel. Then when you manually log out of your Panopto session using the Admin panel and close the incognito/private browser, your Panopto session closes and you are fully logged out.

Before you begin, you need your Panopto server URL, for example:
`https://<myorg>.hosted.panopto.com/`

Manually logout of an ad hoc session with Panopto using the Admin panel

1. From the Events menu, click **Events**. The Events page opens.



2. Click **Logout** beside your login user name.
3. To close the authentication session with the Panopto server, open a new tab in the same browser that you used to login and go to: `https://<PanoptoServerURL>/Panopto/Pages/Auth/Logout.aspx`

> Closing the authentication session with the Panopto server may not close the authentication session with a third-party LMS.

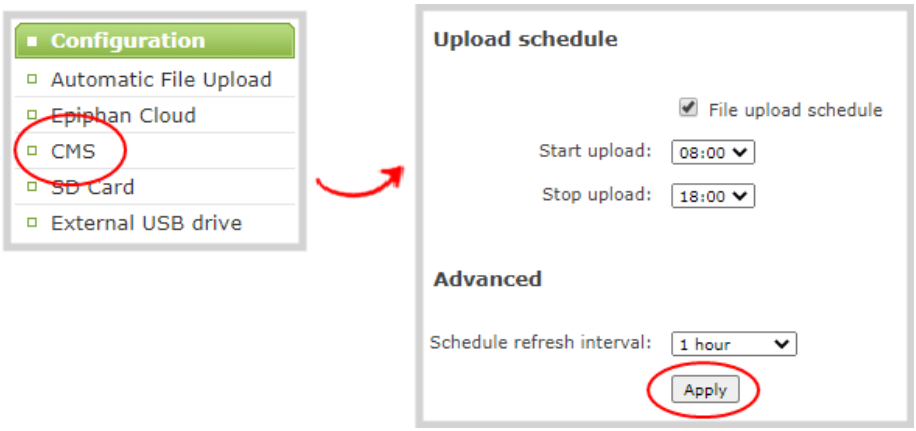
4. Return to the Admin panel and click **Create new event** on the Events page to confirm that you're logged out of Panopto. A blank login page should appear.

Schedule when CMS event recordings upload

As soon as your Content Management System (CMS) event ends, the Pearl device uploads the associated recordings to the CMS server if a network connection to the CMS server is available. Using the Admin panel, you can schedule the Pearl device to upload recordings only during a specific time period. Recordings made outside the upload time period are queued and only upload when the time to start uploading is reached. This feature is disabled by default.

Schedule when the Pearl Device can upload event recordings using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration menu opens.
3. Under **Upload schedule**, check **File upload schedule** and select the start and stop times of the file upload period. Then click **Apply** at the bottom of the page.



Upload the local Panopto webcast recording

By default, the Pearl device always records a Panopto webcasting event locally and uploads that recording when the webcast ends. Once uploaded, the Panopto server uses the local recording from the Pearl device instead of the original webcast. You can disable this feature using the Admin panel.

If an upload schedule is set, the webcast recording uploads during the scheduled upload time period, see Schedule when CMS event recordings upload.

Enable or disable uploading the local webcast recording using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **CMS**. The Content management system configuration page opens.
3. Under **Settings**, check **Upload the webcast recording** and click **Apply** at the bottom of the page to always upload the local recording of webcasting events or uncheck **Upload the webcast recording** to disable the feature.

Recover channel backup recordings

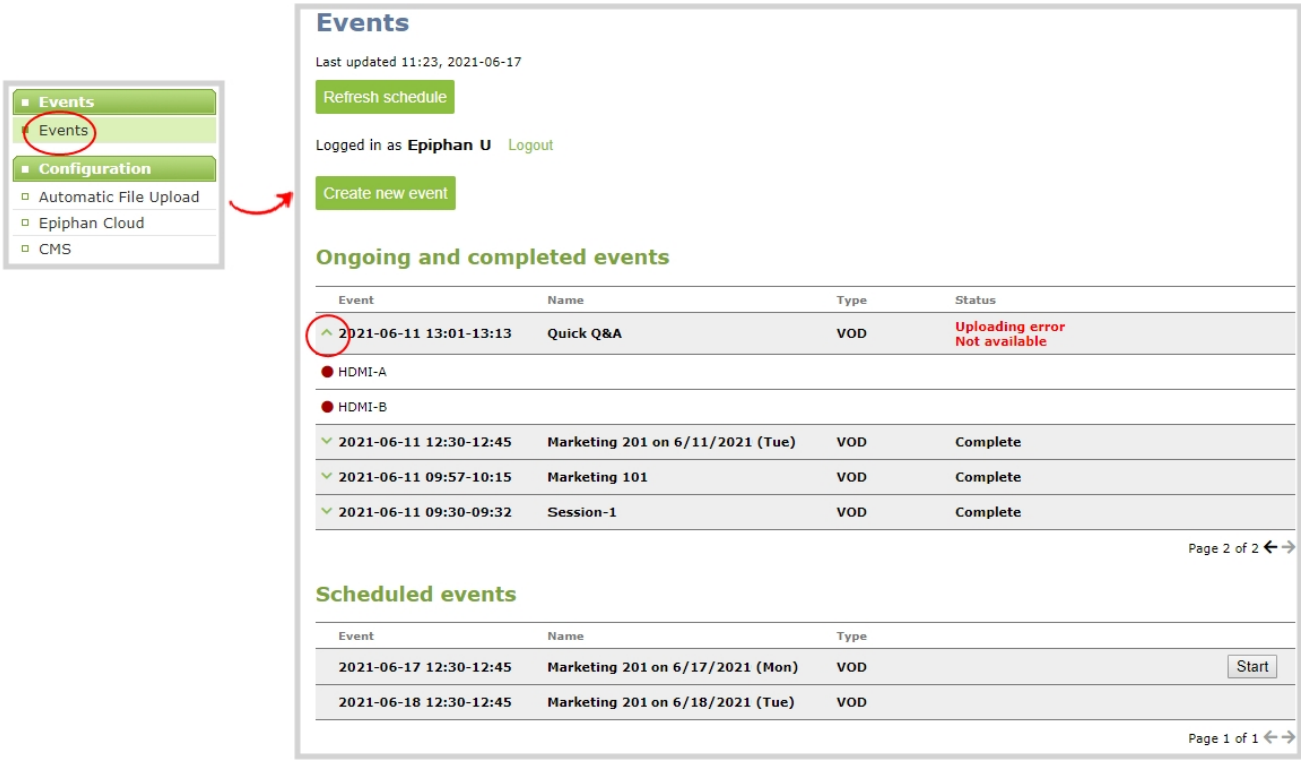
Recordings automatically upload to Kaltura or Panopto after the event ends. If for some reason the recordings are not available in the CMS, administrators can manually download backup recordings for a channel on the Pearl device.

Your Pearl device saves a local backup of recordings automatically in a round-robin fashion. When the record drive is full, new recordings overwrite the oldest ones. Pearl administrators and operators can use the Admin panel to manually download and delete channel recordings. For more details about managing recordings, see Manage recorded files.

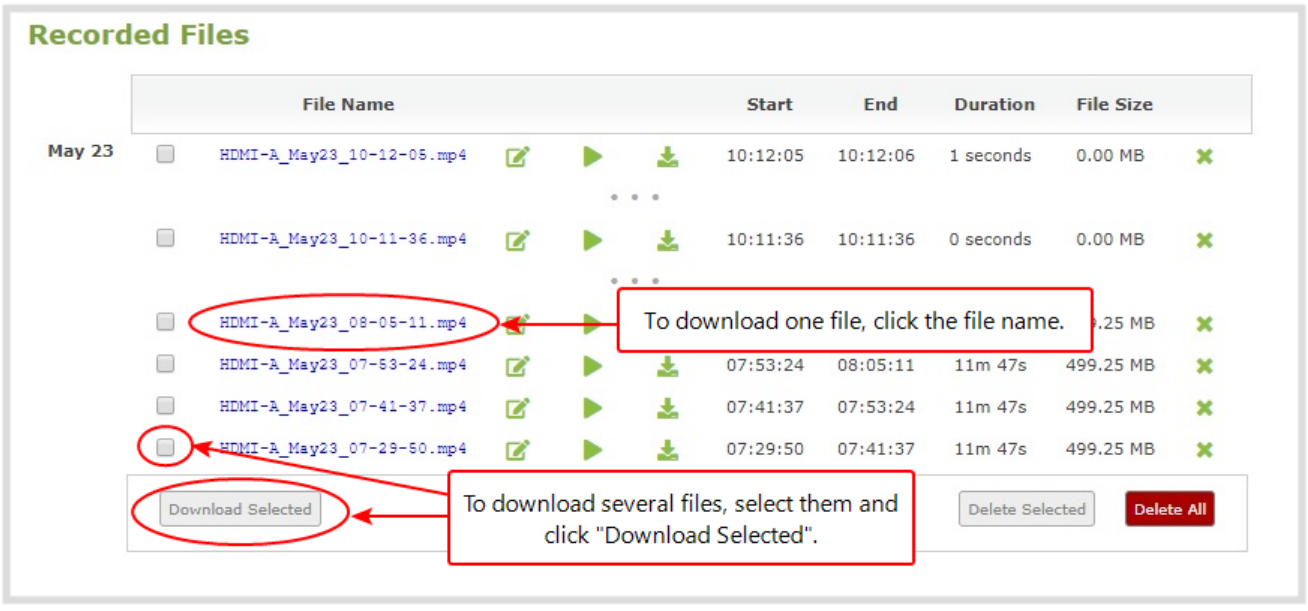
Download recordings for a channel using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.

2. From the Events menu, click the arrow icon beside the event to see which channels were included for that event.



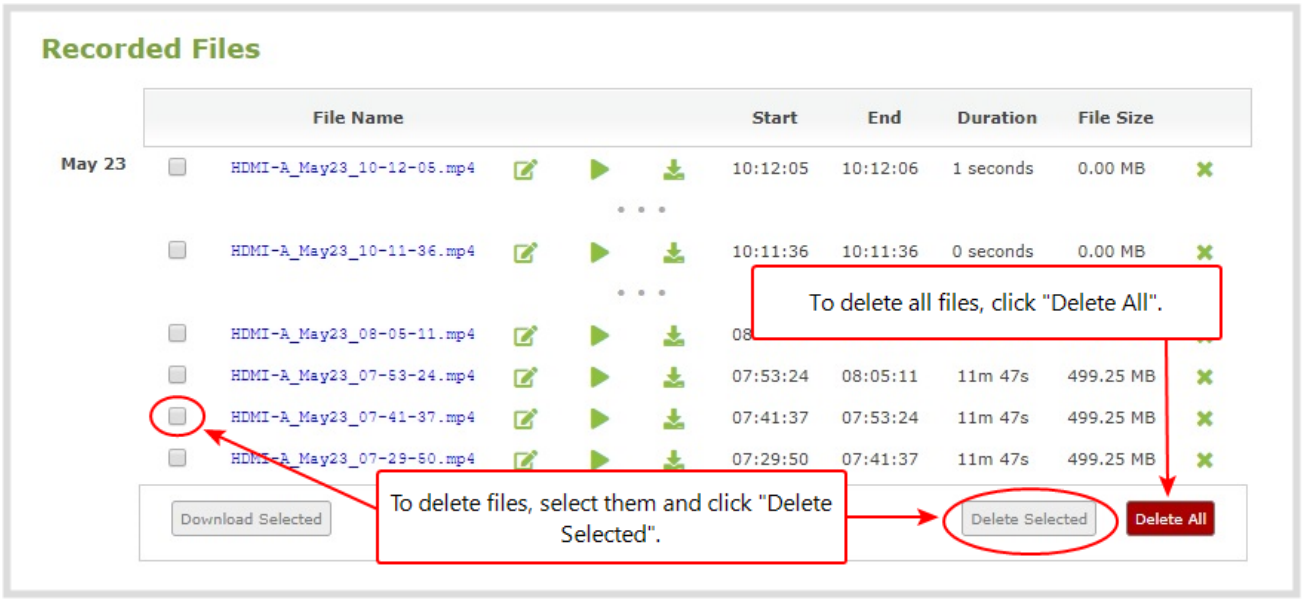
3. From the Channels menu, click **Recording**. The Recordings page for that channel opens with a list of recorded files.
4. Click the name of the recording to download the file or select multiple files and click **Download Selected**.



Delete recordings for a channel using the Admin panel

To delete recordings for a channel, do one of the following:

- To delete a single recording, click the X icon to the right of a recording and click **OK** when prompted.
- To delete multiple recordings, check the check box beside the recordings you want to delete and click **OK** when prompted.
- To delete all recordings for the selected channel, click **Delete Selected** and click **OK** when prompted.



The list may not update immediately. You can refresh the list by reloading the Recording page (for channels) or the recorder settings page (for recorders).

Status and monitoring

Pearl-2 lets you monitor audio and check the status of your channels, live streams, and recordings.

Topics include:

- Monitoring audio
- Channel monitoring using the touch screen
- View system information using the touch screen
- View system information using the Admin panel
- View device information using the touch screen
- View network status
- View 802.1x network connection status
- View channel status and stream information
- View the video output port status
- View AFU and file transfer progress
- View scheduled CMS events and history

Monitoring audio and VU sensitivity

You can connect headphones to the 3.5 mm audio jack on the front panel of Pearl-2. To monitor audio for a specific channel, just select the channel using the touch screen. The audio you hear depends on which layout is currently live because different layouts can have different audio sources configured. To adjust the volume, tap the headphones icon using the touch screen. See Monitoring audio for details.

A VU meter on the touch screen shows the audio levels for the channel. The value is displayed in dBFS (decibels relative to full scale). Colored bars represent the audio level.

Table 71 Audio VU meter levels

Color	Decibel range
Red	0 to -9 dBFS

Color	Decibel range
Yellow	-9 to -18 dBFS
Green	-18 dBFS and lower

Channel monitoring using the touch screen

Have complete confidence about what you're capturing, streaming, and recording. Up to 6 channels are displayed in the grid view, depending on how many channels you have configured.

The grid view opens by default when you turn on Pearl-2. If necessary, tap the touch screen once to turn it on and tap again to display the controls.

Table 72 Grid view indicators

Item	Description
Streaming and recording indicators	Streaming (left) and recording (right) indicators appear in the top-right corner for each channel: (no dots) Streaming is disabled and recording is stopped. Streaming is stopped and recording is stopped. Streaming is started and recording is stopped. Streaming has an error and recording is stopped. Streaming is stopped and recording is started. Streaming is started and recording is started. Streaming has an error and recording is started. Streaming is disabled and recording is started. **TIP**: You stop and start recording from the individual channel view.
Audio VU meter	Each channel has an audio VU meter that uses quasi-peak ballistics with samples averaged every 10 ms. The maximum average audio level in each 100 ms period is displayed using colored bars.

Item	Description
	• RED = 0 to -9 dBFS • Yellow = -9 to -18 dBFS • Green = -18 dBFS and lower

You can do more monitoring for a specific channel when you select a channel from the grid view. Just tap the channel you want to monitor from the grid view and the channel view opens.

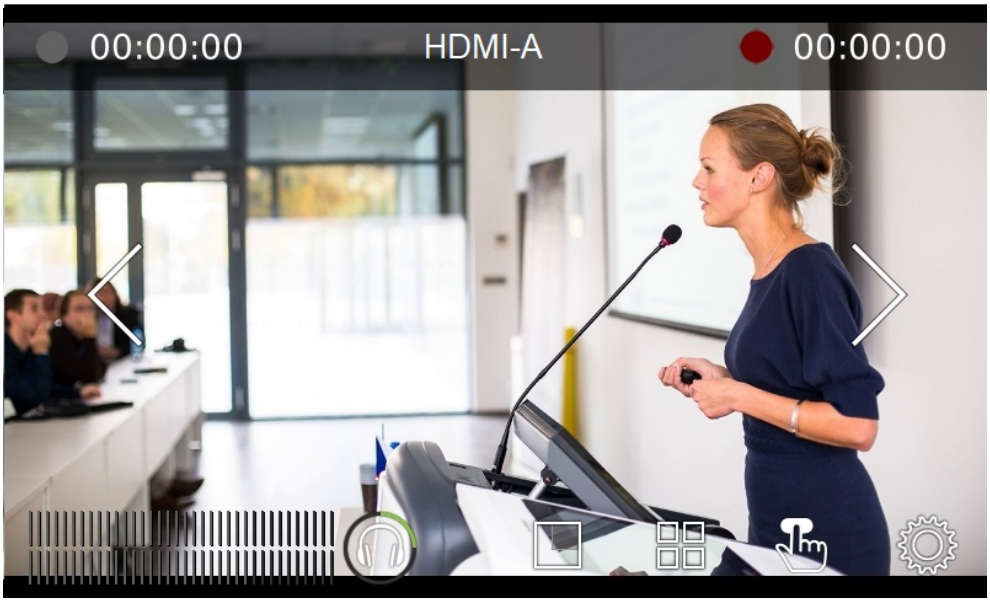


Table 73 Individual channel view indicators

Item	Description
Streaming status	Streaming indicator appears in the top-left corner: (no dot) Streaming is disabled. Gray means streaming is stopped. Flashing blue means streaming is in progress. Streaming has an error.
Streaming timer	The streaming timer shows the length of time that streaming has been in progress.
Recording status	Recording indicator appears in the top-right corner: (no dot) Recording is disabled. Gray means recording is stopped.

Item	Description
	Flashing red means recording is in progress. Recording has an error.
Recording timer	The recording timer shows the length of time that recording has been in progress.
Audio VU meter	Audio VU meter for the channel uses quasi-peak ballistics with samples averaged every 10 ms. The maximum average audio level in each 100 ms period is displayed using colored bars. • RED = 0 to -9 dBFS • Yellow = -9 to -18 dBFS • Green = -18 dBFS and lower

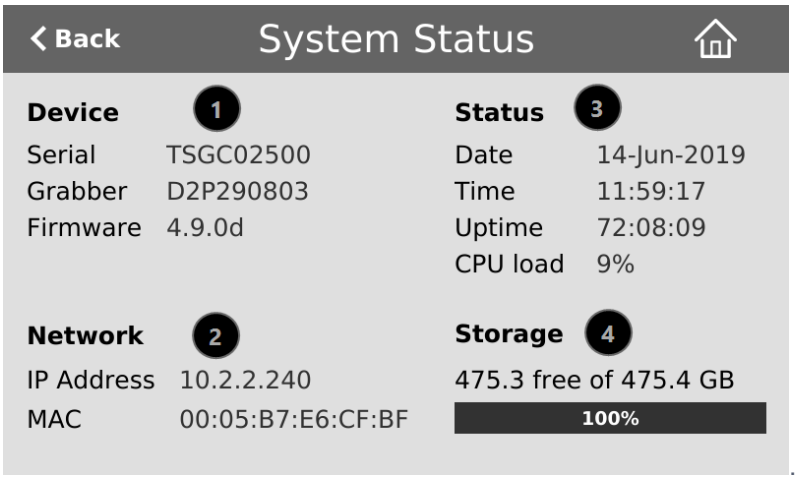
To monitor a different channel, tap the right or left arrows on the channel view to see the next (or previous) channel. If the touch screen controls aren't showing, tap anywhere on the touch screen to make them reappear.

To get back to the grid view, tap the grid icon .

View system information using the touch screen

Find the serial number, check the installed firmware version of your Pearl-2 and more on the System Status screen using the touch screen.

The System Status screen displays basic system information that's useful when first setting up your Pearl-2.



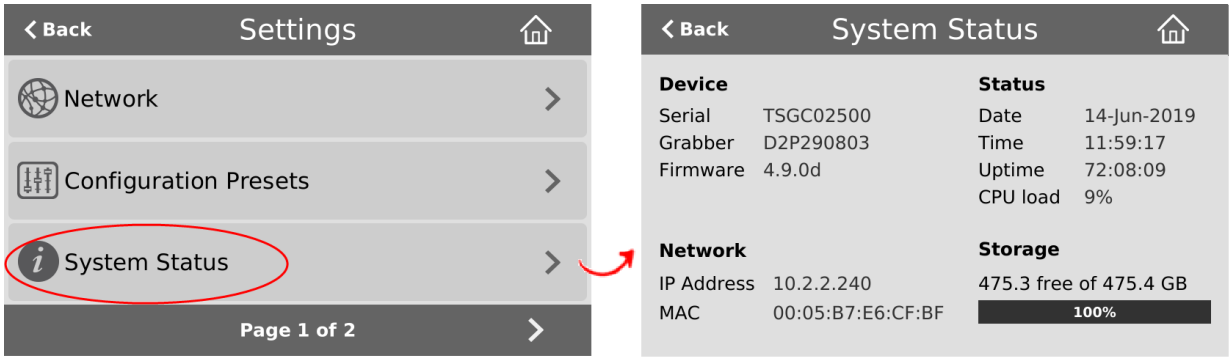
Label	Description
1	Device Information

Label	Description
	• Serial number • Video grabber number • Firmware version
2	Network Information • IP Address • MAC Address
3	Device Status • System date • System time • Uptime • CPU load (%) and Temperature (°Celsius)
4	Storage Information (when available) • Disk space available • Pictogram of available disk space

Open the System Status screen

1. Tap the **gear** icon. If the control icons aren't showing, tap anywhere on the touch screen.

2. Tap **System Status** to see the System Status page.



3. Tap **CPU load** to toggle between the operating temperature (°Celsius) and CPU load (%).
4. Tap **Back** to return to the **System Settings** screen, or the **Home** icon to return to the channel view.

If the system settings control icon won't appear when you tap the touch screen, it may be disabled. See **Configure the touch screen** to enable system information.

View system information using the Admin panel

Get useful information about Pearl-2 on the Info page from the Configuration menu. You can view your current firmware level, the system hardware version (if available), and currently configured settings for a channel.

View system information using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Info**. The system information page opens.

The Bitrate / Actual bitrate values show the total of the video bitrate plus audio bitrate.

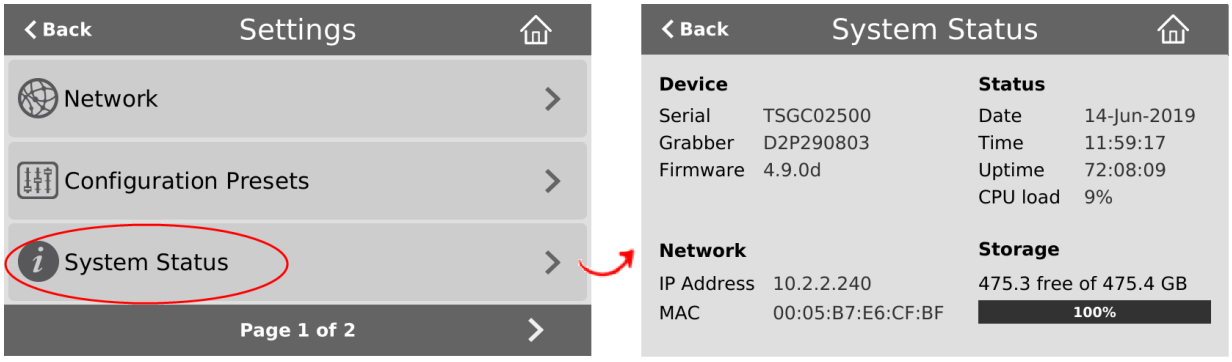
View device information using the touch screen

View Pearl-2's device name, location, and description from the System Status screen using the touch screen.

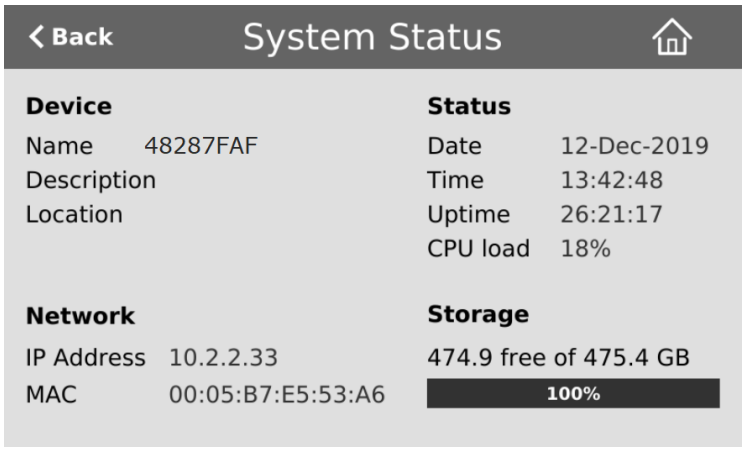
To view the device information from the touch screen:

1. Tap the **gear** icon. If the control icons aren't showing, tap anywhere on the touch screen.

2. Tap **System Status** to see the System Status page.



3. Tap below **Device** to show the device information. Tap a second time to show the serial number, grabber, and firmware values again.



4. Tap **Back** to return to the **System Settings** screen, or the **Home** icon to return to the channel view.

If the system settings control icon won't appear when you tap the touch screen, it may be disabled. See **Configure the touch screen** to enable system information.

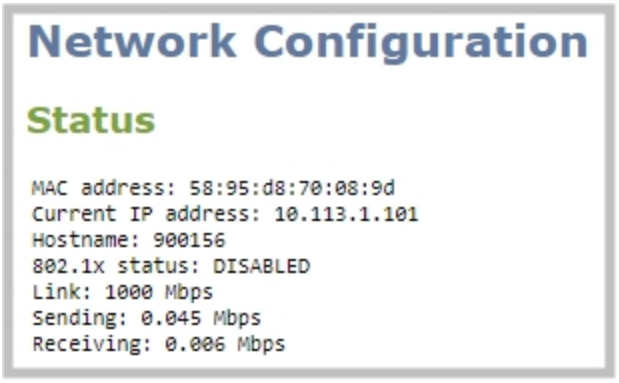
View network status

Get useful status information about Pearl-2 network connection from the Network configuration page using the Admin panel, including:

- Current IP address
- Hostname
- Rated Ethernet link speed (Mbps)
- Sending and receiving speed (Mbps)
- MAC address
- 802.1x status

View the network status using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Network**. The Network configuration page opens.

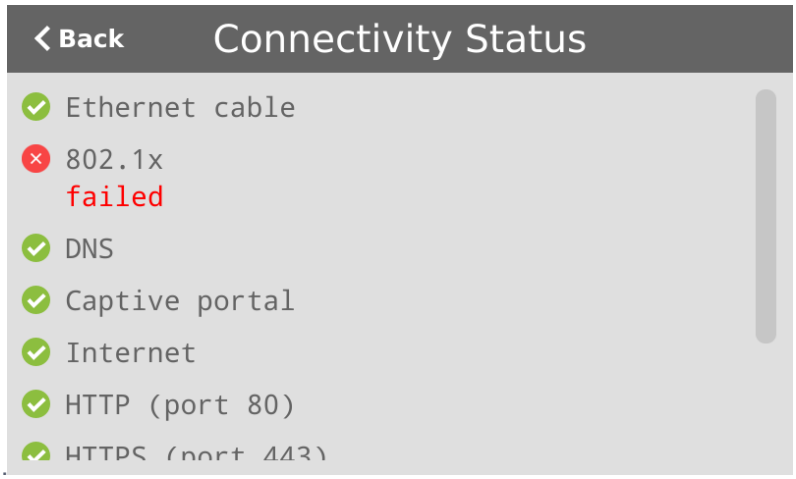


View 802.1x network connection status

View the 802.1x network connection status in the following locations:

- the Connectivity status diagnostic in the Admin panel
- the touch screen on Pearl-2 and Pearl Mini when you select **Network > Connectivity Status**. The status can display as either passed, failed, or disabled.

The status can display as either passed, failed, or disabled.



If you attempt to connect to a network that isn't 802.1x enabled when 802.1x is configured on Pearl-2, a consistent **802.1x status: failed** status message appears on the Network Configuration page in the Admin panel.

For more information about the Connectivity status diagnostics, see Diagnostic tools.

View channel status and stream information

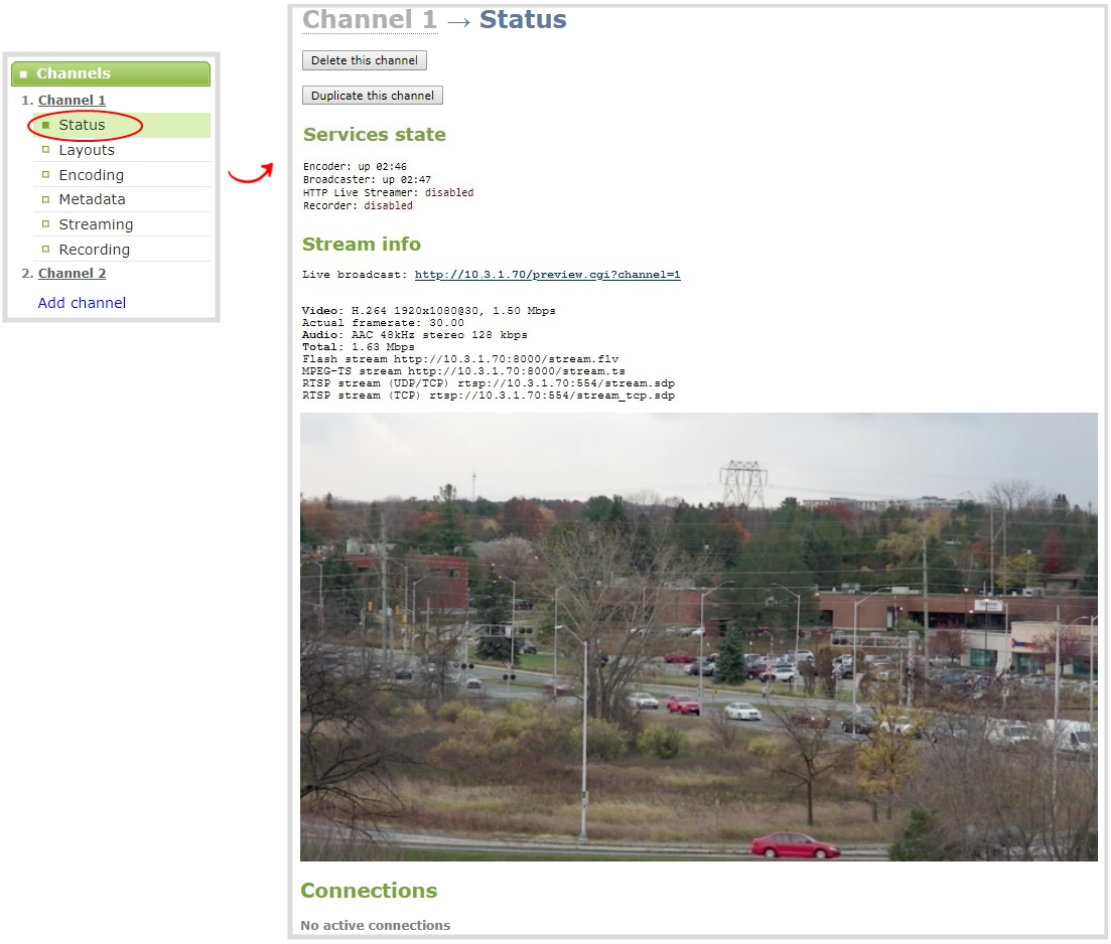
You can see information about the status of a channel on Pearl-2 from the channel's status page using the Admin panel, including:

- The status and uptime of encoder services
- Stream information and URLs
- Channel preview
- Active network connections

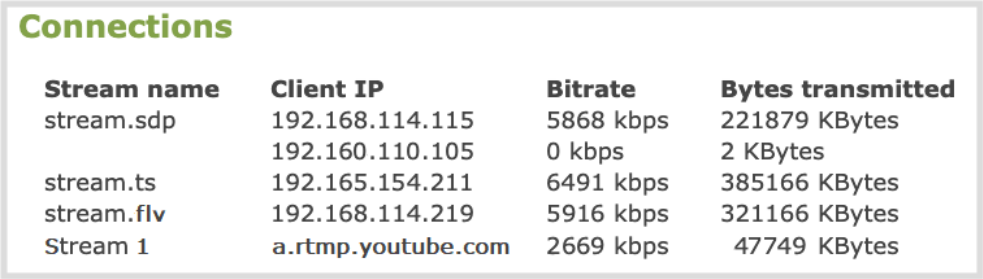
More encoder information can be found on the Info page from the Configuration menu, see View system information using the Admin panel

View the status information for a channel using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, click a channel to open the status page for that channel.



Active unicast and multicast stream information displays under **Connections**.



NDI connections aren't currently displayed on the channel's status page under **Connections**.

View the video output port status

The current status of the video output port and attached video display appears at the top of the video output port configuration page. You can view the status using the Admin panel.

View the video output port status using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the **Output port(s)** menu, click the output port. The video output port configuration page opens.

Table 74 Possible video output status messages

Message	Description
Disabled	This video output port is disabled in the configuration.
Display is not connected	There is no display connected to the video output port or the connected display is not powered on or not functioning.
Source is currently unavailable	The video output port is configured to display a source that no longer exists. Change the source. see Select the video output source using the device

Message	Description
	screen.
Starting ...	The video output port is configuring the display and will shortly output the first frame.
Running at w×h	The video output port is functioning at the specified resolution.

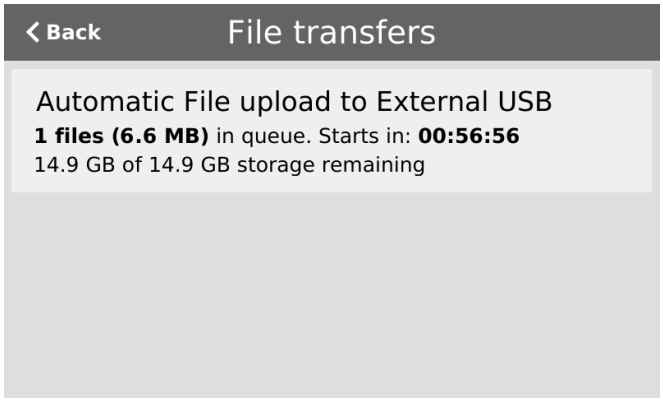
You can also view video output status using the Epiphan Live control interface. See Monitor and select the video output source using Epiphan Live for more information.

View AFU and file transfer progress

You can view Automatic File Upload (AFU) and file transfer information from the following places:

- the Admin panel.
- touch screen menu on Pearl-2 and Pearl Mini

In this example, AFU is scheduled to occur at specified time intervals so the start of the next scheduled file transfer is shown.



If the Pearl device is configured to allow copying recordings to a connected USB drive instead of AFU, the USB drive status displays. If AFU is not enabled, the screen displays **AFU File upload is disabled**.

The Admin panel displays a history of uploaded files, which persists until the list is manually cleared.

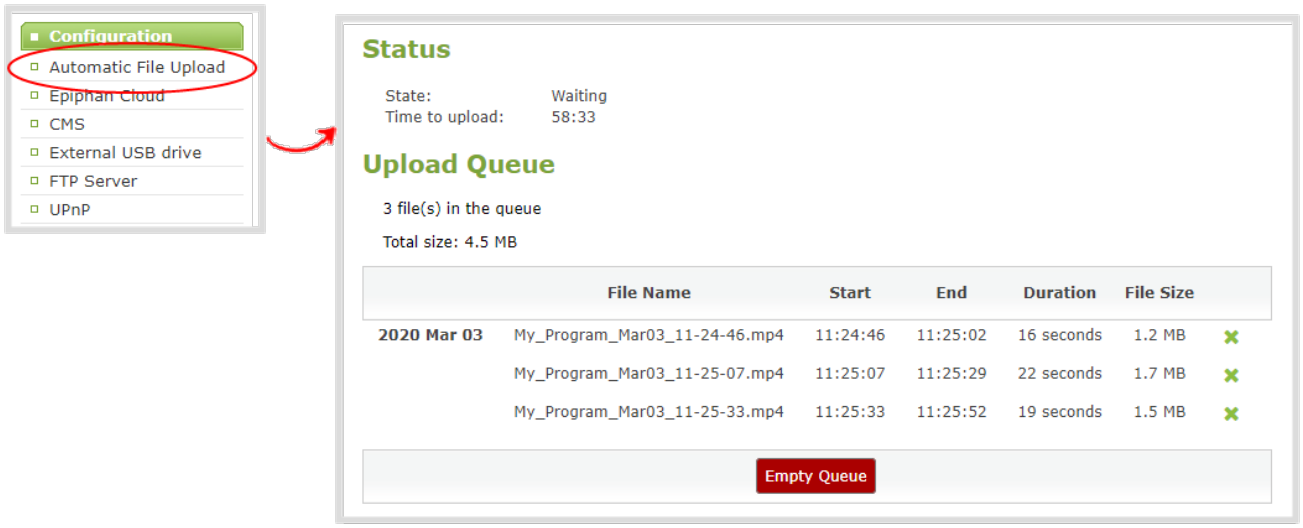
You can also restart the Pearl device to clear the list.

You can also cancel file uploads manually using the Admin panel.

For more information, see Manage the AFU queue and Manage USB file transfer queue.

View file transfer status using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Automatic File Upload**. If there are files to be uploaded, they appear in the queue.

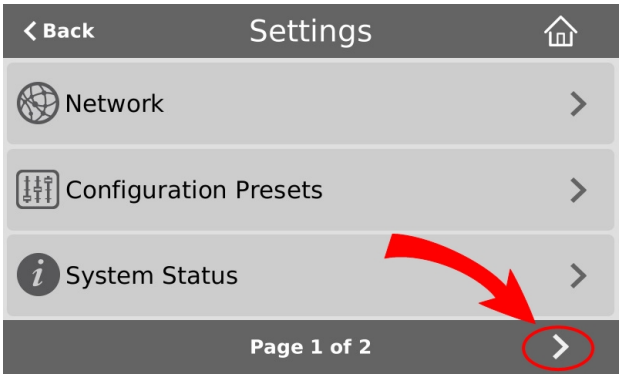


View file transfer status using the Pearl-2 and Pearl Mini touch screen

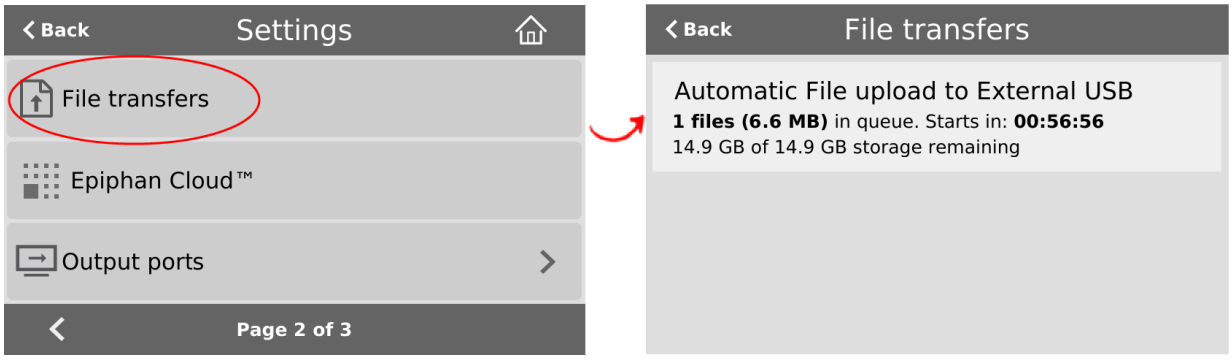
1. Tap the **gear** icon. If the control icons aren't showing, tap anywhere on the touch screen.

If the gear icon is not visible on the touch screen, tap the screen once to activate the control buttons. If the system settings button is still not visible, it is disabled in the system's touch screen configuration. See **Configure the touch screen** to enable system information.

2. Tap the arrow icon in the lower-right corner of the screen to go to the second Settings page.



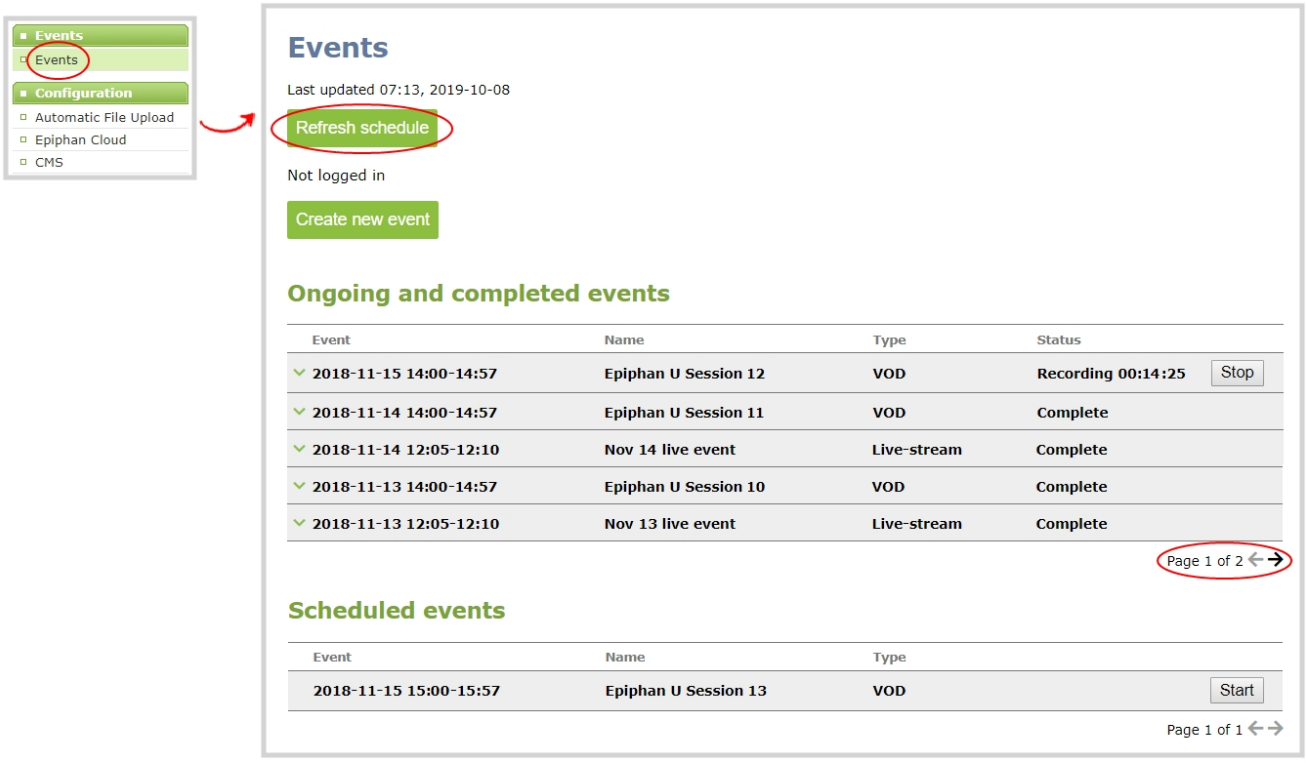
3. Tap **File transfers** to display the AFU Status page.



To close the system information screen, tap **Back** in the upper-left corner of the screen to return to the **System Settings** view. Tap the **Home** icon to return to the channel view.

View scheduled CMS events and history

Using the Admin panel, select the **Events** menu to see up to 90 days of upcoming scheduled events and up to 90 days of ongoing and completed events for Pearl-2. Click the page arrows at the bottom of each list to navigate through multiple pages.



The Events page updates to show new events every hour. Click **Refresh schedule** at any time to manually update the Events page. The Events page only displays when Kaltura or Panopto CMS is enabled on Pearl-2.

If the time and zone settings of Pearl-2 are out of synchronization with Kaltura's scheduling server, an error appears on the Events page when you refresh the schedule. Configure the time settings on Pearl-2 to match the time and zone of Kaltura's scheduling server, see **Configure date and time**.

From the touch screen on Pearl-2, you can tap the Scheduled events icon at any time to display the Events screen. The icon only appears when Kaltura or Panopto CMS is enabled on Pearl-2.

The Events screen displays automatically on the touch screen of Pearl-2 about five minutes before a scheduled event starts.

For events with more channels than can be previewed at the same time on the touch screen, an arrow appears so you can scroll through a carousel of channel previews.

Maintenance

Keep your Pearl-2 running smoothly using the latest firmware updates and maintenance features.

Topics include:

- Power down and system restart
- Back up your Pearl device setup
- Perform a factory reset
- Firmware upgrade
- Support
- Register your device
- Storage capacity and maintenance
- Adjust the fan speed

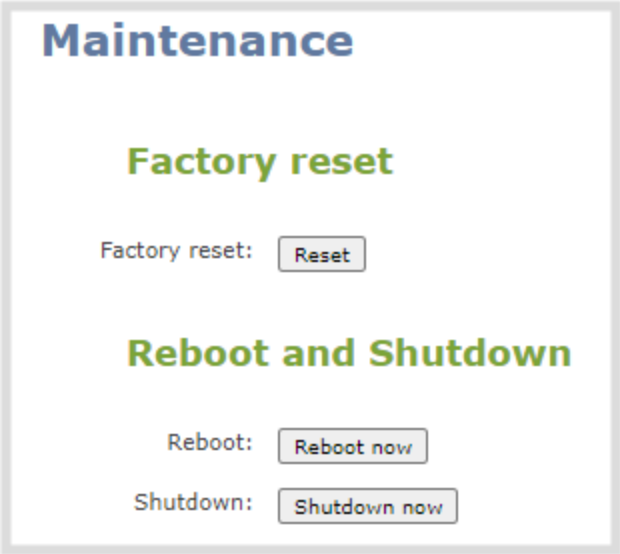
Power down and system restart

You can do the following to power off Pearl device or reboot the device:

- Choose **Reboot** or **Shutdown Now** from the Maintenance page using the Admin panel.
- Power off the device using the power button.

Reboot the device using the Admin panel

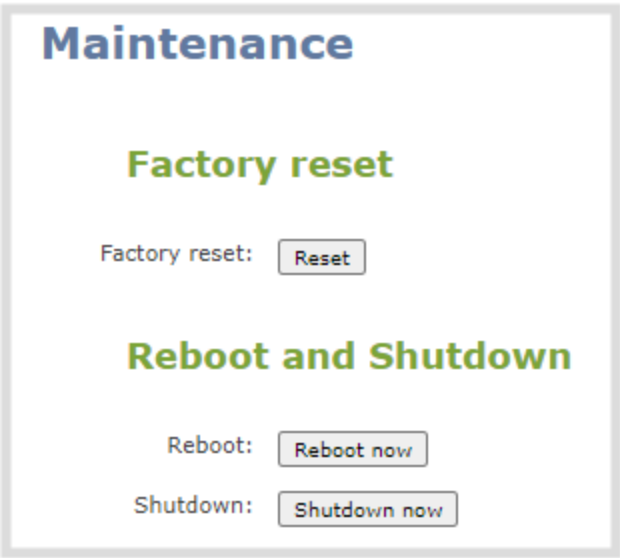
1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance**. The maintenance page opens.
3. Under the **Maintenance** section, select **Reboot Now** and click **OK** when prompted.



Power off the device using the Admin panel

You can use the Admin panel to power off Pearl-2. The power button on Pearl-2 is a toggle switch. If you power off the device using the Admin panel, the power switch remains in the on state. To power back on, you must double press the power button.

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Maintenance**. The maintenance page opens.
3. Under the **Maintenance** section, select **Shutdown Now** and click **OK** when prompted.



Power off the device using the power button

You can manually shut down Pearl-2 using the power button.

The power button for Pearl-2 is found on the front.

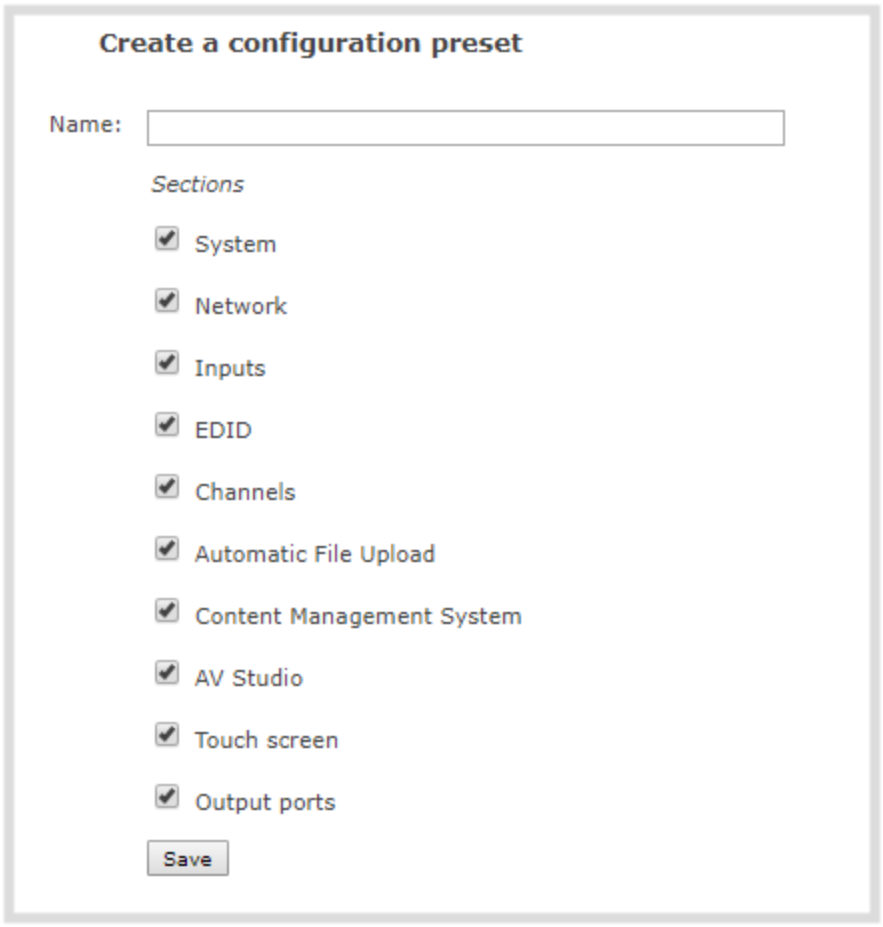
To power off Pearl-2 manually, double-press (two successive fast presses and releases) the power button to initiate a safe power down.

If the system is unresponsive, press and hold the power button for 4 seconds to force an immediate power down.

Back up your Pearl device setup

Configuration presets are the perfect way to back up your Pearl device setup so that you can reapply it later without worrying if someone changes your settings or does a factory reset.

You can create a configuration preset from the Configuration menu when you select **Maintenance**, see Configuration presets.



Perform a factory reset

Administrators can use the Admin panel to perform a factory reset and restore the configuration of Pearl-2 to the manufacturer's original default settings. For a list of affected settings, see The Factory default configuration preset and Factory reset.

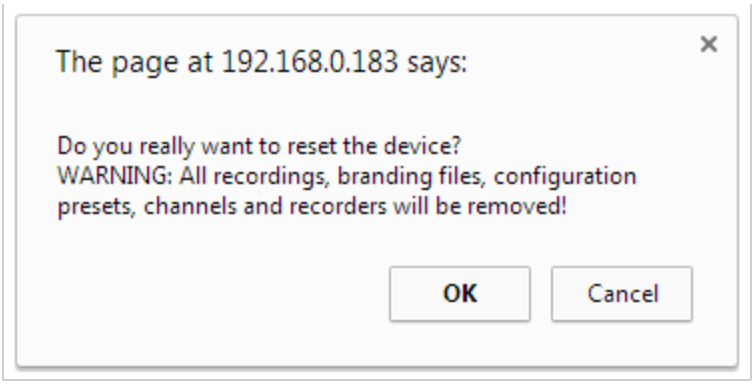
Performing a factory reset erases all your input port settings (video and audio), channel configuration, network settings, configuration presets, all locally saved media files and recordings from Pearl-2.

Consider applying a factory default configuration preset if you want to preserve your uploaded media files, configuration presets, and channel recordings, see Configuration presets.

Perform a factory reset using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Maintenance**. The maintenance page opens.

3. Under the **Maintenance** section, select **Reset** and click **OK** when prompted.



4. The device resets to factory defaults and reboots. Wait for the system to finish rebooting before configuring Pearl-2.

Firmware upgrade

When you register your product with Epiphan, you can choose to receive email notifications whenever firmware updates are available. To take advantage of exciting new features and important fixes for your Pearl device, install new firmware whenever the system indicates that a firmware update is available.

Topics include:

- Firmware upgrade
- Update the firmware

The BIOS update section appears on the **Firmware Update** page only when your Pearl device system requires a BIOS update. For more information, see BIOS update.

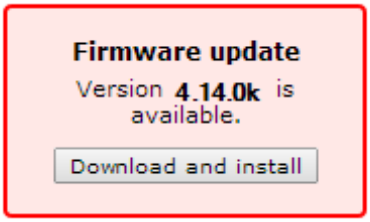
Check for firmware updates

Your Pearl device automatically checks for firmware updates if the **Enable connection to maintenance server** option is checked on the **Maintenance** page of the Admin panel. You can also manually check for updates If your Pearl device has internet access. Don't miss out on any feature enhancement. Register your Pearl device and be eligible to download firmware updates, see Register your device.

When **Enable connection to maintenance server** is checked, the built-in firmware update mechanism checks for updates for your specific product and hardware version automatically.

Manually check for new firmware using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Firmware Upgrade**. The firmware upgrade page opens.
3. Click **check for updates** beside the current firmware version. If an update is found, a red box appears in the top left side of the Admin panel with a link to download and install the firmware.



Update the firmware

If your Pearl-2 has internet access, the easiest way to install a firmware update is to use the download link that's provided when you check for new firmware. If you have a Pearl-2 firmware file that was provided to you by Epiphan Video, you can install the new firmware using the web-based Admin panel.

You cannot install new firmware from a locally saved file using the local console on Pearl-2.

While the firmware is updating, the touch screen displays a firmware update in-progress notice. All streaming and recording functions stop until after the firmware upgrade is complete.

Installing new firmware takes a few minutes, after which the system reboots. Depending on the upgrade, a disk rebuild may be required, causing the restart process to take more time. Please be patient and wait for the system to finish rebooting.

Do not interrupt power to the system during a firmware upgrade.

Before you begin

Schedule a time to when you can update the firmware without negatively impacting viewers or automatic file upload and recording schedules.

It's good practice to make a backup of your current configuration before applying a firmware update so that you can revert to the previous firmware if needed, see Create a configuration preset. You should also clear your web browser's cache after the update is complete.

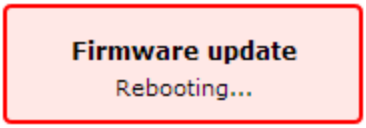
Perform a firmware update using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. (Optional) Save a copy of the current system configuration. See Configuration presets.
3. From the Configuration menu, select **Firmware Upgrade**. The firmware upgrade page opens.
4. Do one of the following:
   a. Click **check for updates**. If a red box appears in the top left side of the Admin panel, click **Download and install**.
   b. Click **Choose File** and select the firmware upgrade file that's located on your admin computer, then click **Apply**. The system unpacks and verifies the file. If the file is valid, the upgrade begins.

   If the touch screen is enabled, a notice that the firmware update is in progress appears.

Do not interrupt power to the system during the firmware upgrade.

5. When the firmware update is complete, a message lets you know that Pearl-2 is going to reboot. Wait for the system to restart.



6. After the system reinitializes, go to the settings for your web browser and clear your web browser's cache.
7. Connect to the Admin panel and login as **admin**, see Connect to the Admin panel.
8. From the Configuration menu, select **Firmware Upgrade**. The firmware upgrade page opens. Verify that the firmware version is the expected new version.

If in the rare occasion the firmware update fails, the touch screen reports the failure. Please collect system information such as the serial number of Pearl-2, the previous firmware version (if known), and the new firmware version and contact **info@epiphan.com**

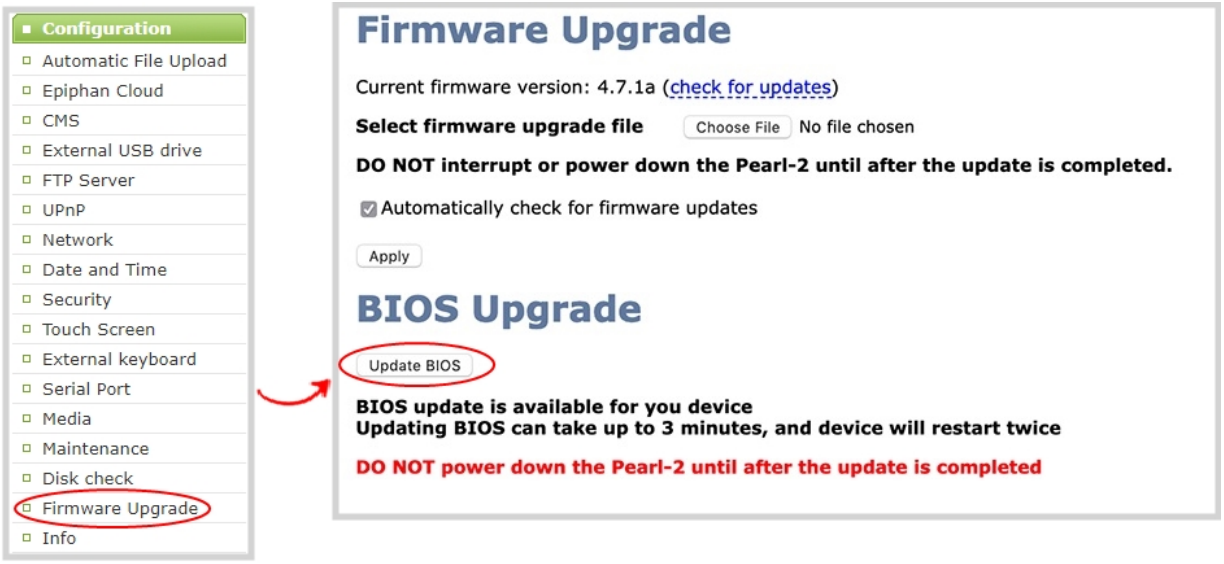
BIOS update

If Pearl-2 requires a BIOS update, a BIOS Upgrade section appears on the Firmware update page in the Admin panel. We recommend performing the BIOS update whenever they become available to ensure optimum performance of your device.

The BIOS Upgrade section appears on the **Firmware Update** page only when your Pearl-2 system requires a BIOS update.

Perform a BIOS update using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. (Optional) Save a copy of the current system configuration. See Configuration presets.
3. From the Configuration menu, select **Firmware Upgrade**. The firmware upgrade page opens.
4. Select **Update BIOS** and click **OK** when prompted. The update should begin.



If the touch screen is enabled, a notice that the BIOS update is in progress appears.

A notice that the BIOS update is in progress appears on the front screen.

Do not interrupt power to the system during the BIOS update.

5. When the BIOS update is complete, a message lets you know that Pearl-2 is going to reboot. Wait for the system to restart.

6. After the system reinitializes, go to the settings for your web browser and clear your web browser's cache
7. Connect to the Admin panel and login as **admin**, see Connect to the Admin panel.
8. From the Configuration menu, select **Info** and confirm that the date of the BIOS has updated.

You can also confirm that the latest BIOS is installed on Pearl-2 when the section called **BIOS Upgrade** no longer appears on the **Firmware Upgrade** page in the Admin panel.

Register your device

When you register your product with Epiphan, you become eligible to download firmware updates when they become available. Take advantage of exciting new features and important fixes for your Pearl device. Registering your Pearl device is free and only needs to be done once. You have an option to sign up for email notifications whenever a new firmware update is available.

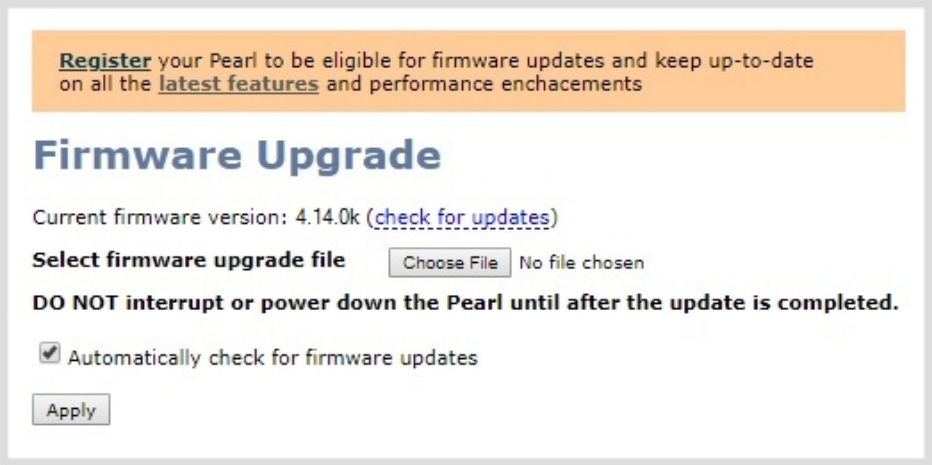
You can register using the Admin panel or online at: www.Epiphan.com/register

You need the serial number of your Pearl device to register. The serial number appears on a sticker attached to the bottom of the device. You can also see the serial number using the front screen menu when you select **System > Device Information**.

The banner to register your device appears on the Firmware update page in the Admin panel. If your system is registered or there are no firmware updates are available, you will not see a banner on the Firmware update page.

Register using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Firmware Upgrade**. The firmware upgrade page opens.
3. Click **Register** in the banner at the top of the page, then enter the information on the registration form.



Support

Your Pearl device comes with a one-year complimentary support plan starting one year from the original product shipment date. You can purchase a 2-year extended support plan from Epiphan Video for a total of three years of product support from the original product shipment date:

- **SupportPlan** offers a 2-year support extension
- **SupportPlan+** offers a 2-year support extension plus remote troubleshooting support

Remote troubleshooting support allows the Epiphan support team to remotely access Pearl-2 to help troubleshoot issues and reset lost admin passwords. No private information is sent to the Epiphan maintenance server during a remote session. For more information about service plans, see www.epiphan.com/supportplan.

To contact Epiphan support:

- **Email**: support@epiphan.com
- **Online chat**: www.epiphan.com/support (Monday to Friday between 9am and 6:30pm EST)
- **Call**: 1-877-599-6581 / 613-599-6581

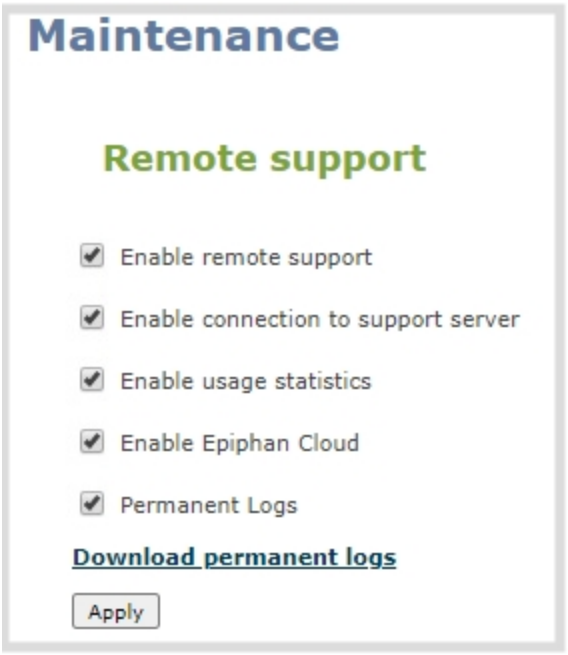
From time to time, Epiphan support may ask you for logs from your system. Follow the instructions to download files for support.

Remote support is only provided for systems covered by SupportPlan+.

Download the logs using the Admin panel

If requested by Epiphan support, you can download the logs files and/or "allinfo" data from your system. These files help our support team troubleshoot problems.

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Maintenance**. The maintenance page opens.



3. Check **Permanent Logs** and click **Apply**.
4. Select **Maintenance** again to refresh the maintenance page and click **Download permanent logs**. A zip file containing system downloads.

Download the allinfo file

1. From your browser, run the **allinfo** script. A file is saved to your computer.

> Pearl devices: http://<ip address of your system>/admin/allinfo.cgi

2. Share the log files and the allinfo results with Epiphan support.

Configure remote support

Remote support is enabled on Pearl-2 by default and allows the Epiphan support team to remotely access Pearl-2 to help you troubleshoot issues and reset lost admin passwords.

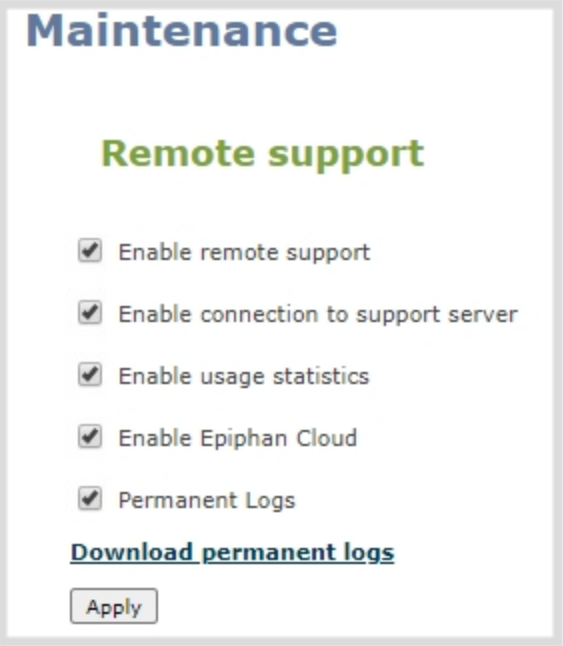
Your network must allow access to the Epiphan maintenance server, which has the domain name epiphany.epiphan.com. Pearl-2 must be able to resolve this domain name to connect to the Epiphan maintenance server for remote support.

Remote support uses ports 22 and 30. Ensure that these ports are opened to allow remote communication. If your Pearl-2 is on a network that is protected from the Internet by a firewall, consult with your network administrator to configure your network to allow remote Internet access through the firewall for those ports and to add epiphany.epiphan.com to the network's allowed list.

Remote support is only provided for systems covered by SupportPlan+. For more information about service plans, see **www.epiphan.com/supportplan**.

Configure remote support using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Maintenance**. The maintenance page opens.



3. Check **Enable remote support** to enable incoming connections from Epiphan Systems.
4. Check **Enable connection to maintenance server** to enable outgoing links to the Epiphan maintenance server epiphany.epiphan.com.
5. Click **Apply**.

6. Test that Pearl-2 can access the maintenance server:
    a. From the Configuration menu, select **Network**.
    b. In **Network Diagnostics**, enter **epiphany.epiphan.com** and click **ping**.
    c. The result of the ping should show an IP address for epiphany.epiphan.com. Report any packet losses to Epiphan support.
7. If Pearl-2 can't reach the maintenance server, check the network settings to ensure DHCP is selected or a DNS server is listed, then try again. Consult with your network administrator if problems persist.
8. If Pearl-2 reaches the maintenance server, ensure your firewall has port 30 open.
9. Confirm with Epiphan support that they are able to access your Pearl-2 for remote troubleshooting.

Disable remote support

Remote support is enabled by default. You can turn remote support off for your Pearl-2 using the Admin panel.

Disabling remote support removes the ability for Epiphan to reset a lost admin password on your Pearl-2. If you forget the admin password and remote support feature is off, you will need to return the system to Epiphan for reprogramming.

Disable remote support for your Pearl-2 using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance**. The maintenance page opens.
3. Uncheck **Enable remote support** to disable incoming connections from Epiphan Systems.
4. Uncheck **Enable connection to maintenance server** to disable outgoing links to the Epiphan maintenance server epiphany.epiphan.com.
5. Click **Apply**.

Storage capacity and maintenance

Pearl-2 has a solid-state storage drive for storage of recordings. Occasionally, some maintenance is required.

Topics include:

- Check internal storage space
- Perform disk check

Check internal storage space

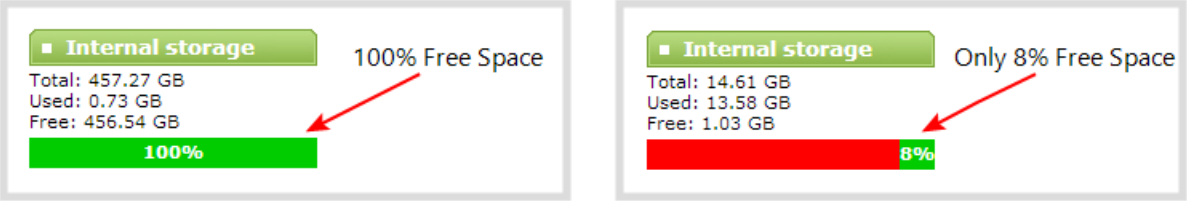
You can check how much internal storage space is available on Pearl-2 using Using the Admin panel and from the touch screen.Pearl-2 has a 512 GB SSD.

It's good practice to monitor how much free space is available. If the amount of available storage is low, you can always remove some of the recorded files, see Manage recorded files and Automatic file transfers.

Disk space can also be checked using Epiphan Live, see **Configure Dashboard panels**.

Check internal storage space using the Admin panel

1. Login to the Admin panel as **admin** or **operator**, see Connect to the Admin panel.
2. View the **Internal Storage** section at the bottom of the menu panel. The bar will be mostly green if there is lots of space left, or mostly red if storage space is nearly full.



Perform disk check

A disk maintenance schedule is used to periodically check the system storage drives for errors. If you prefer, you can run the disk check manually at a time that is convenient for you.

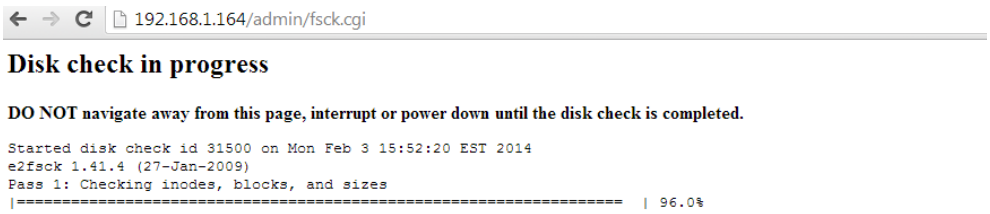
Running the disk check manually resets the timers for the scheduled disk check (i.e. next check won't happen automatically until either the number of restarts or months passes).

If the system is recording when you start a disk check, it will stop recording and resume after the check is complete. Frames presented during the disk check are not part of any recording.

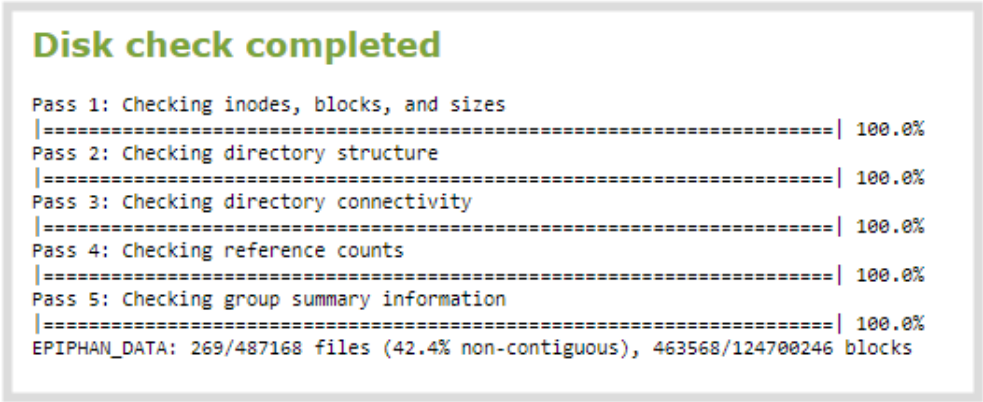
Start a manual disk check using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, select **Disk Check**. The Disk maintenance page opens.
3. Select **Check Now** to start the process. A new page showing the progress of the disk check opens.

Do not interrupt power to the system during the disk check.



4. When the disk check is complete, the main page returns and a summary is shown.



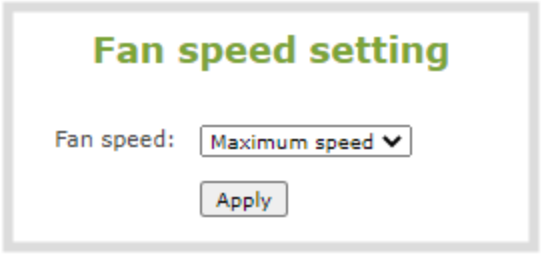
Adjust the fan speed

You can adjust the internal fan speed using the Admin panel. The fan speed is set to maximum by default. We recommend leaving the fan speed at the maximum setting.

Do not operate Pearl-2 at the reduced fan speed for long periods when device temperature is elevated. Lowering the fan speed could reduce the reliability of the equipment.

Adjust the fan speed using the Admin panel

1. Login to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Configuration menu, click **Maintenance** . The maintenance page opens.
3. Under **Fan speed setting**, select either **Maximum speed** or **Reduced speed** and click **Apply**.



Troubleshooting

Pearl devices have easy-to-use diagnostic tools to test connectivity status, check upload/download bandwidth, traceroute, and more to help you troubleshoot your Pearl device. You can also fine tune channel settings such as frame rate, resolution and bitrate to ensure optimal use of resources while streaming a quality video and fine tune the video input sources.

Topics include:

- Diagnostic tools
- Run diagnostic tests using the Admin panel
- Run diagnostic tests using the device screen
- Troubleshooting Quick Reference
- Remove black bars (matte) from the video
- Use a specific EDID for the video input port
- Unstretch the output video
- Remove the combing effect on images

It's good practice to backup your configuration settings so that you can revert back to a good configuration if the changes you made are not desirable, see Configuration presets .

If your problems persist, there are more resources, including contact information, at Epiphan Support.

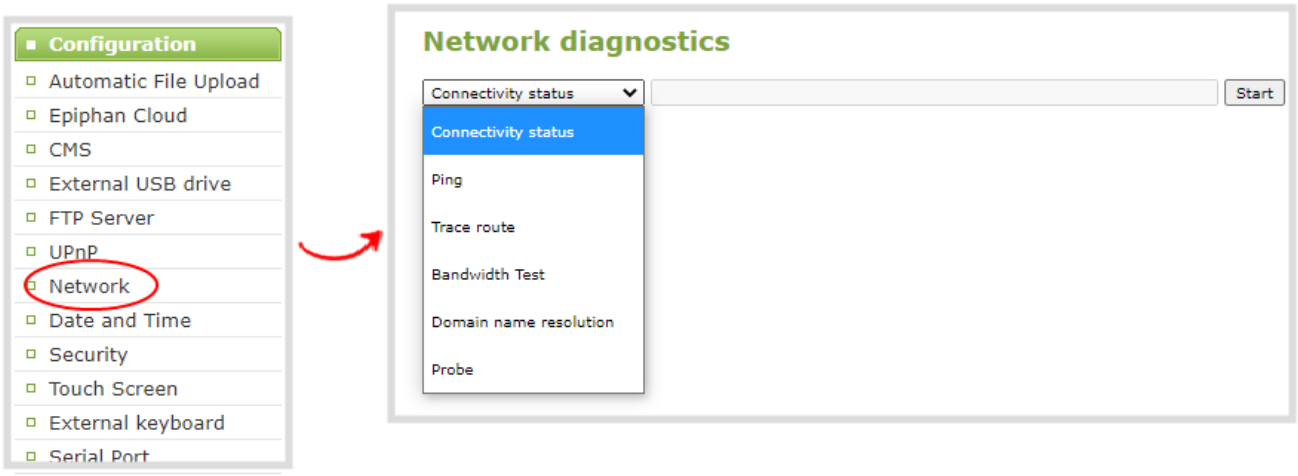
Diagnostic tools

Diagnostic tools are available to help you troubleshoot your Pearl device setup and network connection. You can run them from the touch screen on Pearl-2 or using the Admin panel.

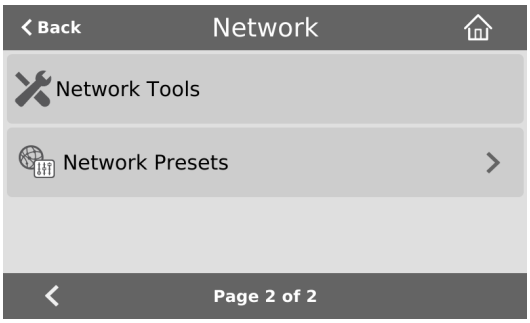
Available diagnostic tools:

- **Connectivity status**: Display the status of critical network connections and features like 802.1x, see Connectivity status results.
- **Ping**: Test if the Pearl device can reach a specified destination server on the network. Not all networks support ping.
- **Trace route**: Trace the route that packet traffic takes to get from Pearl device to a specified destination server on the network. Not all networks support traceroute.
- **Bandwidth test**: Display the available upload and download bandwidth speed in Mbps.
- **Domain name resolution**: Confirm that the domain name of the DNS server configured on Pearl device is resolvable.
- **Probe**: Check if a network port is open on the network side.

Using the Admin UI, diagnostic tools are accessed from the Configuration menu when you select **Network**. To learn how, see Run diagnostic tests using the Admin panel.



Using the touch screen, the diagnostic tools are accessed when you tap **Settings > Network** and select **Connectivity Status**. More diagnostic tools are found on the second page under **Network Tools**. To learn how, see Run diagnostic tests using the device screen.



The following table describes what the colored icons in the results indicate.

Table 75 Diagnostic test result icons

Icon	Description
	The diagnostic test result is okay. This can also mean that a specific feature is enabled on Pearl-2.
	The feature or option is disabled on Pearl-2.
	The diagnostic test result is not okay. An error was detected.

Connectivity status results

The following table describes the Connectivity status diagnostics results shown on the touch screen and the Admin panel.

Table 76 Connectivity status diagnostics results

Diagnostic	Description
Ethernet cable	Check if an Ethernet cable is detected and connected to the LAN.
802.1x	Report the status of 802.1x negotiation and if the feature is disabled on Pearl-2. Status results include: disabled, authenticated, in progress, and failed.
DNS	Check if Pearl-2 can resolve host names with their associated IP address using the DNS server that is configured for Pearl-2. For information about setting a DNS server IP address for Pearl-2, see Configure a static IP address.
Captive portal	Check for connectivity issues caused by a Captive portal. An **okay** result can indicate several conditions: • No captive portal is detected and Pearl-2 can successfully reach the Internet. • A captive portal is detected and Pearl-2 can successfully reach the public Internet.
Internet	Check if Pearl-2 is connected to the Internet by sending a ping to IP address 8.8.8.8 on the Internet.
HTTP (port 80)	Check if traffic can be sent and received over the network using HTTP port 80.
HTTPS (port 443)	Check if traffic can be sent and received over the network using HTTPS port 443.
Support server	Check if the connection to the Epiphan support server is enabled and if enabled, confirm that Pearl-2 can establish communication with the server. A successful connection is required to use the Epiphan Edge remote login feature.
Epiphan Edge™	Check if the Epiphan Edge remote management feature is disabled on Pearl-2 and if Pearl-2 can successfully connect to Epiphan Edge.
Public IP	Display the public IP address of this Pearl-2. Knowing the public IP address is useful when configuring SRT on Pearl-

Diagnostic	Description
	2, especially if Pearl-2 is behind a NAT on the network. An empty result means the IP address was not reported.

When you run Connectivity status diagnostics using the Admin panel, additional networking information about Pearl-2 is displayed.

- MAC address
- IP address
- Network mask
- Default gateway
- DNS servers
- mDNS

Run diagnostic tests using the Admin panel

Using the Admin panel, you can access useful diagnostic tools from the Configuration menu when you select **Network**.

Available diagnostic tools:

- **Connectivity status**: Display the status of critical network connections and features like 802.1x, see Connectivity status results.
- **Ping**: Test if the Pearl device can reach a specified destination server on the network. Not all networks support ping.
- **Trace route**: Trace the route that packet traffic takes to get from the Pearl device to a specified destination server on the network. Not all networks support traceroute.
- **Bandwidth test**: Display the available upload and download bandwidth speed in Mbps up to a maximum bandwidth of 1000 Mbps.
- **Domain name resolution**: Confirm that the Pearl device can resolve a Fully Qualified Domain Name (FQDN) using the DNS server that is configured for the Pearl device.
- **Probe**: Check if the Pearl device can establish communication to a specific port on a network host using a network protocol that you specify. Supported network protocols are: TCP, HTTP, HTTPS, RTSP, RTMP, and RTMPS.

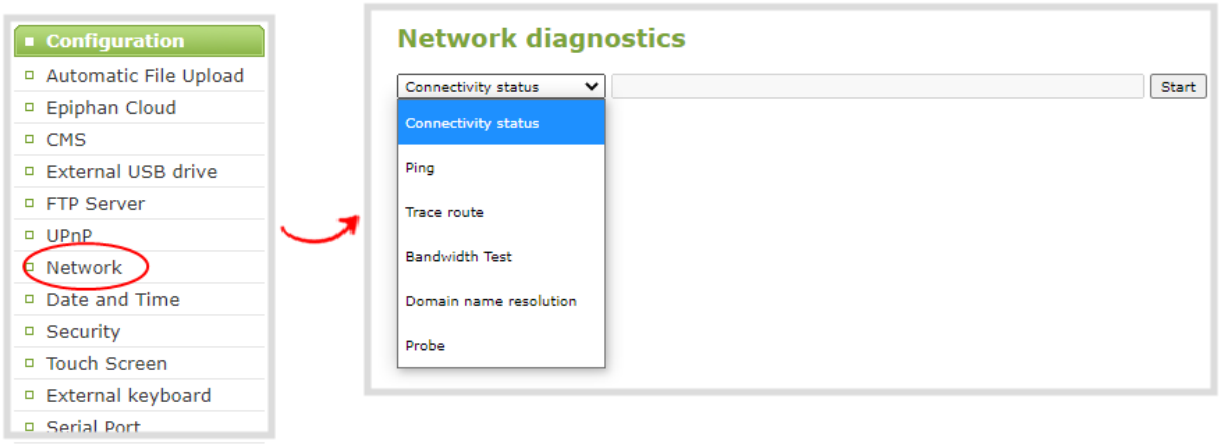
To troubleshoot networking issues yourself, try to ping the IP address of your Pearl device or do a traceroute to a server such as 8.8.8.8. If you are unable to resolve your networking issues, contact your network administrator and provide them the IP address and MAC address of your Pearl device or contact Epiphan support.

For more information about diagnostic tools and test results, see Diagnostic tools.

Run diagnostics using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.

2. From the Configuration menu, select **Network**. The Network configuration page opens.



3. In the **Network diagnostics** section, select the diagnostic test to run from drop down.
   a. If **Connectivity status** is selected, the results display after you click **Start**.
   b. If **Ping** is selected, enter the destination server IP address or domain name before clicking **Start**.
   c. If **Trace route** is selected, enter the destination server IP address or domain name to routetrace before clicking **Start**.
   d. If **Bandwidth test** is selected, the measured upload and download bandwidth displays after you click **Start**.
   e. If **Domain name resolution** is selected, enter the IP address or server name to resolve before clicking **Start**.
   f. If **Probe** is selected, choose the transport protocol from the drop-down menu and then enter the destination server IP address or server name along with the port before clicking **Start**. For example, enter: *10.100.10.1:1234* or *domain.example.com:1234*
4. Click **Start**.

Run diagnostic tests using the device screen

You can access useful diagnostic tools from the device screen when you select **Settings > Network** and select **Connectivity Status**. The Pearl-2 and Pearl Mini have additional diagnostic tools found on the second page under **Network Tools**.

Available diagnostic tools for all Pearl devices:

- **Connectivity status**: Display the status of critical network connections and features like 802.1x, see Run diagnostic tests using the device screen.

Available diagnostic tools on Pearl Mini and Pearl-2

- **Ping**: Test if the Pearl device can reach a specified destination server on the network. Not all networks support ping.

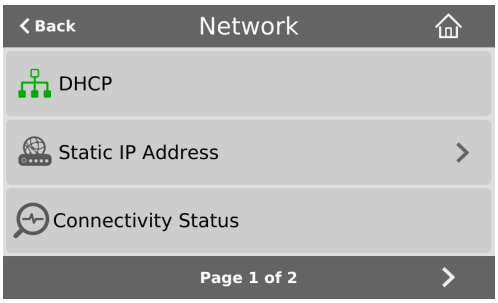
- **Trace route**: Trace the route that packet traffic takes to get from the Pearl device to a specified destination server on the network. Not all networks support traceroute.
- **Bandwidth test**: Display the available upload and download bandwidth speed in Mbps up to a maximum bandwidth of 1000 Mbps.
- **Domain name resolution**: Confirm that the Pearl device can resolve a Fully Qualified Domain Name (FQDN) using the DNS server that is configured for the Pearl device.
- **Probe**: Check if Pearl device can establish communication to a specific port on a network host using a network protocol that you specify. Supported network protocols are: TCP, HTTP, HTTPS, RTSP, RTMP, and RTMPS.

To troubleshoot networking issues yourself, try to ping the IP address of your Pearl device or do a traceroute to a server such as 8.8.8.8. If you are unable to resolve your networking issues, contact your network administrator and provide them the IP address and MAC address of your Pearl device or contact Epiphan support.

For more information about diagnostic tools and test results, see Diagnostic tools.

Run diagnostics

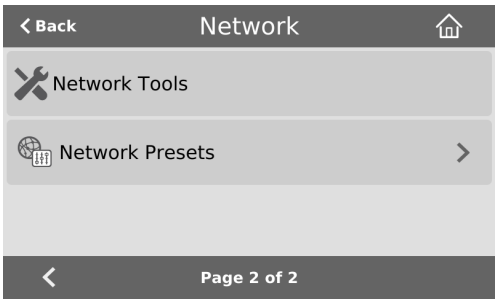
1. Tap the **gear** icon to open the System settings screen. If the control icons aren't showing, tap anywhere on the touch screen. If you are using the Pearl Nano, navigate to the Settings screen.
2. Select **Network**. The Network settings page opens.



3. To run the connectivity status diagnostics, select **Connectivity status** and then select **Start** on the Connectivity status screen.

Use Network Tools on Pearl-2 or Pearl Mini

1. To run other diagnostic tools, tap the chevron icon in the bottom right of the screen to go to the second page of network options, and then tap **Network Tools**.



2. Do one of the following:
    a. If **Ping** is selected, enter the destination server IP address or domain name in the empty field.
    b. If **Trace route** is selected, enter the destination server IP address or domain name to routetrace in the empty field.
    c. If **Bandwidth test** is selected, the measured upload and download bandwidth displays after you click **Start**.
    d. If **Domain name resolution** is selected, enter the IP address or server name to resolve in the empty field.
    e. If **Probe** is selected, choose the transport protocol from the drop-down menu and then enter the destination server IP address or server name along with the port in the empty field. For example, enter: *10.100.10.1:1234* or *domain.example.com:1234*
3. Tap **Start**.

Troubleshooting Quick Reference

Use the follow quick reference table for help if you are experiencing problems or unexpected behavior from your Pearl device.

Table 77 Troubleshooting Quick Reference

Problem	Action(s) to Resolve
4K features not working	The most likely problem is that the 4K Feature add-on is not activated. You can lean more about activating this feature here: 4K
Not sure if the connected video inputs are being captured.	Check each source's input from the source preview in the Admin panel. OR Check the touchscreen interface to view confidence monitoring for each channel, see About the touch screen. OR Check the Dashboard interface in Epiphan Live, see Monitor video and audio input sources using Epiphan Live.
No sound is coming from an audio source.	Verify that you are using the correct audio input by following the steps in Configure encoding. OR Check the touchscreen interface for audio monitoring or use the 3.5 mm headphone jack on the front panel of Pearl-2 to verify audio, see About the touch screen. OR Check the audio meter from the Dashboard view in Epiphan Live, see Monitor video and audio input sources using Epiphan Live.
Captured SDI audio contains audible "clicking" sound or other audio distortions upon playback.	Ensure audio sample rate is set to 48 kHz. Lower sample rates (i.e. 32 kHz and 44 kHz) can sometimes cause audio distortion.
When previewing a channel using the Live broadcast link or the preview link in the Admin panel, some web browsers do not play audio.	The Flash (FLV) plugin must be installed for your web browser to play back audio that's encoded as PCM. Web browsers that use Flash players to preview video do not support audio that's encoded using 48 kHz MP3 or 48 kHz PCM.
All my input names don't look normal in the Admin panel menu after I applied the default preset	Refresh your browser to clear the cache and restore the proper input names displayed in the Admin panel.

Problem	Action(s) to Resolve
Time stamps between Pearl-2 and an RTSP source are not synchronized.	Reconnect your RTSP source to reset desynchronized time stamps. Verify that you are using a local NTP server on your Pearl-2 as a time synchronization server for your RTSP source, see Configure a time server.
Pearl-2 doesn't show up as an NDI source	Ensure Pearl-2 is connected to the network and that the network discovery port 5557 on Pearl-2 is enabled, see Disable the network discovery port.
My NDI source keeps connecting & disconnecting.	The timecode sent from the source may not be stable. Set the Ignore timecode parameter for the connected NDI source, see Connect an NDI source.
My NDI source won't connect.	The NDI source may not send a timecode. Set the Ignore timecode parameter for the connected NDI source, see Connect an NDI source.
My NDI source isn't detected.	Pearl-2 supports different versions of NDI and NDI|HX depending on the firmware version. There may be an incompatibility between Pearl-2 and your NDI source. Contact Epiphan support to determine which version of NDI and NDI|HX your Pearl-2 currently supports. Then check with the manufacturer of your device to see which version of NDI or NDI|HX it supports. Some NDI|HX devices using version HX 1 may use non-standard discovery protocols and you may need to use other mechanisms to discover their existence, such as manually adding the IP address or using an NDI Discovery Server if the device supports that.
Too much noise is present in the audio output.	Check the input level of the audio source to make sure it's the correct level. Modify the input **gain** if necessary, see Adjust audio gain and delay.
Video playback is fine, but when I play the clip in Adobe Premiere Pro the audio and video are out of sync.	Adobe Premiere Pro has a known issue handling video that is recorded using a variable frame rate. Convert the clip to a constant frame rate using a third-party software, such as Handbrake, before editing in Adobe Premiere Pro.
Adobe Premiere Pro won't load my .mp4 recording from Pearl-2.	Check if the selected recording format in Pearl-2 is MP4-Fragmented. Adobe Premiere Pro does not currently support fragmented .mp4 files. Before editing in Adobe Premiere Pro, convert the clip to progressive .mp4 format. Run the file through ffmpeg or a third-party software such as Handbrake to preserve both audio and video output.
I can't preview my channels using the Epiphan Live Dashboard on Chrome even after I updated the security certificate for	Some versions of Chrome and Microsoft Edge don't display channel previews from the Dashboard if you're on an HTTPs network and your website has an insecure or invalid security

Problem	Action(s) to Resolve
my website	certificate, even after you update the security certificate. Use a different web browser such as Firefox or update the version of your web browser, then add the security certificate for the website to the exceptions list.
Image quality is poor or insufficient.	The following tips can help improve image quality: 1. Ensure the source resolution is used as the output or recorded resolution. Up-scaling and down-scaling can affect picture quality. 2. Increase the **Bitrate** value and/or decrease the **Limit frame rate** value in the Encoding menu. See Configure encoding.
Frames per second are lower than expected.	The following tips can help improve frames per second (fps): 1. Increase **the Limit frame rate** value and/or decrease the **Bitrate** value in the Encoding menu. See Configure encoding. 2. Reduce the number of actions happening simultaneously on the system (i.e. if streaming, recording, and copying files, consider waiting to copy files until after streaming and recording are complete). 3. Enter a low negative value (i.e. -5) in the Frame Grabber's Vertical Shift field. 4. Reduce the number of channels encoding data. 5. Ensure the hardware-accelerated H.264 encoding preset is chosen for all channels.
Stream won't play in my media player or browser.	Verify that the Stream Type matches with the media player used and that you have the correct url or SDP file for the player. See Share a live broadcast stream (HTTP, HTTPS, or RTSP) and Streaming to a media player or smart TV. If you still cannot see the stream, try disabling your local computer firewall. If the issue is still not resolved, contact Epiphan Support at support@epiphan.com.
The stream interrupts or the image breaks up.	The following tips can help diagnose image problems: 1. Ensure the source resolution is used as the output or recorded resolution. Up-scaling and down-scaling can affect picture quality. See Configure encoding.

Problem	Action(s) to Resolve
	2. Increase the **Bitrate** value and/or decrease the **Limit frame rate** value in the Encoding menu. See Configure encoding. 3. Check network settings including filters, routers and application settings. Packet loss can result in stream failure.
The video streamed to my set-top box is dropping frames.	If you're streaming to set-top boxes that have 10/100 Mbps interfaces on the same Gigabit Ethernet and you notice frames are dropping, you can limit the bandwidth of the stream using traffic shaping to adapt for lower bandwidth set-top boxes and prevent frame drops, see Set up traffic shaping.
Recording won't start.	If recording will not start, check the Disk Status Information to see if the system is out of storage space. See Check internal storage space and Manage recorded files.
AFU to my CIFS server doesn't work.	Pearl-2 supports Automatic File Transfer (AFU) to CIFS servers (also known as SMB or samba) with samba version 1.
Firmware upgrade fails.	Reboot the system and try again. If the problem persists, contact Epiphan support at support@epiphan.com.
Certain Media players won't play encoded videos but others will.	Depending on the media player used, there could be different issues. If you encounter a playback issue, try using a different media player. Some issues we know of include: 1. On Windows 10, the Movies & TV app sometimes fails to playback MP4-fragmented files with MP3 audio: try changing your MP4 audio encoding to AAC. 2. VLC doesn't play MP4-fragmented files normally. 3. Streams and recordings at very low frame rates (e.g. 1 fps) are not playable in VLC media player, use Windows Media Player and Quicktime Player instead.
Certain Media players won't play MOV videos.	Some media players won't play MOV videos that are recorded with MP3 audio encoding, including: 1. VLC 2.2.4 (Microsoft Windows) if MP3 audio encoding is at 48 kbps. 2. Movies & TV 10.16122.1029 on Windows 10. 3. Windows Media Player 12. Choose a different audio encoding when recording MOV files or use a different media player to playback the recording. The MOV file type on Pearl also has a time limit of 13h15m,

Problem	Action(s) to Resolve
	exceeding this limit will render the file unplayable.
There's no audio when I playback an MP4 file in QuickTime 10.	Apple doesn't support MP3 audio. If your MP4 file is created with MP3 audio, you will not hear the audio during playback in QuickTime 10. Choose a different audio encoding when recording MP4 files or use a different media player to playback the recording.
I can't hear the audio in VLC or the video won't play.	VLC version 3.0.3 won't play audio for MP4 fragmented files. In VLC's Input/Codecs settings page, you can try increasing the file caching parameter. VLC version 3.0.6 (windows) won't play MP4 fragmented video files. This is a VLC issue.
Ubuntu not recognizing attached monitor.	Legacy Ubuntu systems have poor support for HDMI 2.0, and does not recognize a monitor being plugged into Pearl-2 unless the monitor is plugged into Pearl-2 before the system is turned on.
Feature add-on purchase/activation not working.	Currently, Pearl-2 requires internet access to activate new add-ons. If the system has internet access, ensure that there is no firewall preventing access to license.epiphan.com, Port 443.
In Epiphan Live, sources are sometimes invisible in the preview panel.	This can occur if the image is too large for the panel. Check the size of the source, and ensure that constraints are applied to each corner of the layout.
Video output port is configured to display 4K video, but the video is not appearing on is configured to display working, but not appearing on the connected 4K monitor.	Not all AOC brand monitors are compatible with HDMI 1.4 output. Check the brand of your monitor and attempt on different display.
There's noticeable latency on the video output port.	Disabling the audio on the video output port improves latency for the port, see Disable or enable audio and output port volume.
System is not starting up correctly.	Ensure there is no USB stick inserted into a USB port during power up. A potential conflict with the internal hard drive could cause unexpected behavior.
I can't register my Pearl-2 with Kaltura using the same device name that I just deregistered.	If you deregister Pearl-2 from Kaltura and then too quickly register again using the same name, you may receive the following error message "Unable to register device: System name [*MyPearl*] already exists". To avoid this, ensure the deregistered Pearl-2 entry in the list of encoder devices disappears before registering again using the same device name.
My login attempt to create an ad hoc event	Kaltura or Panopto has denied you access to create unscheduled

Problem	Action(s) to Resolve
from Pearl-2 was denied.	ad hoc recordings and webcasts using Pearl-2. Contact your CMS administrator to either activate your CMS account or enable the necessary access rights.
Web camera is not working correctly.	There are several possible causes of poor performance on web cameras: • The camera itself might be malfunctioning. Try hooking it into a computer to see if the problem remains. • If the picture quality is below standard, try adjusting the settings using the instructions for how to Configure a video input source • Check that your web camera is on our list of supported models. If it is not, try using a supported camera, and if the problem persists, contact our support team.

Remove black bars (matte) from the video

A channel with only one layout and only one source by default uses the aspect ratio of the video input source when the output is streamed. If the input video signal doesn't match the encoded frame aspect ratio of the channel, bars are added to the sides or top and bottom of the encoded stream when the output is streamed and recorded.

If you see bars on your output but would rather have the image fill the whole screen, you can:

1. Change the output frame size to match the aspect ratio of the video source at the input, see Match output frame size with aspect ratio of input signal.
2. Stretch the image to fit the output frame size aspect ratio, see Stretch the image.

The color of the bars (matte) is defined by the Background color that is selected using the custom layout editor for the channel, see Custom layout configuration.

For example:

- Input signal resolution is 720×480 (a 3:2 aspect ratio)
- encoded resolution is 640×480 (a 4:3 aspect ratio that is narrower than the input resolution)

Borders are added to the top and bottom of the image to preserve the wider ratio of the input.

For example:

- Input signal resolution is 720×480 (a 3:2 aspect ratio)
- encoded resolution is 1280×800 (a 16:10 aspect ratio that is wider than the input resolution)

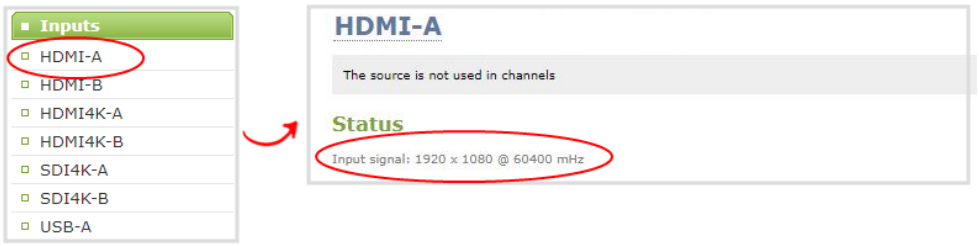
Borders are added to the left and right of the image to preserve the narrower ratio of the input.

Match output frame size with aspect ratio of input signal

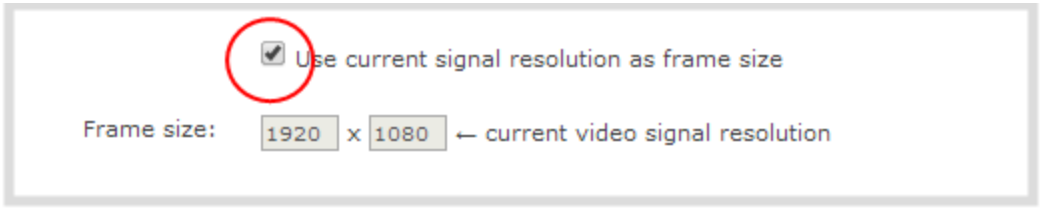
The output frame size is automatically matched only for a layout that has one source. If you have layouts with different frame sizes, switching them while live streaming will cause an interruption and restart of the stream. The same thing happens if you change the resolution of your source while streaming. You can change the output frame size on channels to match the aspect ratio of the video source to avoid this problem.

Change the output frame size of a channel to match the aspect ratio of the video source using the Admin panel

1. Connect to the Admin panel and login as **admin**, see Connect to the Admin panel.
2. To determine the input port name of the video source that's used in the channel, select the channel from the Channels menu and click **Layouts**. The custom layout page opens.
3. Once you have determined the name of the video input source , select the input port for that video source under Inputs menu.



4. Make note of the input signal resolution.
5. From the Channels menu, click **Encoding** for the channel. The Encoding page opens.
6. You can either check **Use current signal resolution as frame size** or you can choose the frame size resolution from the list.
   a. If the source resolution appears in the list, you can choose any resolution that's listed on the same line (i.e. with the same aspect ratio).
   b. If the source resolution doesn't appear in the list, calculate the source resolution and enter it in the **Frame size** fields.



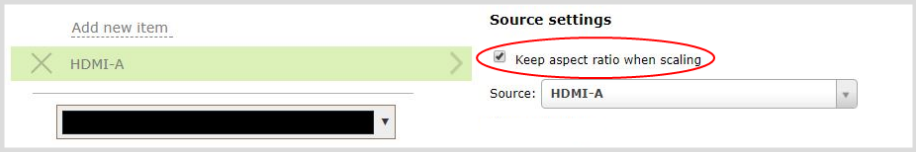
TIP: Temporarily check **Use current signal resolution as frame size** to see the frame size listed in the Frame size fields, then uncheck that check box and manually enter the value in the **Frame size** fields.

7. Click **Apply**.

Stretch the image

You can remove the matte (black bars) by stretching the image to fit your output frame size using the custom layout editor.

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Channels menu, select the channel and click **Layouts**. The custom layout editor page opens.
3. In the layouts list, select the row for the layout you want.
4. In the items list below the layout editing area, select the video source. The video source settings appear.
5. Uncheck **Keep aspect ratio when scaling**.



6. In the layout editing area, click and drag to stretch the video source to fill the frame.
7. Click **Save**.

Use a specific EDID for the video input port

Extended display identification data (EDID) is data provided by a video display device, like a monitor. The EDID describes the display's capabilities to a video source, such as the graphics card in a PC or other video output device.

In the Pearl device, the video source uses the EDID information to determine what resolutions, color depth, and other settings the monitor supports.

EDID is crucial for DVI sources.

The video input ports on the Pearl device have a factory set EDID. When you connect a video source such as a laptop or camera to the Pearl device, the video source sees the Pearl device as if it were a monitor. The EDID that's assigned to the input port is read by the video source to determine what video signal it needs to send to the Pearl device.

Usually, the video input ports on the Pearl device correctly emulate a monitor for the connected video source. However, there are times when you may need to upload a custom EDID, like when your source uses a custom set of display properties.

When you upload a custom EDID to an input port on the Pearl device, you can force the port to supply a specific resolution, color depth, etc to the connected video source.

Upload a new EDID

In most cases, the factory installed default EDID works fine for sources connected to the HDMI ports on the Pearl device. However, there may be times when a connected video source uses resolutions that you do not want to use. In that case, you can manually upload an EDID and force the Pearl device to use a specific set of attributes for a specific HDMI input port. All video sources you connect to that HDMI input port will use the EDID you've manually assigned to the port.

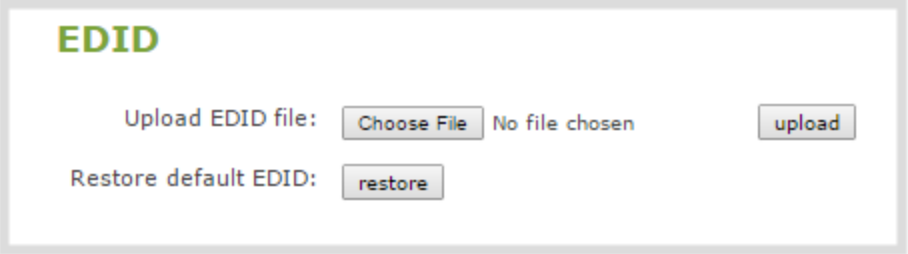
EDID changes remain in effect for the HDMI input port until you replace the EDID with another one or specifically choose to restore the factory EDID for that specific HDMI input port. A system-level factory reset does not remove a manually assigned EDID from the HDMI port.

To get a new EDID, contact Epiphan Support. When you have the new EDID, you can upload that using the Admin panel.

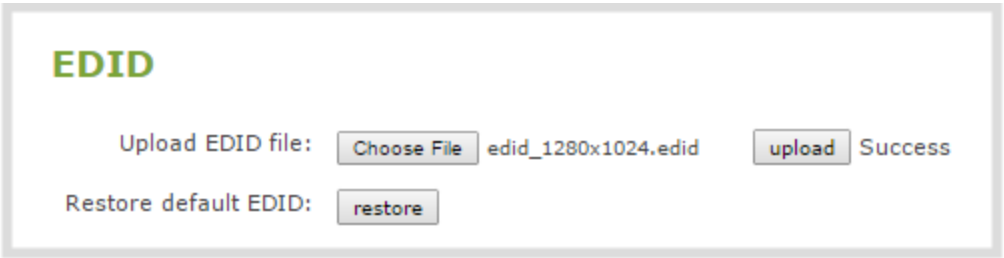
This feature is not available using the local console on the Pearl Nano.

Upload a new EDID file using the Admin panel

1. Connect to the Admin panel and log in as **admin**. See Connect to the Admin panel
2. From the Inputs menu, select the input port for which you want to upload the EDID.
3. On the configuration page for that source, scroll to the **EDID upload** section and click **Choose File**.



4. Browse to the location where the custom EDID file was saved and select it, then click **open**.
5. Select **upload**. When the upload is complete, the page updates to reflect success or failure.

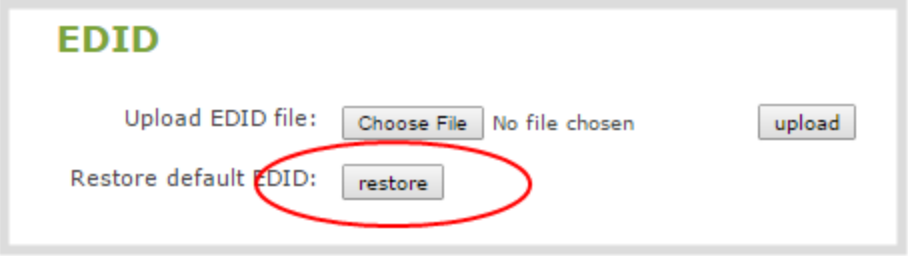


Restore factory default EDID

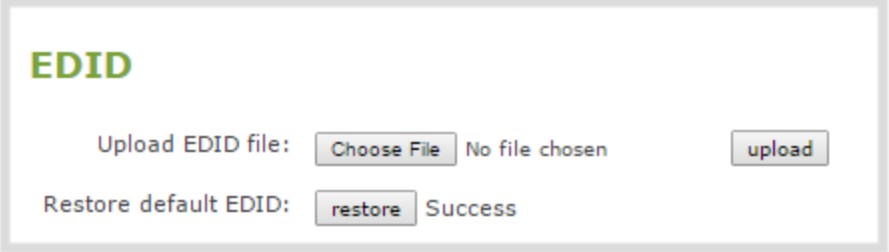
When you no longer want a custom EDID assigned to an input port, you can restore the input port to use the factory default EDID. Currently there is no way to tell if your input port is using a custom EDID. If you are unsure, restoring to factory default is the best approach.

Restore the default EDID using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
2. From the Inputs menu, select the source you want to restore. The source configuration page opens.
3. Scroll to the **EDID** section and select **restore**.



4. When the default EDID is applied, the page updates to reflect success or failure.



Unstretch the output video

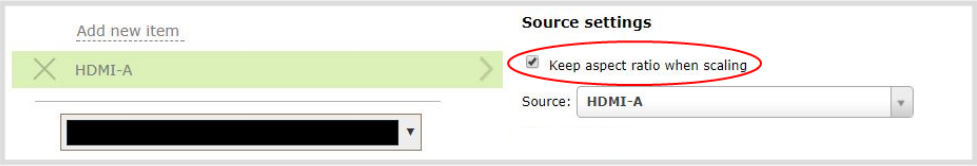
Pearl-2 preserves the aspect ratio of your input video signal by default when you add the source to a layout using the custom layout editor. If you've changed the default setting, the image is stretched to match the output frame size.

To prevent the image from looking stretched, you can use the custom layout editor to preserve the video source's aspect ratio.

Unstretching the image causes a matte (black bars) to appear on the sides or top and bottom of the output. To remove these see **Remove black bars (matte) from the video**.

Unstretch the output video to preserve the video source's aspect ratio using the Admin panel

1. Connect to the Admin panel and login as **admin**. See Connect to the Admin panel.
2. From the Channels menu, select a channel and click **Layouts**. The custom layout editor page opens.
3. In the layouts list, select the row for the layout you want.
4. In the items list below the layout editing area, select the video source. The video source settings appear.
5. Check **Keep aspect ratio when scaling** and click **Save**.



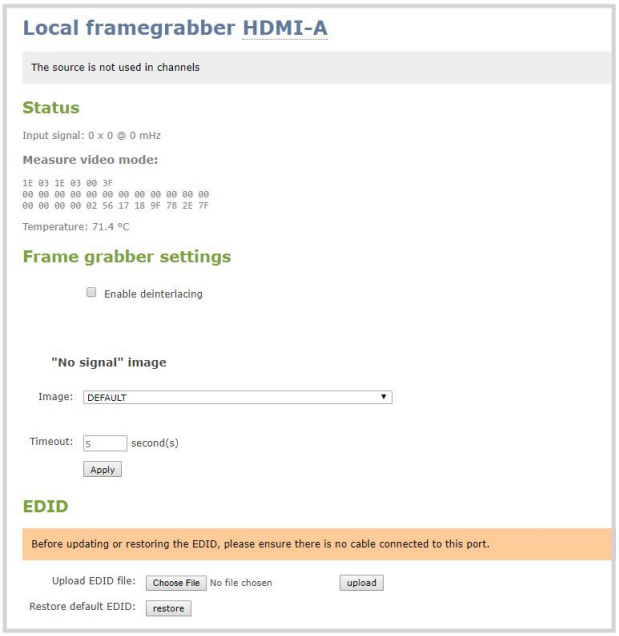
Remove the combing effect on images

When frames are interlaced, artifacts from one frame may appear on the next frame. This happens when a fast motion video is interlaced.

Since each frame is captured from a different point in time, the action captured in one frame is carried over to the next frame. The result is a blurred image and horizontal lines running across the video.

Convert an interlaced source signal to a non-interlaced signal using the Admin panel

1. Log in to the Admin panel as **admin**, see Connect to the Admin panel.
3. From the Inputs menu, click the source name. The configuration page for the source opens.



4. Check **Enable deinterlace** and click **Apply**.

External keyboard shortcuts

You can use keyboard shortcuts with an external USB keyboard that is connected to Pearl-2. For information about connecting a USB keyboard, see Connect an external keyboard.

Table 78 Keyboard shortcuts available for the different screens

Item	Description
Channel View	
Left arrow	Show the previous channel on screen.
Right arrow	Show the next channel on screen.
1 to 9	Enter the channel's index number to show that channel on screen.
shift+F	Enter full screen and toggle show/hide on-screen items like the status bar.
shift+G	Open the Grid view.
shift+S	Open the live switcher.
shift+E	Open the Content Management System (CMS) events screen.
shift+C	Create a new ad hoc event.
shift+P	Open the settings.
shift+R	Start recording the channel and toggle start/stop recording.
shift+T	Start streaming the channel and toggle start/stop streaming.
shift+I	Open the system information screen.
Grid View	
1 to 9	Enter the channel's index number to show that channel on screen.
shift+E	Open the Content Management System (CMS) events screen.
shift+C	Create a new ad hoc event.
shift+P	Open the settings.
shift+I	Open the system information screen.

Item	Description
Events screen	
shift+C	Create a new ad hoc event.
shift+S	Start/stop the current event.
Enter	When it is the last text field on a screen, press Enter to move to next screen (if available) or start an action on the current screen.
Space bar	Initiate a button action, accept text entered into a text field, and toggle a switch or check box. Select and initiate a control button action when only one button appears on screen. When the last text field on a screen is highlighted, press Space bar to move to the next screen (if available) or start an action on the current screen.
Live switcher	
Left arrow	Select the previous layout in the carousel and load it into the preview panel.
Right arrow	Select the next layout in the carousel and load it into the preview panel.
1 to 9	Enter the layout's index number to select that layout in the carousel and load it into the preview panel.
CTRL+1 to 9	Select and apply the layout.
Space bar	Make the layout that's in the preview panel go Live.
Common to most screens	
Tab	Move to the next input field or control.
shift+Tab	Move to the previous input field or control.
Space bar	Initiate a button action, accept text entered into a text field, and toggle a switch or check box. Select and initiate a control button action when only one button appears on screen. When the last text field on a screen is highlighted, press Space bar to move to the next screen (if available) or start an action on the current screen.
Esc	Cancel unapplied changes on the current screen and return to

Item	Description
	the previous screen.

Limitations and known issues

This section includes known issues or limitations that affect functionality or usability and ways that you can work around these limitations.

Affecting firmware downgrades to 4.5.0 or earlier

Pearl-2 systems that have serial numbers within the following ranges are not backwards compatible with firmware 4.5.0 and earlier.

- Pearl-2 Desktop: TSIC01526 and higher
- Pearl-2 Rackmount: TSJ103024 and higher
- Pearl-2 Rackmount Twin: TSJ103000 and higher

Affecting firmware upgrades to 4.8.1 (or later) with traffic shaping

If traffic shaping is already configured using the Pearl-2 API, observe the following before upgrading to 4.8.1 (or later):

- Traffic shaping that's configured using the API will continue to work after you upgrade the firmware. You can clear traffic shaping for one or more channels using the API at any time.
- If you reconfigure traffic shaping for a channel using the Admin panel after upgrading the firmware, the API can no longer be used to configure traffic shaping for that channel. You must use the Admin panel going forward. The other channels are not affected.
- If you plan to use the Admin panel to configure traffic shaping for easy access and ease of use, you can clear traffic shaping for all channels using the API before you upgrade the firmware or after the upgrade. Keep in mind that you can no longer use the API to clear or configure traffic shaping for any channels that were configured using the Admin panel.

Recommendation: After enabling traffic shaping using the Admin panel, test a multicast stream using the auto traffic shaping settings. If your low bandwidth network device is displaying poor video quality, then manually set the limit bandwidth bitrate according to the bandwidth of your particular network device. See Set up traffic shaping.

Affecting firmware upgrades to 4.17.3 and beyond

All Pearl-2 units manufactured after November 2022 will have a new LCD screen and a new fan that require firmware version 4.17.3 or higher. These Pearl-2 devices cannot be downgraded to previous versions. Similarly, old Pearl-2s whose fans require repair, will have the new model of fan installed. These Pearl-2s also require firmware release 4.17.3 and cannot be downgraded to older firmware versions.

Affecting firmware upgrades to 4.17

- If Pearl power connection is interrupted after a recording has been stopped, but before the Automatic File Upload has finished, Pearl will complete the upload after power has been restored but both the file saved on the Pearl and the file uploaded to the AFU location will be corrupted.
- If you start an event early in YuJa using any Pearl interface and then extend the event, the event appears to extend but ends at the originally scheduled ending time.
- When using the front headphone jack to monitor audio if the touch screen goes dark due to timeout and is then tapped to wake it up sometimes the audio will not return. **Workaround:** Change screens, navigate to a different section of the touch screen and then back to the channel and the audio should resume.

Affecting encoding

- **Limitation**: When Pearl-2 is overloaded, video frames or audio samples can be dropped causing variable frame rate and audio cracks.
  Workaround: Pearl-2 is a powerful system capable of many simultaneous tasks, but like any other computing device, it has finite resources. If this problem is observed, check the CPU load from your system's Info page.

  To reduce system load, do any of the following: disconnect unused video displays from Pearl-2's video output ports, delete unused channels and unused layouts, or reduce the complexity of layouts by scaling at the source instead of having the system scale, or reduce the number of sources in layouts, or reduce the frame size or frame rate for channels displayed on the video output ports. Note that actions performed in the Admin panel and Epiphan Live can increase overhead (such as adding channels/sources to Epiphan Live's Dashboard preview panels), as can switching layouts via Pearl-2's touch screen.
- Configuring very low frame rates such as 1 fps encoding with a high bitrate setting (e.g. 7000 kbps) results in poor video quality.
  Workaround: Allow Pearl-2 to automatically select the best bitrate setting. For 1 fps, this results in a bitrate of about 1180 kbps.
- Some audio distortion is heard on the video output port when the channel encoding is set to1 fps.
  Workaround: For best results, encode the channel at 5 fps or higher.
- Occasionally, a solid black image appears when connecting an AV.io HD capture card to a USB port on Pearl-2.
  Workaround: Reconnecting the capture card resolves the issue and captures the video normally.
- The GoPro camera model HERO7 and some Evertz video distribution systems can suddenly stop working with Pearl-2.
  Workaround: Reset the EDID for the Pearl-2 input. You can also use a device such as an HDMI splitter to isolate and filter the video signal before the signal is sent to Pearl-2.

Affecting streaming and recording

- Interlaced SDI capture is sometimes shifted downwards, resulting in a small green line at the top of the video.
  Workaround: This issue varies with different sources. If it is affecting your capture, the best solution is to crop out the green line in your layout.
- During recording if the touchscreen is used to switch layouts, headphones attached to the audio jack on the front of Pearl-2 sometimes pick up audio crackling and pops during the switching process.
  Workaround: Note that these artifacts do not affect the final recording, only the audio monitoring feature. To avoid the disruption to audio confidence monitoring, use the Pearl-2 Admin Panel or Epiphan Live to switch between layouts.
- AFU to Amazon Web Services S3 Simple Cloud Storage transfer sometimes does not recover after the network connection is cut. The expected behavior is that the file transfer would restart, but there is sometimes a time desync that results in a failed transfer.
  Workaround: If the network connection is severed during a AFU transfer, the process must be restarted from the beginning, and the transfer must proceed without interruptions to the network.
- In the current FTP session, the **FTP Delete** command continues to work even after the **Disable FTP Delete** setting is applied using the Admin panel.
- Occasionally, tracks won't extract from a 64 GB .AVI multi-track recording using the Admin UI.
  Workaround: Perform the extraction again.

Affecting the Admin panel

- It is possible to name two or more channels with the same value. Use of automatic file transfer and UPnP is unpredictable if this occurs.
  Workaround: Ensure each channel has a unique name.

- Cropping a video source to 16:9 using the layout editor may not scale correctly and can appear as a thin line in the layout editor. This happens when the device or web browser you're using with the admin interface has a different approach to composing layout. Recording and streaming are not affected.
  Workaround: Due to color space limitations (YUV with 2x2 subsampling), the cropped region's dimensions must be set to even values.
- The special preview mode that lets you preview all channels at once using a web browser isn't functioning.
  Workaround: Preview individual channels using different tabs in your web browser.
- If you've created more than five channels on Pearl-2, it's possible to select more than the maximum number of five channels supported by Kaltura for scheduled VOD and manual (ad hoc) events. Only the first five channels will list for an event in MediaSpace.
  Workaround: From the **Content management system configuration** page in the Admin panel, choose only up to a maximum of 5 channels and ensure that no other channels are selected.
- NDI connections aren't currently listed on the channel's status page under **Connections**.

Affecting Epiphan Live

- Very fast, repeated switching between layouts using the Switcher interface can sometimes cause the monitoring panels and the preview in the Admin Panel to display an blank screen until the video image finishes loading.
  Workaround: Avoid repeated fast switching between layouts.
- The green and red borders around the "Preview" and "Live" areas in the Channel section are offset from the video by a few pixels.
  Workaround: The offset is cosmetic and does not affect your Live stream, so no workaround is required.
- When a HDMI output assigned to a Dashboard preview panel has its source changed, the preview panel does not automatically update to reflect the change.
  Workaround: Refresh the Epiphan Live Dashboard in your web browser to update any changes in your preview panels.

Affecting video output ports

- Connecting an external monitor to the HDMI 1 port while Pearl-2 is powered on may cause the monitor to not be detected.
  Workaround: Connect an external monitor to the HDMI 1 port before turning on Pearl-2.
- When setting up the video output ports on Pearl-2, the video input source's frame rate as set for the channel is used by default for the video at the output. The **Frame rate** field in the video output port settings does not change the frame rate of the video at the output port or change the frame rate of the connected display device.
  Workaround: Ignore the Frame rate field in the video output port settings.

Affecting USB devices

- For the IPEVO Ziggi-HD Plus web camera, you must enable the power line frequency setting in the web camera before connecting the camera to Pearl-2.
- Audio from an HDMI video source that's coming in on one of the USB ports will occasionally drop some bytes of the audio signal.
  Workaround: Use audio from another source in your layouts.

Affecting CMS integrations

- When configuring the primary channel and audio sources for a Pearl-2 remote recorder in Panopto, choosing a Pearl-2 channel that has no audio as the primary video source without choosing a primary audio source from another channel can cause the remote recorder's preview to not display properly in Panopto.
  Workaround: Choose a primary audio source from one of the other channels.
- If no Pearl-2 channels are selected when setting up the Pearl-2 remote recorder in Panopto, you can still create an ad hoc event using Pearl's Admin panel or touch screen; however, the ad hoc event isn't actually created on Pearl-2 or recorded.
  Workaround: Enable the channels for the Pearl-2 remote recorder in Panopto.
- The hyper linked Panopto name and logo that appears at the top of the login screen when creating an ad hoc event from the touch screen opens a page that cannot be navigated.
  Workaround: Select **Back** in the upper left corner to return to the login screen.
- In multi-view recordings, different Kaltura players (such as the KMC and MediaSpace) can playback audio differently, where the KMC plays audio from the channel selected as the "main entry".
- If you modify a particular recurring lecture capture plus live webcasting event (e.g. a VOD + Live Stream event in a recurring series), Kaltura excludes that event from the recurring series and the webcast doesn't stream. That's because the RMTP URLs for the modified event looses it's mandatory tokens. However, the recurring Kaltura event does record as scheduled and other events in the series are not affected.
  Workarounds: To regenerate the RTMP tokens for a live event, go to MediaSpace, find the modified live event entry and uncheck the Live event checkbox - and save. Then re-check it and save the event again. Alternatively, you can go to the Kaltura Management Console (KMC), find the modified live event entry and then, in the Live stream tab, click **Re-generate Stream Token**.
- On the create new ad hoc event screen, the keyboard shortcut **shift+Tab** does not move to the previous input field or control, but moves to the next input field or control.
  Workaround: Press Tab repeatedly until the field you want is highlighted.
- If a Panopto VOD event is left on pause until the scheduled end time of the event or the event is manually stopped while on pause, a recording of the full duration of the event is uploaded to Panopto instead of only the recording up to the point when the event was paused or stopped. **Workaround**: Unpause the event and then manually Stop the event.

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February 26, 2023

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Important Safety Warnings

Model numbers covered by this document: ESP1442, ESP1474, ESP1556, and ESP1610

Ensure the power cord attached to Pearl-2 is connected to a socket with a ground connection.

WARNING: Risk of explosion if the power supply is replaced by an incorrect type.

WARNING: This product has no user-serviceable parts and the battery used in this device is not replaceable. Do not attempt to disassemble. Return the device for service.

CAUTION, RISK OF ELECTRIC SHOCK: This device may have multiple AC power cords installed. All power sources shall be disconnected before servicing to avoid shock hazard.

ATTENTION: Risque d'explosion si la source de courant est remplacée par un type incorrect.

ATTENTION: Cet appareil ne contient aucun composant pouvant être entretenu ou réparé par l'utilisateur. En cas de panne, retourner l'appareil pour réparation.

ATTENTION, RISQUE DE CHOC ÉLECTRIQUE: Cet appareil peut être équipé de multiples cordons d'alimentation en courant alternatif. Pour placer cet appareil hors tension, débrancher tous les cordons d'alimentation sans exception.

FCC Compliance Statement

47 CFR Section 2.1077 Compliance Information

Unique identifier: Pearl-2

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

Responsible party (US contact):

Epiphan Video
459 Hamilton Avenue, Suite 301
Palo Alto, CA
94301, USA

www.Epiphan.com

FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Innovation, Science and Economic Development Canada:

This device complies with ICES-003 of the ISED rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme à la norme ISED NBM-003 pour les appareils radio agréés. Son fonctionnement est sujet aux deux conditions suivantes:

(1) Le dispositif ne doit pas produire de brouillage préjudiciable, et

(2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

CE Compliance Statement

Marking by the symbol CE indicates compliance of this device with the applicable directives of the European Community and meets or exceeds the following technical standards.

Directive 2014/30/EU - Electromagnetic Compatibility

Directive 2014/35/EU - Low Voltage Directive

Directive 2011/65/EU - RoHS, restriction of the use of certain hazardous substances in electrical and electronic equipment

Warning: Operation of this equipment is not intended for a residential environment and could cause radio interference.

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- Live chat from our support site https://www.epiphan.com/support/
- Phone toll free at 1-877-599-6581 or call +1-613-599-6581

Gather as much information about your problem as you can before you contact us so we can help you better, including:

- A description of the problem
- Details about your video or audio source (type, connection, resolution, refresh rate, etc.)
- Product serial number
- Product firmware version (using the admin interface)
- Product LED lights